

केवल कार्यालयीन उपयोग हेतु
(For Official Use Only)



भारत सरकार GOVERNMENT OF INDIA
रेल मंत्रालय MINISTRY OF RAILWAYS



VANDE BHARAT EXPRESS TRAINSET (V2.0) MAINTENANCE MANUAL

Volume 3 – Part II
Brake System

IRCAMTECH/GWL/2022-23/T-18/MM/2.0
SEPTEMBER, 2022



Indian Railways
Centre for Advanced Maintenance Technology

THIS PAGE IS INTENTIONALLY LEFT BLANK

Content

Content.....	3
Amendment and Revisions	5
Introduction	6

Descriptive Manual

1. Micromesh oil filter - OEF 1-5
2. Check valves with damping - G1, G1 1 / 2 , G3/ 4
3. Safety valves - SV1809, SV1810, SV1811, SV1812
4. Drain valve - EW6
5. Silencers - NW6, NW12
6. Magnet valve - WMV-01/1NZG
7. Test fitting - T2-TS
8. Pressure governor - MCS4, MCS11, MCSN11
9. Ball-cock with a switch module and with or without an exhaust - SK-DN, SM
10. Pressure sensors with a current output - DG10, DG10-B, DG10-S
11. General Servicing Instructions - ESRA
12. Check valve - RV19-T
13. Ball-cock with an exhaust and a switch module - SK-T-DN..E-SM, SK-T-DN..E-SM-K
14. Impulse valve - WIMHV5-NT
15. Double check valve - DRV7-T
16. Filter - FIL100
17. Ball-cock with an exhaust - SK-T-DN..E, SK-T-DN..E-K
18. Pressure reducing valve - DMV15/T
19. Distributor valve - STV200
20. Mean pressure valve - MDV1, MDV1-T
21. Brake pads UIC KRS Standard sintered
22. Brake caliper units - RZTS, RZTM
23. Wheel-mounted brake disc with keyed plug centering
24. Anti Skid Valve - GV12-3, GV12-3S
25. Air Filter - LF7-T, LF7-TF, LF7-TFF
26. Over-Flow Valve without Reflux - DR07-T
27. Piston valve - WKV1-T
28. Air Suspension Leveling Valve
29. Tyfon - MKT

Overhauling Manual

30. Check valves with damping - G3/4" , G1" , G1 1 / 2"
31. Silencer - NW6, NW12
32. Magnet valve - WMV-01/1NZG
33. Check valve - RV19-T
34. Ball-cock with an exhaust and switch module - SK-T-DN..E-SM,
35. SK-T-DN..E-SM-K

36. Impulse valve - WIMHV5-NT
37. Double check valve - DRV7-T
38. Air filter - FIL100
39. Pressure reducing valve - DMV15/T
40. Distributor valve - STV200
41. Piston valve - WKV1-T
42. Mean pressure valve - MDV1
43. Ball-cock with an exhaust - SK-T-DN..E, SK-T-DN..E-K
44. Magnet valves - WMV1-ZEST
45. Drivers Brake Valve - FB11, FB11-1
46. Magnet Valve - WMV- 20/2Z
47. Ball-cocks with or without an exhaust - SK-DN
48. Magnet Valve - WMV-20/2ZG, WMV-20/2ZE , WMV-20/2ZES
49. Display pressure gauge - PG-80D
50. Wheel-slide valve - GV12-3, GV12-3S
51. Air filter - LF7-T, LF7-TF, LF7-TFF
52. Over flow valve without reflux - DR07-T
53. Leveling Valves - SV1205
54. Tyfon - MKT75, MKTH75
55. Motor Compressor Set - V10-T
56. Check Valve - RV7-T

Amendment and Revisions

The correction slips to be issued in future for this report will be numbered as follows:

RCAMTECH/GWL/2022-23/T-18/MM/2.0# XX date

Where “XX” is the serial number of the concerned correction slip (starting from 01 onwards).

Version	Date	Corrections	Remarks
1.0	AUGUST 2020	First Release	For first and second rake of the VBE trainset manufactured by ICF.
2.0	SEPTEMBER 2022	Second Release	For 44 rakes of VBE trainset (Third rake onwards).



All rights reserved. This book or any portion thereof may not be reproduced or used in any manner whatsoever without authorization from Indian Railways.

All technical information and guidelines are latest at the time of publishing and are subjected to change due to technology updates and requirements.

Introduction

This volume of the maintenance manual contains maintenance/ operational/ installation related document from various OEM associated with different system and components of Trainset. For ease of understanding and for simplification the document, this volume has been divided into 5 parts to divide the large document for ease of download and navigation. These are:

PART - 1

- Bogie
- Couplers

PART - 2

- Electro-Pneumatic Brakes and Air Supply

PART - 3

- Furnishing Items
- Passenger Amenities

PART - 4

- Propulsion System

PART - 5

- Train Lighting & Air-conditioning

.....
.....
B - L E 7 0 . 2 1

Rev. 15 - 08.05.2018 - en
.....

.....
Description

Micromesh oil filter
OEF 1-5
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
14	18.12.2015	Revision history inserted		x				
		2.1, 4.2, 4.3, 5.1.2, 5.2.2, 6.2.2	x	x				
15	08.05.2018	2.1	x					
		3.1, 4.1, 5.1.2, 5.2.2, 6, 6.2, 6.2.1, 6.2.2, 7.2					x	x



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group of this documentation	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	10
3.1	Validity	10
3.2	Proper usage of the product	10
3.3	Operator's commitment to due care	11
3.3.1	Assignment of personnel	11
3.3.2	Availability of the document	11
3.3.3	Amendments to the document	11
3.3.4	Spares and wearing parts	11
4	Technical description	12
4.1	Technical features	12
4.2	Construction	13
4.3	Working principle	16
5	Removal and installation	17
5.1	Installation	17
5.1.1	Requirements	18
5.1.2	Procedure	18
5.1.3	Leakage testing	19
5.1.4	Function test	19
5.2	Removal	20
5.2.1	Requirements	20
5.2.2	Procedure	20



6	Maintenance	22
6.1	Inspection	22
6.2	Servicing	23
6.2.1	Venting and discharging the oil precipitate	23
6.2.1.1	Interval	23
6.2.1.2	Special tools	23
6.2.1.3	Implementation	23
6.2.2	Changing the filter element	24
6.2.2.1	Special tools	24
6.2.2.2	Implementation	24
6.3	Repair	24
6.4	Overhaul	24
7	Troubleshooting	25
7.1	Special tools	25
7.2	Implementation	25
8	Disposal	27



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group of this documentation

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

The related installation drawing specific to each item number must be consulted.

Item number	Type	Number of the installation drawing	
I98554	OEF 1	C52521	
I98554/X61, I98554/X77, I98554/X91, I98554/X168, I98554/X166		C103988/X	
I98554/X144, I98554/X193, I98554/X196, I98554/X173		C141473/X	
I98554/X177		C147456/X	
I98554/Z		C52521/Z	
II33466/..		Basis: C68851 versions: ..	
II35635/..		Basis: C72136 versions: ..	
II43400/..		Basis: C107398 versions: see accompanying documentation	
II57392/..		Basis: C113682 versions: see accompanying documentation	
II43401/..		Basis: C84996 versions: ..	
II56448..		Basis: C112191 versions: ..	
II63305		C126881	
II14251/..		OEF 2	Basis: C53739 versions: see accompanying documentation
II44934/..., II57339/..			Basis: C86940 versions: see accompanying documentation
II17208/..	Basis: C57644 versions: ..		
II17209/..	Basis: C57645 versions: see accompanying documentation		
II17209/WCML	C57645/WCML		
II17848	C58455/JRE		
II46255/..	Basis: C89942 versions: ..		
II59566/..	C118544/X		
II99026	C198319		



Item number	Type	Number of the installation drawing
I99670/..	OEF 3	Basis: C52818 versions: ..
I99671		C52818
II44325/..		Basis: C107640 versions: ..
II44327/..		Basis: C85772 versions: ..
II14252/..	OEF 4	Basis: C53740 versions: ..
II70871	OEF 5	C141508



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate or is engraved on the unit. The item number and type designation must match the validity note stated in this document.

This document is valid for units with item numbers/type designations:

see Table, Section 2.1

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

Micromesh oil filters are used to extract the residual amounts of oil left in compressed air. They are located in the compressed air piping downstream of the air dryer unit.

Oil consumption by a compressor depends very much on the oil properties (mineral oil or synthetic oil, viscosity at operating temperature, vapour pressure behaviour) and on service conditions (ambient and operating temperatures, oil temperature, volumetric intake, duty cycle, frequency of startup).

A large proportion of the oil leaving the compressor (oil consumption) is extracted by the oil separator in the air dryer unit. Nevertheless, residual oil quantities are still entrained to the pneumatic system, especially at high oil temperatures. They are precipitated at cool places where flow is sluggish and problems can occur after lengthy periods of operation. However, such difficulties can be avoided if an additional OEF micromesh oil filter is installed downstream of the air dryer unit.

4.1 Technical features

The micromesh oil filter is rated for a maximum working pressure of 16 bar. The maximum acceptable operating temperature is 60°C. The next table indicates the maximum volumetric flow, the pipe threads for the system interfaces, and means of fastening.

Type	Max. volumetric flow l/min* (8 bar, 20°C)	System interface (pipe threads)**	Optional fastening	
			Through-holes	Thread/Helicoil insert***
OEF 1	1185	ISO 228-G1/2	8.3 mm	EGM8 / AM8x16 A2
OEF 2	2825	ISO 228-G1	13 mm	-
OEF 3	4425	ISO 228-G1 1/2	13 mm	-
OEF 4	6590	ISO 228-G1 1/2	13 mm	-
OEF 5	355	ISO 228-G1/4	-	EGM6

* In case of working pressures and operating temperatures other than above, please contact your KNORR-BREMSE Rail Service for the maximum values applicable in your case.

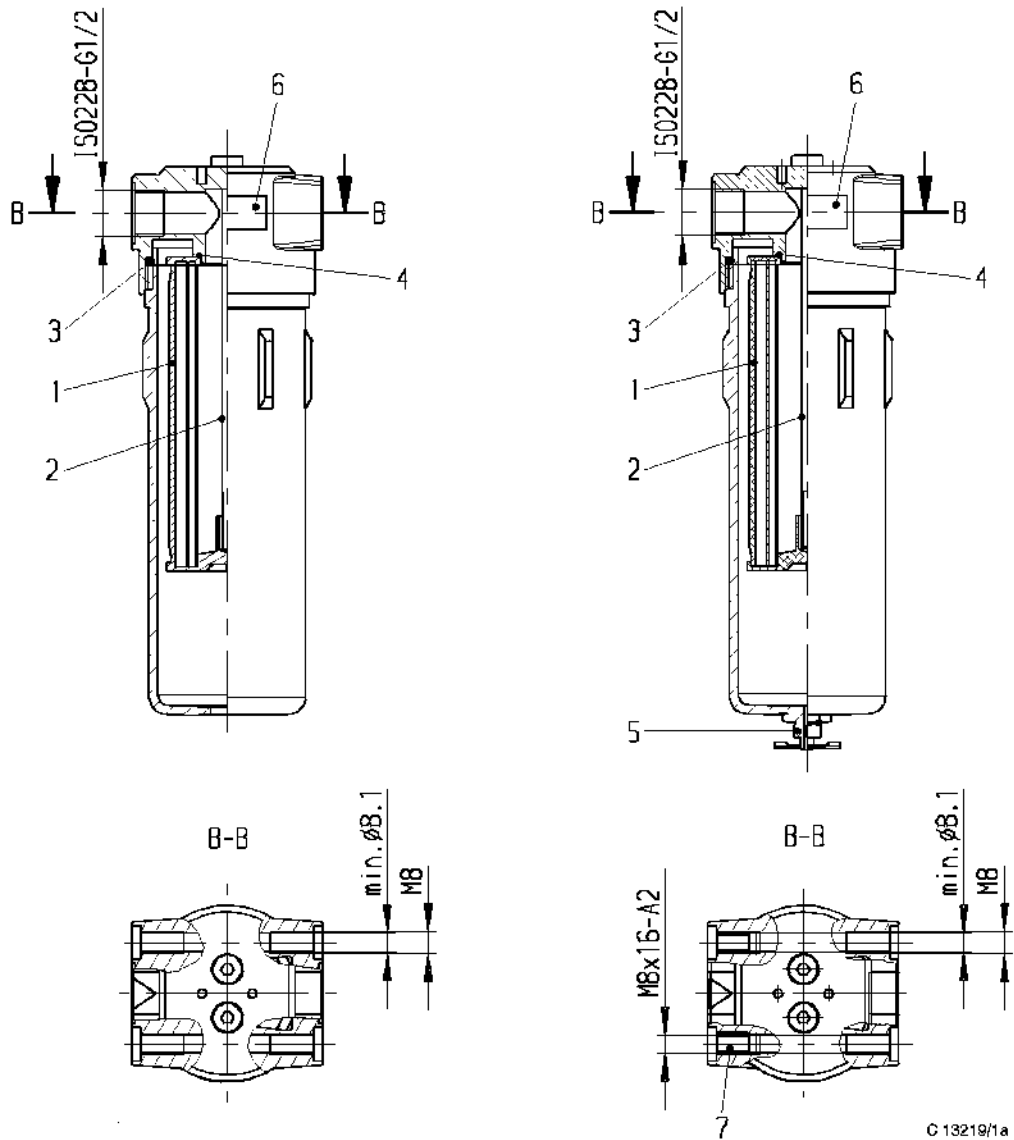
** Suitable fittings (or reducers) can be added to provide further interfaces.

*** Integrated Helicoil inserts (special series) can be supplied additionally as fasteners.



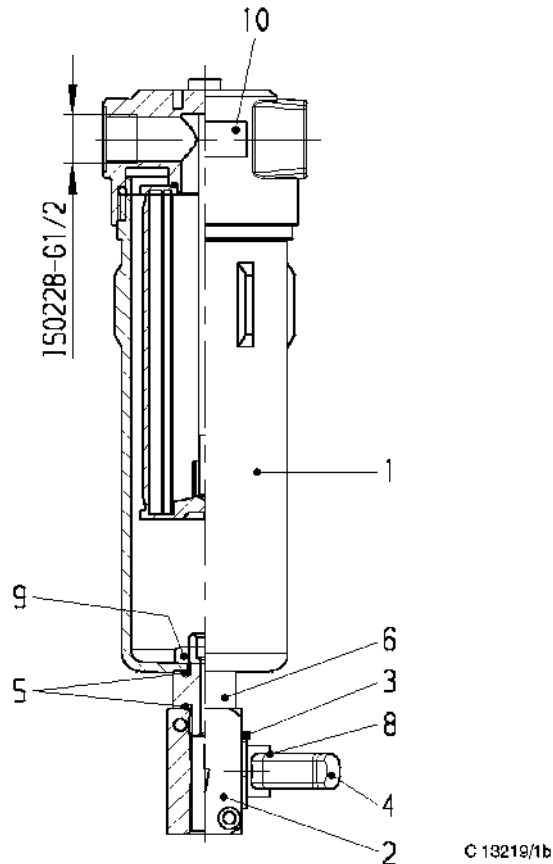
4.2 Construction

Figure 1 and Figure 2 show the main constructive versions (without regard to the chosen colour or sizes).



- | | | | |
|---|----------------|---|-----------------|
| 1 | Filter element | 5 | Hand drain |
| 2 | Threaded rod | 6 | Plate |
| 3 | O-ring | 7 | Threaded insert |
| 4 | O-ring | | |

Figure 1 Constructive versions of the micromesh oil filter



- | | | | |
|---|----------------------|----|----------------|
| 1 | Micromesh oil filter | 6 | Screwed union |
| 2 | Isolating cock | 8 | Retaining ring |
| 3 | Stop disc | 9 | Hexagon nut |
| 4 | Handle | 10 | Plate |
| 5 | O-ring | | |

Figure 2 Constructive versions of the micromesh oil filter (continued)
(see above for filter element (1), threaded rod (2) and O-rings (3, 4))

The following versions are basically available:

- with a hand drain / without a hand drain / with a cock drain; several different cock drains are possible
- fastening by through-holes, with threads for Helicoil inserts / fastening by integral Helicoil inserts; possible at inlet/outlet ends
- optional mounting parts (fittings; not shown here)



The unit is distinguished by the following features:

■ Housing

The aluminium housing is rated for a maximum working pressure of 16 bar (gauge). Sufficient corrosion protection is provided by polyester-based powder coating (as standard), though polyurethane-based wet painting is also possible. The upper and lower parts of the filter are joined together by trapezoid threads. In addition, the head of the filter offers various means of fastening (see section 4.2 Figure 1 Figure 2).



NOTE

The gauge pressure in contrast to normal atmospheric pressure of approx. 1 bar will be labelled with bar (gauge).

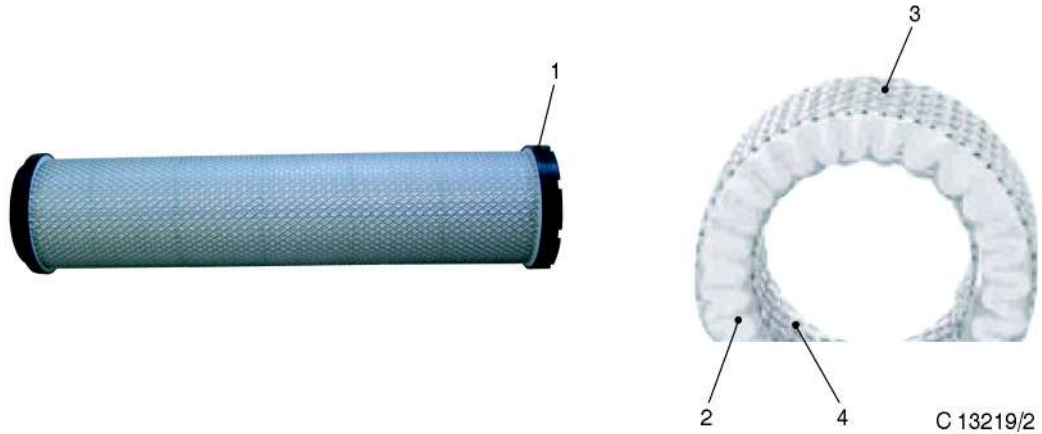
■ Filter element

The filter element is screwed to a threaded rod located in the centre of the housing (filter head), and is self-sealed by its end caps (Figure 3). The filter element contains an extremely deep fibreglass bed (Figure 3), combined with a high proportion of hollow space. This means higher throughput rates and lower differential pressures. The special filter material permits the drainage layer to be directly integrated into the prefolded fleece fabric. This arrangement minimizes the disadvantages of using a foam jacket as a drainage layer (unstable temperature response, loss of particles, separating effects). On the other hand, the filter element is distinguished by a large filter area, its extra capacity to absorb dirt, an excellent service life and a low differential pressure.

■ Drainage device

As shown in Figure 1 and Figure 2, there are three different devices for draining off the oil by hand:

- by a drain cock - when the cock handle is swivelled (90°); wing nut
- by a hand drain (when the wing nut is loosened)
- by a suitable drain fixture attached by customers (at their own responsibility)



- | | | | |
|---|--------------------------------|---|-------------------------------|
| 1 | End caps of plastic | 3 | Outer steel supporting jacket |
| 2 | Borosilicate fibre glass layer | 4 | Inner steel supporting jacket |

Figure 3 Filter element (overall view, sectional view)

4.3 Working principle

Oil aerosol particles and solid impurities are removed to a degree of 1 micron. The residual oil content is not more than 0.1 mg/m^3 relative to 20°C and 7 bar (gauge). The solid particles are held in the filter fabric, whereas the very fine droplets of liquid are merged by attraction to form larger drops which are then carried down by gravity through the integrated drainage layer as a film of liquid collecting in the lower part of the housing. The steel supporting cylinders (3, 4; Figure 3), which are made to fit the fibre-glass material on the inside and outside, make the filter medium sufficiently stable. Microfibres cannot exit the sandwich, not even under severe pressure fluctuations.



NOTE

The gauge pressure in contrast to normal atmospheric pressure of approx. 1 bar will be labelled with bar (gauge).



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

5.1.2 Procedure

see Figure 1, Figure 2



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the housing securely with a suitable tool, such as an open-end wrench.

Direct pipe mounting in combination with suitable (screw) fittings:

OEF 1 is the only version that allows the filter element to be directly integrated into the pipework through (screw) fittings. Larger filter versions must be fastened additionally at the usual mounting points (Figure 1/ Figure 2). The dead weight that has to be accounted for is the reason for this measure.

- Screw the screw fittings into the filter head (making sure that suitable sealing is provided).
- Attach the succeeding pipe fittings and fix them by locking.

Direct pipe mounting by means of suitable holders (attached to mounting points):

- Insert machine screws (M12; waisted bolts) in the through-holes (13 mm).
- Fix in place at the mating holder by state-of-the-art fasteners (e.g. locking ring, nut (preferably self-locking)).
- OEF 1 only: Insert machine screws (M8; neck-down bolts) in the through-holes (8.3 mm) or Helicoil inserts. Additional fastening will not be needed if the threaded inserts are used.
- OEF 5 only: Insert machine screws (M6; waisted bolts) in the mounting-holes.
- For ongoing procedure, see "Direct pipe mounting by suitable (screw) fittings)".



5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.

- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Hot surfaces and hot oil!

Beware of burns and scalding.

Allow the surfaces to cool down, and wear protective gloves.



WARNING

Pneumatic system is under high pressure!

Particles flung outwards will, for instance, cause severe eye injuries.

Observe the safety regulations for pneumatic systems.

Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

The oil precipitate must be drained off in good time and surrendered for proper disposal.

5.2.2 Procedure



DANGER

High voltage!

Danger of physical injuries that have fatal consequences.

Before starting work, have the onboard power supply switched off by authorized electricians only, and prevent it from being restored without due authorization.



CAUTION

Beware of removing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To remove the unit, hold the housing securely with a suitable tool, such as an open-end wrench.

Venting and draining (Figure 1Figure 2)



- Put a suitable vessel in place before starting to vent and drain the unit.
- Cautiously vent the micromesh oil filter by loosening the hand drain slowly or by switching over/ turning the isolating cock or drain plug.
- Remove the oil precipitate from the unit.
- Continue removing the unit in the reverse sequence to installation.



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

- Arrange for oil disposal in compliance with the regulations.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

The next table contains an overview of the necessary maintenance activities.

Interval*	Maintenance activity	See
Every 300 operating hours or after 3 months at the latest*	Venting and draining off the filtered oil.	Section 6.2.1
Every 3,000 oh or after 2 years at the latest	Change the filter element.**	Section 6.2.2
<p>* 1. According to vehicle operator's project-specific experience. 2. In accordance with project-specific maintenance schedule, if any. This point will be agreed by the customer and KNORR-BREMSE as the need arises. 3. According to KNORR-BREMSE recommendation in the table.</p> <p>** The interval for this maintenance activity must be observed.</p>		

6.1 Inspection

Not required



6.2 Servicing



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.



NOTE

The unit must be switched off and prevented from being switched on again and the air supply must be interrupted before carrying out any maintenance work. Wait for the compressor to come to a standstill.

6.2.1 Venting and discharging the oil precipitate



CAUTION

Hot surfaces!
Danger of burns close to the motor compressor set.
Allow the surfaces to cool down, and wear gloves for protection.

6.2.1.1 Interval

see Table, Section 6

6.2.1.2 Special tools

Not required

6.2.1.3 Implementation

See Section 5.2.2



6.2.2 Changing the filter element



CAUTION

Hot surfaces!

Danger of burns close to the motor compressor set.

Allow the surfaces to cool down, and wear gloves for protection.

6.2.2.1 Special tools

Not required

6.2.2.2 Implementation



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

- Vent and drain the unit (see Section 6.2.1).
- Unscrew the lower housing member.
- Unscrew the filter element (1) from threaded rod (2) by hand (see Figure 1).
- Using Loctite 222 thread sealant (applied in accordance with the maker's direction for use), screw a new filter element onto the threaded rod by hand, and re-assemble the micromesh oil filter in the reverse sequence. Make sure that the O-rings (3, 4) are correctly seated (see Figure 1).

6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

There is no provision for overhauling the unit.



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Implementation



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Problem	Cause	Remedy	See
Oil losses around the micromesh oil filter	Connections leaking	Tighten the connections and test for leakage.	Section 5.1.3
		Remove the micromesh oil filter, exchange the sealing ring and/or bite ring, and install the filter.	Section 5
	Wing nut on the hand drain is loose or cock is leaking	Tighten the wing nut and test for leakage.	Section 5.1.3
	Lower housing member loose	Tighten the lower housing member.	
	O-ring stuck, damaged.	Remove the micromesh oil filter, inspect the O-rings and exchange if necessary, and put back the micromesh oil filter.	Section 5
Amount of oil precipitate much higher than the average value (empirical value according to service conditions)	Possible signs of wear in the compressor (e.g. oil trap)	Test the compressor function; if necessary, ship the unit to KNORR-BREMSE for repair.	



Problem	Cause	Remedy	See
Amount of water and emulsion in the micromesh oil filter is much higher than normal.	Air dryer malfunctioning (electric connections, ratings)	Measure the air dryer dew point. If necessary, have the system analysed by the KNORR-BREMSE sales engineer responsible for your area.	
Amount of oil precipitate much lower than the average value (empirical value according to service conditions)	Filter element damaged, installed incorrectly or leaking	Vent and empty the micromesh oil filter. Unscrew the lower housing member. Check filter seating (end cap sealing) and correct if necessary. Examine the filter element visually for damage. If necessary, exchange the filter element and/or readjust the threaded rod.	Section 6.2.1 Section 6.2.2



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - O F 1 1 . 2 1

Rev. 06 (07/ 2008) -en
.....

.....
Description

Check valves with damping
G1; G1 1/2; G3/4



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright 2008© Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	10
4.2	Construction	10
4.3	Working principle	13
5	Removal and installation	14
5.1	Installation	14
5.1.1	Requirements	15
5.1.2	Procedure	15
5.1.3	Leakage testing	15
5.1.4	Function testing	15
5.2	Removal	16
5.2.1	Requirements	16
5.2.2	Procedure	16



6	Maintenance	17
6.1	Inspection	17
6.1.1	Interval	17
6.1.2	Special tools	17
6.1.3	Procedure	17
6.2	Servicing	17
6.3	Repair	18
6.4	Overhaul	18
6.4.1	Interval	18
7	Troubleshooting	19
7.1	Special tools	19
7.2	Procedure	19
8	Disposal	20



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS trained service technicians who

- have the skill, experience, safety awareness and professional ability:
 - to remove and install the unit,
 - to inspect, maintain and debug the unit,
- have read and understood this document from start to finish, and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are included only for the sake of completeness.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

Related installation drawings specific to a given item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

8.000.0.769.002.7

I47617

8.000.0.769.003.7

8.000.0.769.700.6

8.000.0.769.700.7



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KB SfS parts or KB approved spares or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Technical description

The unit is used specifically in compressed air supply systems where it fits between the compressor and auxiliary reservoir and stops air reflux from the charged auxiliary reservoir when the compressor is idle.

4.1 Technical features

The unit is designed for installation in pneumatic pipeline systems and is rated for the working pressure range from 1+0.5/-0.3 bar to 10 bar. It can be used across a temperature range from -40°C to +200°C.

The direction of flow is indicated by an arrow on the outside of the housing (a).



P1 Port from compressor

P2 Port to auxiliary reservoir

Figure 1 Functional symbol according to DIN ISO 1219-1

4.2 Construction

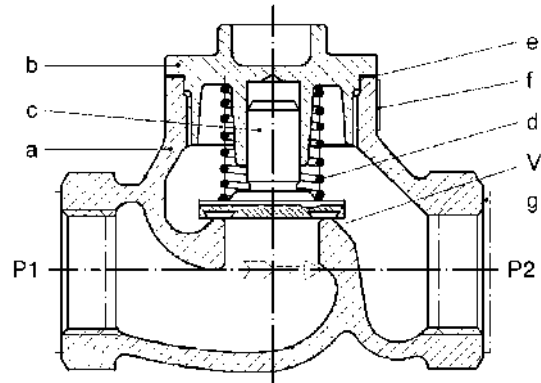
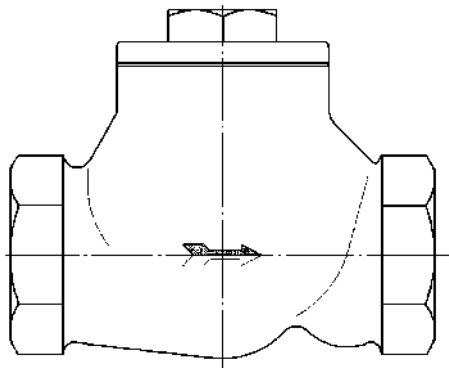
See Figure 2, Figure 3, Figure 4

The damping action cushions the upward and downward strokes of the valve cone (c) in such a way that the pressure surges from the compressor will not cause disturbing noises or premature valve wear.

The seal is a high-temperature, oil-resistant Viton ring that is vulcanized onto the valve cone.

Item number	Pipe thread according to ISO 228-1	Version with a reducing nipple	Version with insulation
8.000.0.769.002.7	G1 1/2	no	no
8.000.0.769.003.7	G1	no	no
8.000.0.769.700.6	G3/4	yes	no
8.000.0.769.700.7	G3/4	yes	yes
I47617	G1	no	no

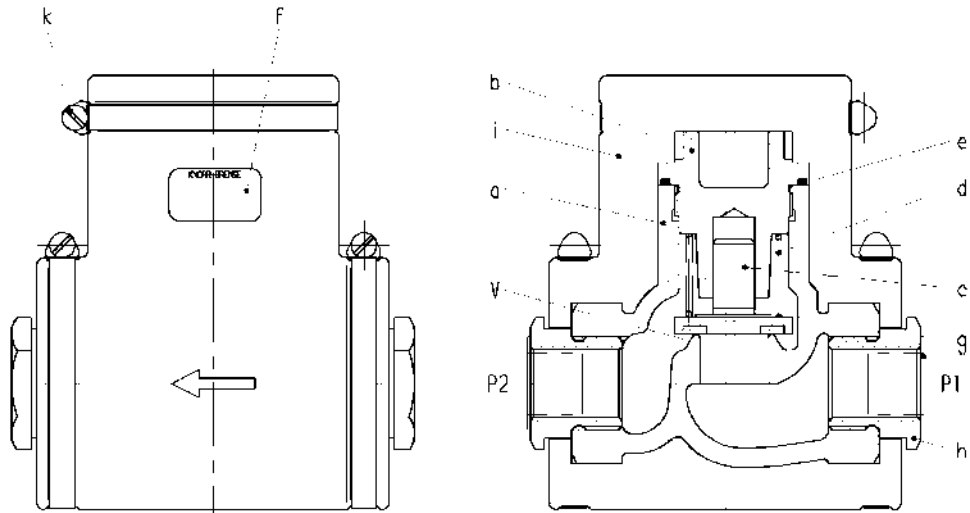
Table 1 Versions of the unit



© 1987:2

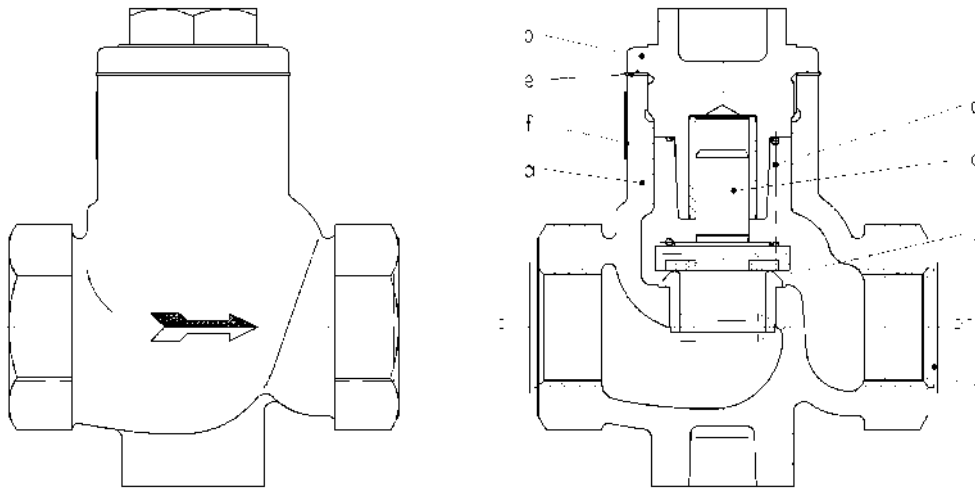
- | | | | |
|----------|--------------------|-----------|-----------------------------|
| a | Housing | f | Name plate |
| b | Screw plug | g | Thread cap |
| c | Valve cone | P1 | Port from compressor |
| d | Compression spring | P2 | Port to auxiliary reservoir |
| e | Sealing ring | V | Valve seat |

Figure 2 Check valve 8.000.0.769.002.7



- | | | | |
|----------|--------------------|-----------|---|
| a | Housing | h | Reducing nipple
(not on 8.000.0.769.003.7) |
| b | Screw plug | i | Insulator (only on 8.000.0.769.700.7) |
| c | Valve cone | k | Hose clamp (only on 8.000.0.769.700.7) |
| d | Compression spring | P1 | Port from compressor |
| e | Sealing ring | P2 | Port to auxiliary reservoir |
| f | Name plate | V | Valve seat |
| g | Thread cap | | |

Figure 3 Check valves 8.000.0.769.003.7, 8.000.0.769.700.6 and 8.000.0.769.700.7



© 191.87 4

- | | | | |
|----------|--------------------|-----------|-----------------------------|
| a | Housing | f | Name plate |
| b | Screw plug | g | Thread cap |
| c | Valve cone | P1 | Port from compressor |
| d | Compression spring | P2 | Port to auxiliary reservoir |
| e | Sealing ring | V | Valve seat |

Figure 4 Check valve I47617

4.3 Working principle

See Figure 2, Figure 3, Figure 4

When air delivery is started, the valve cone (c) is lifted off the valve seat (V) against the force of the spring (d). The guiding shank of the valve cone (c) acts like a piston and compresses the air above its head, because the stream of discharging air is restricted by the annular gap between the screw plug (b) and the shank. The valve cone (c) is hence cushioned on its upward motion and does not strike the screw plug (b) at the end of its stroke.

When the valve cone (c) goes downwards - after the compressor has been turned off - a slight negative pressure is formed in the chamber above the guiding shank. As a result, the valve cone (c) is cushioned again as it is pushed back downwards onto the valve seat (V) by the force of the compression spring (d).

Because its upward and downward motions are cushioned, the valve cone (c) is unable to follow the rapid succession of pressure fluctuations from the compressor and remains suspended at its raised position throughout air delivery.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

Observe the operating restrictions stated in Section 4.1.

Mounting position

- The mounting position corresponds to the illustrations in Figure 2, Figure 3, Figure 4. The unit must be installed in the piping with the screw plug (b) at the top.
- The compressed air delivered by the compressor must flow through the unit in the direction of the arrow.
- Sufficient clearance to unscrew the screw plug (b) must be left above the unit.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

5.1.2 Procedure



CAUTION

Concerning units with reducing nipple (h)!

Beware of installing the unit incorrectly.

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the reducing nipples (h) securely with a suitable tool, such as an open-end wrench.

- Insert the unit in the piping.
- Tighten the pipe fittings to the vehicle builder's specifications.

5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leakage testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, release the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports and connections.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



CAUTION

Concerning units with reducing nipple (h)!
Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the reducing nipples (h) securely with a suitable tool, such as an open-end wrench.

- Turn off the supply of compressed air and vent the (sub)system.
- Unscrew the unit with a suitable tool.
- Plug the ports on the unit and the pipe connections.



6 Maintenance

In general, maintenance at KB SfS is subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental conditions in the area where the vehicles are operated. An interval stated generally for all projects will therefore be of only limited validity.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find together with the customer the optimal maintenance intervals for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

If the unit develops a malfunction that cannot be corrected by the measures described in Section 7.2 please contact a KB SfS Service Center.

6.4 Overhaul

KB SfS gives top priority to safety and quality.

To help fulfil this claim, KB SfS provides an overhauling service for its own units. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

Both the experience and the technical equipment necessary for performing professional overhauls are present in KB SfS Service Centers.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Not enough pressure in the consumer line (port P2)	Supply line shut off	Open up the path between compressor and unit.	Section 5.1.3
	Inadequate air delivery by compressor	Check the compressor.	Section 5.2, 5.1 and 5.1.3
	Unit contaminated or defective	Remove the unit and exchange for an operative one. Submit the internally soiled or defective unit for repair.	Section 5.2
Air reflux through the unit			
Air discharging constantly from pipe unions (P1, P2)	Ports leaking	Tighten the connections (apply the specified tightening torque!) and test for leakage.	Sections 5.1.2 and 5.1.3
Air discharging constantly between housing (a) and reducing nipple (h)	Sealant in the bolted joint is ineffective	Remove the unit and exchange for an operative one. Submit the leaking unit for repair.	Section 5.2
Air discharging constantly from screw plug (b)	Screw plug loose	Tighten the screw plug and then test for leakage.	Section 5.1.3
	Sealing ring and/or O-ring(s) damaged	Remove the seal, arrange for its disposal and exchange for a new one. Then test for leakage.	Section 5.1.3



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KB Sfs units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - O S 1 0 . 2 9

Rev. 00 - 07.05.2015 - en
.....

.....
Description

Safety valves
SV1809, SV1810, SV1811, SV1812



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	11
4.2	Construction	13
4.3	Working principle	17
5	Removal and installation	18
5.1	Installation	18
5.1.1	Requirements	19
5.1.2	Procedure	20
5.1.3	Leakage testing	21
5.2	Removal	22
5.2.1	Requirements	22
5.2.2	Procedure	22



6	Function tests	23
6.1	Discharging air	23
6.1.1	Visual inspection and checking	23
6.1.2	Servicing (prior to discharging air)	24
6.1.3	Procedure	24
6.2	Function test I	26
6.2.1	General	26
6.2.2	Procedure	27
6.3	Function test II	28
6.3.1	General	28
6.3.2	Running function test II	29
7	Maintenance	30
7.1	Inspection	31
7.1.1	Interval	31
7.1.2	Special tools	31
7.1.3	Procedure	31
7.2	Servicing	32
7.3	Repair	32
7.4	Exchange	32
8	Troubleshooting	33
8.1	Special tools	33
8.2	Procedure	33
9	Disposal	34



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD25701 Technical Information Test Instructions

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

II91917/..

II91918/..

II91919/..

II91921/..



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

Safety valves protect the pneumatic units of a compressed air system from unacceptably high pressure and, in this way, prevent the connected units from getting damaged.

4.1 Technical features

The installation drawing contains the technical particulars of the unit.

The unit is distinguished by the following features:

- Versions for different adjustment ranges,
- Quick to exchange
- The safety valves are type-tested normal stroke safety valves. The safety valves satisfy the AD2000 info sheet A2 and A4, the pressure values required correspond to the specifications of DIN EN ISO 4126-1. The standards DIN 3320 and DIN EN 12516 part 2 and part 4 are also applicable.
- Certificate of railworthiness to DIN 5589.
- Certificate of conformity to DGRL 97/23/EC.

Furthermore, when providing security for simple pressure vessels, the requirements of 09/105/EC and EN 286 must be satisfied.

The qualification validated by the component test will be forfeited if the security cap (see Figure 1) is removed.

The safety valve has a manual discharge device by which the movement of the working parts can be checked and dirt deposits ejected from the safety valve.

The dimensions of the safety valves are shown in Figure 2 and Figure 3. Figure 4 and Figure 5 contain the functional symbols representing the safety valve.



Type ¹⁾	Item No. ²⁾	Pipe thread	Height [mm]	Wrench size [mm]	Discharge performance [ltr/min]	Tightening torque T _A [Nm]
SV1809	II91921/ 01105	ISO 228 G 1/2	See installation drawing	See installation drawing	See installation drawing	See installation drawing
SV1810	II91919/ 02105	ISO 228 G 3/4				
SV1811	II91918/ 02105	ISO 228 G 3/4				
SV1812	II91917/ 02105	ISO 228 G 3/4				

1) Type designation - see name plate
2) Full item number:
e.g.:II91917/02 **105** where
02 = code number for G 3/4 thread (see the installation drawing of the safety valve)
01 = code number for G 1/2 thread (see the installation drawing of the safety valve)
105 = pressure setting corresponds to: 10.5 bar (see label)

Table 1 Typical versions



4.2 Construction

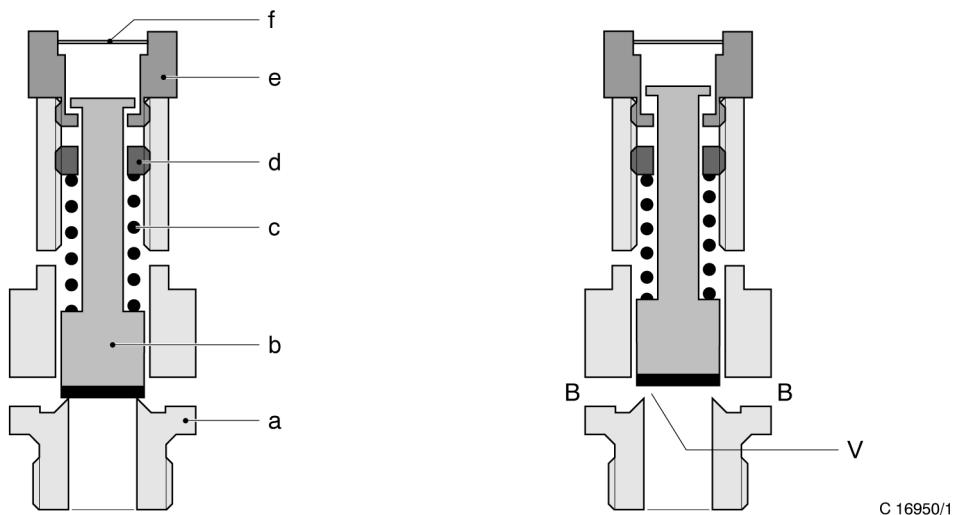
See Figure 1

The valve tappet (b) is loaded by the valve spring (c). This closes the valve seat (V) of the valve body (a).

The compressive force of the spring (c) on the valve tappet (b) is set ex works at the adjusting ring (d).

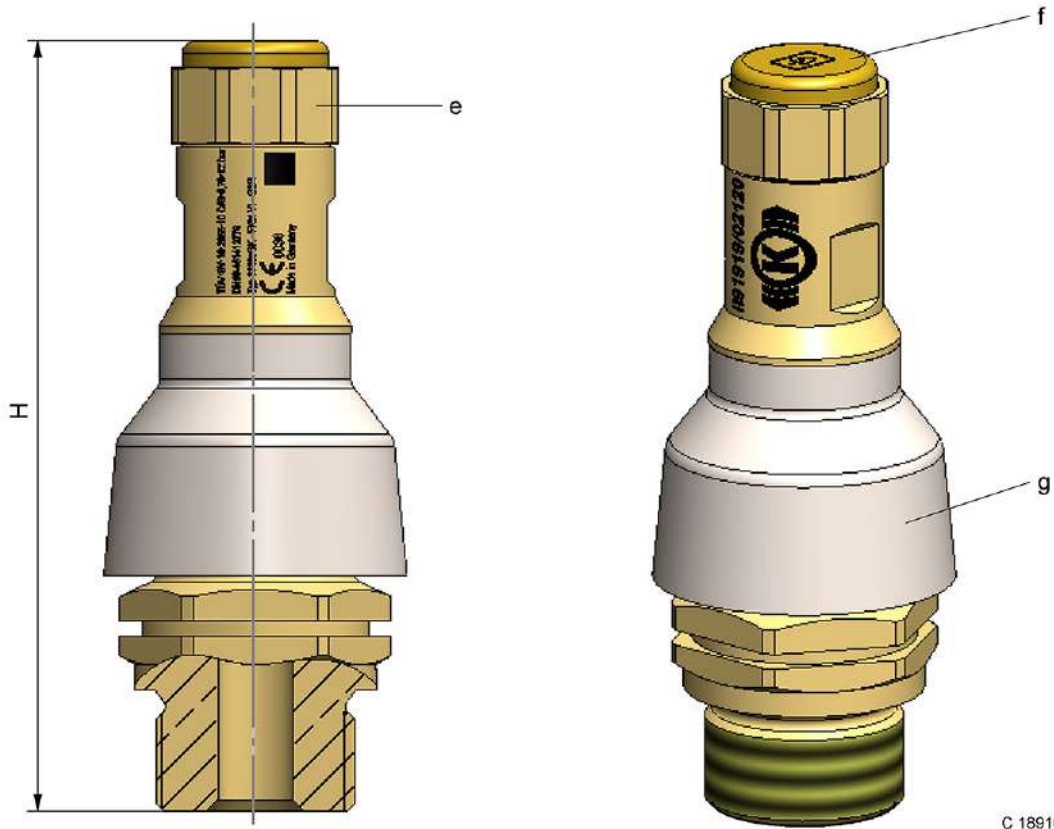
Access to the inside of the valve is blocked by a security cap (f).

Air discharge is achieved via the rotary air discharge (e).



- | | | | |
|----------|----------------|----------|----------------------|
| a | Valve housing | e | Rotary air discharge |
| b | Valve tappet | f | Security cap |
| c | Valve spring | B | Venting hole |
| d | Adjusting ring | V | Valve seat |

Figure 1 Safety valve SV18.. (schematic, closed - open)

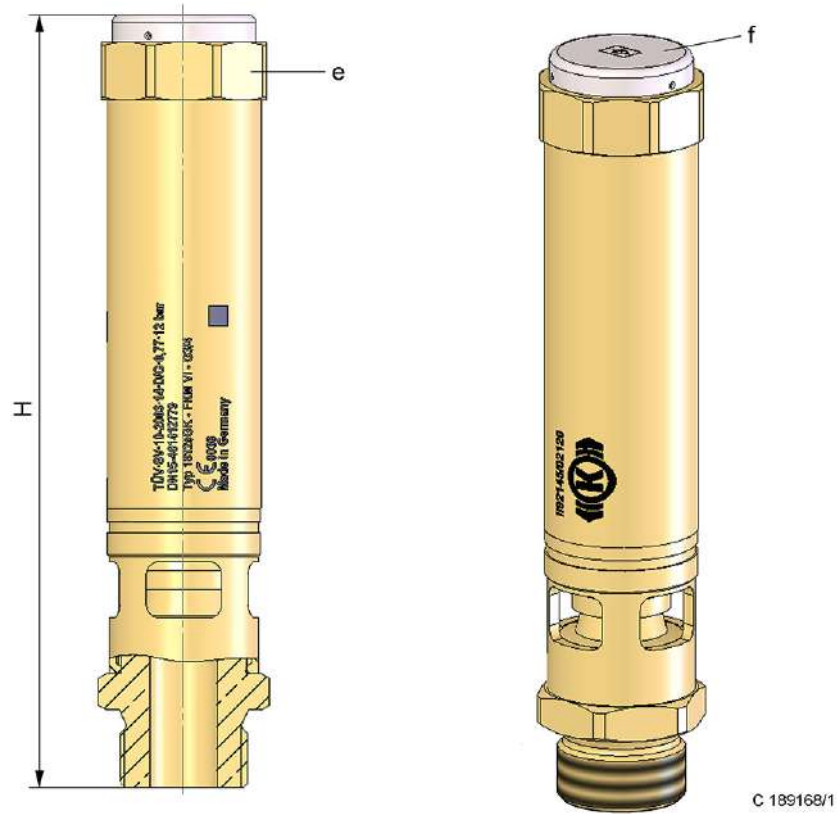


C 189166/1

- e Rotary air discharge
- f Security cap

- H Height
- g Protective hood

Figure 2 Safety valves SV1810 (II91919/..) and SV1809 (II91921/..)
(for differences in height see the installation drawing)



e Rotary air discharge
f Security cap

H Height

Figure 3 Safety valves SV1812 (II91917/..) and SV1811 (II91918/..) (for differences in height see the installation drawing)

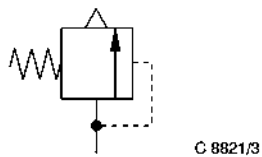


Figure 4 Functional symbol for safety valve according to DIN - ISO 1219

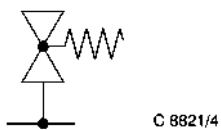
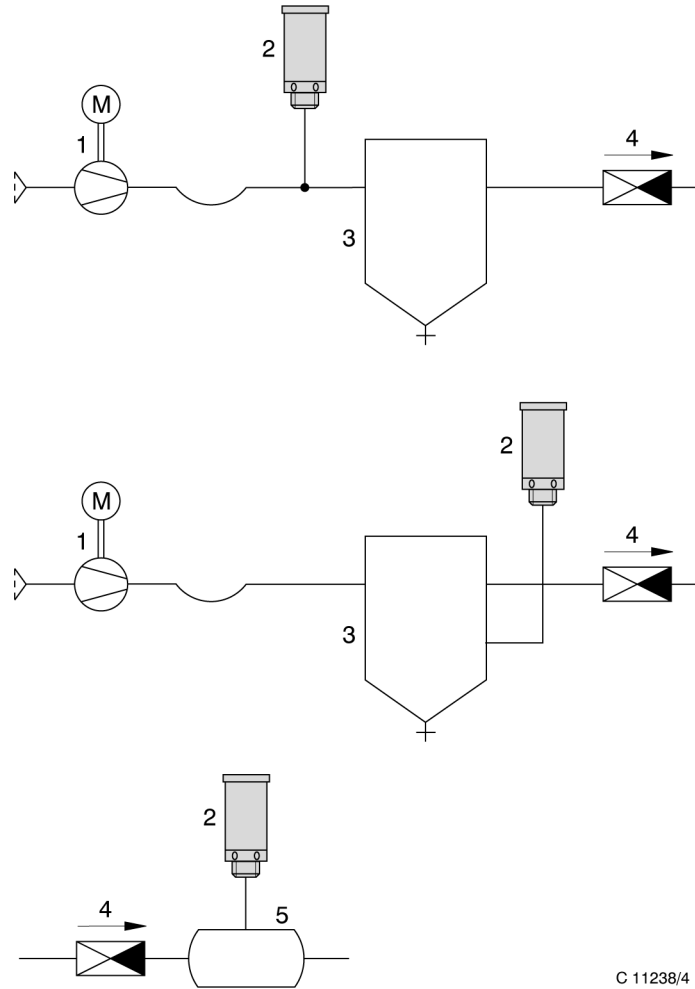


Figure 5 Functional symbol for safety valve according to DIN 5591



C 11238/4

- | | | | |
|---|-------------------------------|---|----------------|
| 1 | Motor compressor set | 4 | Check valve |
| 2 | Safety valve | 5 | Main reservoir |
| 3 | Oil separator/ air dryer unit | | |

Figure 6 Ways of installing the safety valve



4.3 Working principle



WARNING

Pneumatic system is under high pressure.

Deposits or undesired particles in the outlet area may, for instance, cause severe eye injuries as they are ejected.

The safety valve must be fitted so as to avoid any risk of personal injury when air is discharged.

See Figure 1

The valve seat (V) is closed at normal working pressure. When the safe pressure (safety valve setting) is exceeded, the valve tappet (b) is lifted against the force of the valve spring (c) and the excessive pressure is discharged through the exhaust bore (B). The valve seat (V) is closed again as soon as the pressure has been suitably lowered.

The opening pressure of the valve is set ex works at the adjusting ring (d). The valve is protected by the security cap (f) so that its setting cannot be changed without authorisation.

The safety valve has a discharge device by which the movement of the working parts can be checked and dirt deposits ejected from the safety valve. Unscrewing the rotary air discharge (e) (anti-clockwise) lifts up the valve tappet (b) and opens the valve seat V. Dirt deposits are then discharged from the valve together with the air.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



WARNING

Pneumatic system is under high pressure!

Device and/or system functions will fail. Also beware of physical injuries that may have fatal consequences.

Back pressure building up at the outlet side is unacceptable.



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements



WARNING

Pneumatic system is under high pressure!

Deposits or undesired particles in the outlet area may, for instance, cause severe eye injuries as they are ejected.

The safety valve must be fitted so as to avoid any risk of personal injury when air is discharged.



WARNING

Pneumatic system is under high pressure!

Device and/or system functions will fail. Also beware of physical injuries that may have fatal consequences.

Back pressure building up at the outlet side is unacceptable.



NOTE

Refer to the additional AD 2000 info sheet, Chapter 6.

Instructions for the installation position can be found on the installation drawing.

The discharge path from the safety valve must be quite clear. Nothing that might close or obstruct the valve outlet may be fitted in the line of ejection. Discharge pipes must be neither constricted nor have a negative influence on the operation and performance of the safety valve; their discharge orifice must blow off the air without danger.

On no account may there be anything (e.g. cocks, valves) which could be separate or disconnect the object to be protected from the valve inlet.

Safety valves must always be fitted as close as possible to the object to be protected. The connection ought to be straight and as short as possible.

No liquid may be allowed to accumulate in the blow-off system.

The cross-section of the connection and connecting pipe must be at least as large as the cross-section of the safety valve inlet (see installation drawing).

The pressure drop in the supply pipe and inlet bore shall not exceed 3% when the safety valve discharges air at the specified discharge rate (see installation drawing).

Safety valves must not be painted or coated in any way.

External influences (such as weather and pollution) and internal influences and deterioration (arising from causes such as corrosion in the pipework system or the anticorrosive agent used) which might impair or restrict the operation of the safety valve must be avoided.

The installation drawing of the unit shows the necessary clearances and the mounting position.

The unit can be installed with standard tools.



The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

5.1.2 Procedure



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the housing securely with a suitable tool, such as an open-end wrench.

- Sight-check the marking (component test) for the relevant service conditions and response pressure.
- Sight-check the unit for external damage. Do not install damaged safety valves.
- Remove any protective caps that are fitted to the safety valve inlet unions.
- Prior to installation, thoroughly clean the supply pipe and pipework, and remove all traces of dust and dirt.
- Seal the fitting with suitable sealing rings. Apply the tightening torque from the installation drawing.



NOTE

Use a suitable torque wrench to screw in the parts.



5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the safety valve's pipe thread for leakage at maximum working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



CAUTION

Beware of electric shock!
Danger of physical injury.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the housing securely with a suitable tool, such as an open-end wrench.

- Entirely vent the compressed air pipes and unscrew the safety valve, observing the safety rules as you proceed.



6 Function tests

6.1 Discharging air



WARNING

Pneumatic system is under high pressure!

Deposits or undesired particles in the outlet area may, for instance, cause severe eye injuries as they are ejected.

Wear goggles.

Mask discharge openings with a cloth.



WARNING

Beware of unauthorized tampering by third parties!

Device and/or system functions will fail or be impaired.

If the security cap is removed, the safety valve will forfeit the qualification validated by the component test. The warranty will be cancelled entirely by any such action.



WARNING

Beware of extreme environmental exposure (e.g. a hot, dry, dusty or very humid environment)!

Device and/or system functions will fail or be impaired.

Test operation at shorter intervals.



NOTE

Detailed information can be found in the Technical Information Test Instructions GD25701.

- Use of the discharge device serves basically to check the safety valve with regard to the following parameters:
 - General opening
 - Closing pressure (leakage)
 - Freedom of movement
 - Any dirt deposits lodged in the valve seat (c)

The action of air discharge consists of the following process steps:

6.1.1 Visual inspection and checking

- Visually check the safety valve for external damage, signs of corrosion and traces of dirt around the entire safety valve, especially at the discharge openings. If possible, inspect the valve seat (c) for foreign bodies trapped there. The inspection must be recorded in a report.



6.1.2 Servicing (prior to discharging air)

- Using a suitable cleaning substance (applied with a cloth), remove each and every trace of dirt from the whole safety valve. Take care to clean the discharge openings as well.
- Traces of corrosion found on the unit must be removed to a high degree. If this is impossible and the degree of corrosion seems functionally harmful, the safety valve will have to be exchanged.

6.1.3 Procedure



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.



CAUTION

Beware of operating the discharge device incorrectly!

Device and/or system functions will fail or be impaired.

Refer to the Technical Information Test Instructions GD25701.



CAUTION

Beware of operating the discharge device incorrectly!

Malfunctions and failures of device functions and system functions. The rotary air discharge (e) can become detached from the safety valve.

Unscrew the rotary air discharge no more than a maximum of two turns.



NOTE

If the rotary air discharge (e) has become detached from the safety valve it can be screwed back on carefully by hand. When doing so, be sure not to cause the rotary air discharge to jam!

After this a further air discharge must be performed.

As soon as a jammed rotary air discharge is discovered, the safety valve must be removed and exchanged.



Basic information (for details see the associated Technical Information)

- Slacken the rotary air discharge (e) by turning it anti-clockwise by hand (no more than a maximum of two turns). A slight resistance must be perceptible during the first turn. Air must be discharged through a constant valve opening for at least three seconds.
- Then screw the rotary air discharge back home again to the stop. The safety valve, i.e. the valve seat (c), closes of its own accord.
- Once the valve has closed, there must not be any sign of leakage (see also Leakage testing in Section 5.1.3)
- The safety valve's outlet openings must always be kept clean and free from residue or other particles.
- This concludes the process of discharging air.



NOTE

Detailed information can be found in the Technical Information Test Instructions GD25701.



6.2 Function test I

6.2.1 General



WARNING

Pneumatic system is under high pressure!

Deposits or undesired particles in the outlet area may, for instance, cause severe eye injuries as they are ejected.

Wear goggles.



WARNING

Beware of unauthorized tampering by third parties!

Device and/or system functions will fail or be impaired.

If the security cap is removed, the safety valve will forfeit the qualification validated by the component test. The warranty will be cancelled entirely by any such action.

- Function test I serves basically to check the safety valve with regard to the parameters stated below. It must be regarded as a reference test! Allowance must additionally be made for pulsations, especially in connection with piston compressors. Owing to the procedure used during the test, special attention must therefore be paid to safety valves located close to the compressor. To inquire about the extended tolerances needed to account for compounded effects, please contact the person responsible for your project at KNORR-BREMSE. Usually, these extended tolerances are equivalent to half the pulsation amplitude.

Parameters:

- Opening pressure
- Closing pressure (leakage)
- Freedom of movement
- Any dirt deposits lodged in the valve seat (c)

- Necessary prerequisites / utilities for performing the work are as follows:

- Discharging air in accordance with Section 6.1
- Two test unions for mounting a pressure gauge in the immediate vicinity of the safety valves
- One pressure gauge (0.1bar scale division)
- Means of connection to the main reservoir for mounting a cock
- System-integrated 3/2-way cock with variable venting (test fixture).



NOTE

The test fixture must be inserted downstream of the safety valve that protects the dryer.



For more information please contact the KNORR-BREMSE engineer who is responsible for your project.

6.2.2 Procedure



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Condition: Discharging air is performed in accordance with Section 6.1.



NOTE

Detailed information can be found in the Technical Information Test Instructions GD25701.

If the function test I cannot be performed on the vehicle, the safety valve must be removed. The test must be performed on a separate test bench.

If the values are outside the permissible tolerances, exchange the safety valve for a new one (see installation drawing).



6.3 Function test II



WARNING

Pneumatic system is under high pressure!

Deposits or undesired particles in the outlet area may, for instance, cause severe eye injuries as they are ejected.

Wear goggles.



WARNING

Beware of unauthorized tampering by third parties!

Device and/or system functions will fail or be impaired.

If the security cap is removed, the safety valve will forfeit the qualification validated by the component test. The warranty will be cancelled entirely by any such action.



WARNING

Beware of contaminating the unit!

Device and/or system functions will fail.

After completing the tests, plug the connection with a thread cap and mask the exhaust bores.

6.3.1 General

- Repairs and alterations (e.g. changes to the pressure setting) must always be left to the manufacturer in order to preserve the qualification validated by the safety valve's component test.
- Sight-check the safety valve for external damage, signs of corrosion and traces of dirt around the entire safety valve, especially at the discharge openings. If possible, inspect the valve seat (c) for foreign bodies trapped there. The inspection must be recorded in a report.
- Function test II serves to check the safety valve with regard to:
 - Pressure setting
 - Opening pressure
 - Response pressure
 - Closing pressure (leakage)
 - Freedom of movement
 - Any dirt deposits lodged in the valve seat (c)
- For the function test II (see Section 5.2) the safety valve must be detached and mounted on a special test bench.



6.3.2 Running function test II



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.



NOTE

Refer to the Technical Information Test Instructions GD25701 when performing the function test II.

Refer also to the documentation for the test bench.

If the values are outside the permissible tolerances, exchange the safety valve for a new one (see installation drawing).



7 Maintenance

KNORR BREMSE has the capacity to test the state of its equipment regularly during its life cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Maintenance at KNORR BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

The next table contains an overview of the necessary maintenance activities.

Interval *	Maintenance activity	See
Every 6 months	Discharging air	6.1
Every 12 months*	Discharging air and function test I (decided by the central supervisory authority) or function test II *	6.2
Every 12 months**	Discharging air and function test II **	6.3
<p>* 1. According to vehicle operator's project-specific experience in connection with the relevant, national central supervisory authority. 2. In accordance with project-specific maintenance schedule, if any. This point will be agreed by the customer and KNORR BREMSE as the need arises. 3. According to KNORR BREMSE recommendation in the table.</p> <p>** Can be extended to 8 years if function test I can be performed. The operator and the national central supervisory authority (e.g. TÜV) must decide autonomously whether, as well as discharging air every 12 months, they must also run function test I (on board) or function test II (on test bench) on the same occasion. Which decision is taken depends on how the pneumatic system is actually constructed. What must be answered in this connection is whether the circumstances required for running function test I (precise means of validating each of the pressure values) are in place (e.g. test union for a pressure gauge in the immediate vicinity of the safety valve; individual "means of starting up" the safety valve without triggering other safety devices or without exposing other components to unnecessary and unacceptable safety risks due to excessive pressures; accessibility, etc.).</p>		

Table 2 Overview of intervals and activities



7.1 Inspection



WARNING

Pneumatic system is under high pressure!

Deposits or undesired particles in the outlet area may, for instance, cause severe eye injuries as they are ejected.

The safety valve must be fitted so as to avoid any risk of personal injury when air is discharged.

7.1.1 Interval

See section 7

7.1.2 Special tools

Not required

7.1.3 Procedure



WARNING

Pneumatic system is under high pressure!

Deposits or undesired particles in the outlet area may, for instance, cause severe eye injuries as they are ejected.

Wear goggles.



WARNING

Beware of unauthorized tampering by third parties!

Device and/or system functions will fail or be impaired.

If the security cap is removed, the safety valve will forfeit the qualification validated by the component test. The warranty will be cancelled entirely by any such action.



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

- The outward condition of the safety valve must be checked at regular intervals.
- The security cap of the safety valve must be intact. If not, the safety valve must be exchanged.
- Perform the **air discharge** in accordance with Section 6.1, perform the **function test I** in accordance with Section 6.2 and the **function test II** in accordance with Section 6.3. Comply with the intervals (see Section 7).



7.2 Servicing

Not required

7.3 Repair



NOTE

Spare parts are not available for the safety valves.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 8.2.

7.4 Exchange



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.



NOTE

Safety valves that do not meet the requirements of the function tests (see Sections 6.1, 6.2 and 6.3) or that reveal functionally harmful damage must be exchanged.

Safety valves removed from the equipment can be tested in accordance with the relevant Test Instructions, but must not be dismantled or overhauled.



8 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

8.1 Special tools

Not required

8.2 Procedure



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Problem	Cause	Remedy	See
Small volume of air discharging constantly from the safety valve	Valve seat (c) dirty	Operate the rotary air discharge (i) and blow out the valve seat (c).	Section 6.1
	Unit defective	Remove the unit and exchange for an operative one.	Section 5.2
Large volume of air discharging constantly from the safety valve	Applied air pressure permanently too high	Check the supply of compressed air.	
	Unit defective	Check the supply of compressed air. Remove the unit and exchange for an operative one.	Section 5.2
Safety valve not popping when response pressure is exceeded (see installation drawing)	Unit defective	Remove the unit and exchange for an operative one.	Section 5.2



9 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - M B 2 0 . 2 1

Rev. 01 - 27.10.2014 - en
.....

.....
Description

Drain valve
EW6..
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
01	27.10.2014	Revision history started		x				
		all				x	x	x



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Authorized use of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	14
4.3	Working principle	18
5	Removal and installation	19
5.1	Installation	19
5.1.1	Requirements	20
5.1.2	Procedure	20
5.1.3	Leakage testing	23
5.1.4	Function test	23
5.2	Removal	24
5.2.1	Requirements	24
5.2.2	Procedure	24



6	Maintenance	26
6.1	Inspection	26
6.1.1	Interval	26
6.1.2	Special tools	26
6.1.3	Procedure	26
6.2	Servicing	27
6.3	Repair	27
6.4	Overhaul or replacement	27
6.4.1	Interval	27
7	Troubleshooting	28
7.1	Special tools	28
7.2	Procedure	28
8	Disposal	29
9	Annex	30
9.1	Accessories	30



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

The related installation drawings and circuit diagrams specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I82281

I81535

I81790

I86712

I87558

I81791

I88256

I93975

I84328/..

I130305/..

I83970/11..

I83970/21..



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

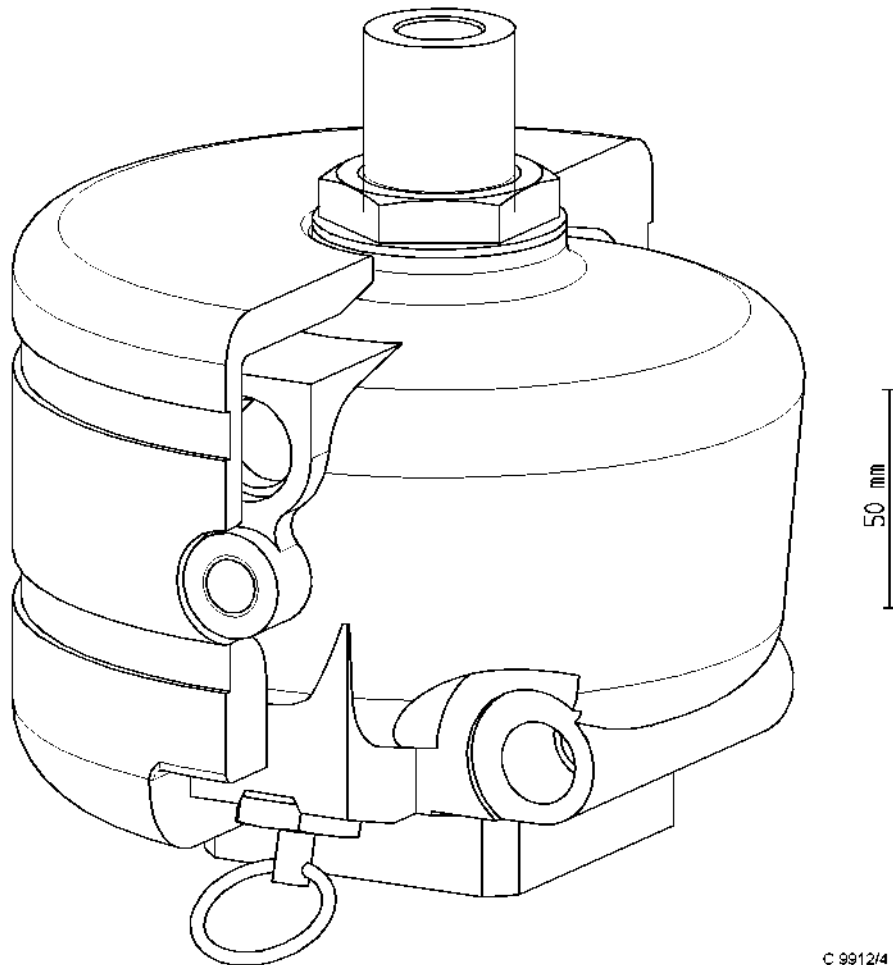
The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The unit is used for automatic draining of liquids from air reservoirs, oil separators, centrifugal filters and air dryer units in pneumatic systems of rail vehicles.



© 9912/4

Figure 1 Drain valve EW6
(the unit with item number I86712 is shown here by way of example)



4.1 Technical features

The EW6 series includes a range of different valve variants. Table 1 gives an overview of the standard equipment of the drain valves. Additional available equipment is listed in Section 9.1.

Item number	Type	Cutoff function	Manual drainage	Insulation	Cartridge heater Thermostat	Figure
I82281	EW6	x				Figure 2
I81535	EW6	x	x			Figure 2
I81790	EW6	x		x		Figure 2
I86712	EW6	x	x	x		Figure 2
I81791	EW6.1			x		Figure 2
I88256	EW6.1		x	x		Figure 2
I93975	EW6.1					Figure 2
I84328/..*	EW6A	x		x	x	Figure 3
II30305/..*	EW6A	x		x	x	Figure 3
I83970/11..*	EW6.1A			x	x	Figure 3
I83970/21..*	EW6.1A			x	x	Figure 3
I87558**	EW6B	x				Figure 2
* For the operating voltage of the cartridge heater see Table 3						
** Inner parts of non-rusting material, design similar to EW6						

Table 1 Overview of the technical features

The dimensions and the technical data of the units can be found in the associated installation drawings.

Drain valves of types EW6, EW6.1 and EW6B can be fitted with a cartridge heater. The operating temperature range can be found in Table 2. Cartridge heaters can be supplied with various different operating voltages, powers and cable lengths, see Table 6 for a list.

Cartridge heater power N [W]	for use up to t_{\min} [°C]	switches off at t_{\max} [°C]
20	-20	+40
40	-40	+5

Table 2 Operating temperature with cartridge heater and insulation (EW6, EW6.1, EW6B)



Two versions of the type EW6.1A drain valves are available:

- Item number **I83970/11..** for mounting on a bracket or reservoir
- Item number **I83970/21..** for mounting on an LTE air dryer

Drain valves of types EW6A und EW6.1A are supplied fitted with cartridge heater and thermostat. Various different operating voltages for cartridge heaters are listed in Table 3. When ordering a cartridge heaters, the operating voltage must be stated as shown in the ordering example (see Table 4 for EW6A and Table 5 for EW6.1A).

Operating voltage [V]	Item number Cartridge heater
24	I79773/132
36	I79773/130
48	I79773/131
65	I79773/129
72	I79773/128
96	I79773/133
110	I79773/127
220	I79773/135

Table 3 Operating voltage of the cartridge heater (EW6A, EW6.1A)

Type ¹⁾	Item number ²⁾
EW6A	I84328/..
1) Type designation - see name plate 2) Full item number: I84328/048 048 = operating voltage of the cartridge heater (48 V)	

Table 4 Ordering example EW6A

Type ¹⁾	Item number ²⁾
EW6.1A	I83970/..
1) Type designation - see name plate 2) Full item number: I84328/1 0 220 1 = version (1 : For mounting on a bracket or reservoir, 2 : For mounting on an LTE air dryer) 0 = connector (0 = without connector, 1 = with connector) 220 = operating voltage of the cartridge heater (220 V)	

Table 5 Ordering example EW6.1A



4.2 Construction

See Figure 2 to Figure 5

The drain valves are compact units activated by compressed air, for automatic drainage of liquids.

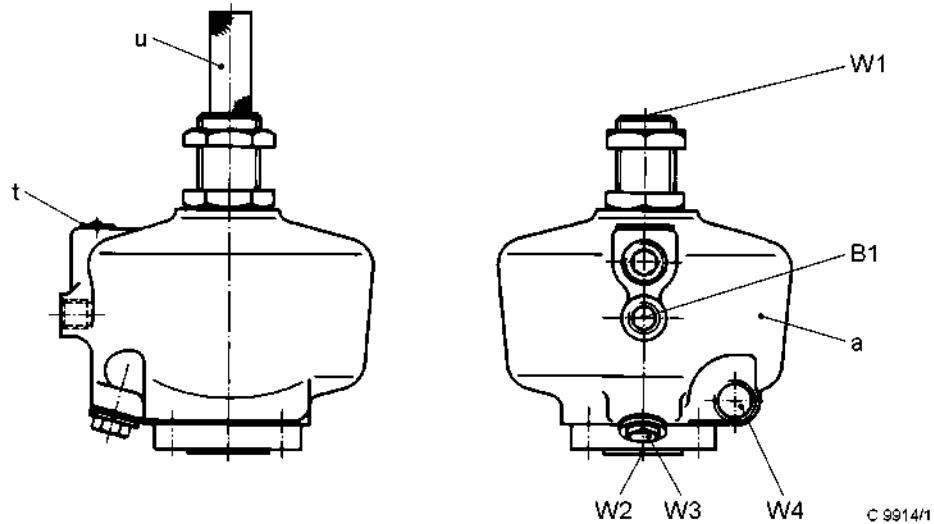
Drain valves consist essentially of the following:

- Housing with control elements,
- Manually-operated drain valve (if fitted),
- Cartridge heater and thermostat (if fitted).
- Insulation (if fitted).

Various different variants of valves allow them to be mounted via the drainage port (W1) or on air reservoirs, air dryer units and brackets.

The valve variants for mounting on air reservoirs are fitted with a cutoff function at the drainage port (W1). The cutoff function allows drainage via the drainage port (W1) to be blocked by control elements within the housing, so as to prevent a pressure drop in the reservoir. Valve variants for air dryer units do not have this cutoff function.

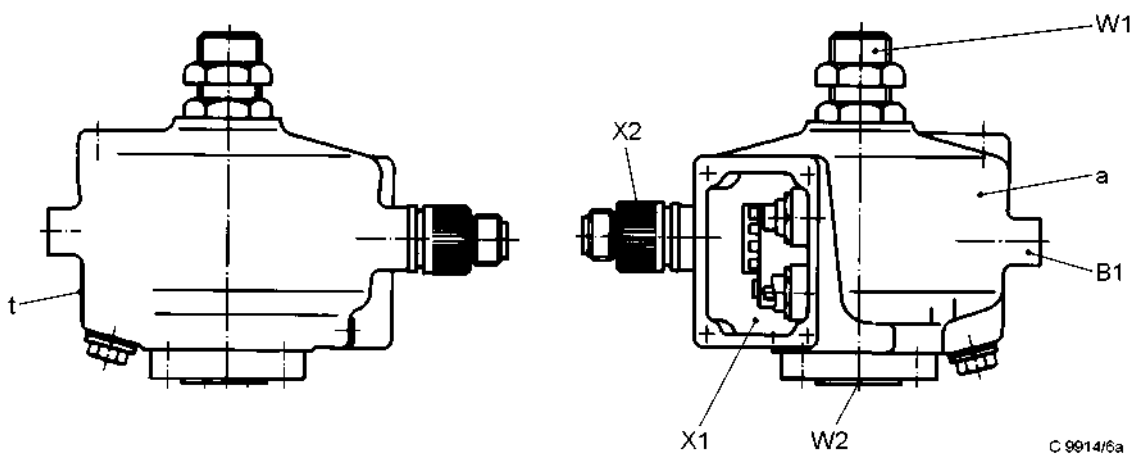
The pneumatic activation of drain valves is provided by the control air port (B1). Depending on the application, the activation can be performed by a central magnet valve or by a magnet valve within the air dryer unit.



- a** Housing
- t** Name plate
- u** Filter sieve (optional)
- B1** Control port

- W1** Drainage port
- W2** Outlet
- W3** Screw plug/hole for the manual drain valve (see Table 1)
- W4** Screw plug/hole for a cartridge heater (optional)

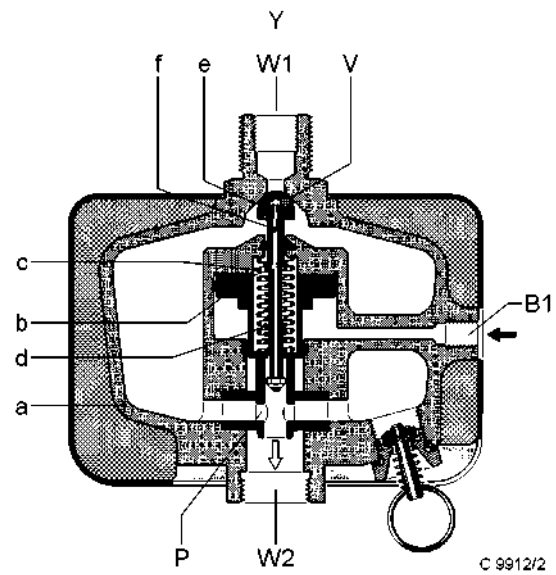
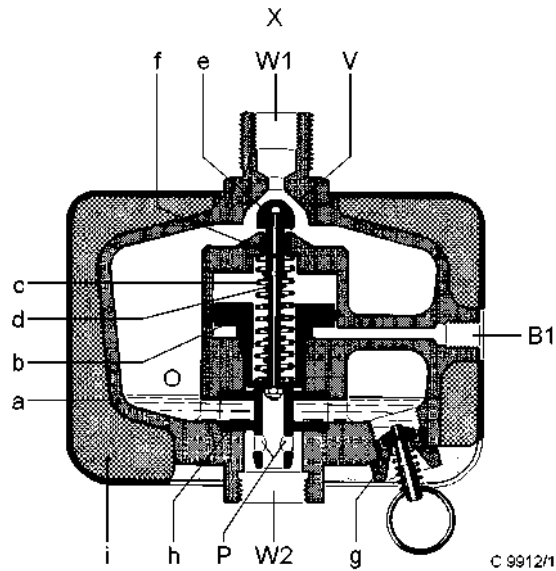
Figure 2 Drain valve EW6, EW6.1, EW6B
(shown without insulation and without manual drain valve)



- a** Housing
- t** Name plate
- B1** Control port
- W1** Drainage port

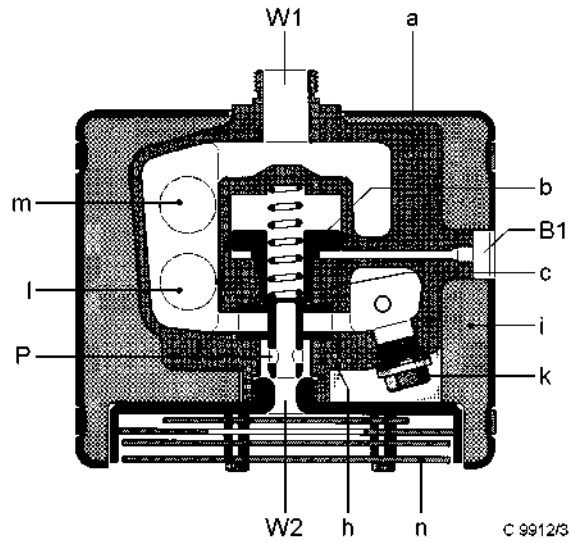
- W2** Outlet
- X1** Terminal box
- X2** Flanged socket

Figure 3 Drain valve EW6A, EW6.1A
(shown without insulation and without terminal box cover)



- | | | | |
|----------|--------------------|-----------|--------------------|
| a | Housing | O | Settling chamber |
| b | Valve piston | P | Outlet port |
| c | Compression spring | V | Conical valve seat |
| d | Compression spring | B1 | Control port |
| e | Valve head | W1 | Drainage port |
| f | Valve rod | W2 | Outlet |
| g | Manual drain valve | X | Neutral position |
| h | Sealing ring | Y | Drain position |
| i | Insulation | | |

Figure 4 Drain valve EW6 with cutoff function



- | | | | |
|---|--------------------|----|------------------|
| a | Housing | m | Thermostat |
| b | Valve piston | n | Silencer |
| c | Compression spring | O | Settling chamber |
| h | Sealing ring | P | Outlet port |
| i | Insulation | B1 | Control port |
| k | Screw plug | W1 | Drainage port |
| l | Cartridge heater | W2 | Outlet |

Figure 5 Drain valve EW6.1A without cutoff function (shown in the neutral position)



4.3 Working principle

Neutral position

See Figure 4, Figure 5

The control air port (B1) is vented. The valve piston (b) is held in the blocking position by the compression spring (c). The outlet port (P) of the slide tube is not in communication with the settling chamber (O), which causes the outlet (W2) to be shut off from the settling chamber by the sealing rings (h) on the slide tube. In the version with the cutoff function (see Figure 4) the valve head (e) is in the lower position and opens the drainage port (W1). In both versions the liquid can drain through the drainage port into the drain valve and collect in the settling chamber.

Drain position

See Figure 4

The description is based on drain valves with cutoff function.

The control port (B1) is charged with compressed air. The valve piston (b) is pushed into the upper position by the inflowing compressed air against the force of the springs (c and d). The spring (d) pushes the valve rod (f) upwards and presses the valve head (e) into the valve seat (V), thereby closing the drainage port (W1). This process takes place before the outlet port (P) of the slide tube comes into alignment with the openings of the sealing rings (h). This advance function prevents any loss of pressure at the drainage port. In the next step the outlet port (P) establishes a connection with the settling chamber (O) and the liquid that has been collected is expelled from the outlet (W2) by the pressure prevailing in the settling chamber. On resetting to the neutral position - the control air port (B2) is vented - first the vent port is closed, after which the drainage port is opened.

In the version without the cutoff function (see Figure 5) there is no closure facility for the drainage port (W1). The drainage of the settling chamber (O) is performed similarly to the version with the cutoff function.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



WARNING

Pneumatic system is under high pressure!

Particles flung outwards will, for instance, cause severe eye injuries.

Observe the safety regulations for pneumatic systems.

Prior to installation, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.

5.1.1 Requirements

The unit can be installed with standard tools.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

5.1.2 Procedure

See Figure 2, Figure 3, Figure 6, Figure 7



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail. Provide for a free flow through the ports.



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.

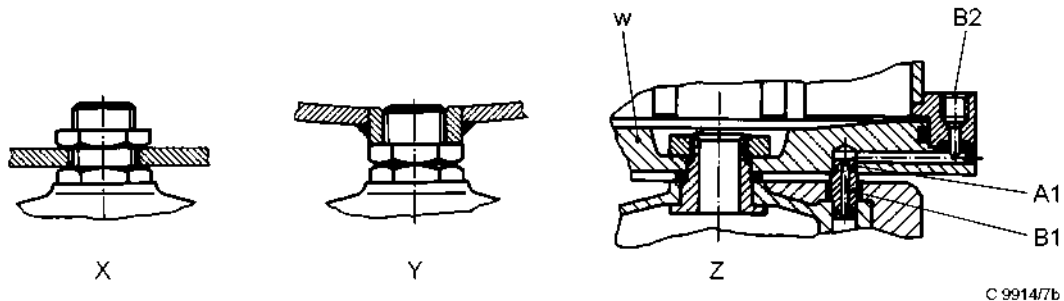


CAUTION

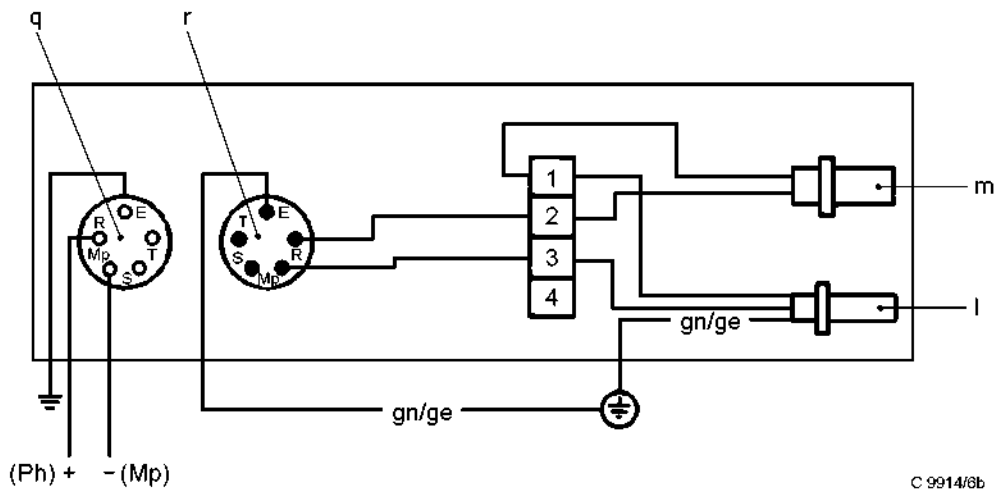
Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.



- | | | | |
|----------|--------------------------|-----------|--------------------------------|
| X | Mounting on a bracket | A1 | Control air outlet (air dryer) |
| Y | Mounting on a reservoir | B1 | Control port (drain valve) |
| Z | Mounting on an air dryer | B2 | Control port (air dryer) |
| w | Air dryer | | |

Figure 6 Mounting variants

- | | | | |
|----------|------------------|----------|----------------|
| l | Cartridge heater | q | Connector |
| m | Thermostat | r | Flanged socket |

Figure 7 Circuit diagram, heater (EW6A, EW6.1A)

Units with item number **183970/21..** are mounted directly on to the drainage port of the air dryer (w). All other units can optionally be mounted on a bracket (X) with a through hole or directly on to the drainage port of a reservoir (Y).

A pipe can be connected to the outlet (W2) to direct the liquid that flows from the drain valve. KNORR-BREMSE recommend the use of a flexible pipe.



NOTE

Drain valves should be mounted vertically on a bracket or reservoir, with the outlet (W2) facing downwards.



NOTE

If the valve is mounted on a bracket, the drain pipe to the drainage port (W1) should be laid with a constant gradient, which should be as steep as possible.



NOTE

If a pipe is attached to the outlet (W2) should be laid with a constant gradient, which should be as steep as possible.

- Take the covers off the ports on the drain valve and off the components to be connected.
- Thoroughly clean the ports.



NOTE

For units with the item number **I83970/21..** the control air feed is provided via a connection with the control air port (B2) of the air dryer (see Figure 6, Z).

- Mount the drain valve using the onboard bolted connections to the bracket, reservoir or air dryer. When mounting on the air dryer, make the connection between the control air port (B1) and the control air outlet (A1) of the air dryer (w).
- Screw the control air pipe into the control air port (B1) or into the control air port (B2) of the air dryer (w).



NOTE

Connect the unit electrically as shown in the circuit diagram (see Figure 7) and the vehicle documents.

- If present, connect the onboard mating connector (q) on to the flanged socket (r) of the drain valve.



5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

Test the unit for leakage during the test run (see Section 5.1.4).

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

See Figure 2, Figure 3, Figure 6, Figure 7



WARNING

Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the housing securely with a suitable tool, such as an open-end wrench.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.



- If present, disconnect the onboard mating connector (q) of the onboard connection cable from the flanged socket (r) and secure it in a protected place on the vehicle.
- If present, unscrew the control air pipe from the control air port (B1) and secure it in a protected place on the vehicle.
- If present, remove the pipe from the outlet (W2).
- If present, remove the drain pipe from the drainage port (W1).
- Undo the onboard bolted fastenings from the bracket, reservoir or air dryer and take off the drain valve.
- Cover up the corresponding on-board ports if a replacement unit is not going to be installed immediately after removal.

To learn exactly how to remove the drain valve, please refer to the vehicle builder's documentation on this subject.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The external condition of the unit, and the system functionality for which the unit is used must be checked at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection, function test (correct drainage)	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
	3. Every day in winter.
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions



6.2 Servicing

Not required

6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul or replacement

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhauling random sample	As instructed by the vehicle operator on the basis of service conditions
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
	3. After 12,000 compressor operating hours or 8 years (recommended/specified by KNORR-BREMSE)
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy
Air discharging constantly from the air pipe connections	Connections leaking	Tighten the connections and test for leakage in accordance with Section 5.1.3; observe the tightening torque.
Heater not working.	Defective connection.	Make the connection correctly, see the electrical circuit diagram (Figure 7).
	Thermostat and/or heater defective.	Replace the thermostat and/or heater.



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.



9 Annex

9.1 Accessories

In addition to the equipment fitted as standard, drain valves can also be fitted with the following components:

- **Filter sieve** for fitting into the drainage port, item number: 4B51445 for drain valves with item numbers: I82281, I81535, I81790, I86712, I81791, I88256
- **Silencer** item number: I83602, additional insulation item number I84501 for drain valves with the item numbers: I82281, I81790, I81791, I84328/..
- **Silencer** item number: I84285 for drain valves with item numbers: I83970/11..., I83970/21. No insulation is necessary, since it is included in the existing insulation.
- **Cartridge heater** for drain valves with item numbers: I81790, I86712, I81791, I88256, for cartridge heater item numbers see Table 6

Item number Cartridge heater	Operating voltage [V]	Power [W]	Cable length l [mm]
I81804/102	24	20	1700
I81804/121	24	25	1700
I81804/117	24	40	1700
I81804/115	28	20	2000
I81804/114	32	20	1700
I81804/106	32	40	1700
I81804/107	36	20	1700
I81804/103	48	20	1700
I81804/116	48	20	1700
I81804/104	65	20	1700
I81804/119	72	20	1700
I81804/101	72	40	1700
I81804/105	110	20	1700
I81804/100	110	40	2000
I81804/120	110	40	1700
I81804/118	220	40	1700
I81804/110	220	40	2000

Table 6 Cartridge heaters for EW6 and EW6.1

.....
.....
B - T B 1 0 . 2 1

Rev. 02 - 07.09.2012 - en
.....

.....
Description

Silencers
NW6, NW12
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
02	07.09.2012	Revision history started		x				
		All		x	x			



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Authorized use of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	13
4.3	Working principle	13
5	Removal and installation	16
5.1	Installation	16
5.1.1	Requirements	17
5.1.2	Procedure	17
5.1.3	Leakage testing	17
5.1.4	Function testing	17
5.2	Removal	18
5.2.1	Requirements	18
5.2.2	Procedure	18



6	Maintenance	19
6.1	Inspection	19
6.1.1	Interval	19
6.1.2	Special tools	19
6.1.3	Procedure	19
6.2	Servicing	20
6.2.1	Interval	20
6.2.2	Special tools	20
6.2.3	Procedure	20
6.3	Repair	20
6.4	Overhaul	21
6.4.1	Interval	21
7	Troubleshooting	22
7.1	Special tools	22
7.2	Procedure	22
8	Disposal	23



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I83602

I84285

I88533

I89666

I89666/A

I93076

II15905

II67222

II67293



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The model NW6 and NW12 silencers are used to reduce the noise caused when air containing dirt, oil or water is discharged from pneumatic equipment (e.g. drain valves and air dryer units).

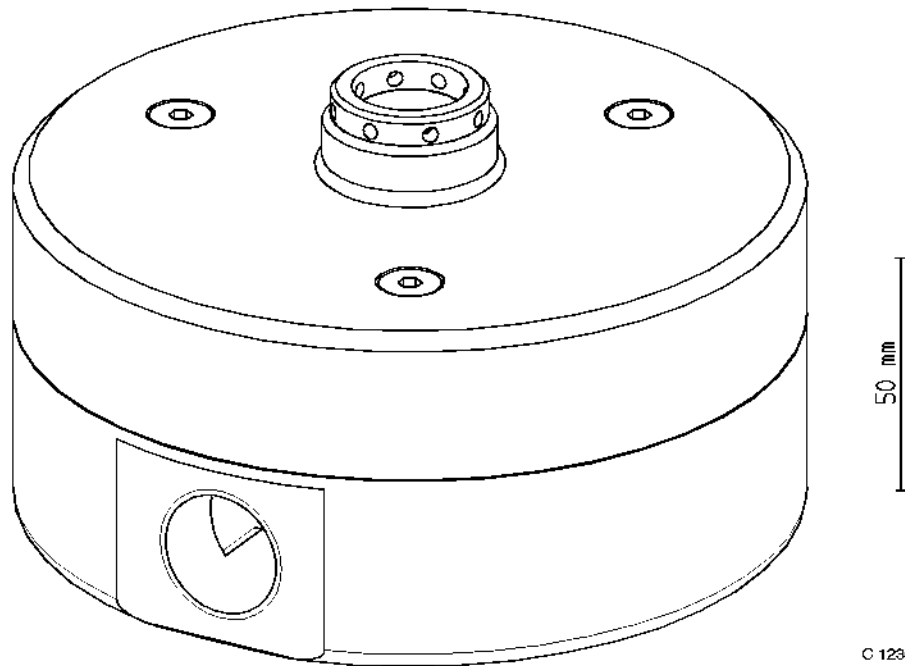


Figure 1 Silencer
(typical item number II67222)



4.1 Technical features

The units are distinguished by the following features:

- Working pressure 10 bar max.
- If the silencers are operated at ambient temperatures below 0°C, they may be suitably insulated against freezing.

Item number	Nominal bore	Cover (e)	Ring (f)	Nipple (g)
I83602	6			
I84285	6			
I88533	6			x
I89666	12			
I89666/A	12			
I93076	12	x	x	
II15905	12	x	x	
II67222	12	x	x	
II67293	12			

Table 1 Versions of the unit

The installation drawing that goes with the unit contains the technical particulars of the unit.



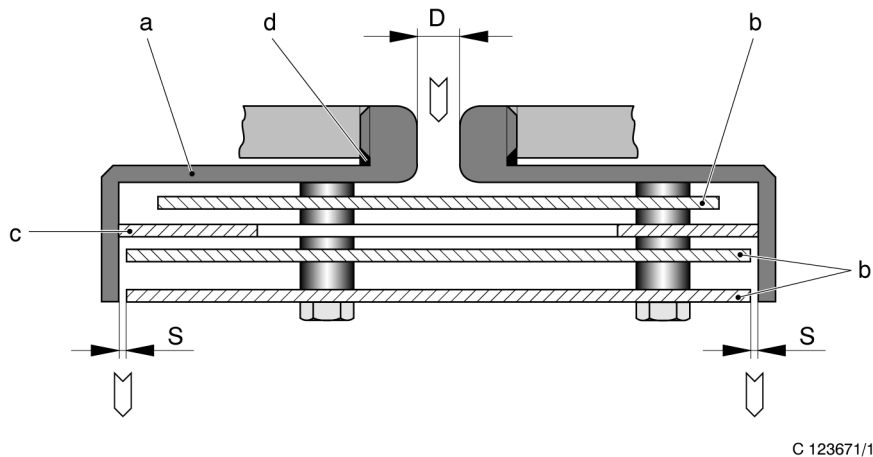
4.2 Construction

See Figure 2, Figure 3, Figure 4, Figure 5

The silencers consist essentially of

- Housing (a)
- Plates (b)
- Rings (c)

Variants of the unit additionally have cover (e), ring (f) and nipple (g) (see Table 1 as well as Figure 3, Figure 4 and Figure 5).



- | | | | |
|---|---------|---|-------------|
| a | Housing | D | Bore |
| b | Plate | S | Annular gap |
| c | Ring | | |
| d | O-ring | | |

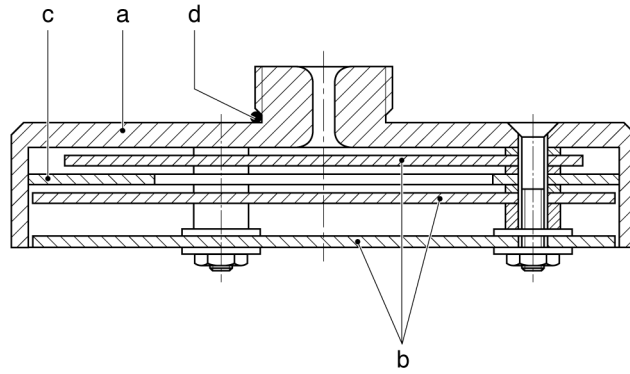
Figure 2 Silencer (schematic)

4.3 Working principle

See Figure 2

The air (port D) discharging from the consumer flows through the silencer where it is deflected repeatedly by the plates (b) and rings (c) arranged in the housing (a). This action causes the sound pressure amplitude to be averaged out, which in turn reduces the sound pressure peaks.

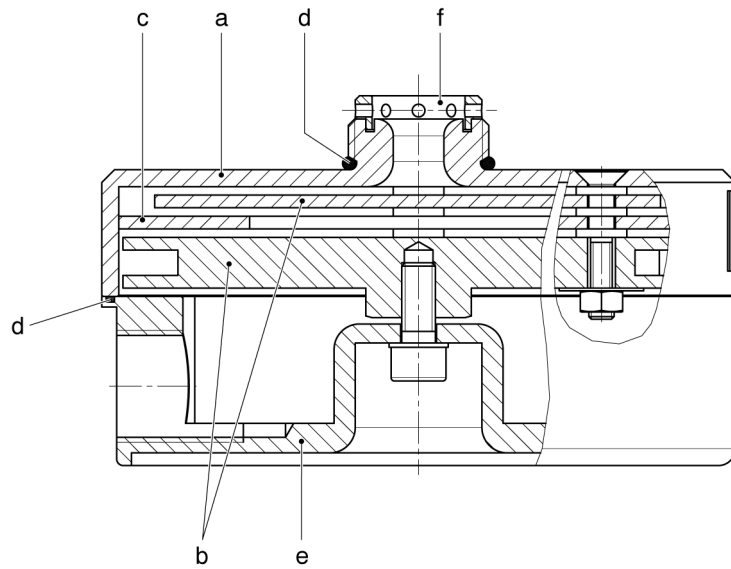
The air exits through the annular gap S between housing (a) and plate (b).



- a Housing
- b Plate

- c Ring
- d O-ring

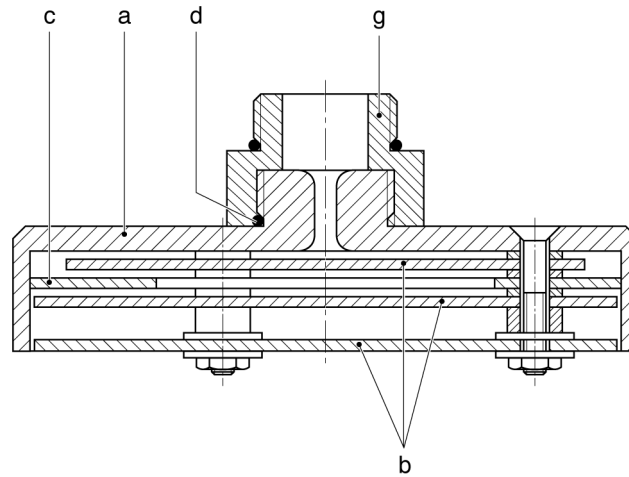
Figure 3 Silencer
(typical item number I89666/A)



- a Housing
- b Plate
- c Ring

- d O-ring
- e Cover
- f Ring

Figure 4 Silencer and cover
(typical item number I167222)



C 123671/4

- a Housing
- b Plate
- c Ring

- d O-ring
- g Nipple

Figure 5 Silencer with a nipple
(typical item number I88533)



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The directions in the installation drawing of the unit must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.
Provide for a free flow through the ports.



NOTE

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.

- Take the covers off the silencer's port and off the pneumatic unit.
- Clean the ports of the silencer and pneumatic unit.
- Lubricate O-ring (d) with a thin film of grease.
- Put O-ring (d) in its seat on housing (a) and, if included, in the seat on nipple (g).
- Screw the silencer tight into the port provided for this purpose.
- Connect the supply of compressed air.

5.1.3 Leakage testing

Not required

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Unscrew the silencer from the port of the upstream unit.
- Cover up the port on the silencer.
- Cover up the port on the unit unless a replacement unit is going to be fitted immediately after removal and the upstream unit remains inactive.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions



6.2 Servicing

Check the silencer for an unobstructed passage (through annular gap S) at regular intervals in accordance with the applicable railway administration regulations.

6.2.1 Interval

Activity	Interval
Servicing	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.2.2 Special tools

Not required

6.2.3 Procedure

See vehicle operator's instructions

6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.



6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air not discharging from the silencer while the compressor is delivering air	Annular gap too small	Remove the unit and ship to KNORR-BREMSE for repair.	Section 5.2
	Annular gap iced up	Thaw out the silencer.	
	Air dryer defective	Remove the unit and ship to KNORR-BREMSE for repair.	Section 5.2



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - O G 2 0 . 3 1

Rev. 00 - 02.03.2015 - en
.....

.....
Description

**Magnet valve
WMV-01/1NZG**



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	12
4.3	Working principle	14
5	Removal and installation	16
5.1	Installation	16
5.1.1	Requirements	17
5.1.2	Procedure	17
5.1.3	Leakage testing	18
5.1.4	Function test	18
5.2	Removal	19
5.2.1	Requirements	19
5.2.2	Procedure	19



6	Maintenance	21
6.1	Inspection	21
6.1.1	Interval	21
6.1.2	Special tools	21
6.1.3	Implementation	21
6.2	Servicing	22
6.3	Repair	22
6.4	Overhaul	22
6.4.1	Interval	22
7	Troubleshooting	23
7.1	Special tools	23
7.2	Implementation	23
8	Disposal	25



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

B-OG51.21 Description of valve magnets Z-01N-G; ...

GD15904 Technical Information "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I82553/...

I85094/...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The unit is a directly controlled, electrical 3/2-way valve for charging and venting downstream units, which is additionally equipped with a hand control.

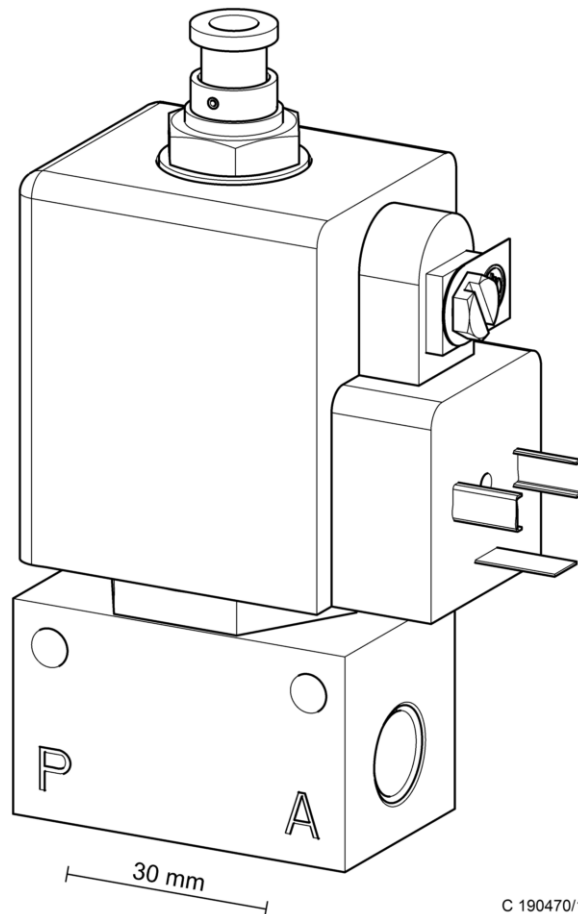


Figure 1 Magnet valve WMV-01/1NZG



4.1 Technical features

The unit is distinguished by the following features:

- Simple installation
- Pipeline design
- Version with hand control

The installation drawing that goes with the unit contains the technical particulars of the unit.

4.2 Construction

See Figure 2

The unit consists essentially of:

- the housing (a)
- the valve magnet (b)

The magnet valves are controlled directly by energising and de-energising their valve magnets (b).

The housing (a) has two ports. The unit is connected to the on-board compressed air system via bolted joints. Two mounting holes X are provided for attaching the unit to an on-board mounting bracket. Both compressed air ports, the supply port P and the consumer port A are protected from dirt by wire strainers (g).

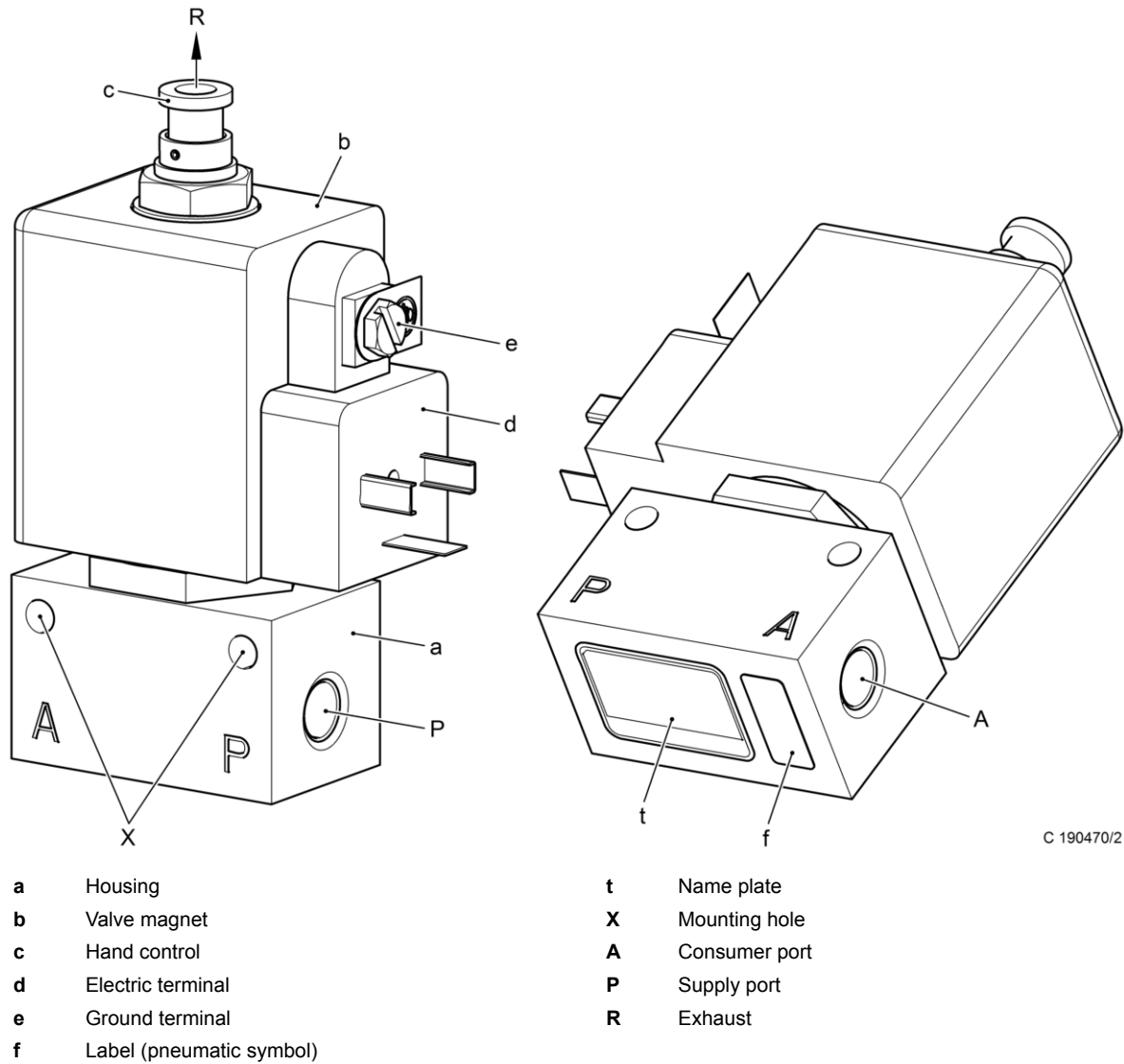
The parts required for the conversion can be ordered from KNORR-BREMSE. The order numbers are shown in the installation drawing.

The unit is connected electrically via a power socket. The associated power socket must be ordered separately. The order number is shown in the installation drawing.



NOTE

The documents listed in Section 2.1 deal with the construction of the component assemblies used in the unit.



C 190470/2

Figure 2 Magnet valve WMV-01/1NZG



4.3 Working principle

See Figure 3

The unit is controlled directly by electrical energization and deenergization of the valve magnet (b).

Valve magnet (b) not energised

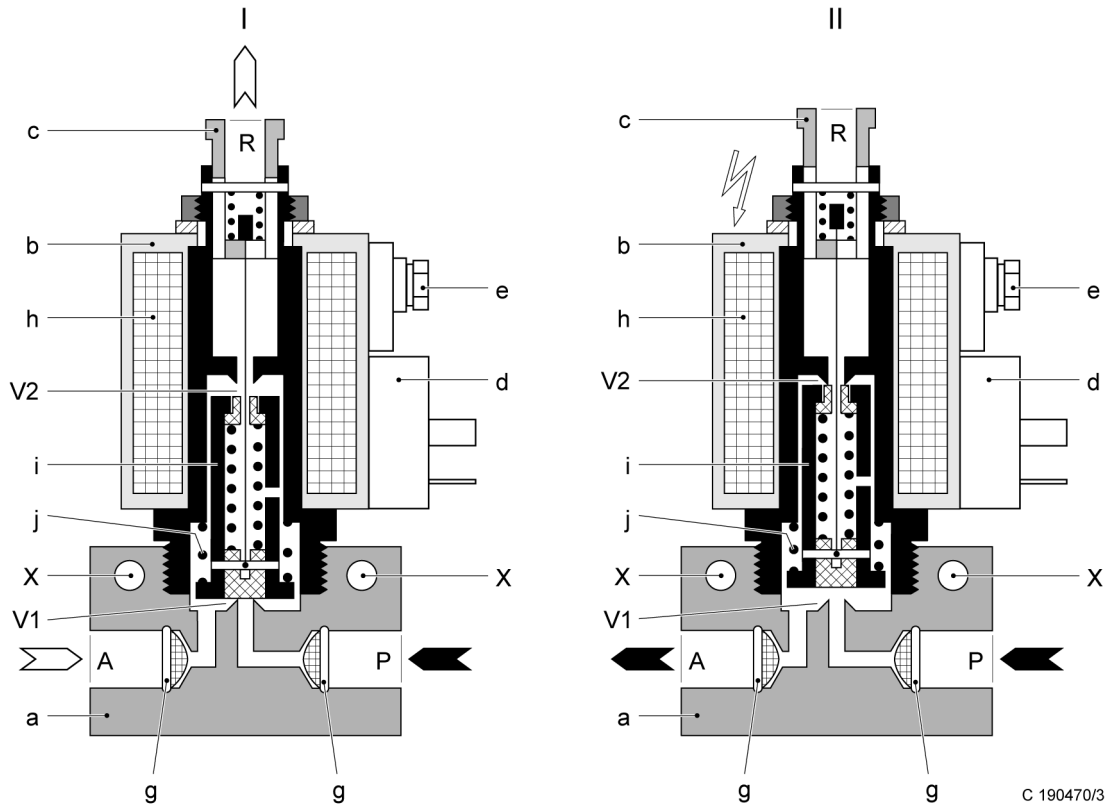
The valve magnet is in neutral position when the magnet coil (h) is de-energised. The magnet armature (i) is pressed onto the valve seat V1 by the compression spring (j). The passage from the supply port P to the consumer port A is cut off when the exhaust pipe from A to R is open.

Valve magnet (b) energised

When the magnet coil (h) is energised the magnet armature (i) is pulled against the force of the compression spring (j) into the upper end position against the valve seat V2. The passage from supply port P to the consumer port A is opened via the valve seat V1 when the exhaust R is cut off.

Hand control

The magnet valve can be operated by hand. To do this, pull out the knob of the hand control (c) as far as it will go. The passage from supply port P to consumer port A is open. After releasing the knob, the magnet valve automatically returns to its neutral position.



C 190470/3

- I Position when valve magnet is not energised
- II Position when valve magnet is energised
- a Housing
- b Valve magnet
- c Hand control
- d Electric terminal
- e Ground terminal
- g Wire strainer

- h Magnet coil
- i Magnet armature
- j Compression spring
- A Consumer port
- P Supply port
- R Exhaust
- V.. Valve seat
- X Mounting hole

Figure 3 Magnet valve WMV-01/1NZG (schematic)



NOTE

The documents listed in Section 2.1 deal with the working principle of the component assemblies used in the unit.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Only allowed to be installed are units that

- have been stored in compliance with the details given in the GD15904 regulation and
- whose date of manufacture has not exceeded the limit value specified in the GD15904 regulation.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricants are needed; they can be purchased from KNORR-BREMSE by their order numbers:

- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)
- RENOLIT L20 grease (order number: ID No. 506043)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.
Provide for a free flow through the ports.



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.

- Take the covers off the ports on the unit and off the on-board compressed air pipes.
- Thoroughly clean the ports.
- Lubricate the threads of the fasteners with a **thin** film of STABURAGS NBU 30 PTM grease.



- Clean the joining surfaces of the unit and onboard mounting bracket.
- Locate and align the unit on the on-board mounting bracket.
- Attach the unit to the onboard mounting bracket in the correct mounting position, using the fasteners in the mounting holes X.
- Lubricate the threads of the on-board compressed air pipes with a **thin** film of STABURAGS NBU 30 PTM grease.
- Screw the onboard compressed air pipes into the ports on the unit as shown in the pneumatic diagram.
- Unscrew the grounding screw from the ground terminal (e) on the unit.
- Lubricate the thread of the grounding screw with a **thin** film of RENOLIT L20 grease.
- Attach the on-board ground cable to the ground terminal (e) by the grounding screw.
- Connect the on-board power socket to the electric terminal (d) and secure it.
- Connect the supply of compressed air.
- Connect the power supply.

5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



WARNING

Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.
- Release the fastener holding the onboard power socket, and unplug the power socket from electric connector (d).
- Unscrew the grounding screw at the ground terminal (e) and remove the on-board ground cable.



- Screw the grounding screw on the ground terminal (e) back in.
- Unscrew the onboard compressed air pipes from the ports of the unit.
- Cover up the ports on the unit.
- Remove the fasteners at mounting holes X, and take the unit off the onboard mounting bracket.
- Unless a replacement unit is going to be fitted immediately after removal, cover up the ports of the on-board air pipes.
- Protect the onboard power socket and the onboard ground cable from damage.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.



NOTE

The documents listed in Section 2.1 contain further information about inspecting the component assemblies.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Implementation

See vehicle operator's instructions



6.2 Servicing



NOTE

As regards servicing the component assemblies please refer to the applicable documents (see Section 2.1).

6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.



NOTE

As regards repairing the component assemblies please refer to the applicable documents (see Section 2.1).

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.



NOTE

As regards overhauling the component assemblies please refer to the applicable documents (see Section 2.1).

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.



NOTE

As regards debugging the component assemblies please refer to the applicable documents (see Section 2.1).

7.1 Special tools

Not required

7.2 Implementation



NOTE

If the problem can be traced to specific component assemblies with the help of the pneumatic diagram, then the Descriptions relating to those component assemblies (see Section 2.1) will be required as support for debugging.

Problem	Cause	Remedy	See
Incorrect or no output pressure	Unit not being activated pneumatically	Test the unit for correct pneumatic control.	
	Unit not being activated electrically	Check the connector.	
		Test the unit for correct electric control.	
	Unit defective	Remove the unit and submit for repair.	Section 5.2
Magnet valve not toggling when valve magnet (b) is energized	Unit not being activated electrically	Check the connector.	
		Test the unit for correct electric control.	
	Unit defective	Remove the unit and submit for repair.	Section 5.2
The knob of the hand control (c) cannot be pulled out.	Unit defective	Remove the unit and submit for repair.	Section 5.2
The knob of the hand control (c) does not automatically return to its home position.	Unit defective	Remove the unit and submit for repair.	Section 5.2



Problem	Cause	Remedy	See
Compressed air discharging constantly to the ports A and P	Connections leaking	Tighten the connections (apply the specified tightening torque!) and test for leakage.	Section 5.1.3
Compressed air discharging constantly to the exhaust R when the valve magnet (b) is energised	Unit defective	Remove the unit and submit for repair.	Section 5.2
When the valve magnet (b) is not energised, compressed air discharges constantly from P to A, and the exhaust pipe from A via R is not vented.			
Air discharging constantly between basic magnet valve and valve magnet (b).	Metal sealing surface between basic magnet valve and valve magnet (b) is dirty or damaged.	Remove the unit and submit for repair.	Section 5.2



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - VC 40.29

Rev. 03 - 10.08.2011 - en
.....

.....
Description

Test fitting
T2-TS
.....



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Inhaltsverzeichnis

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Implementation	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	11
4.2	Construction	11
4.3	Working principle	13
4.3.1	Passage – position I	13
4.3.2	Pressure measurement– position II	13
4.3.3	External injection - position III	13
4.3.4	Operating instructions	13
5	Removal and installation	15
5.1	Installation	15
5.1.1	Requirements	16
5.1.2	Procedure	16
5.1.3	Leakage testing	17
5.1.4	Function testing	17
5.2	Removal	17
5.2.1	Requirements	17
5.2.2	Procedure	17



6	Maintenance	18
6.1	Inspection	18
6.1.1	Interval	18
6.1.2	Special tools	18
6.1.3	Procedure	18
6.2	Servicing	18
6.3	Repair	19
6.4	Overhaul or exchange	19
6.4.1	Interval	19
7	Troubleshooting	20
7.1	Special tools	20
7.2	Procedure	20
8	Disposal	21



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Implementation

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

II51150/A

II65577



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The T2TS test fitting is designed for mounting in pneumatic systems. In general this includes manifold panels, equipment blocks, as well as brake control units or modules.

The unit makes it possible to quickly attach a diagnostic unit to monitor the pressure as well as to externally inject compressed air.

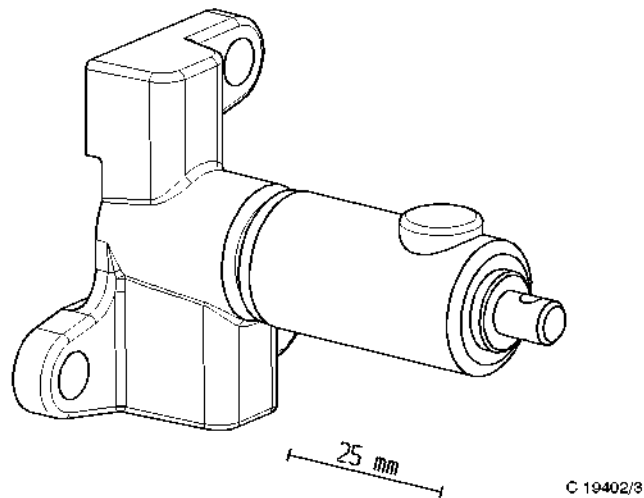


Figure 1 Test fitting T2-TS
(the unit with item number II51150/A is shown here by way of example)



4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction
- consists of rustproof steel



NOTE

The units mentioned in section 3.1 are almost structurally identical. Only the coupling head shown in Figure 2 (b) is additionally equipped with a rubber-like protective cover with the unit with item number II51150/A.

The installation drawing that goes with the unit contains the technical particulars of the unit.

4.2 Construction

See Figure 2

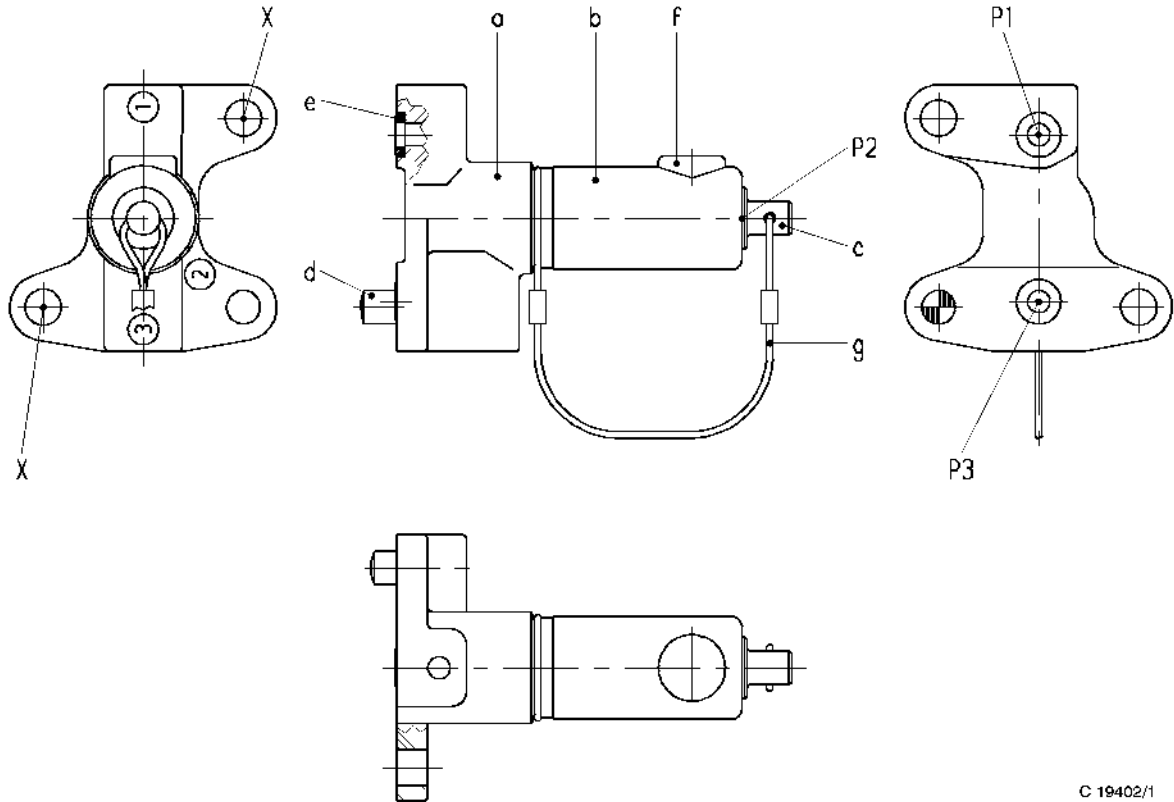
The unit consists essentially of the following components:

- Base (a)
- Coupling head (b)

The measurement and injection port P2 is closed by the plug-in nipple (c). The plug-in nipple keeps dust and dirt out of the port and protects the interior locking mechanism from damage. The plug-in nipple is joined permanently to the body by the wire () so that it cannot get lost.

Two air pipe connections P1 and P3 are located on the underside of the base (a). The hollows around the air pipe connections contain O-rings (e) serving to seal the two ports. The unit is fastened with bores X and screws to the brackets (e. g. a module).

The ports P1, P2 and P3 on the upper side of the base (a) are identified correspondingly by the digits 1, 2 and 3. The underside of the base has a coding pin (d) to position the unit correctly over the air pipe connections on the bracket.



C 19402/1

- | | | | |
|----------|-----------------|-----------|--------------------------------|
| a | Base | X | Mounting hole |
| b | Coupling head | P1 | Inlet port |
| c | Plug-in nipple | P2 | Measurement and injection port |
| d | Coding pin | P3 | Outlet port |
| e | O-ring | | |
| f | Coupling button | | |
| | Wire | | |

Figure 2 Test fitting T2-TS
(the unit with item number II51150/A is shown here by way of example)



4.3 Working principle

See Figure 3



NOTE

The nipple (m) is not included in the content of the unit. However, it can be purchased from KNORR-BREMSE in several versions (different pipe threads).

The unit can be used for three different functions. It can accordingly assume the three positions that are described below and represented by the symbols shown in Fig.

4.3.1 Passage – position I

The open position is the unit's basic position where the port P2 of the test fitting is closed by the plug in nipple (c). The passage from port P1 to port P3 is open.

4.3.2 Pressure measurement– position II

For the pressure measurement, the pressure gauge must be previously attached to the nipple (m).

The plug-in nipple (c) is pulled out with simultaneous pressure on the coupling knob (f). When it is subsequently pushed in, the nipple (m) may only go to the catch, which is noticeable at a distance of 3.5 mm. The marking M in the form of a groove remains visible on the nipple (m).

When the nipple (m) is in this position, the connection between the air delivery pipe to be tested P1-P3 and the measuring device is automatically established at the port P2. The connection is made with the bore located in the nipple.

4.3.3 External injection - position III

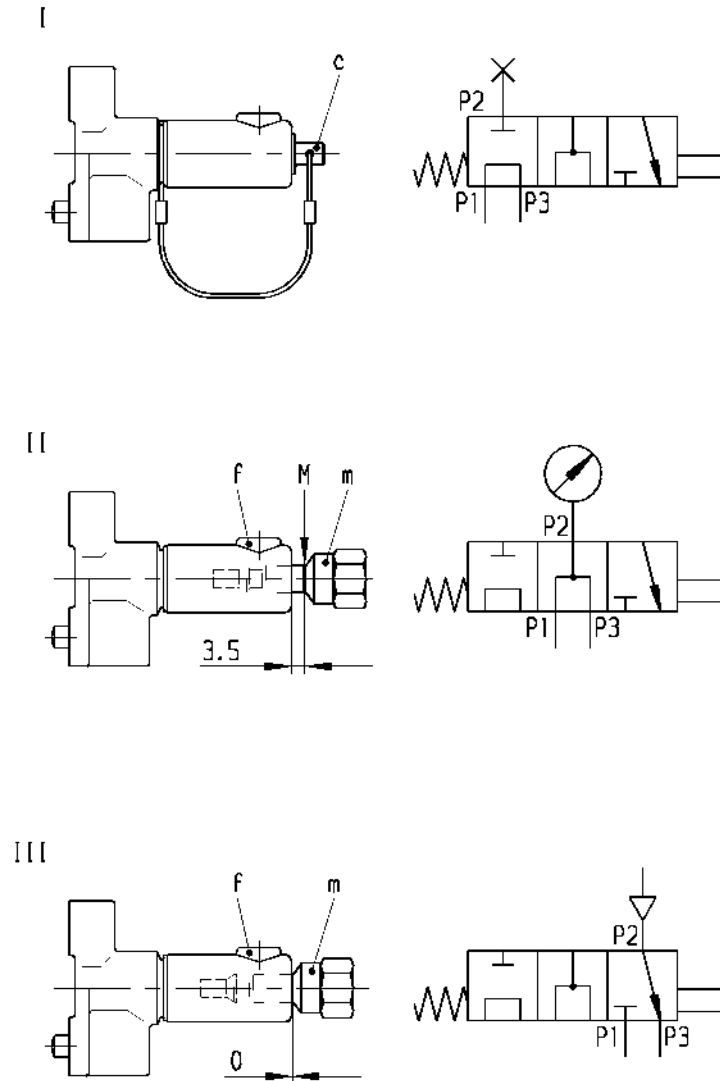
For the pressure measurement, the external pressure gauge must be previously attached to the nipple (m).

The plug-in nipple (c) is pulled out with simultaneous pressure on the coupling knob (f). The nipple (m) is subsequently pushed in completely, that is, all the way to the nipple's stop.

When the nipple (m) is in this position, the connection between the air delivery pipe to be tested P3 and the measuring device is automatically established at the port. At the same time the connection between the ports P1 and P3 is interrupted.

4.3.4 Operating instructions

After concluding pressure measurement or external injection, thoroughly clean the area around the nipple (m) before pulling it out. Then close the port P2 with plug-in nipple (c) to keep out dust and dirt.



c Plug-in nipple to close the port

f Coupling button

m Nipple for measurement and external injection

M Marking

P1 Inlet port

P2 Measurement and injection port

P3 Outlet port

Figure 3 Positions of the test fitting and their functional symbols



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation in a vehicle, in a place where it is protected from impact by ice and stones. The place of installation must be defined accordingly when the vehicle is being engineered.

The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.

Provide for a free flow through the ports.

- Take the covers off the ports of the unit's flange and off the mating ports of the bracket to which the unit is going to be joined.
- Thoroughly clean the ports.



NOTE

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.

- Lubricate the O-rings with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings in their seats on the unit's flange.



NOTE

The unit is positioned precisely for installation by one or more dowel pins fitted in the joining surface of the housing.

- Locate the unit in its mounting position on the bracket and attach by the fasteners through the through-holes in the unit.
- Connect the supply of compressed air.



5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Remove the fasteners, and take the unit plus O-rings off the bracket.
- Cover up the unit's ports.
- Cover up the mating ports of the bracket to which the unit was joined, unless an exchange unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

Exchange the unit if it happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul or exchange

There is no provision for overhauling the unit. The unit must be exchanged in accordance with the directions in Section 6.4.1.

6.4.1 Interval

To judge when replacement is required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation.

Activity	Interval
Exchanging	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air discharging constantly from the flange joint (between unit and bracket)	Fastening screws loose	Tighten the fastening screws (observe the tightening torque!) and test for leakage.	Section 5.1.3
	O-rings damaged or missing	Remove the unit, exchange the O-rings, install the unit and test for leakage.	Sections 5.2 and 5.1, respectively
Air discharging constantly from coupling head (b).	Unit defective	Remove the unit, arrange for its disposal and exchange for an operative unit.	
During pressure measurement at port P2: air pressure not being registered on the pressure gauge, although air pressure is present at port P1.	Nipple (m) in port P2 adjusted incorrectly	Adjust nipple as per position II in the opening of the port P2.	Section 4.3.2
	Port P2 contains a nipple that is unsuitable for injection.	Use suitable nipple	Read the note in Section 4.3.
External injection at port P2: air pressure not being registered at port P3.	Nipple (m) in port P2 adjusted incorrectly	Adjust nipple as per position III in the opening of the port P2.	Section 4.3.3
	Port P2 contains a nipple that is unsuitable for external injection.	Use suitable nipple	Read the note in Section 4.3.



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - E N 2 0 . 2 2

Rev. 05 - 15.12.2016 - en
.....

.....
Description

Pressure governor

MCS4...

MCS11...

MCSN11...



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
05	15.12.2016	Revision history started		x				
		1, 1.1, 1.2, 1.3, 3.1, 3.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4, 4.1, 4.2, 4.3, 5.1.2, 5.2.2, 6, 6.1.1, 6.3, 6.4.1		x				
		2.1, 5.1.1, 6.3.1, 6.4, 7.2					x	
		3.1	x					



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	12
4.3	Working principle	14
5	Removal and installation	15
5.1	Installation	15
5.1.1	Requirements	16
5.1.2	Procedure	16
5.1.3	Leakage testing	17
5.1.4	Function test	17
5.2	Removal	18
5.2.1	Requirements	18
5.2.2	Procedure	18



6	Maintenance	20
6.1	Inspection	20
6.1.1	Interval	20
6.1.2	Special tools	20
6.1.3	Implementation	20
6.2	Servicing	20
6.3	Repair	21
6.3.1	Re-adjusting the working point	21
6.4	Overhaul - replacement	22
6.4.1	Interval	22
7	Troubleshooting	23
7.1	Special tools	23
7.2	Implementation	23
8	Disposal	24



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Specification "Packaging, handling, transport and storage"

The "Installation drawing" that goes with the unit, as well as the "Technical Information" or the "Data sheet for the installation drawing" must be consulted for technical particulars.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I84649/...

II35828/...

I92268/...

II35829/...

II18552/...

II35830/...

II18610/...

II35831/...

II18612/...

II35832/...

II35385/...

II77662/...

II35386/...

II100452



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

Pressure governors operate electric circuits as a function of the pressure in pneumatic systems.

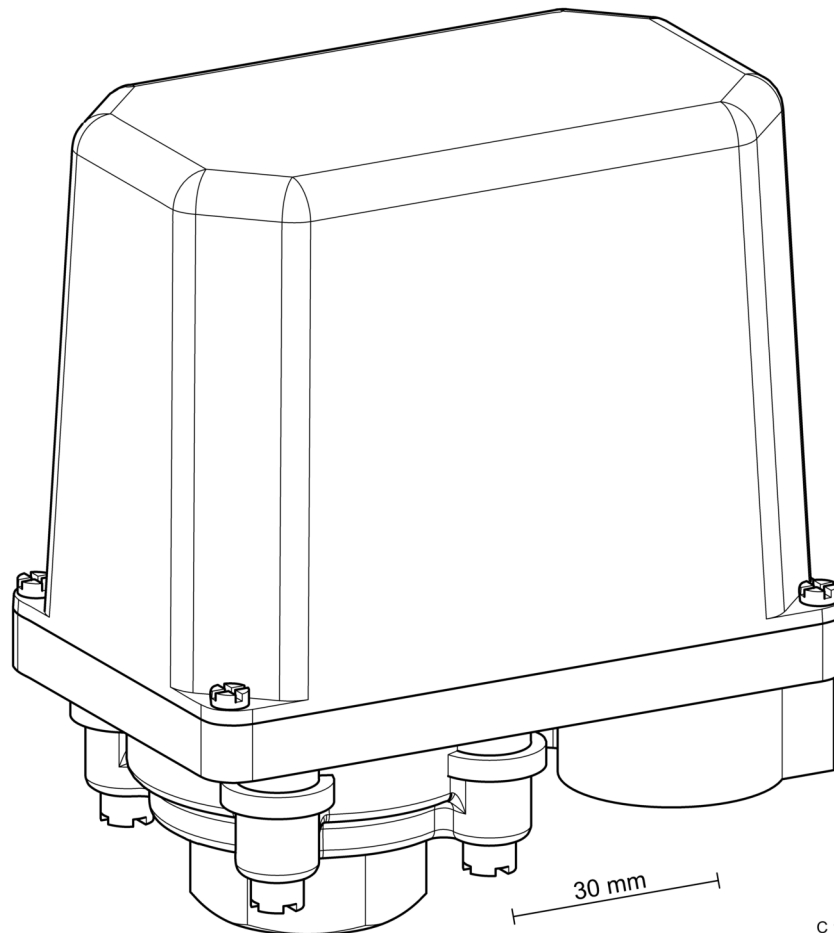


Figure 1 Pressure governor MCS11WA-SOND910G
(the unit with item number II77662/06258 is shown here by way of example)



4.1 Technical features

The unit performs the following function:

- alternately opening and closing electric circuits when the given upper or lower working point is reached.

The installation drawing contains the technical particulars of the pressure governor.

For technical particulars to be considered in connection with the unit, please refer to the "Technical Information" or the "Data sheet for the installation drawing".

4.2 Construction

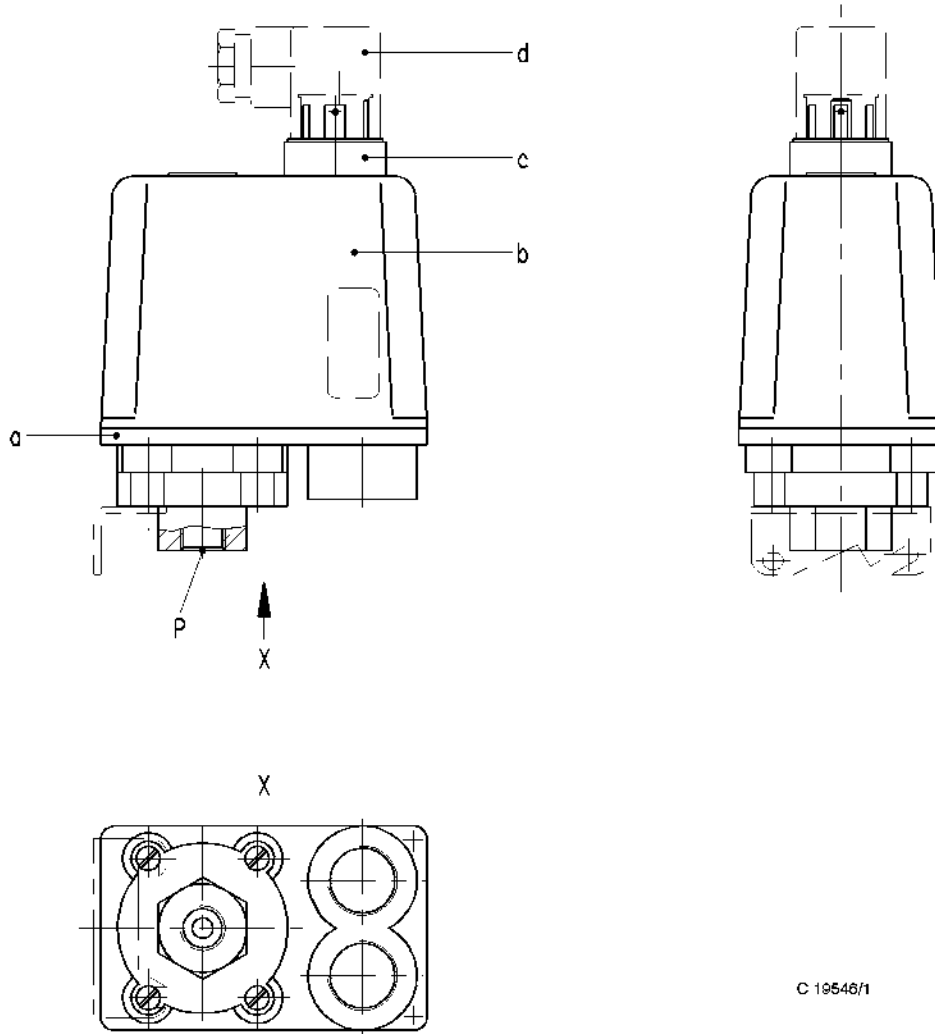
See Figure 2

The pressure governor consists essentially of

- a base plate (a) with its fittings and
- a cover (b) and connector (c).

Located on the underside of the base plate (a) is the port P.

The base plate (a) contains a switch. The contacts are gold-plated.



C 19546/1

a Base plate

b Cover

c Plug connection

d Mating connector (not included in the content of the pressure governor)

P Compressed air port

Figure 2 Pressure governor



Type	Item number	Delivery
MCS4/W	I92268/...	Silver contacts, 1 switch, standard unit without connector
MCS4/W-G	II18612/...	Gold contacts, 1 switch, standard unit without connector
MCS4+S3-MCS	II35832/...	Silver contacts, 1 switch, with connector
MCS4-G+S3-MCS	II35830/...	Gold contacts, 1 switch, with connector
MCS4 Sond 910G	II35385/...	Gold contacts, 2 switches, without connector
MCS4 Sond 910-G+S6-MCS	II35828/...	Gold contacts, 2 switches, with connector
MCSN11	II18552/...	Motor switch
MCS11/W	I84649/...	Silver contacts, 1 switch, standard unit without connector
MCS11/W-G	II18610/...	Gold contacts, 1 switch, standard unit without connector
MCS11WA/W-G	II100452	Gold contacts, 1 switch, unit with electromechanical portion
MCS11+S3-MCS	II35831/...	Silver contacts, 1 switch, with connector
MCS11-G+S3-MCS	II35829/...	Gold contacts, 1 switch, with connector
MCS11 Sond 910G	II35386/...	Gold contacts, 2 switches, without connector
MCS11WA-Sond 910G	II77662/...	Gold contacts, 2 switches, with connector
MCS11 Sond 910-G+S6-MCS	II35827/...	Gold contacts, 2 switches, with connector

Table 1 Versions of the pressure governors

4.3 Working principle

See Figure 2

When the pressure governor is charged by compressed air, the circuits connected to it are opened or closed as the given upper or lower working point is reached.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Only allowed to be installed are units that

- have been stored in compliance with the details given in the GD15904 regulation and
- whose date of manufacture has not exceeded the limit value specified in the GD15904 regulation.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

5.1.2 Procedure



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without authorization.



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the housing securely with a suitable tool, such as an open-end wrench.

Pressure governor with a connector

- Take the covers off the port of the pressure governor and off the on-board compressed air pipe.
- Thoroughly clean the ports.
- Connect the onboard air pipe to the pressure governor as shown in the installation drawing.
- Plug the onboard electric connector into the pressure governor and secure by its fastener.
- Connect the supply of compressed air to the pressure governor.
- Connect the power supply for the pressure governor.



Pressure governor without a connector

- Take the covers off the port of the pressure governor and off the on-board compressed air pipe.
- Thoroughly clean the ports.
- Connect the onboard air pipe to the pressure governor as shown in the installation drawing.
- Release the screws fastening the cover and take off the cover.
- Draw the onboard electric connecting cable into place and connect as shown in the overall electric circuit diagram.
- Put on the cover and secure the fastening screws.
Tightening torque: 0.7 Nm.
- Connect the supply of compressed air to the pressure governor.
- Connect the power supply for the pressure governor.

5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connection for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



WARNING

Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without authorization.



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the housing securely with a suitable tool, such as an open-end wrench.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.



Pressure governor with a connector

- Disconnect the pressure governor electrically by releasing the fastener and unplugging the connector.
- Unscrew the pressure governor.
- Cover the port of the pressure governor.
- Cover up the onboard compressed air pipe unless a replacement unit is going to be fitted immediately after removal.
- Protect the onboard connecting cable and the connector from damage.

Pressure governor without a connector

- Follow these steps to disconnect the onboard electric connecting cable from the pressure governor:
 - Release the screws fastening the cover and take off the cover.
 - Disconnect the connecting cable and withdraw it from the pressure governor.
 - Put on the cover and secure the fastening screws.
Tightening torque: 0.7 Nm.
- Unscrew the pressure governor.
- Cover the port of the pressure governor.
- Cover up the onboard compressed air pipe unless a replacement unit is going to be fitted immediately after removal.
- Secure the onboard connecting cable.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Implementation

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.3.1 Re-adjusting the working point

Re-adjustment of the working point is only possible when pressure and voltage are applied. A measuring instrument with the necessary accuracy must be present in the connected compressed air pipe at the same time.



NOTE

Pressure governor with connector:
The cabling may not be damaged when opening the cover (b).
Do not forcibly turn the adjusting knob past the end stops.

- Unscrew the four fastening screws from the cover (b).
- Carefully take off the cover (b), being careful of the cabling.
- Remove the locking pin from the adjusting knob.



NOTE

Always set the upper working point first when re-adjusting.

- Setting the upper working point:
 - Turn the adjusting knob that is in its upper position according to the requirement for increasing or decreasing the upper working point (see Figure 3, left figure).
Turning clockwise: - Increases the upper working point
Turning anti-clockwise: - Decreases the upper working point



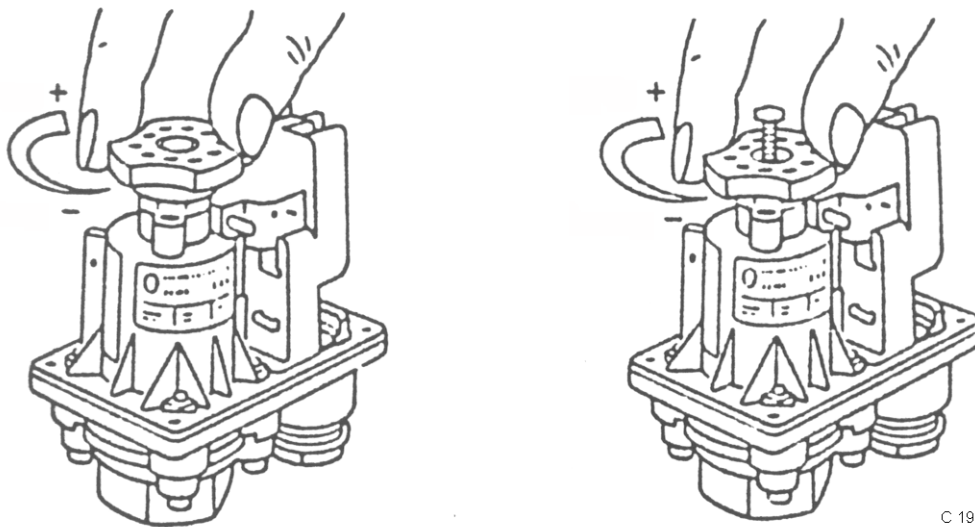
NOTE

The upper working point remains unchanged when re-adjusting the lower working point.

- Setting the lower working point:
 - Carefully press the adjusting knob (see Figure 3, right figure) downwards.
 - Turn the adjusting knob that is in its lower position according to the requirement for increasing or decreasing the lower working point, during which the spindle itself does not turn. If necessary, the spindle must be held in place (see Figure 3, right figure).
Turning clockwise: - Increases the lower working point
Turning anti-clockwise: - Decreases the lower working point



- Insert the locking pin of the adjusting knob.
- Carefully pull the adjusting knob upwards from its lower position.
- Carry out a visual inspection of the cabling.
- Carefully position the cover (b), being careful of the cabling.
- Attach the covering hood (b) using the four fastening screws.
Tightening torque: 0.7 Nm



C 19546/3

Figure 3 Re-adjusting the working point

6.4 Overhaul - replacement

There is no provision for overhauling the unit. The unit must be exchanged in accordance with the directions in Section 6.4.1.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when replacement is required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation.

Activity	Interval
Replacement	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Implementation

Problem	Cause	Remedy	See
Unit inoperative	Unit not being activated pneumatically	Test the unit for correct pneumatic control.	
	Unit not being activated electrically	Test the unit for correct electric control.	
Unit not reacting when pressure threshold is reached	No electric power	Check the plug connection.	
		Test the unit for correct electric control.	
	Unit defective	Remove the unit, arrange for its disposal and exchange for an operative unit.	Section 5.2
	Working point outside tolerance	Remove the unit and ship to a KNORR-BREMSE Service Center for adjustment.	Section 5.2
Re-adjust working point.		Section 6.3.1	
Compressed air discharging from the port	Connection leaking	Tighten the connection (apply the specified tightening torque!) and test for leakage.	Section 5.1.3



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - O J 4 1 . 2 1

Rev. 09 - 18.06.2018 - en
.....

.....
Description

Ballcocks with a switch module and
with or without an exhaust
SK-DN...-SM



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are null and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
08	29.05.2012	Revision history started		x				
		3.1	x					
		4, 4.2, 5.1, 5.1.1, 5.1.2, 7.2					x	
09	18.06.2018	1.3, 3.1, 3.2, 5.1, 5.1.1, 5.1.2, 6, 7.2		x				



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group of this documentation	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	10
3.3	Operator's commitment to due care	11
3.3.1	Assignment of personnel	11
3.3.2	Availability of the document	11
3.3.3	Amendments to the document	11
3.3.4	Spares and wearing parts	11
4	Technical description	12
4.1	Technical features	13
4.2	Construction	14
4.3	Working principle	20
5	Removal and installation	21
5.1	Installation	21
5.1.1	Requirements	22
5.1.2	Procedure	22
5.1.3	Leakage testing	23
5.1.4	Function test	23
5.2	Removal	24
5.2.1	Requirements	24
5.2.2	Procedure	24



6	Maintenance	26
6.1	Inspection	26
6.1.1	Interval	26
6.1.2	Special tools	26
6.1.3	Implementation	26
6.2	Servicing	26
6.3	Repair	27
6.4	Overhaul - replacement	27
6.4.1	Interval	27
7	Troubleshooting	28
7.1	Special tools	28
7.2	Implementation	28
8	Disposal	30



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group of this documentation

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

B-OJ45.21 Description of the switch module

GD15904 Specification "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate or is engraved on the unit. The item number and type designation must match the validity note stated in this document.

This document is valid for units with item numbers:

II53481/...	II62781/...
II53482/...	II62782/...
II53483/...	II62783/...
II53484/...	II62784/...
II53485/...	II62785/...
II53487/...	II67091/...
II58611/...	II67092/...
II58612/...	II67093/...
II58613/...	II67094/...
II58614/...	II67095/...
II58615/...	II67096/...
II62101/...	II73901/...
II62102/...	II73902/...
II62103/...	II73903/...
II62104/...	II73904/...
II62105/...	II73905/...
II62106/...	II73906/...
II62241/...	II80981/...
II62242/...	II80982/...
II62243/...	II80983/...
II62244/...	II80984/...
II62245/...	II80985/...
II62246/...	II80986/...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.



3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

Series SK-DN...-SM ballcocks are used as isolating cocks, stopcocks or drain cocks in brake systems and other installations on rail vehicles. They are equipped with a module to monitor the switch position.

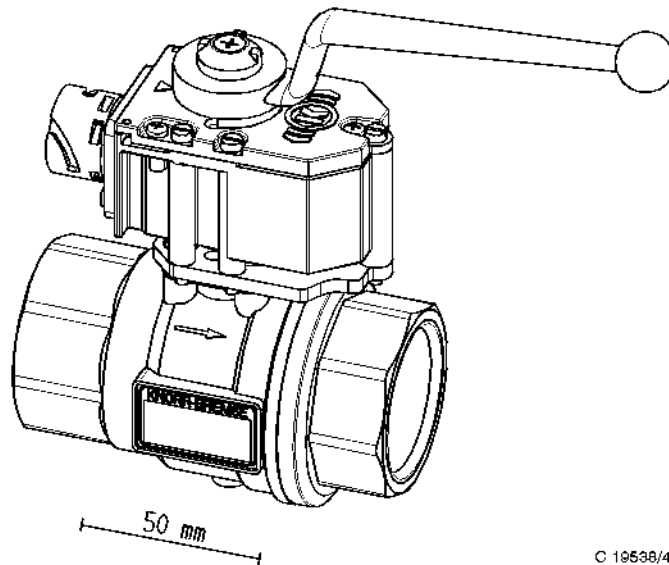


Figure 1 Ballcock SK-DN32E-SM
(the unit with item number II53487/1A1E is shown here by way of example)



4.1 Technical features

See Figure 2, Figure 3, Figure 4, Figure 5, Figure 6

The units differ in:

- Shape of the handle (d)
- Colour of the handle (d)
- Starting position (cock open)
- Version with or without an exhaust
- Rotating direction
- Connector positioning
- Working point

The ballcocks come with either a long handle or a T-handle.

The long handle can be displaced by $4 \times 90^\circ$. The T-handle can be fitted in two positions. The handle (d) and the stop disc (m) can be mounted so as to adjust the home position of the handle (d) to any mounting scenario. The applicable installation drawing shows the handle's (d) possible starting positions.

The swivelling range of the handle (d) is defined by the position of the arc-shaped recess in the stop disc (m) relative to the stop pin (n).

The handle (d) can be fixed in the wanted position by a lead seal and wire drawn through the hole (U) in the handle (d) and through the two holes X in the casing of the switch module SM.

The handles come in several different colours. The applicable installation drawing shows which colours are available.

The parts belonging to the pneumatic portion are enclosed in a brass housing, those for the electrical portion are situated inside a plastic housing.

The two-part item number on the name plate (t) additionally indicates the features of the relevant ballcock.

For example item number: II53481 / **1A1E**:

The number "II53481" in front of the stroke is the core item number of series SK-DN8-SM ballcocks which turn to the right, see Table 1.

The number "II58613" in front of the stroke is the core item number of series SK-DN8-SM ballcocks which turn to the left, see Table 1.



The characters after the stroke define the individual features of a particular ballcock in the following sequence:

Place 1	Handle code	1 = long handle
Place 2	Handle colour code	A = fiery red
Place 3	Handle position - when open	1 = horizontal right
Place 4	with/without exhaust	E = with exhaust

For full details of all the features of the various ballcocks and their switch modules and for the specifications please refer to the applicable installation drawing.

4.2 Construction

See Figure 2, Figure 3, Figure 4, Figure 5, Figure 6

The ballcock SK is a one-way cock that is designed and built for installation in pipelines.

It has two identical pipe thread ports: input port P1 and output port P2. These ports are marked by the numbers 1 and 2 stamped in the housing.

The following particulars are also stamped in the housing of each cock at the opposite side to the name plate:

- For the size of the threaded ports, graduated in steps according to the nominal bore of the relevant series - see Table 1
- Maximum working pressure
- Arrow indicating the direction of flow from inlet port P1 to outlet port P2; on cocks with an exhaust, it also indicates the vented side of the cock
- Material of the housing

The main components of the unit are as follows:

- Ballcock (SK) - with the following parts:
 - Isolating ball (a)
 - Housing (b)
 - Control shaft (c)
 - Handle (d)
 - Moulded sealing ring (e1) and counter-support (e2)
- Switch module (SM)



The chrome-plated brass isolating ball (a) floats inside the housing (b). It is held and sealed by two plastic rings that are located inside the housing. The moulded sealing ring (e1) is at the inlet end, the counter-support (e2) at the outlet end.

The wall of the isolating ball (a) has a slanting through-hole D which enables the cock's outlet end P2 to communicate with the exhaust port O.

The housing (b) is inseparable. It is a nickel-plated brass component which therefore does not need to be painted.

The aluminium handle (d) is joined rigidly to the isolating ball (a) via the control shaft of the switch module and the control shaft (c) of the cock. The control shaft is sealed by the O-ring (f) in the housing.

For information about the switch module please refer to the related Description (see Section 2.1).



Series SK-...- SM	Working point	Connector pointing towards the inlet end		Connector pointing towards the outlet end		Installa- tion drawing
		turning to right	turning to left	turning to right	turning to left	
.-DN8-	10°/10°	I162781/...	I180981/...			C105465
	10°/80°	I153481/...	I158611/...	I173901/...		
	80°/80°	I162241/...	I167091/...	I162101/...		
.-DN10-	10°/10°	I162782/...	I180982/...			C105466
	10°/80°	I153482/...	I158612/...	I173902/...		
	80°/80°	I162242/...	I167092/...	I162102/...		
.-DN12-	10°/10°	I162783/...	I180983/...			C105467
	10°/80°	I153483/...	I158613/...	I173903/...		
	80°/80°	I162243/...	I167093/...	I162103/...		
.-DN20-	10°/10°	I162784/...	I180984/...			C105468
	10°/80°	I153484/...	I158614/...	I173904/...		
	80°/80°	I162244/...	I167094/...	I162104/...		
.-DN25-	10°/10°	I162785/...	I180985/...			C105469
	10°/80°	I153485/...	I158615/...	I173905/...		
	80°/80°	I162245/...	I167095/...	I162105/...		
.-DN32-	10°/10°		I180986/...			C105470
	10°/80°	I153487/...		I173906/...		
	80°/80°	I162246/...	I167096/...	I162106/...		

Table 1 Versions available

The type SK-DN...-SM ballcocks with a switch module come in several different versions.

Ballcocks without venting have a core stopper to seal their exhaust port O. Ballcocks with venting do not have such a core stopper in their exhaust port O.

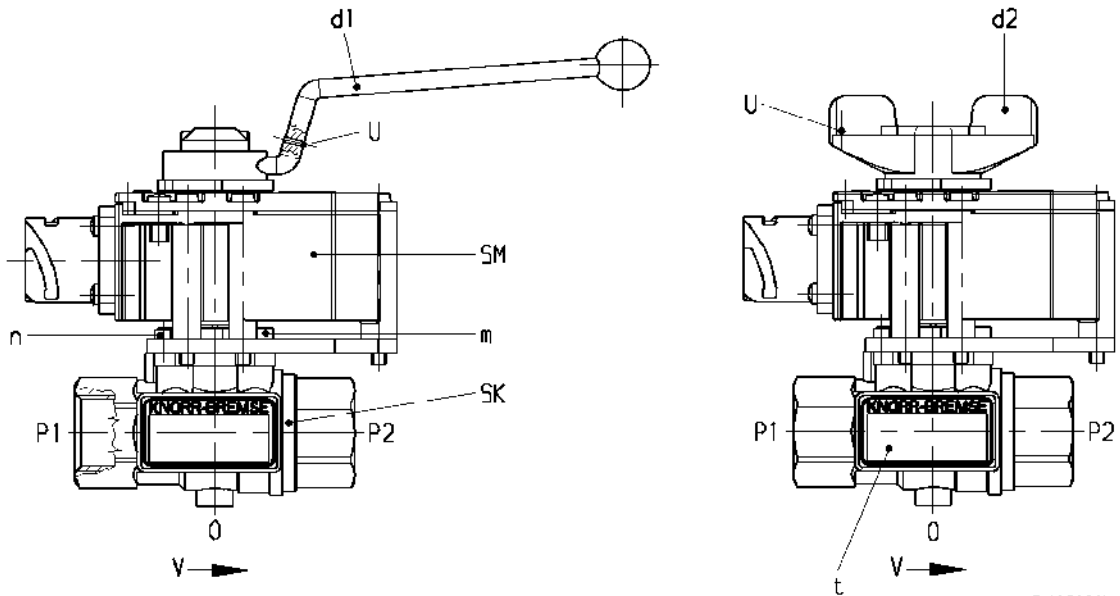
The cap on the control shaft has three protuberances, two of them K at opposite sides and one R between them see Figure 3 and Figure 4.

The cock's working position (open or closed) can be identified by the position of the two protuberances K (parallel or at right-angles to the cock's longitudinal axis).

The position of the protuberance R indicates the position of the through-hole D in the isolating ball (a). When the marking point R points in the direction of flow, the ballcock is vented, provided it is a version with an exhaust, see Figure 2 to Figure 6.



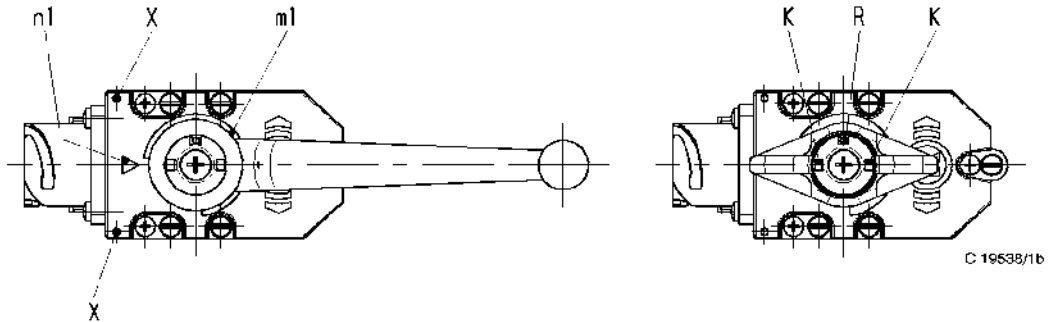
The switch module bears the pin marking (n1, Figure 3). Mounted beneath the handle (d) is a disc (m1, Figure 3) which is similar to the stop disc (m, Figure 2). These two elements map the position of the stop pin (n, Figure 2) and stop disc (m, Figure 2) and make the working position easy to identify.



© 19538/1a

- | | | | |
|-----------|---------------|-----------|--|
| SK | Ballcock | t | Name plate |
| SM | Switch module | U | Hole for lead seal in the handle |
| d1 | Long handle | O | Breather hole; alternatively: closed by core stopper |
| d2 | T-handle | P1 | Inlet port |
| m | Stop disc | P2 | Outlet port |
| n | Stop pin | V | Direction of flow |

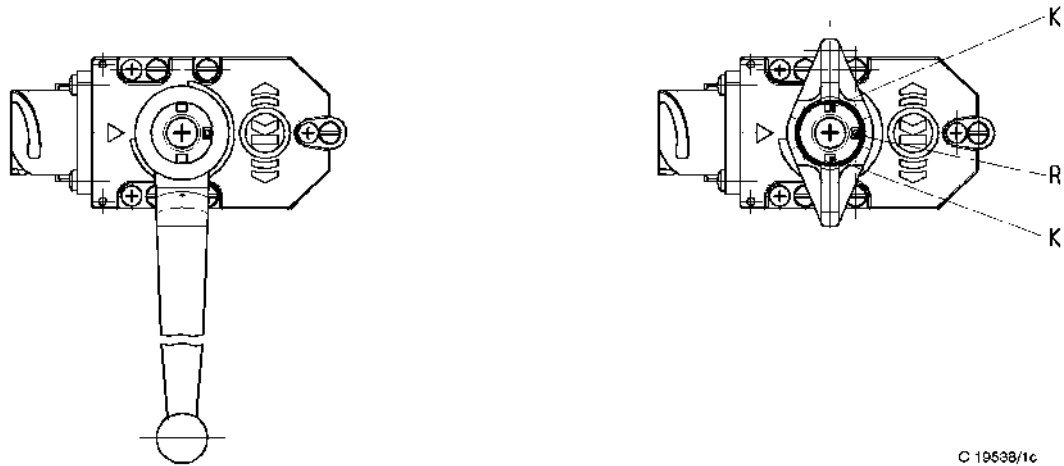
Figure 2 Ballcock with a switch module, with a T-handle or long handle
Version: turning to right (typical view)



m1 Washer
n1 Pin marking

K Protuberance marking direction of flow
R Protuberance marking exhaust
X Hole for lead seal in the switch module

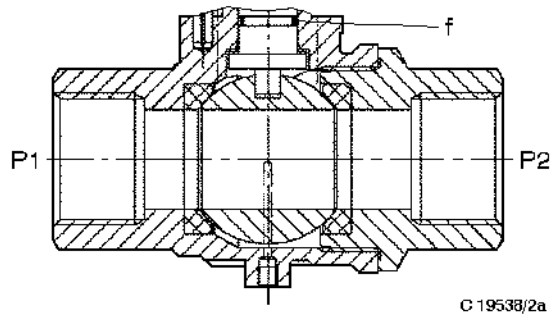
Figure 3 Ballcock with a switch module, with a T-handle or long handle
 Open position



K Protuberance marking direction of flow

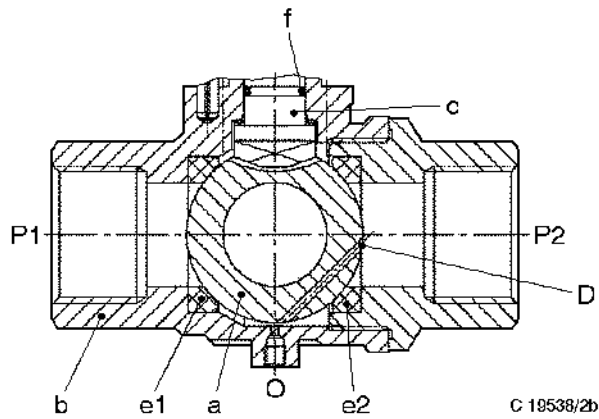
R Protuberance marking exhaust

Figure 4 Ballcock with a switch module, with a T-handle or long handle
 Cutoff position



- | | | | |
|-----------|------------|-----------|-------------|
| f | O-ring | P2 | Outlet port |
| P1 | Inlet port | | |

Figure 5 Ballcock with an exhaust (without the switch module)
Open position



- | | | | |
|-----------|----------------------|-----------|--------------------------|
| a | Isolating ball | f | O-ring |
| b | Housing | D | Through-hole for exhaust |
| c | Control shaft | O | Exhaust port |
| e1 | Moulded sealing ring | P1 | Inlet port |
| e2 | Counter-support | P2 | Outlet port |

Figure 6 Ballcock with an exhaust (without the switch module)
Cutoff position



4.3 Working principle



CAUTION

Beware of incorrect operation!

The unit will be damaged and/or its functionality impaired.

The handle (d) must always be swung home to its stop. Intermediate positions will damage the moulded sealing ring (e1) and the counter-support (e2) and may cause the ballcock to leak.

The two working positions of the ballcock: "Open position" and "cutoff position" are reached by turning the handle (d) by 90°.

Open position

In this position, the isolating ball's through-hole is parallel to the ballcock's longitudinal axis - see cross-section in Figure 5. The two protuberances K visible on the end of the control shaft cap are also parallel to the ballcock's longitudinal axis.

The passage from port P1 to port P2 is open.

The circuits in the two electric microswitches of the switch module SM are connected as shown in the circuit diagram (see installation drawing).

Cutoff position

In this position, the isolating ball's through-hole is at a right angle to the ballcock's longitudinal axis - see cross-section in Figure 6. The protuberances K visible on the cap of the control shaft are similarly at right-angles to the ballcock's longitudinal axis.

The circuits in the two electric microswitches of the switch module SM are connected as shown in the circuit diagram (installation drawing).

In the closed position, the working principle varies according to whether or not a particular ballcock has an exhaust (see circuit diagram in the installation drawing).

Closed position without an exhaust

The exhaust port O is plugged by a core stopper. The supply of compressed air is shut off at the inlet end.

The passage from port P1 to port P2 is closed. The outlet pipe is not vented. The position of the R on the control shaft cap is irrelevant in this case.

Closed position with an exhaust

The exhaust port O is quite clear, i.e. the port is not blocked by a core stopper. The supply of compressed air is shut off at the inlet end.

The passage from port P1 to port P2 is closed. The outlet pipe is vented through the ball's through-hole D and the exhaust port O. The protuberance R on the control shaft cap is pointing in the direction of flow and indicates the vented side.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Only allowed to be installed are units that

- have been stored in compliance with the details given in the GD15904 regulation and

- whose date of manufacture has not exceeded the limit value specified in the GD15904 regulation.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements



CAUTION

Beware of an incorrect mounting position!

The unit will be damaged and/or its functionality impaired.

Ballcocks with venting must be mounted with their exhaust port (O) pointing either downwards or sideways.



CAUTION

Beware of an incorrect mounting position!

The unit will not function.

Point the unit in the direction of the arrow on its housing.

The unit can be installed with standard tools.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)

5.1.2 Procedure



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.



- Remove the covers from the ports on the unit and the on-board compressed air pipes to be connected.
- Thoroughly clean the ports.
- Lubricate the threads of the on-board compressed air pipes with a **thin** film of STABURAGS NBU 30 PTM grease.
- Screw the on-board compressed air pipes into the unit, taking care to observe the correct direction of flow.
- Attach the on-board connector to the bayonet fastener on the switch module.
- Connect the supply of compressed air and the power supply to the unit.

5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test



CAUTION

Beware of incorrect operation!

The unit will be damaged and/or its functionality impaired.

The handle (d) must always be swung home to its stop. Intermediate positions will damage the moulded sealing ring (e1) and the counter-support (e2) and may cause the ballcock to leak.

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



CAUTION

Beware of electric shock!
Danger of physical injury.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.



- Turn off the supply of compressed air and vent the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. No part of the unit may still be live.
- Unlock the on-board bayonet connector and removed the bayonet connector from the bayonet lock of the switch module.
- Unscrew the on-board compressed air pipes from the compressed air ports of the unit.
- Cover up the compressed air ports and the electric connections of the unit.
- Unless a replacement unit is to be fitted immediately after removal, cover up the on-board ports and the on-board bayonet connector.
- Protect the on-board connection cable and the bayonet connector from damage.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Implementation

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul - replacement

There is no provision for overhauling the unit. The unit must be exchanged in accordance with the directions in Section 6.4.1.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when replacement is required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation.

Activity	Interval
Replacement	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Implementation

Problem	Cause	Remedy	See
Unit inoperative	Actuator not in the end position	Move the actuator to the end position.	
Compressed air discharging from threaded port P1 or P2	Threaded ports leaking	Tighten the threaded connections (observe the tightening torque!) and test for leakage.	Section 5.1 Section 5.1.3
Air discharging from control shaft (c)	Unit defective	Remove the unit, arrange for its disposal and exchange for an operative unit.	Section 5
Compressed air present at outlet port P2 in the closed position			
Air discharging through the exhaust port in the open position			
Cock with an exhaust is not venting	Exhaust port O clogged	Clean out the exhaust port O.	
	Through-hole D clogged	Remove the unit, arrange for its disposal and exchange for an operative unit.	Section 5
Electric monitoring function of switch module SM has failed	Power supply failure	Check the onboard power supply.	
		Check the on-board electric leads for correct connection.	
		Check the electric leads for correct connection to the bayonet connector.	
	Switch module defective	Remove the switch module, arrange for its disposal and exchange for an operative one.	See document of the switch module Section 2.1



Problem	Cause	Remedy	See
Other problems	Unit defective	Remove the unit, arrange for its disposal and exchange for an operative unit.	Section 5



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous! This would mean unnecessary and legally punishable harm to the environment. Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B-IS30.24

Rev. 07 - 10.05.2012 - en
.....

.....
Description

Pressure sensors with a current output

DG10

DG10-B

DG10-S



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
07	10.05.2012	Revision service started		x				
		3.1	x					
		4, 4.1, 4.2, 4.3, 5.1, 5.1.1, 5.1.2, 5.2, 5.2.1, 5.2.2, 7.2					x	



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Authorized use of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	12
4.3	Working principle	14
5	Removal and installation	15
5.1	Installation	15
5.1.1	Requirements	16
5.1.2	Procedure	16
5.1.3	Leakage testing	17
5.1.4	Function testing	17
5.2	Removal	17
5.2.1	Requirements	18
5.2.2	Procedure	18



6	Maintenance	19
6.1	Inspection	19
6.1.1	Interval	19
6.1.2	Special tools	19
6.1.3	Procedure	19
6.2	Servicing	20
6.3	Repair	20
6.4	Replacement	20
6.4.1	Interval	20
7	Troubleshooting	21
7.1	Special tools	21
7.2	Procedure	21
8	Disposal	22



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Specification "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

STN29889

STN29890/K

STN29890

STN31086



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

Pressure sensors convert pneumatic or hydraulic pressures into proportional electric current signals.

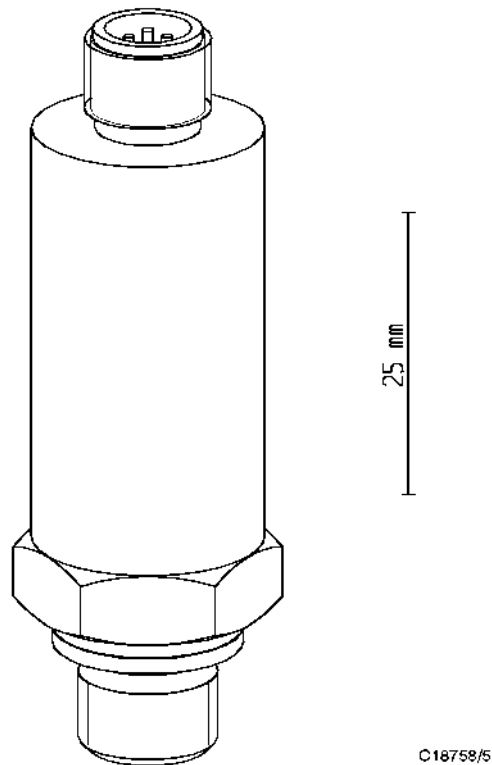


Figure 1 Pressure sensor DG10
(the unit with item number STN29889 is shown here by way of example)



4.1 Technical features

Pressure sensors are engineered for use in pressure control circuits requiring a high degree of precision and reliability (e.g. brake control units).



NOTE

Overloading must not exceed twice the maximum pressure reading!

The installation drawing contains the technical particulars of the pressure sensor.

The letter "K" at the end of the item number denotes units with enhanced resistance to low temperatures.

4.2 Construction

See Figure 2

The pressure sensors consist of a sensing device and electronics.

A stainless steel diaphragm in the pressure sensor separates the working fluid (air or oil) from the electronic circuitry.

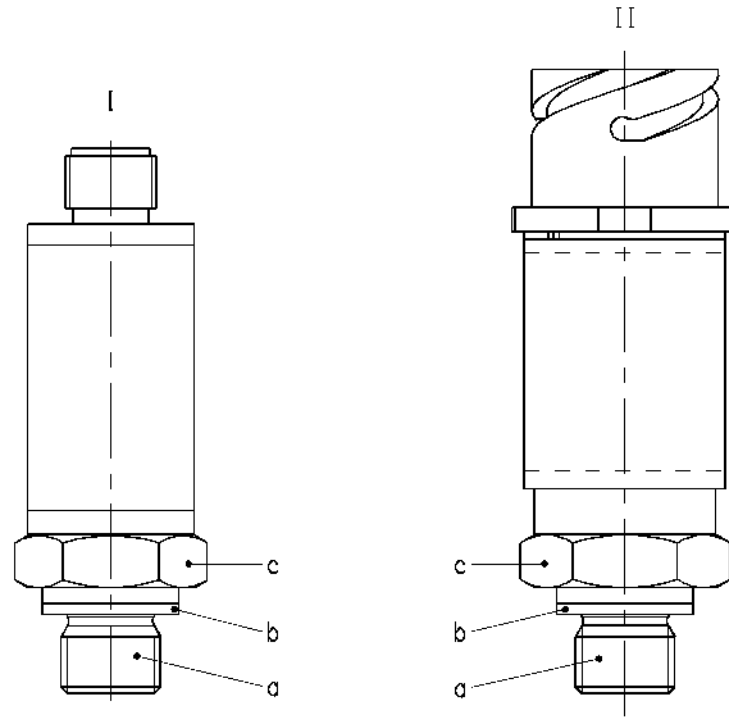
The pressure sensors have four electric connections. The related installation drawing contains the electric circuit diagram and shows how the connections are configured.

The electronic part delivers the voltage to power the pressure sensor and processes the output signal from the pressure sensor.

The output signal from the pressure sensors still amounts to 4mA in the absence of pressure.

The DG10 and DG10-S pressure sensors have an M12 connector.

The model DG10-B pressure sensor has a bayonet connector.



C 18758/6

- a Screwed union G1/4
- b Sealing ring
- c Hexagon head

- I Construction of DG10 and DG10-S
- II Construction of DG10-B

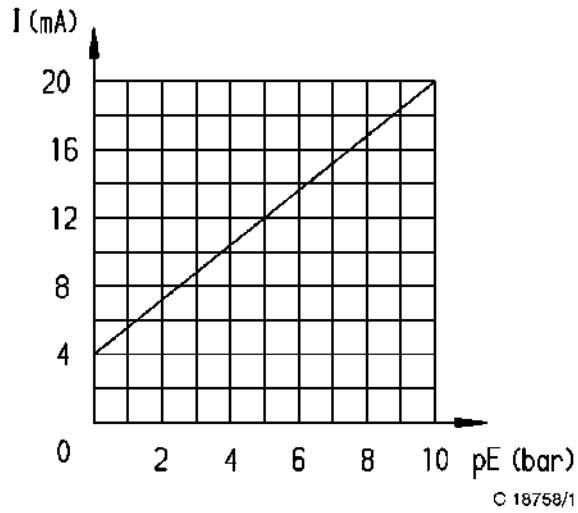
Figure 2 Pressure sensors (variants)



4.3 Working principle

The input pressure is converted linearly into an output current of between 4 and 20mA.

Figure 3 plots the pressure sensor's characteristic curve.



I Output current

pE Input pressure

Figure 3 Characteristic



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements



WARNING

Beware of electrical or mechanical damage!

Device and/or system functions will fail.

The pressure sensor is not suitable for unprotected mounting beneath the car body.

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold it securely with a suitable tool, such as an open-end wrench.



- Take the covers off the unit's port and off the onboard port.
- Thoroughly clean the ports.
- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the type designation):
 - Lubricate sealing ring (b) with a **thin** film of RENOLIT KBS 1 grease.
- For all other units:
 - Lubricate sealing ring (b) with a **thin** film of RENOLIT HLT2-KB grease.
- Place the greased sealing ring (b) on the unit.
- Screw the unit into the onboard port.
Tightening torque: See installation drawing
- Plug in the onboard connecting cable, and screw the union nut tight or plug in and secure the bayonet connector.
- Connect the supply of compressed air.
- Connect the power supply.

5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the screwed joint for leakage at the acceptable working pressure. Air bubbling is unacceptable.
- Leakage testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



CAUTION

Beware of electric shock!
Danger of physical injury.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold it securely with a suitable tool, such as an open-end wrench.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.
- Release the union nut holding the onboard connecting cable, or unlock the bayonet fastener and remove the connecting cable.
- Unscrew the unit from the onboard port.
- Cover up the pneumatic and electric connections on the unit.
- Cover up the onboard port and secure the connecting cable unless a replacement unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions



6.2 Servicing



NOTE

The pressure sensor is calibrated to its characteristics by the manufacturer. So never attempt to open its casing.

Not required

6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Replacement

There is no provision for overhauling the unit. The unit must be exchanged in accordance with the directions in Section 6.4.1.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when replacement is required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation.

Activity	Interval
Replacement	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Incorrect or no electric signal for signalling the pressure	Unit not being activated pneumatically	Test the unit for correct pneumatic control.	
	Unit not being activated electrically	Check the connector.	
		Test the unit for correct electric control.	
	Unit defective	Remove the unit, arrange for its disposal and exchange for an operative unit.	Section 5.2
Air discharging constantly from the port	Connection leaking	Tighten the connection and test for leakage; observe the tightening torque.	Section 5.1.3



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B-IE21.175

Rev. 12 - 28.04.2015 - en
.....

.....
Description

General Servicing Instructions
ESRA



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
11	29.04.2014	Revision history started		x				
		5.1.1					x	
12	28.04.2015	5.1.4					x	



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	11
4.2	Construction	12
4.3	Working principle	13
5	Removal and installation	14
5.1	Installation	14
5.1.1	Requirements	15
5.1.2	Procedure	17
5.1.3	Leakage testing	19
5.1.4	Placing in service	19
5.1.5	Function testing	21
5.2	Removal	25
5.2.1	Requirements	25
5.2.2	Procedure	25



6	Maintenance	26
6.1	Inspection	26
6.1.1	Interval	26
6.1.2	Special tools	27
6.1.3	Procedure	27
6.2	Servicing	27
6.2.1	Interval	27
6.2.2	Special tools	28
6.2.3	Procedure	28
6.3	Repair	29
6.3.1	Exchanging boards	29
6.3.2	Repairing boards	32
6.4	Overhaul or replacement	33
6.4.1	Interval	33
7	Troubleshooting	34
7.1	Special tools	34
7.2	Procedure	34
8	Disposal	35



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

I-IE21.50	Technical Information about ESRA
I-IE21.630	Technical Information about the service terminal software
WB420332A	Table of specified tightening torques

The related installation drawing and ESRA board description specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for brake control units marked "**ESRA**" on the name plate (see Figure 2).



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

4.1 Technical features

Brake control units with ESRA electronics are distinguished by the following features:

- ESRA is a modular system with standardized boards. A wide variety of types is avoided in this way.
- The application software gives the boards their project-specific functionality.
- This denotes vital benefits, such as
 - accelerated spare part delivery,
 - low stocking and
 - proven high-quality technology.
- ESRA electronics may only be used in rail vehicles.
- ESRA has been engineered in accordance with Standard EN 50155, i.e. the following requirements are met:
 - Climate test (dry heat and low temperatures)
 - Mechanical vibration stress
 - Mechanical shock stress
- ESRA has been engineered in accordance with Standard EN 50121-3-2, i.e. the following requirements are met:
 - EMC immunity
 - EMC emission



4.2 Construction

See Figure 1

The brake control unit consists of a 19-inch or ½ 19-inch rack into which boards are plugged.

The brake control unit consists essentially of the following boards:

- power board(s),
- main board(s),
- extension board(s),
- communication board(s),
- remote board(s)

as well as other 19-inch boards from the ESRA range of electronics.

The boards are operated and cabled from the front.

Which boards are chosen is a question of project specifics.

The mounting brackets (Figure 1, part No. 1) are used to fasten the rack in a standard 19-inch cabinet. There are four mounting points (Figure 1, part No. 2) for fixing the rack inside the cabinet.

The boards are based on microcontrollers and usually have an interface with a serial bus.

The board hardware is independent of any specific project. The software consists partly of all-purpose firmware and partly of a dedicated loadable application software package.

The application software can be installed on board the vehicle using the ESRA Service Terminal. This application software contains all the project-specific board configurations and functions.



1 Mounting bracket

2 Mounting points

Figure 1 Mounting the rack in the cabinet

4.3 Working principle

The Technical Information I-IE21.50 discusses the functionality and working principle of the brake control unit.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the onboard power supply and prevent it from being restored without due authorization.

The work of connecting and disconnecting cables in the electrical system must always be left to specially trained and authorized personnel.



NOTE

It is vital to observe the maker's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for horizontal installation in a standard 19-inch cabinet. The place of installation must be defined accordingly when the vehicle is being engineered.

The definitions made at the project engineering stage must not be altered in connection with any servicing activities.



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

Horizontal positioning is mandatory for heat dissipation. Make sure that the unit is mounted horizontally.

Mounting scenario

The rack satisfies the requirements of sealing class IP20. In view of this circumstance, the mounting scenario used for the rack must comply, as a minimum, with pollution class PD2 as defined by EN50124-1.

Ambient conditions

To work correctly, the brake control unit must be operated in ambient conditions complying with the specifications (climate, EMC, vibration/acceleration according to EN50155).

Pay particular attention to the following points:

- Enough clearance must always be left around the brake control unit to permit cooling by free convection.
- External sources of heat above or below the boards must be avoided. The acceptable operating temperature range must be observed.
- Always store and install the brake control unit in places protected permanently from moisture.

Grounding rules

The rack must be joined to the vehicle chassis by an electrically conductive connection. This can be achieved in one of two alternative ways (see installation drawing of the rack):

- Connection using the electrically conductive joining surface of the rack
- Connection to the bolted joint provided for this purpose on the rack

The precise form will be defined in accordance with the directives valid at the time when the project is engineered.

The connector cases, cable shields and racks are connected to common potential. This is essential for the shielding concept.

In the ESRA system, the boards and peripheral components, such as active sensors and valves, are powered by the supply voltage which is galvanically isolated from onboard battery potential. Isolation is provided on the power board.



Discrete, external signals (digital and analog) are processed in a galvanically isolated part of the unit.

In cases where the brake control unit is interfaced with a vehicle bus, the bus signals are isolated galvanically on the board.

Shielding the connecting cables

The connecting cable shields must be connected to the car body by broad electrical contact. On the brake control unit, this is achieved by locating the shield on the connector (e.g. using a metallized Harting connector).

The precise form will be defined in accordance with the directives valid at the time when the project is engineered.

Supply voltage to the brake control unit

The brake control units are powered by the power boards provided for this purpose.



CAUTION

Beware of using the wrong power board!

The unit will be damaged and/or its functionality impaired.

Before connecting the brake control unit, make sure that the vehicle's supply voltage matches the rated voltage of the power board.



NOTE

Check the connector notation against the particulars from the layout diagram.



CAUTION

Beware of connecting the power board incorrectly!

Use of the wrong polarity may damage the power board.

Check the polarity of the power supply.



5.1.2 Procedure



WARNING

Beware of electric shock!

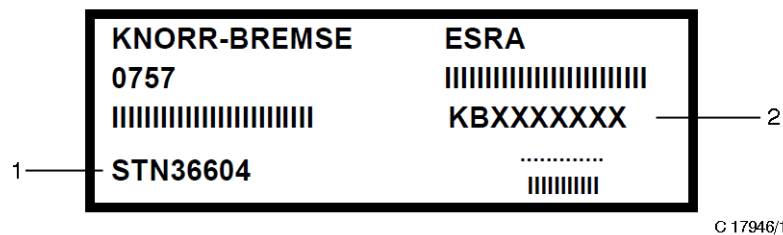
Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the onboard power supply and prevent it from being restored without due authorization.

The work of connecting and disconnecting cables in the electrical system must always be left to specially trained and authorized personnel.

Checking the type

The item number (STN ...) on the brake control unit (see Figure 2) must agree with the item number stated in the applicable Spare parts list.



1 Item number

2 Serial number

Figure 2 Name plate of a brake control unit



NOTE

The sticker shown in Figure 2 is located on the rack's right-hand mounting bracket (see Figure 3, part No. 3).

Switching off the battery voltage

Always switch off the power before installing and cabling the brake control unit. Make sure that none of the contacts on the front-panel connectors is live.

Attaching the protective earth PE

The unit must be connected to protective earth PE in accordance with the grounding rules (see Section 5.1.1).

Installing the rack

Insert and position the brake control unit's rack in the 19-inch cabinet on board the vehicle.

The brake control unit is held by four nuts and bolts in its correct mounting position in the 19-inch cabinet. The bolts must be tightened to the specified torques (see Section 2.1).



Power supply

Connect the power supply (see Section 5.1.1).

The power board is interfaced with the onboard voltage via the connector (front panel) as shown in the layout diagram of the project-specific description.

Plug the connector into the power board's contacts and secure by the screw.

Connecting the brake control unit's input/output signals to the vehicle

Connect the brake control unit to the vehicle as shown in the layout diagram of the project-specific description. For this purpose, plug the mating connectors into the corresponding boards and secure by screws in the correct mounting position.

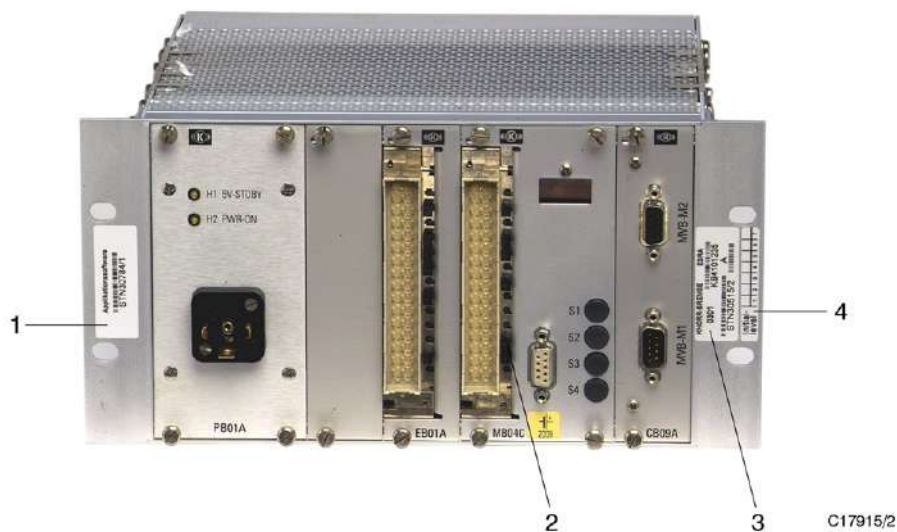


NOTE

Check the connector notation against the particulars from the layout diagram.

The main and extension board connectors are mechanically coded (see Figure 3, part No. 2).

The connectors are secured by two screws.



- 1 Name plate, application software
- 2 Mechanical coding

- 3 Name plate, brake control unit
- 4 Label, initial level

Figure 3 Positions of the stickers on the rack



5.1.3 Leakage testing

Not required

5.1.4 Placing in service



CAUTION

Brake control unit malfunctioning!

Brake system failure.

The work of placing the brake control unit in service must be left to suitably qualified, authorized personnel.

Make sure that the brake control unit is correctly installed and cabled.

Switch on the power supply to the brake control unit.

Both LEDs (PWR-On and 5V-STDBY) are lit on the power board.

All other steps for placing in service are defined specifically for each project.

The version of the application software can be verified via the ESRA Service Terminal; or, if required, the software itself can be installed using this terminal (see Section "Downloading the application software").

ESRA Service Terminal

The "ESRA Service Terminal" package is software that is installed on a personal computer.

This ESRA Service Terminal package can be used to install the application software in the brake control unit, and to run system diagnostics.

The ESRA Service Terminal package is supplied with setup instructions and a user's guide. These documents contain a detailed description of all the functions of the ESRA Service Terminal package.

The ESRA Service Terminal package can be purchased from KNORR-BREMSE.



NOTE

It is requested to restart the connected unit (power off/on) at the end of ST03A usage, to ensure that the unit is in the defined state.

Downloading the application software

The application software can be installed in a brake control unit using the ESRA Service Terminal package.



NOTE

For this purpose, read the software release reports concerning the relevant vehicle! Make sure that the STN number and the application software version match the brake control unit.



Data medium (CD or disk) containing application software (system software)

The data medium contains all the application software files for the boards of a brake control unit. A separate item number is defined for this package (see Figure 3, part No. 1).



NOTE

To order the data medium, the purchaser must state the item number of this medium (see Figure 4, part No. 3).

Checking the data medium (CD or disk)

The item number must be verified before the application software is installed.

The item number of the application software on the data medium (see Figure 4, part No. 2) must be identical to the item number on the brake control unit (Figure 5).

The version of the application software must be stated together with the item number on the data medium (see Figure 4, part No. 2).

"DMU North Tunesia" — 1
 "STN36861, V*.*)" — 2
 "STN36862" — 3 C 17946/22

- 1 Name of the project
- 2 Item number of the application software plus version number
- 3 Item number of the data medium

Figure 4 Name plate on the data medium

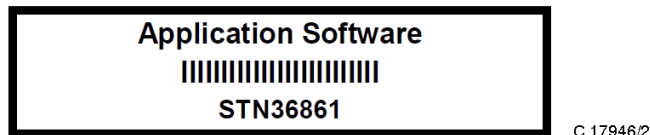


Figure 5 Name plate of the application software on the brake control unit



NOTE

The sticker shown in Figure 5 is located on the rack's left-hand mounting bracket (see Figure 3, part No. 1).



5.1.5 Function testing

The brake control unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

Diagnostics

The diagnostics covers the brake control unit, and associated components on board the vehicle. It serves, say, to identify defective boards, short-circuits and open circuits in the vehicle cabling. Fault codes and fault groups are assigned to the faults and events recognized in this way.

The boards are monitored automatically for correct working throughout operation. The faults and events can be retrieved through the MMI (man-machine interface). The fault codes are displayed together with them. A more precise diagnostic analysis indicating corrective action can be made with the ESRA Service Terminal package.

General notes on diagnostics are summarized in the next few sections.

Retrieving events via MMI

If an MMI is included in the project-specific version of the ESRA brake control unit, it can be used to retrieve event codes and other entries (e.g. test run, deleting event entries).

The man-machine interface has four keys (Figure 6, part No. 3) and a 4-character alphanumeric display (Figure 6, part No. 2).

The RS232 interface (Figure 6, part No. 1) is used for connecting an ESRA service PC.

An event may be current, or it may be "volatile"; i.e. it has occurred in the past but is not present at the time of query and retrieval.



NOTE

The board event codes are defined and documented specifically for each project.



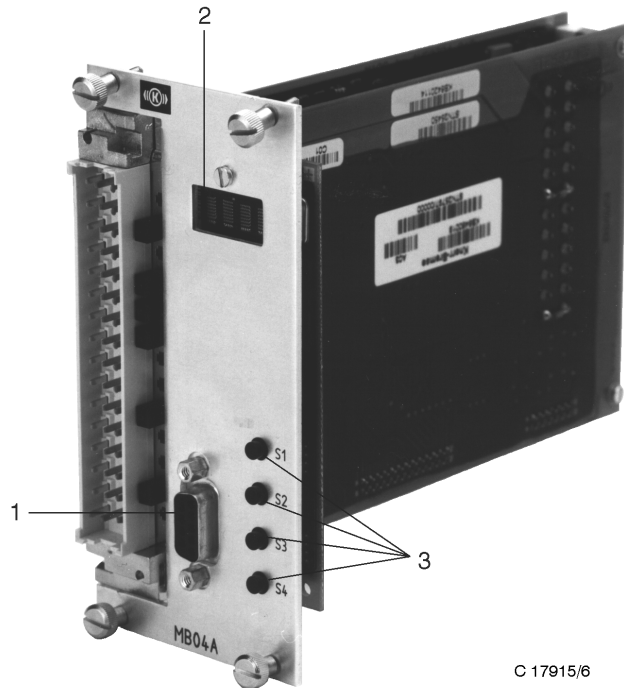
CAUTION

The fault memory must be queried at the specified servicing intervals.
Faults must be corrected.



CAUTION

The cause of volatile faults must be traced.



C 17915/6

1 RS232 interface

2 Display

3 Keys

Figure 6 Main board MB04A with a man-machine interface (MMI)

Using the keys



NOTE

The key functions are explained in the project-specific descriptions.

Extended diagnostics:

The fault and event codes can also be displayed using the ESRA Service Terminal package.

Extended vehicle and brake system diagnostics can be performed as well.



Test run

A test run in which the brake control system can be tested globally can be defined specifically for each project.

Test run procedure:

The test run is usually started with an MMI key while the vehicle is at standstill.
The test run procedure is explained in the project-specific description.



CAUTION

The test run must be performed fully and entirely at the specified servicing intervals.



CAUTION

Faults detected during the test run must be corrected.

Pressure regulator: Measuring the valve spring tension

The trigger threshold at which the inlet and outlet valves are just able to close is ascertained at the selected working point. The valve spring tension is calculated from the readings as a function of the valve characteristic. The results obtained for the valve spring tension are allotted a safety factor and saved on the related main board.

The readings are required for optimizing the control characteristic.



CAUTION

Measurement is mandatory each time

- the analog converter (solenoid and valve) is altered/exchanged, or
- the associated main board is exchanged!

The measurements can be made at standstill only. The vehicle must be arrested securely in place for this purpose. Measurement is terminated automatically as soon as speed is sensed.



CAUTION

Please note that measurement will not be terminated if a vehicle not having facilities to send speed information to the brake control unit is moving or starts to move.



NOTE

Measurement should be carried out at low outside temperatures. The brake system must be operative. This means:

- no kind of emergency braking is allowed,
- the supply pressure must be within the working range, and
- no other test run may be performed at the same time.

Measurement procedure:

Measurement is usually started with key S4 on the man-machine interface while the vehicle is stationary. The process of measurement is quite automatic. Provided a **good** result is obtained, the display will revert to the state it had prior to measurement. If the result is bad, the parameters saved last will be used.

Differences are described in the project-specific documentation.



CAUTION

Faults detected during the measurement must be corrected.



5.2 Removal

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the onboard power supply and prevent it from being restored without due authorization.

The work of connecting and disconnecting cables in the electrical system must always be left to specially trained and authorized personnel.

- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the brake control unit any longer. All of the contacts on the front-panel connectors are powered down.
- Release the fastener holding the power board connector, and unplug the connector.
- Release the screws holding the front-panel connectors, and unplug the front-panel connectors.
- Release the ground cable.
- Release the screws fastening the brake control unit, and draw the brake control unit forwards out of the 19-inch rack.
- Insulate the onboard electric connecting cables unless a replacement unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



6.1.2 Special tools

The following items should be placed in readiness as support for inspection.

Utility	Remarks
Fault code list	Fault codes are project-specific and are given in the descriptions of each of the brake control units.
Brake control settings	Settings are project-specific and are given in the descriptions of each of the brake control units.
ESRA Service Terminal plus setup instructions and user's guide	The "ESRA Service Terminal" package is software that is installed on a personal computer.

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

The boards will generally not need servicing within their useful life of 20 years (according to EN50155). Any board hardware containing parts (such as batteries) that do require attention has a servicing label on its front panel, indicating the latest date by which servicing is due.

A board bearing a servicing label must be serviced not later than the given date, in order to ensure that it will continue working correctly.

Peripherals, such as magnet valves, that are powered by the brake control unit, are not free from servicing. The servicing procedure required for such components is discussed in the descriptions written specially for them.

6.2.1 Interval

Activity	Interval
Exchanging the battery	1. As directed by the board's servicing label
	2. According to vehicle operator's project-specific experience
	3. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



6.2.2 Special tools

The following items should be placed in readiness as support for servicing.

Utility	Remarks
Fault code list	Fault codes are project-specific and are given in the descriptions of each of the brake control units.
Brake control settings	Settings are project-specific and are given in the descriptions of each of the brake control units.
ESRA Service Terminal plus setup instructions and user's guide	The "ESRA Service Terminal" package is software that is installed on a personal computer.

6.2.3 Procedure

Ship the boards to KNORR-BREMSE Rail Services for servicing. Servicing is chargeable.



6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

To enhance vehicle availability, vehicle operators themselves can do repairs by exchanging boards.

Servicing and repairs to the peripheral components of the brake system are described in separate documents.

The following safety rules must be observed. Failure to comply is dangerous, because the contacts of the front-panel connectors may carry hazardous voltages.



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the onboard power supply and prevent it from being restored without due authorization.

The work of connecting and disconnecting cables in the electrical system must always be left to specially trained and authorized personnel.



CAUTION

Never plug in or unplug a board or front-panel connector before you have switched off the power.

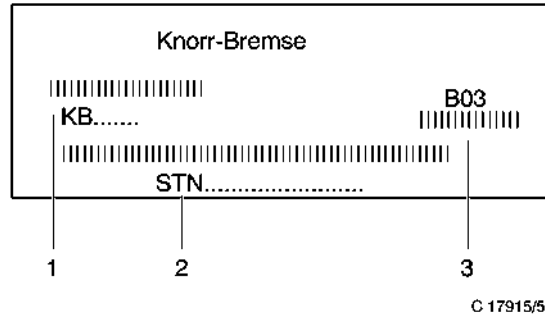
6.3.1 Exchanging boards

Revision level of a board

The revision level uniquely defines the versions of all the component parts of a board – both hardware and firmware.

The boards are subject to changes owing to additional requirements or product maintenance measures. Compatibility with earlier versions is considered in all changes. You may therefore find that later shipments contain more recent (higher) revision levels, but this does not affect or alter the application software.

Before exchanging any board, you must therefore check its revision level. The revision level is encoded alphanumerically on a board's name plate (see Figure 7).



- | | | | |
|---|---------------|---|--|
| 1 | Serial number | 3 | Revision level with alphabetic and numeric parts |
| 2 | Item number | | |

Figure 7 Name plate of a board

The alphabetic part indicates a downward-compatible change to a board. This means that a board having a revision level with a lower alphabetic part may be exchanged only for a new board with an equal or higher alphabetic part.

The numeric part of the revision level indicates a change that has no influence on the board's compatibility.

The revision level always consists of three places which can be represented in two different ways:

- One place alphabetic and two places numeric (e.g. B03)
- Two places alphabetic and one place numeric (e.g. AA1 or ZA1)

Once a board reaches level Z in its alphabetic part, it will change to the second form of representation for all subsequent revision levels.

The following list shows in detail the sequence in which the alphabetic revision levels are arranged (where x and y stand for the numeric places):

- Axy - Bxy - Cxy - ... - Zxy -
 AAy - ABY - ACy - ... - AZy -
 BAy - BBy - BCy - ... - BZy -
 CAy - CBy - CCy - ... - CZy -
 ... -
 ZAy - ZBy - ZCy - ... - ZZy



Some of the alphabetic revision levels can be skipped without the sequence of the compatibility being changed (e.g. Zxy can be directly followed by revision level ZAy). See the following examples.

- Revision level B03 can be replaced by revision level C01 but not by A04.
- Revision level K03 can be replaced by revision level AA2.
- Revision level W01 can be replaced by revision level ZB1.
- Revision level AC1 can be replaced by revision level FA1.

Initial level of the brake control unit

The initial level defines the configuration and the minimum revision level of a board (lowest revision level) that has been released for a specific project. This configuration is defined in the project-specific document "Configuration Control List".

The brake control units may contain identical boards having a higher alphabetic revision level than the minimum revision level (see above).

The initial level is incremented each time a board must necessarily be given a higher revision level than when the last initial level was released. This may be because, for instance, the project specification has been amended.

The initial level is marked on the brake control unit (see Figure 3, part No. 4).

Mechanical coding

The boards are standardized, which means they can be used for any project.

Power boards (PBxx), main boards (MBxx), extension boards (EBxx) and communication boards (CBxx) do not have project-specific hardware settings and can therefore be exchanged for a corresponding type on any brake control unit.

The mechanical coding of the front-panel interfacing connectors on main and extension boards must be observed (see Figure 3, part No. 2). That of extension boards is fixed for the relevant board.



NOTE

Vehicle bus couplers (BCLxx) may have special means of adjustment, e.g. jumpers in the front-panel interfacing connector. The project-specific description explains how to configure these bus couplers.

The front-panel connectors are coded mechanically to prevent the user from plugging in the cabling incorrectly.



NOTE

The mechanical coding of the front-panel interfacing connectors on the main boards depends on the relevant application software and must therefore be adapted specifically for each project.



Application software



NOTE

In most cases where main and communication boards are concerned, a replacement will mean that the project-specific application software has to be installed.

If main or communication boards are unprogrammed, they will need to be reprogrammed after replacement as described in Section 5.1.4.

In addition, the mechanical coding of the front-panel interfacing connector on main boards will have to be adapted and the boards labelled correctly with the project-specific STN number (bar code label).

The STN numbers of main boards / communication boards are defined as follows:

- Main board / communication board without application software
 - STNxxxxx/00000
 - xxxxx: STN number of the main board / communication board
- Main board / communication board with project-specific application software
 - STNxxxxx/yyyy
 - xxxxx: STN number of the main board / communication board
 - yyyy: Key to the application software



NOTE

After a board has been exchanged and the software downloaded, qualified personnel must be assigned to perform the function test described in the project-specific documents.



CAUTION

Never place a bad board on stock!

6.3.2 Repairing boards



NOTE

Brake control unit repairs by the operator are confined to exchanging boards. Defective boards may only be repaired by KNORR-BREMSE.



6.4 Overhaul or replacement

No provisions have been made for overhauling the brake control unit or its boards within the useful life of 20 years (according EN50155) (see also Section 6.2).

However, some components (e.g. relays) may necessitate the replacement of the brake control unit or some of its boards, but this again will depend on the project-specific service conditions. Due to physical effects (component aging), the original product characteristics may no longer exist once the useful life (of 20 years) is exceeded.

The unit must be exchanged in accordance with the directions in Section 6.4.1.

6.4.1 Interval

To judge when replacement is required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation.

Activity	Interval
Replacement	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

The following items should be placed in readiness as support for troubleshooting.

Instrument	Remarks
Fault code list	Fault codes are project-specific and are given in the descriptions of each of the brake control units.
Brake control settings	Settings are project-specific and are given in the descriptions of each of the brake control units.
ESRA Service Terminal plus setup instructions and user's guide	The "ESRA Service Terminal" package is software that is installed on a personal computer.

7.2 Procedure

Problem	Cause	Remedy	See
False or no signals being generated	Unit not being activated electrically	Check the connector.	
		Test for correct electric control.	Section 5.1.4
	Unit defective	Remove the unit and submit for repair.	Section 5.2
		Remove the unit, arrange for its disposal and exchange for an operative unit.	Section 5.2



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - G F 1 0 . 2 1

Rev. 05 - 28.12.2012 - en
.....

.....
Description

Check valve
RV19-T
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
05	28.12.2012	Revision service started		x				
		2.1, 4		x				
		5.1						x
		5.1.1, 5.1.2, 6.4					x	



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Authorized use of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	12
4.3	Working principle	13
5	Removal and installation	14
5.1	Installation	14
5.1.1	Requirements	15
5.1.2	Procedure	15
5.1.3	Leakage testing	16
5.1.4	Function testing	16
5.2	Removal	16
5.2.1	Requirements	16
5.2.2	Procedure	16



6	Maintenance	17
6.1	Inspection	17
6.1.1	Interval	17
6.1.2	Special tools	17
6.1.3	Procedure	17
6.2	Servicing	17
6.3	Repair	18
6.4	Overhaul	18
6.4.1	Interval	18
7	Troubleshooting	19
7.1	Special tools	19
7.2	Procedure	19
8	Disposal	20



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Specification "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I88744

I88744/A

II67897

STK8939

STK8939K



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

Model RV19-T check valves stop compressed air reflux from auxiliary reservoirs or charged pipes when air delivery is interrupted.

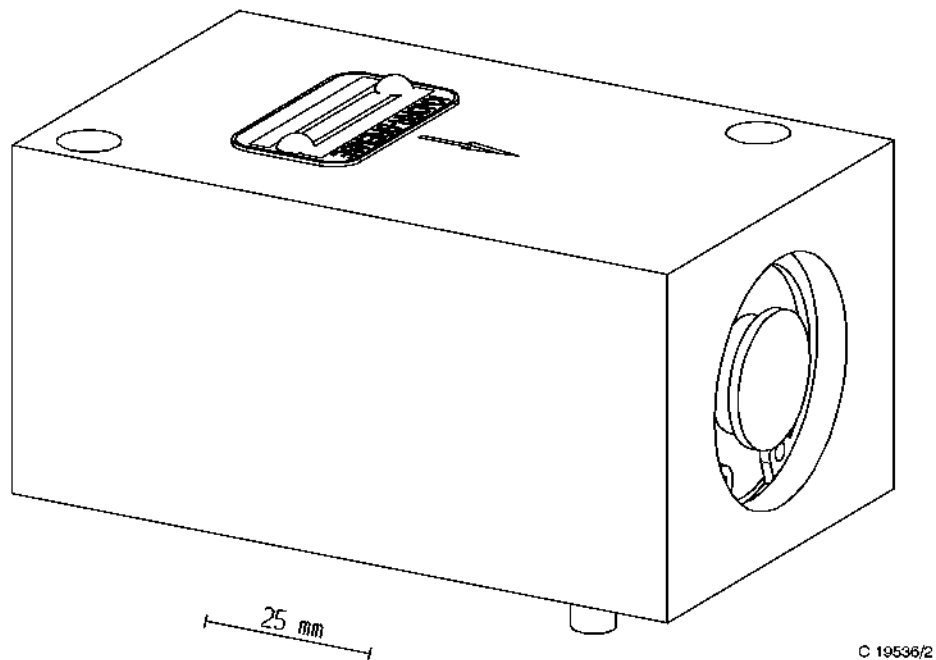


Figure 1 Check valve RV19-T
(the unit with item number I167897 is shown here by way of example)



4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction

The installation drawing contains the technical particulars of the unit.

The letter "K" at the end of the item number denotes units with enhanced resistance to low temperatures.

4.2 Construction

See Figure 2

The RV19-T check valve is a flange-mounted construction suitable for fastening to manifold panels. It has two ports A1 and A2. O-rings are used to seal the ports in the joining surface.

The valve seat V is closed by a spring-loaded valve head (c).

The unit is designed for cushioned working movements.

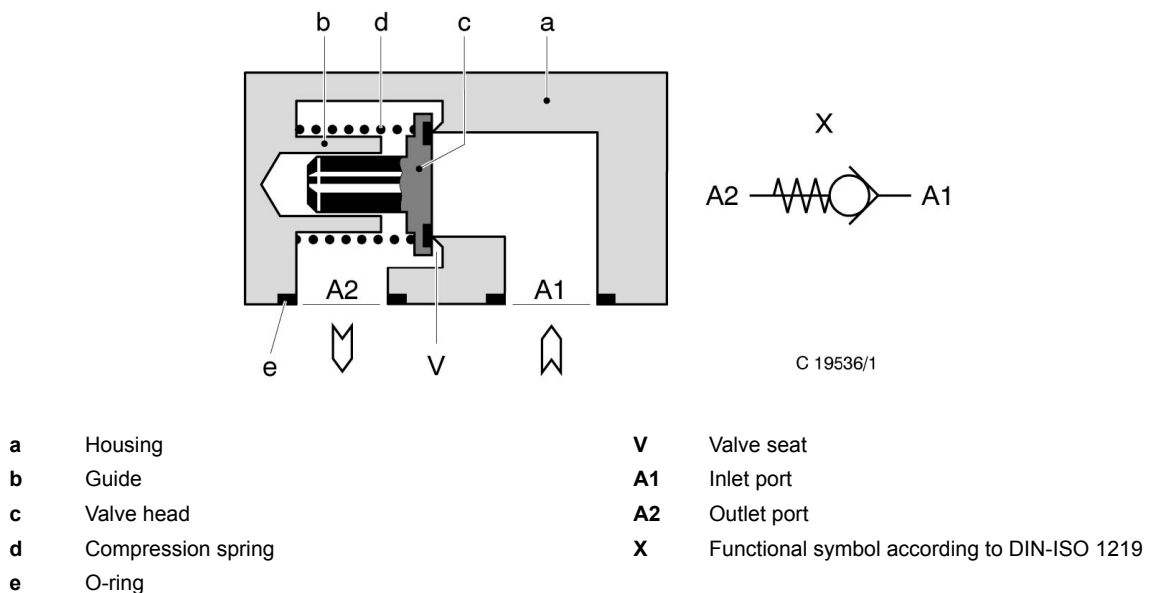


Figure 2 Check valve RV19-T (schematic)



4.3 Working principle

See Figure 2

The valve head (c) is displaced against the thrust of the compression spring (d) when a pressure that is higher than the level at port A2 is applied to port A1. The valve seat V is open.

When the pressure at port A1 falls, the valve seat V is closed by the action of the compression spring (d) once the pressure goes beyond a certain level that is defined by the compression spring (d). Compressed air reflux from the direction of port A2 is stopped.

The opening and closing movements of the valve head (c) are cushioned to suppress vibrations that would cause interfering working noises and premature valve wear. Damping is provided by the cushion of air trapped in the guide (b) beyond the shank of the valve head (c).

When the valve opens, the air is compressed and can escape just slowly through the annular gap between the valve shank and the guide (b). When the valve closes and travels in the opposite direction, the flow of air into the vacuum developing there is retarded in the same way. The movements of the valve are cushioned and impacts diminished in this way.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The directions in the installation drawing of the unit must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



CAUTION

Beware of an incorrect mounting position!

The unit will not function.

Install the unit so that it points in the direction of flow.



NOTE

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.

- Take the covers off the unit's ports and onboard ports.
- Thoroughly clean the ports.
- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - Lubricate the O-rings with a **thin** film of RENOLIT KBS 1 grease.
- For all other units:
 - Lubricate the O-rings with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings in their seats on the unit.
- Locate the unit on the valve bracket or onboard base plate and attach by the fasteners.
- Connect the supply of compressed air.



5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Detach the unit. To do so, release the fasteners and take the unit off the valve bracket or on-board base plate.
- Cover up the ports of the unit.
- Cover up the onboard ports unless a replacement exchange unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air discharging constantly between unit and base plate	Fastener loose	Tighten the fasteners (apply the specified tightening torque) and test for leakage.	Section 5.1.3
	O-rings defective	Remove the unit, exchange the seals, install the unit and test for leakage.	Sections 5.2 5.1 5.1.3
Air discharging constantly from the unit	Unit defective	Remove the unit and submit for repair.	Section 5.2
Air reflux through the unit			



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - G J 2 0 . 2 3

Rev. 02 - 23.11.2011 - en
.....

.....
Description

Ballcock with an exhaust and a switch
module

SK-T-DN..E-SM

SK-T-DN..E-SM-K



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	9
3.3	Operator's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	11
4.2	Construction	12
4.3	Working principle	18
5	Removal and installation	19
5.1	Installation	19
5.1.1	Requirements	20
5.1.2	Procedure	20
5.1.3	Leakage testing	21
5.1.4	Function testing	21
5.2	Removal	22
5.2.1	Requirements	22
5.2.2	Procedure	22



6	Maintenance	23
6.1	Inspection	23
6.1.1	Interval	23
6.1.2	Special tools	23
6.1.3	Procedure	23
6.2	Servicing	23
6.3	Repair	24
6.4	Overhaul	24
6.4.1	Interval	24
7	Troubleshooting	25
7.1	Special tools	25
7.2	Procedure	25
8	Disposal	26



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

B-OJ45.21 Description of the switch module

GD15904 Technical Information "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

II74551/.....

II79751/.....

II74552/.....

II79752/.....

II74553/.....

II79753/.....

II74554/.....

II79754/.....

II74555/.....

II79755/.....

II74556/.....

II79756/.....

II74561/.....

II79791/.....

II74562/.....

II79792/.....

II74563/.....

II79793/.....

II74564/.....

II79794/.....

II74565/.....

II79795/.....

II74566/.....

II79796/.....

II74571/.....

II80461/.....

II74572/.....

II80462/.....

II74573/.....

II80463/.....

II74574/.....

II80464/.....

II74575/.....

II80465/.....

II74576/.....

II80466/.....



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.



3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

Series SK-T-DN..E-SM ballcocks control working processes such as charging, shutting off and venting components in pneumatic systems on rail vehicles. They are equipped with a module to monitor the switch position.

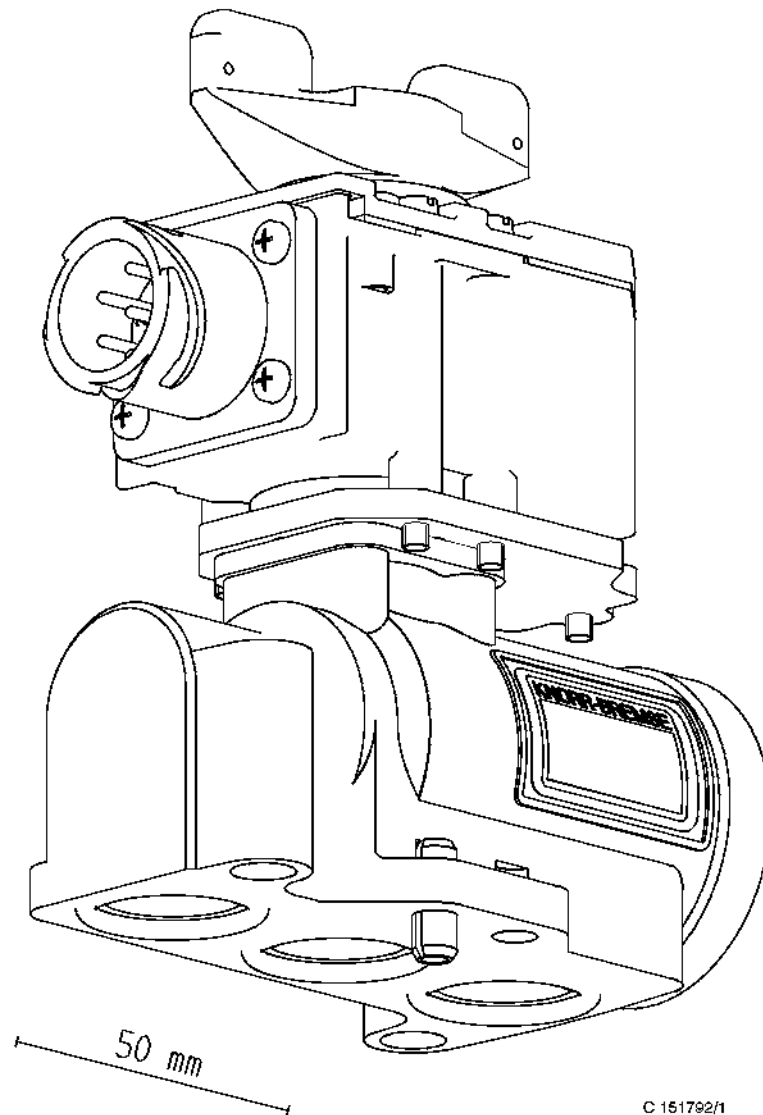


Figure 1 Ballcock SK-T-DN19E-SM
(the unit with item number I174572/2A1RE is shown here by way of example)

4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction

The units differ in:

- Working point of the microswitches of switch module SM
- Connector positioning
- Colour of the handle (d)
- Starting position
- Direction of rotation

The ballcocks have a T-shaped handle.

The handle can be fitted in two positions. The handle and the stop disc (m) can be mounted so as to adjust the starting position of the handle to a particular mounting scenario. The applicable installation drawing shows the handle's possible starting positions.

The handle's range of swivel is defined by the position of the arc-shaped recess in the stop disc (m) relative to the stop pin (n).

The handle can be fixed in the wanted position by a lead seal and wire drawn through the hole (U, see Figure 2) in the handle and through the two holes (U1, see Figure 3) in the casing of the switch module SM.

The component parts are installed in a brass housing.

The two-part item number on the name plate (t) additionally indicates the features of the relevant ballcock.

For full details of all the features of the various ballcocks, such as the numbering code, the position of the connector and the working points of the switch modules, please refer to the applicable installation drawing.

The cock can also be used as one without venting when the exhaust (port A2) is plugged. A dummy union or a cover plate can, for example, be used for this purpose.

The letter "K" at the end of the type designation denotes units with enhanced resistance to low temperatures.



4.2 Construction

See Figure 2, Figure 3, Figure 4, Figure 5

The ballcock SK-T is a one-way cock that is designed for flange mounting on panels and mounting brackets. It has three ports: supply port A3, exhaust port A2 and consumer port A1. The ports are sealed by O-rings.

The following particulars are also stamped in the housing of each cock at the opposite side to the name plate:

- Nominal bore graduated in steps according to series - see Table 1
- Maximum working pressure
- Arrow indicating the direction of flow from the supply port A3 to the consumer port A1
- Material of the housing

The main components of the unit are as follows:

- Ballcock (SK-T) - with the following parts:
 - Isolating ball (a)
 - Housing (b)
 - Control shaft (c)
 - Handle (d)
 - Sealing rings (e1 and e2)
 - Compression spring (f)
- Switch module (SM)

The chrome-plated brass isolating ball (a) floats inside the housing (b). It is held and sealed by two plastic rings that are located inside the housing. The sealing ring (e1) is at the inlet end, the sealing ring (e2) at the outlet end. The sealing ring (e1) is supported by the compression spring (f) on the housing (b).

The wall of the isolating ball (a) has a slanting through-bore allowing the ballcock's consumer port A1 to communicate with the exhaust port A2.

The housing (b) is a nickel-plated brass component which therefore does not need to be painted.

The aluminium handle (d) (actuator) is attached to the switch module.

The switch module SM is installed in an impact-proof plastic case engineered for low temperatures. It is fully insulated on the inside, so there no need to earth the unit. The switch module can be connected quickly and reliably by its bayonet connector.

The switch module contains two microswitches (h) with gold-plated silver contacts.



Series	Item number
SK-T-DN7E-SM	II74551/... II74552/... II74553/... II74554/... II74555/... II74556/...
SK-T-DN7E-SM-K	II79751/... II79752/... II79753/... II79754/... II79755/... II79756/...
SK-T-DN19E-SM	II74571/... II74572/... II74573/... II74574/... II74575/... II74576/...
SK-T-DN19E-SM-K	II79791/... II79792/... II79793/... II79794/... II79795/... II79796/...
SK-T-DN25E-SM	II74561/... II74562/... II74563/... II74564/... II74565/... II74566/...
SK-T-DN25E-SM-K	II80461/... II80462/... II80463/... II80464/... II80465/... II80466/...

Table 1 Versions available

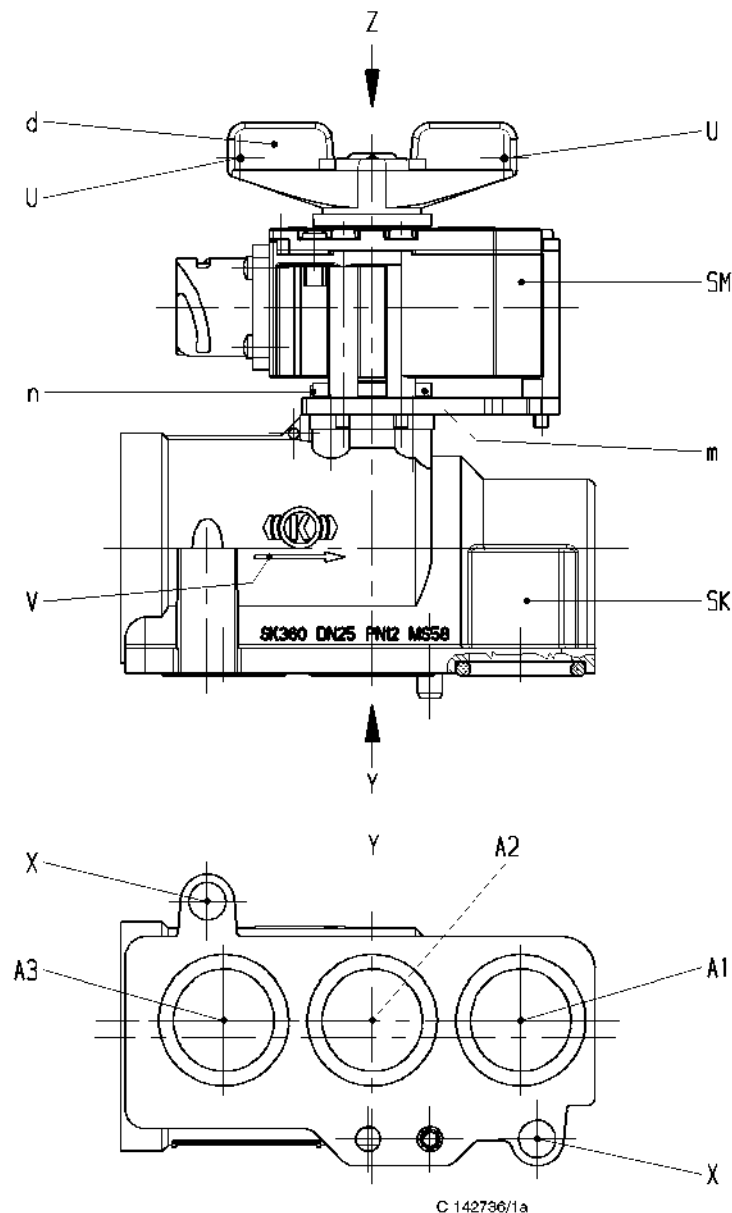


The cap on the control shaft has three protuberances, two of them K at opposite sides and one R between them (see Figure 3 and Figure 4).

The cock's working position (open or closed) can be identified by the position of the two protuberances K (parallel or at right-angles to the cock's longitudinal axis).

The position of the protuberance R indicates the location of the exhaust port in the isolating ball (a). When the marking R is pointing in the direction of flow, the ballcock is vented.

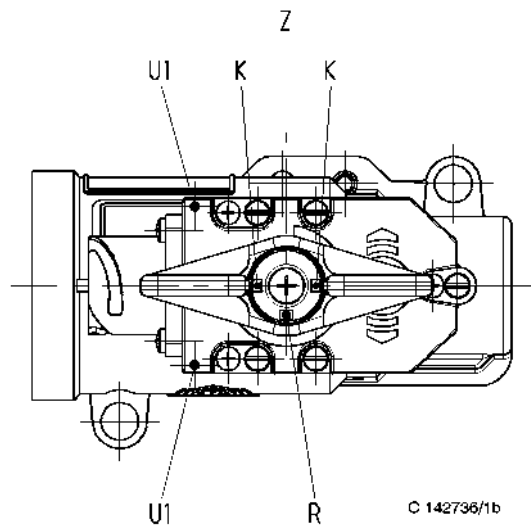
The switch module bears the pin marking (n1). Mounted beneath the handle (d) is a disc (m1) which is similar to the stop disc (m). These two elements map the position of the stop pin (n) and stop disc (m) and make the working position easy to identify.





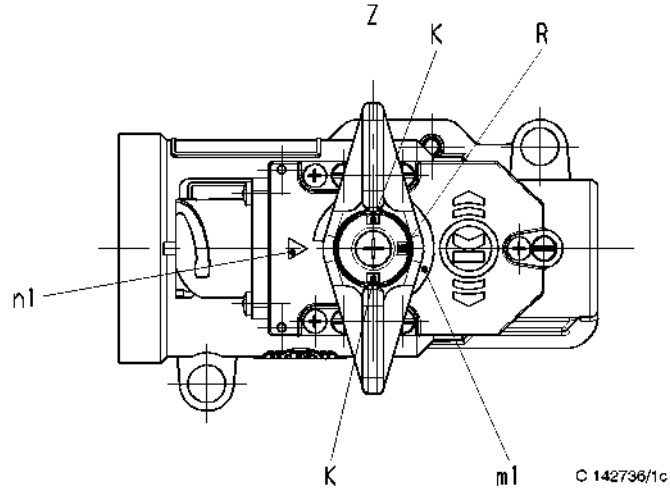
- | | | | |
|-----------|----------------------------------|-----------|---------------|
| d | Handle | A1 | Consumer port |
| m | Stop disc | A2 | Exhaust port |
| n | Stop pin | A3 | Supply port |
| SK | Ballcock | X | Mounting hole |
| SM | Switch module | | |
| U | Hole for lead seal in the handle | | |
| V | Direction of flow | | |

Figure 2 Ballcock SK-T-DN..E-SM
(typical view showing a T-handle)



- | | | | |
|----------|--|-----------|---|
| K | Protuberance marking direction of flow | U1 | Hole for lead seal in the switch module |
| R | Protuberance marking exhaust | | |

Figure 3 Ballcock SK-T-DN..E-SM - open position
(typical view showing a T-handle)



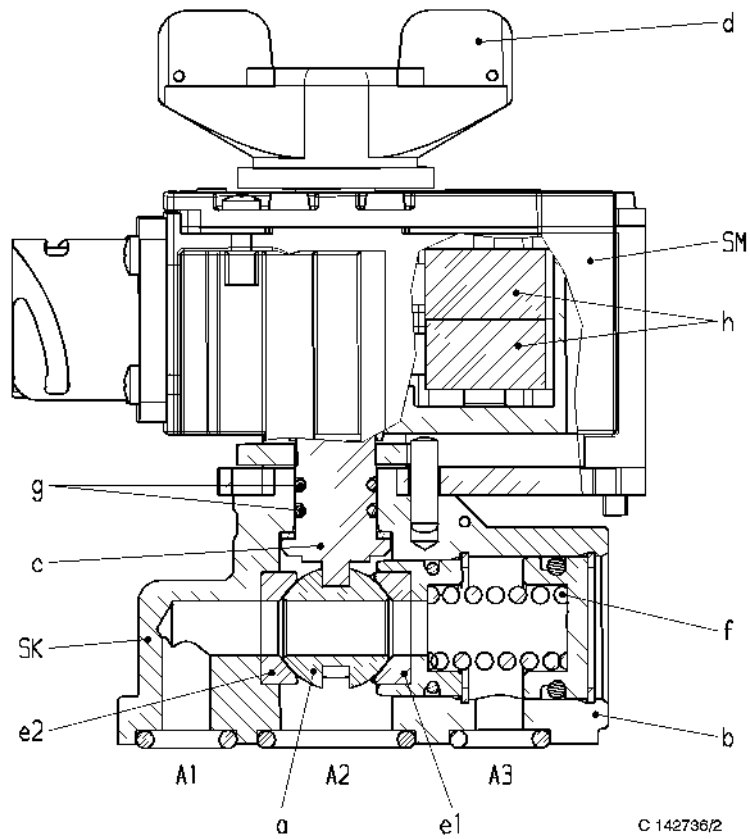
m1 Disc

n1 Pin marking

K Protuberance marking direction of flow

R Protuberance marking exhaust

Figure 4 Ballcock SK-T-DN..E-SM - closed position
(typical view showing a T-handle)





- | | | | |
|-------------|--------------------|-----------|---------------|
| a | Isolating ball | A1 | Consumer port |
| b | Housing | A2 | Exhaust port |
| c | Control shaft | A3 | Supply port |
| d | Handle | SK | Ballcock |
| e... | Sealing ring | SM | Switch module |
| f | Compression spring | | |
| g | O-ring | | |
| h | Microswitch | | |

Figure 5 Ballcock SK-T-DN..E-SM
(typical view showing a T-handle)



4.3 Working principle

See Figure 2, Figure 3, Figure 4, Figure 5



CAUTION

Beware of incorrect operation!

The unit will be damaged and/or its functionality impaired.

The handle (d) must always be swung home to its stop. Any intermediate position will damage the moulded sealing ring (e1) and the counter-support (e2) and might lead to leakage from the ballcock.

The ballcock has two working positions (open and closed) which are reached when the handle (d) is turned by 90°. The working positions are reported to the vehicle control unit by signals representing the working positions of the microswitches in the switch module SM.

Open position

In this position, the bore through the isolating ball (a) is parallel to the longitudinal axis of the ballcock SK (see cross-section in Figure 5). The two protuberances K visible on the end of the control shaft cap are also parallel to the ballcock's longitudinal axis.

The working positions of the two microswitches (h) in the switch module SM are shown in the installation drawing.

The passage from supply port A3 to consumer port A1 is open.

Closed position

In this position, the bore through the isolating ball (a) is at a right-angle to the longitudinal axis of the ballcock SK. The protuberances K visible on the cap of the control shaft (c) are also at right-angles to the ballcock's longitudinal axis.

The working positions of the two microswitches (h) in the switch module SM are shown in the installation drawing.

The passage from supply port A3 to consumer port A1 is closed. The consumer port is vented through the passage in the isolating ball (a) to exhaust port A2. The protuberance R on the control shaft cap is pointing in the direction of flow and indicates the vented side.

Description B-OJ45.21 discusses the working principle of the switch module.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the type designation):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail. Provide for a free flow through the ports.



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.



NOTE

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



- Take the covers off the unit's ports and off the onboard mounting bracket.
- Thoroughly clean the ports.
- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the type designation):
 - Lubricate the O-rings with a **thin** film of RENOLIT KBS1 grease.
- For all other units:
 - Lubricate the O-rings with a **thin** film of RENOLIT HLT2-KB grease.
- Put the O-rings in their seats on the unit.
- Position the unit at the place of installation and attach by the fasteners. Tighten the fasteners alternately step by step. Tightening torque: See installation drawing
- Plug the onboard connector into the bayonet connector of switch module SM and secure by the fastener.
- Connect the supply of compressed air to the unit.
- Connect the power supply.

5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



WARNING

Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.
- Unplug the electric connector from the bayonet connector of the switch module SM.
- Unscrew the fasteners holding the unit, and take the unit plus O-rings off the onboard mounting bracket.
- Cover up the ports of the unit.
- Cover up the onboard ports unless a replacement unit is going to be fitted immediately after removal.
- Mask the electric connections on the unit, and secure the onboard connecting cable.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own units. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packaging that complies with the specifications of Technical Information GD15904.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Unit inoperative	Handle not in the end position	Move the handle to the end position.	
Air discharging constantly between unit and bracket or joining surface	Fasteners loose	Tighten the fasteners (observe the tightening torque!) and test for leakage.	Section 5.1.3
	O-rings damaged or missing	Remove the unit, exchange the O-rings, install the unit and test for leakage.	Section 5.2, 5.1 and 5.1.3
Electric monitoring function of switch module SM has failed	Power supply failure	Check the onboard power supply.	
		Check the onboard electric wiring for correct connection.	
	Check the electric leads for correct connection to the bayonet connector.		
	Switch module defective	Remove the unit and submit for repair.	Section 5.2
Air discharging from control shaft (c)	Unit defective		
Consumer port not being vented in the closed position			
Other problems			



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - G D 8 0 . 2 4

Rev. 00 - 11.06.2009 - en
.....

.....
Description

Impulse valve
WIMHV5-NT



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	10
4.2	Construction	10
4.3	Working principle	11
5	Removal and installation	13
5.1	Installation	13
5.1.1	Requirements	13
5.1.2	Procedure	14
5.1.3	Leakage testing	15
5.1.4	Function testing	15
5.2	Removal	15
5.2.1	Requirements	15
5.2.2	Procedure	16



6	Maintenance	17
6.1	Inspection	17
6.1.1	Interval	17
6.1.2	Special tools	17
6.1.3	Procedure	17
6.2	Servicing	17
6.3	Repair	18
6.4	Overhaul	18
6.4.1	Interval	18
7	Troubleshooting	19
7.1	Special tools	19
7.2	Procedure	19
8	Disposal	20



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS trained service technicians who

- have the skill, experience, safety awareness and professional ability:
 - to remove and install the unit,
 - to inspect, maintain and debug the unit,
- have read and understood this document from start to finish, and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are included only for the sake of completeness.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

C136529	Installation drawing of impulse valve WIMHV5-NT
B-OG51.27	Description of valve magnet N-S2



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

II68655/...



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KB SfS parts or KB approved spares or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Technical description

The units are 5/2-way valves that are used in electropneumatic control circuits. Triggered by electric pulses, they can alternately charge and vent two control volumes that are independent of each other. The impulse valves have a hand control (for use in an emergency).

4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction

The installation drawing contains the technical particulars of the unit.

4.2 Construction

See Figure 1

The units are designed for mounting on manifold panels and base plates where they are held by two M6 screws. The ports for the compressed air are located in the joining surface of the basic valve (a).

The impulse valves consist essentially of the following:

- the pneumatic basic valve (a)
- the two covers (b)
- and the valve magnets (c1 and c2) which are attached to the covers (b)

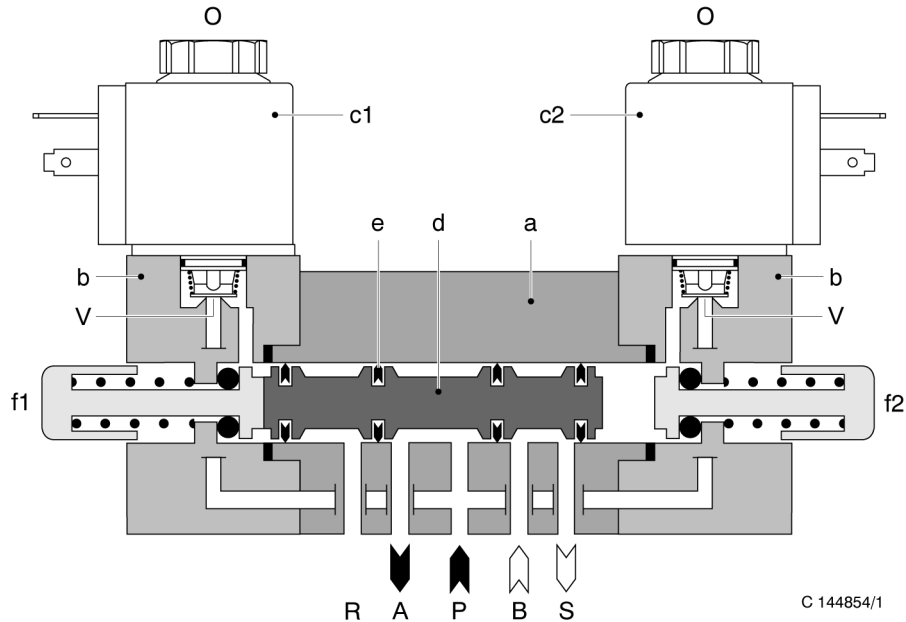
The valve magnets are discussed in detail in KNORR Description B-OG51.27.

The basic valve (a) consists of a housing and a control piston (d) that has four seals (e) (KNORR K-rings).

The impulse valve is toggled as the valve magnets (c1 and c2) are alternately energized and deenergized. The control air is tapped internally; the valve does not have a port for an external supply of control air.

The impulse valve has two hand control buttons (f1 and f2) by which it can be toggled manually in an emergency, such as a power failure.

The units can be used alternatively as 3/2-way valves. One of the two consumer ports (A or B), and the related exhaust port (R or S) on the base plate must be plugged for this purpose.



- | | | | |
|-------------|---------------------|----------|---------------|
| a | Basic valve | A | Consumer port |
| b | Cover | B | Consumer port |
| c... | Valve magnet | O | Exhaust |
| d | Piston | P | Port |
| e | KNORR K-ring | R | Exhaust port |
| f... | Hand control button | S | Exhaust port |
| | | V | Valve seat |

Figure 1 Impulse valve WIMHV5-NT Schematic

4.3 Working principle

See Figure 1

Valve magnets not energized

The impulse valve is at neutral and the control piston (d) of the basic valve (a) is always at one of its two end positions. Figure 1 shows the piston (d) at the left end position. The path from air supply port P to consumer port A is open now. The consumer line B is vented simultaneously through the port S.

When the piston (d) is at its right end position, the path from P to consumer port B is open. The consumer line A is vented simultaneously through the port R.



Valve magnets energized

When one of the two magnet coils is energized, the relevant valve magnet (c1 or c2) opens the valve seat V, allowing control air to flow to the end face of the control piston (d) of basic valve (a). The piston (d) is moved to the opposite end position by the impact of the control air. The supply of control air is stopped again at the end of the current pulse.

The piston (d) stays at the position it has reached, and the control air chamber is vented through the port O.

The piston (d) dwells at the end position it has reached, until the other magnet coil is energized and the movement is reversed.

Working positions of the impulse valve (used as a 5/2-way unit):

- Valve magnet (c1) not energized, (c2) energized:
 - Path open from P to A
 - B vented through S
- Valve magnet (c1) energized, (c2) not energized:
 - Path open from P to B
 - A vented through R

Hand control



NOTE

Means must be provided to prevent unauthorized persons from operating the impulse valve manually when it is being actuated simultaneously by electric control.

The impulse valve can be operated by hand in case of a power failure (that is, when the magnets are not in their energized state or when there is no control pressure). The relevant hand control button (f1 or f2) must be pressed home for this purpose, making the control piston (d) go to the opposite end position. When the button is released it is restored to its initial position by spring force; the piston (d) dwells at the end position it has reached.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.

5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.



The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KB SfS by its order number:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.



NOTE

New seals must always be used for the ports in the flange joints. Do not install new elastomers that are older than one year. Verify the date of manufacture prior to use.

To avoid grease ingress in the air passages, lubricate the seals with just a **thin** film of grease.

- Take the covers off the ports of the unit and onboard manifold panel.
- Thoroughly clean the ports.
- Lubricate the seals with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased seals in their seats on the unit.
- Locate the unit on the joining surface of the manifold panel and attach by its fasteners.
- Plug in and fasten the onboard power sockets as shown in the associated electric circuit diagram.
- Connect the supply of compressed air to the unit.



5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal



WARNING

Pneumatic system is under high pressure!

Particles flung outwards will, for instance, cause severe eye injuries.

Observe the safety regulations for pneumatic systems.

Prior to removal, release the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt after removal, such as by masking the ports and connections.

5.2.1 Requirements

The unit can be removed with standard tools.



5.2.2 Procedure



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.
- Undo the screws fastening the power sockets, and unplug the power sockets.
- Remove the fasteners, and take the unit off the manifold panel.
- Cover up the ports of the unit.
- Cover up the onboard ports and protect the power sockets from dirt and damage unless an exchange unit is going to be fitted immediately after removal.



6 Maintenance

In general, maintenance at KB SfS is subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental conditions in the area where the vehicles are operated. An interval stated generally for all projects will therefore be of only limited validity.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find together with the customer the optimal maintenance intervals for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

If the unit develops a malfunction that cannot be corrected by the measures described in Section 7.2 please contact a KB SfS Service Center.

6.4 Overhaul

KB SfS gives top priority to safety and quality.

To help fulfil this claim, KB SfS provides an overhauling service for its own units. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

Both the experience and the technical equipment necessary for performing professional overhauls are present in KB SfS Service Centers.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Consumer port A or B not being charged or vented	Unit not being activated pneumatically	Test for correct pneumatic control.	
	Unit not being activated electrically	Check the connector.	
		Test the unit for correct electric control.	
	Unit defective	Remove the unit and submit for repair.	Section 5.2
Air discharging constantly between unit and bracket	Fasteners loose	Tighten the fasteners (apply the specified tightening torque!) and test for leakage.	Section 5.1.3
	Seals defective	Remove the unit, exchange the seals and install the unit.	Sections 5.2 and 5.1, respectively
Unit leaking Note: Provided the unit is working correctly, air is briefly discharged only when the valve magnets are deenergized, or when consumer port A or B is vented.	Unit defective	Remove the unit and submit for repair.	Section 5.2



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KB SfS units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - G F 2 0 . 2 7

Rev. 06 - 26.09.2012 - en
.....

.....
Description

Double check valve
DRV7-T
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
06	26.09.2012	Revision service started		X				
		All					X	X



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Authorized use of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	12
4.3	Working principle	13
5	Removal and installation	14
5.1	Installation	14
5.1.1	Requirements	15
5.1.2	Procedure	15
5.1.3	Leakage testing	16
5.1.4	Function testing	16
5.2	Removal	17
5.2.1	Requirements	17
5.2.2	Procedure	17



6	Maintenance	18
6.1	Inspection	18
6.1.1	Interval	18
6.1.2	Special tools	18
6.1.3	Procedure	18
6.2	Servicing	18
6.3	Repair	19
6.4	Overhaul	19
6.4.1	Interval	19
7	Troubleshooting	20
7.1	Special tools	20
7.2	Procedure	20
8	Disposal	21



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Specification "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

II40529

II40529K



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The unit automatically shuttles the passage between two valve inputs and one valve output as a function of the incoming air pressure.

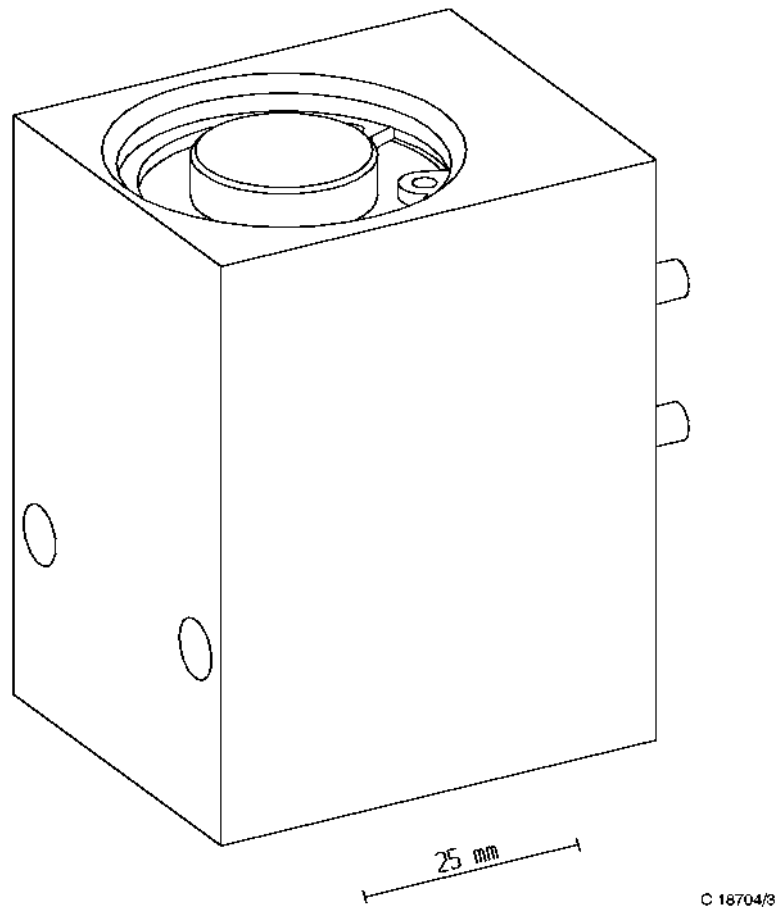


Figure 1 Double check valve DRV7D-T
(the unit with item number II40529K is shown here by way of example)



4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction

The letter "K" at the end of the item number denotes units with enhanced resistance to low temperatures.

The installation drawing that goes with the unit contains the technical particulars of the unit.

4.2 Construction

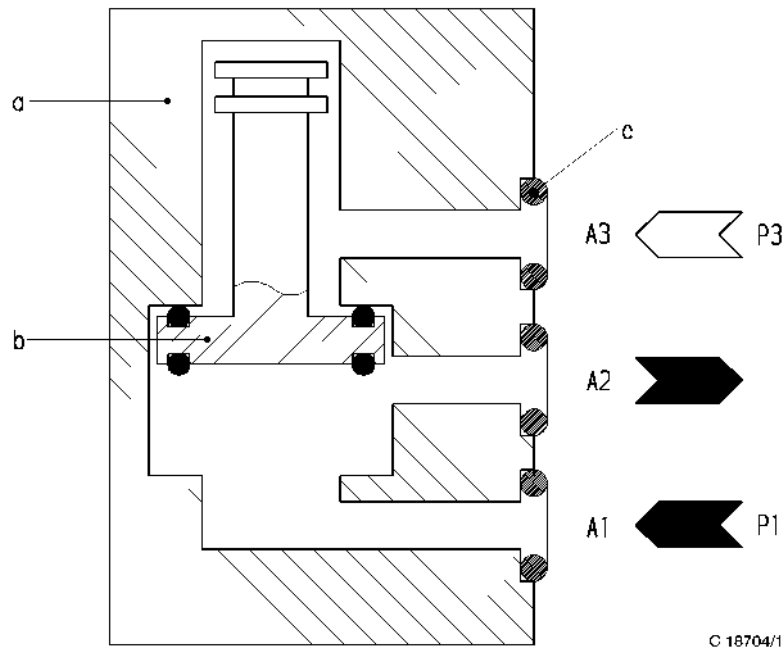
See Figure 2

The unit consists essentially of:

- Housing (a)
- Piston (b)

The double check valve consists of a flange-mounting, block-shaped housing (a) with two inlet ports A1 and A3 and one outlet port A2

The piston (b) serves to shuttle the passage alternately through the valve. O-rings (c) are used as seals for the joint with the valve bracket.



- a Housing
- b Piston
- c O-ring

- A1 Inlet pipe
- A2 Outlet pipe
- A3 Inlet pipe
- P... Inlet pressure

Figure 2 Double check valve (schematic)

4.3 Working principle

The unit does not have a defined home position. The piston (b) can move freely; its actual position depends on the pressures applied to ports A1 and A3.

The unit automatically and alternately connects ports A1 and A3 to port A2 according to the incoming pressures P1 and P3.

The valve shuttles at a pressure difference of ≤ 0.25 bar when the port at the lower pressure is shut off by the seal on the end of the piston (b).



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The directions in the installation drawing of the unit must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.

Provide for a free flow through the ports.



NOTE

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.



NOTE

The unit is positioned precisely for installation by one or more dowel pins fitted in the joining surface of the housing.

- Take the covers off the ports of the unit and onboard valve bracket or onboard manifold panel.
- Thoroughly clean the ports.



- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - Lubricate O-rings (c) with a **thin** film of RENOLIT KBS 1 grease.
- For all other units:
 - Lubricate O-rings (c) with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings (c) in their seats on the unit.
- Locate the unit on the joining surface of the onboard valve bracket or manifold panel and attach by its fasteners. Tighten the fasteners alternately.
- Connect the supply of compressed air to the unit.

5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Release the fasteners, and take the unit plus O-rings off the onboard valve bracket or manifold panel.
- Cover up the ports on the unit.
- Cover up the joining surface of the valve bracket or manifold panel unless a replacement unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience 2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air discharging constantly from the flange joint between unit and base plate	No O-rings (c) in the flange joint	Remove the unit, renew or exchange O-rings (c), install the unit and test for leakage.	Sections 5.2 and 5.1, respectively
	O-rings (c) damaged		
	Sealing surface of base plate damaged	Remove the unit, exchange the base plate, install the unit and test for leakage.	Sections 5.2, 5.1 and 5.1.3
	Fasteners loose	Tighten the fasteners (apply the specified tightening torque!) and test for leakage.	Sections 5.1 and 5.1.3, respectively
Air discharging constantly from the unit	Unit defective	Remove the unit and submit for repair.	Section 5.2
Compressed air reflux from A2 to A1 and/or to A3			



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - G Q 1 0 . 2 2

Rev. 04 (06/ 2008) -en
.....

.....
Description

Filter
FIL100



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright 2008© Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	10
4.2	Construction	10
4.3	Working principle	11
5	Removal and installation	12
5.1	Installation	12
5.1.1	Requirements	13
5.1.2	Procedure	13
5.1.3	Leakage testing	13
5.1.4	Function testing	13
5.2	Removal	14
5.2.1	Requirements	14
5.2.2	Procedure	14



6	Maintenance	15
6.1	Inspection	15
6.1.1	Interval	15
6.1.2	Special tools	15
6.1.3	Procedure	15
6.2	Servicing	15
6.2.1	Interval	16
6.2.2	Special tools	16
6.2.3	Procedure	16
6.3	Repair	16
6.4	Overhaul	16
6.4.1	Interval	16
7	Troubleshooting	17
7.1	Special tools	17
7.2	Procedure	17
8	Disposal	18



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS trained service technicians who

- have the skill, experience, safety awareness and professional ability:
 - to remove and install the unit,
 - to inspect, maintain and debug the unit,
- have read and understood this document from start to finish, and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are included only for the sake of completeness.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

II62044K

WBFIL100AA003

WBFIL100AA001

WBFIL100AA004

WBFIL100AA002

WBFIL100AA005



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KB SfS parts or KB approved spares or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Technical description

The filter prevents dirt from getting inside sensitive downstream equipment. It serves to stop wear and to enhance the reliability of the downstream equipment.

4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction

The installation drawing contains the technical particulars of the unit.

The letter "K" at the end of the item number denotes units with enhanced resistance to low temperatures.

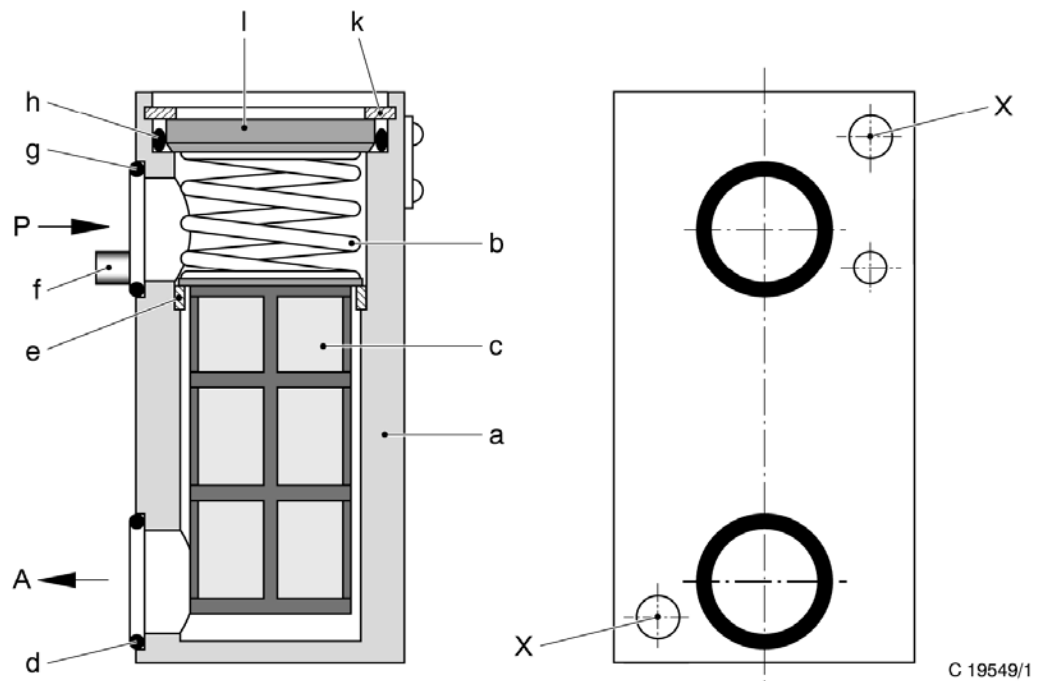
4.2 Construction

See Figure 1

The unit consists essentially of:

- Housing (a)
- Compression spring (b)
- Filter element (c)
- O-rings (d, g and h)
- Supporting ring (e),
- Cover (l)
- Retaining ring (k)

The housing (a) contains the filter element (c). The latter is locked in the housing (a) by the force of the compression spring (b). It is therefore prevented from changing its position in the housing (a). Hence, the incoming stream of compressed air is unable to bypass the filter element (c).



C 19549/1

- | | | | |
|----------|--------------------|----------|-----------------------|
| a | Housing | h | O-ring |
| b | Compression spring | l | Cover |
| c | Filter element | k | Retaining ring |
| d | O-ring | A | Compressed air outlet |
| e | Supporting ring | P | Compressed air inlet |
| f | Coding pin | X | Mounting hole |
| g | O-ring | | |

Figure 1 Construction of the filter (schematic)

4.3 Working principle

See Figure 1

The unit forces the compressed air to flow through the filter element (c). The compression spring (b) fixes the filter element (c) in its correct position. The filter element (c) extracts the particles. The size of the particles extracted by the filter depends on the filter mesh of the element (c). The installation drawing indicates the filter mesh.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.

5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KB SfS by its order number:

- RENOLIT HLT2-KB (order number: ID No. 502647)

5.1.2 Procedure



NOTE

New O-rings must always be used between the flange joints for the ports. Do not install new elastomers that are older than one year. Check the date of manufacture prior to use.

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin film** of grease.

- Take the covers off the ports of the unit and onboard mounting bracket.
- Thoroughly clean the ports.
- Lubricate the O-rings with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings in their seats on the unit, and attach the unit to the mounting bracket by the fasteners.
- Connect the supply of compressed air to the unit.

5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, release the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports and connections.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Release the fasteners and remove the unit from the mounting bracket.
- Cover up the ports of the unit.
- Cover up the onboard ports unless an exchange unit is going to be fitted immediately after removal.



6 Maintenance

In general, maintenance at KB SfS is subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental conditions in the area where the vehicles are operated. An interval stated generally for all projects will therefore be of only limited validity.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find together with the customer the optimal maintenance intervals for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Filters must be cleaned at regular intervals as the need arises or as instructed by the railway administration in charge of working.



6.2.1 Interval

Activity	Interval
Cleaning the filter element	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB Sfs.	

6.2.2 Special tools

Not required

6.2.3 Procedure

See vehicle operator's instructions

6.3 Repair

Please contact a KB Sfs Service Center if the unit develops a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

KB Sfs gives top priority to safety and quality.

To help fulfil this claim, KB Sfs provides an overhauling service for its own units. KB Sfs performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

The KB Sfs Service Centers have the experience and technical equipment needed for performing professional overhauls.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB Sfs.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air discharging constantly between unit and bracket or from the flange surface	Fasteners loose	Tighten the fasteners and test for leakage; observe the tightening torque.	Section 5.1.3
	O-rings (g and d) damaged or missing	Remove the unit, exchange O-rings (g and d) and install the unit.	Section 5.2 5.1
Little or no air throughput	Filter very dirty or frozen	Clean or defrost the filter.	Section 6.2
Downstream air pipes or units are contaminated	Unit defective	Remove the unit and submit for repair.	Section 5.2



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KB Sfs units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - G J 1 0 . 2 2

Rev. 01 - 05.01.2012 - en
.....

.....
Description

Ballcock with an exhaust

SK-T-DN..E

SK-T-DN..E-K



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Implementation	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	11
4.2	Construction	12
4.3	Working principle	16
5	Removal and installation	17
5.1	Installation	17
5.1.1	Requirements	18
5.1.2	Procedure	18
5.1.3	Leakage test	19
5.1.4	Function test	19
5.2	Removal	19
5.2.1	Requirements	19
5.2.2	Procedure	20



6	Maintenance	21
6.1	Inspection	21
6.1.1	Interval	21
6.1.2	Special tools	21
6.1.3	Procedure	21
6.2	Servicing	21
6.3	Repair	22
6.4	overhaul	22
6.4.1	Interval	22
7	Troubleshooting	23
7.1	Special tools	23
7.2	Procedure	23
8	Disposal	24



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Implementation

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Regulation "Packaging, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

1174560/2....

1174721/2....

1174579/2....

1174880/2....

1174581/2....

1180469/2....



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

Series SK-T-DN..E ballcocks control working processes such as charging, shutting off and venting components in pneumatic systems on rail vehicles.

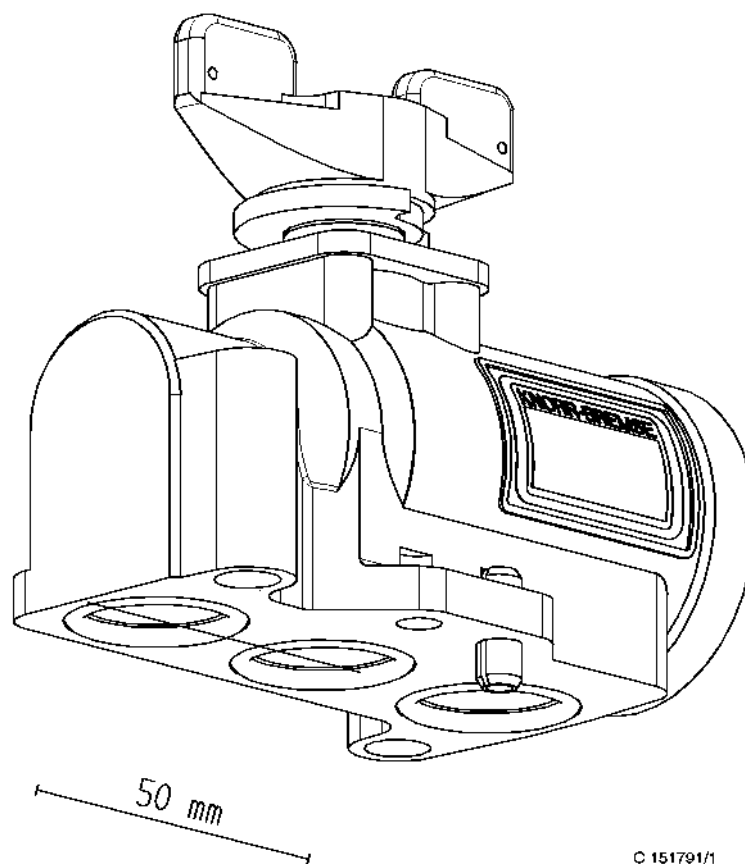


Figure 1 Ballcock SK-T-DN19E
(the unit with item number II74560/2A1LE is shown here by way of example)



4.1 Technical features

See Figure 2

The units are distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction

The units differ essentially in:

- Nominal bore (inside width)
- Starting position (cock open)
- Direction of turning the handle (d) for opening and closing the ballcock
- Colour of the handle (d)

The units have a T-shaped handle (d).

The handle and the stop disc (m) can be mounted so as to adjust the starting position of the handle to a particular mounting scenario. The handle's range of swivel is defined by the position of the arc-shaped recess in the stop disc (m) relative to the stop pin (n).

The installation drawing contains a schematic showing the possible starting positions and the directions in which the ballcock closes.

The holes U in the handle and housing allow the handle to be fixed in position by a lead seal and wire.

The component parts are installed in a brass housing.

The two-part item number on the name plate additionally indicates the features of the relevant ballcock.

For full details of all the features of the various ballcocks, such as numbering code, please refer to the applicable installation drawing.

The ballcock can also be used as one without venting when the exhaust (port A2) is plugged. A dummy union or a cover plate can, for example, be used for this purpose.

The letter "K" at the end of the type designation denotes units with enhanced resistance to low temperatures.



4.2 Construction

See Figure 3

The main components of the unit are as follows:

- Ballcock SK-T
- Handle (d)

The ballcock SK-T is a one-way cock that is designed for flange mounting on panels and mounting brackets. It has three ports: supply port A3, exhaust port A2 and consumer port A1.

The following particulars are also stamped in the housing of each cock at the opposite side to the name plate:

- Nominal bore
- Maximum working pressure
- Arrow indicating the direction of flow from the supply port A3 to the consumer port A1
- Material of the housing

The main components of the unit are as follows:

- Isolating ball (a)
- Housing (b)
- Control shaft (c)
- Handle (d)
- Sealing rings (e1 and e2)
- Compression spring (f)

The chrome-plated brass isolating ball (a) floats inside the housing (b). It is held and sealed by two plastic rings that are located inside the housing. The sealing ring (e1) is at the inlet end, the sealing ring (e2) at the outlet end. The sealing ring (e1) is supported by the compression spring (f) on the housing (b).

The wall of the isolating ball (a) has a slanting through-bore allowing the ballcock's consumer port A1 to communicate with the exhaust port A2.

The housing (b) is a nickel-plated brass component which therefore does not need to be painted.

The handle (d) (actuator) is attached to the control shaft (c).

The cap on the control shaft has three protuberances, two of them K at opposite sides and one R between them.

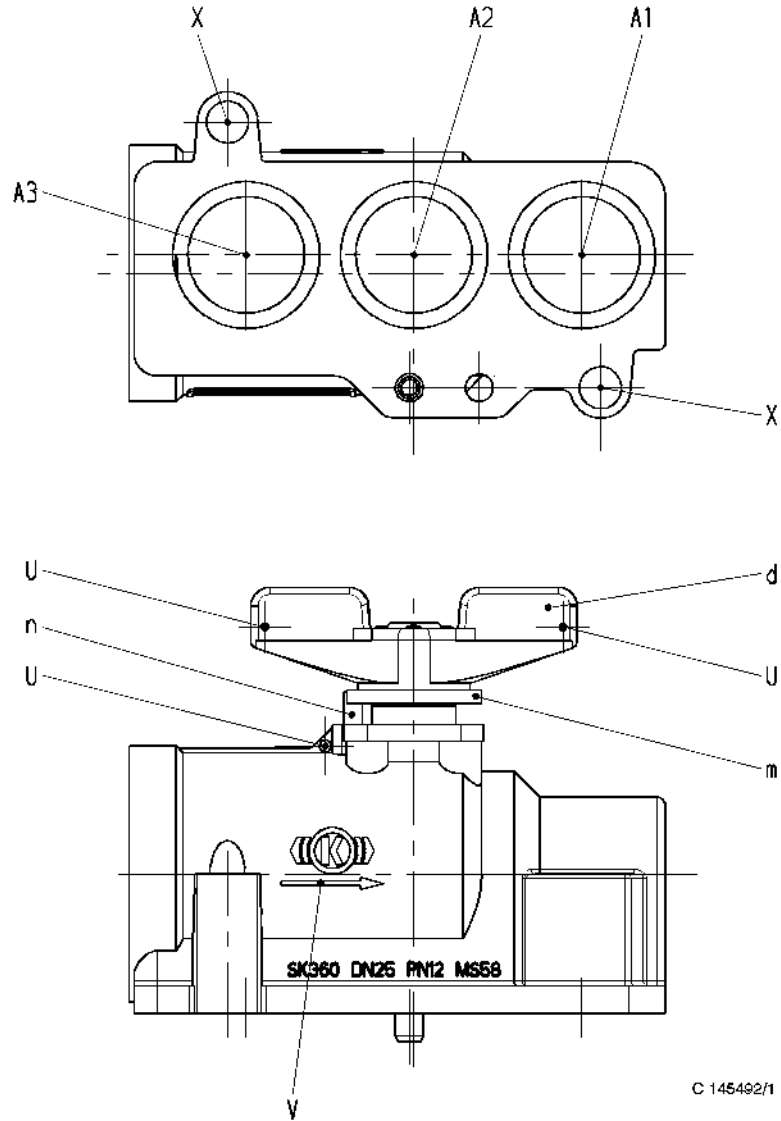
The working position of the ballcock (open or closed) can be identified by the position of the two protuberances K (parallel or at right-angles to the cock's longitudinal axis).



The position of the protuberance R indicates the location of the exhaust port in the isolating ball (a). When the marking R is pointing in the direction of flow, the ballcock is "closed".

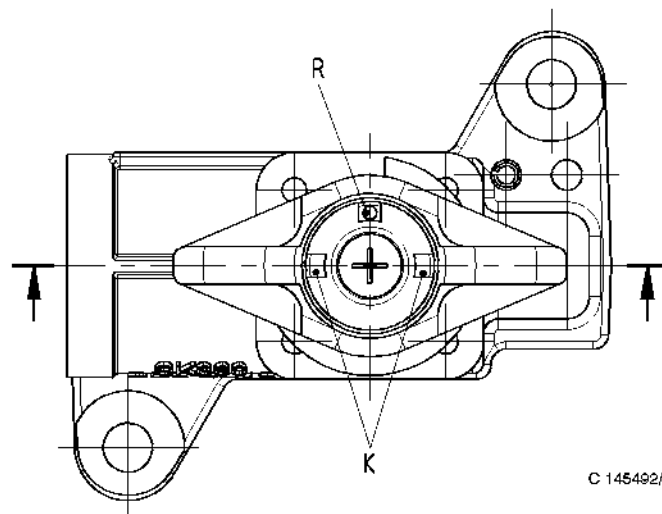
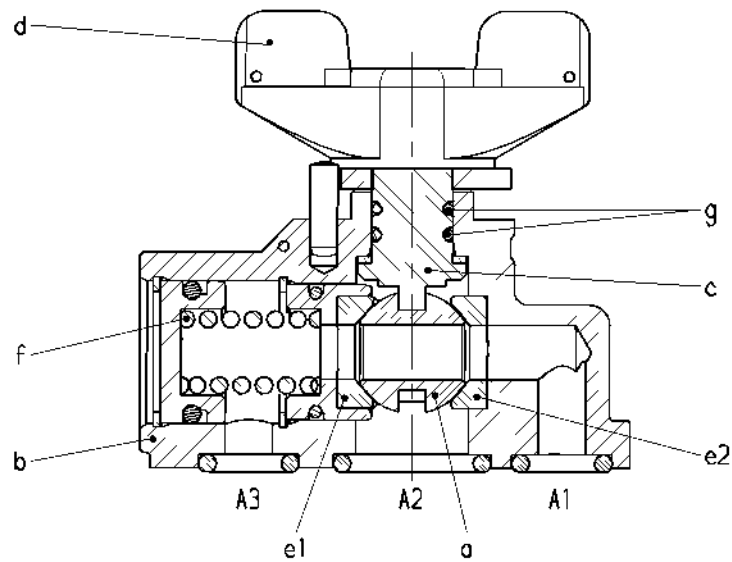
Nominal bore (Series)	Type / item number	
	Standard	Enhanced resistance to low temperatures
	SK-T-DN..E	SK-T-DN..E-K
DN7	I174581/...	I174721/...
DN19	I174560/...	I174880/...
DN25	I174579/...	I180469/...

Table 1 Versions available



- | | | | |
|----------|-----------------------|-----------|---------------|
| d | Handle | A1 | Consumer port |
| m | Stop disc | A2 | Exhaust port |
| n | Stop pin | A3 | Supply port |
| U | Hole for sealing wire | X | Mounting hole |
| V | Direction of flow | | |

Figure 2 Ballcock SK-T-DN..E
(the ballcock with a nominal bore of DN25 is represented by way of example)



C 145492/2

- | | | | |
|-------------|--------------------|-----------|--|
| a | Isolating ball | A1 | Consumer port |
| b | Housing | A2 | Exhaust port |
| c | Control shaft | A3 | Supply port |
| d | Handle | K | Protuberance marking direction of flow |
| e... | Sealing ring | R | Protuberance marking exhaust |
| f | Compression spring | | |
| g | O-ring | | |

Figure 3 Inner construction of ballcock SK-T-DN..E
(the ballcock with a nominal bore of DN7 is represented by way of example)



4.3 Working principle

See Figure 2 and Figure 3



CAUTION

Beware of incorrect operation!

The unit will be damaged and/or its functionality impaired.

The handle (d) must always be swung home to its stop. Any intermediate position will damage the moulded sealing ring (e1) and the counter-support (e2) and might lead to leakage from the ballcock.

The two working positions (open and closed) are reached when the handle (d) is turned by 90°.

Open position

In this position, the bore through the isolating ball (a) is parallel to the longitudinal axis of the ballcock (see longitudinal section in Figure 3). The two protuberances K visible on the end of the control shaft cap are also parallel to the ballcock's longitudinal axis.

The passage from the supply port A3 to the consumer port A1 is open.

Closed position

In this position, the bore through the isolating ball (a) is at a right-angle to the longitudinal axis of the ballcock. The protuberances K visible on the cap of the control shaft (c) are also at right-angles to the ballcock's longitudinal axis.

The passage from the supply port A3 to the consumer port A1 is closed. The consumer port is vented through the passage in the isolating ball (a) to the exhaust port A2. The protuberance R on the control shaft cap is positioned in the longitudinal axis of the ballcock and points in the direction of the vented port.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the type designation):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.
Provide for a free flow through the ports.



NOTE

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.

- Take the covers off the ports of the unit's flange and off the mating ports of the bracket to which the unit is going to be joined.
- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the type designation):
 - Lubricate the O-rings with a **thin** film of RENOLIT KBS 1 grease.
- For all other units:
 - Lubricate the O-rings with a **thin** film of RENOLIT HLT2-KB grease.



- Thoroughly clean the ports.
- Put the O-rings in their seats on the unit.
- Position the unit at the place of installation and attach by the fasteners. Tighten the fasteners alternately step by step, taking care to apply the tightening torque from the installation drawing.
- Connect the supply of compressed air to the unit.

5.1.3 Leakage test

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.



5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Unscrew the fasteners holding the unit, and take the unit plus O-rings off the bracket.
- Cover up the unit's ports.
- Cover up the ports of the bracket unless an exchange unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

Exchange the unit if it happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own units. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Components and units are to be dispatched in packaging in accordance with the specifications of regulation GD15904.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Unit inoperative	Handle not in the end position	Move the handle to the end position.	
Air discharging constantly between unit and bracket (flange joint)	Fasteners loose	Tighten the fasteners (apply the specified tightening torque!) and test for leakage.	Section 5.1
	O-rings damaged or missing	Remove the unit, exchange the O-rings, install the unit and test for leakage.	Section 5
Air discharging from control shaft (c)	Unit defective	Remove the unit and submit for repair.	Section 5
Consumer port not being vented in the closed position			
Other problems			



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - G E 5 0 . 2 5

Rev. 04 - 16.11.2011 - en
.....

.....
Description

Pressure reducing valve
DMV15/T...



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	10
4.2	Construction	10
4.3	Working principle	12
5	Removal and installation	14
5.1	Installation	14
5.1.1	Requirements	15
5.1.2	Procedure	15
5.1.3	Leakage testing	16
5.1.4	Function testing	16
5.2	Removal	17
5.2.1	Requirements	17
5.2.2	Procedure	18



6	Maintenance	19
6.1	Inspection	19
6.1.1	Interval	19
6.1.2	Special tools	19
6.1.3	Procedure	19
6.2	Servicing	19
6.3	Repair	20
6.4	Overhaul	20
6.4.1	Interval	20
7	Troubleshooting	21
7.1	Special tools	21
7.2	Procedure	21
8	Disposal	22



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Technical Information "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

I71472/...A

II36508/...

II36216/...A



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The unit serves to produce a constant working pressure - regardless of supply pressure fluctuations.

4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction

The letter "K" at the end of the item number denotes units with enhanced resistance to low temperatures.

The installation drawing that goes with the unit contains the technical particulars of the unit.

4.2 Construction

See Figure 1

The pressure reducing valve is used in compressed air systems to lower a given pipe pressure on the primary side to the constant working level required on the secondary side.

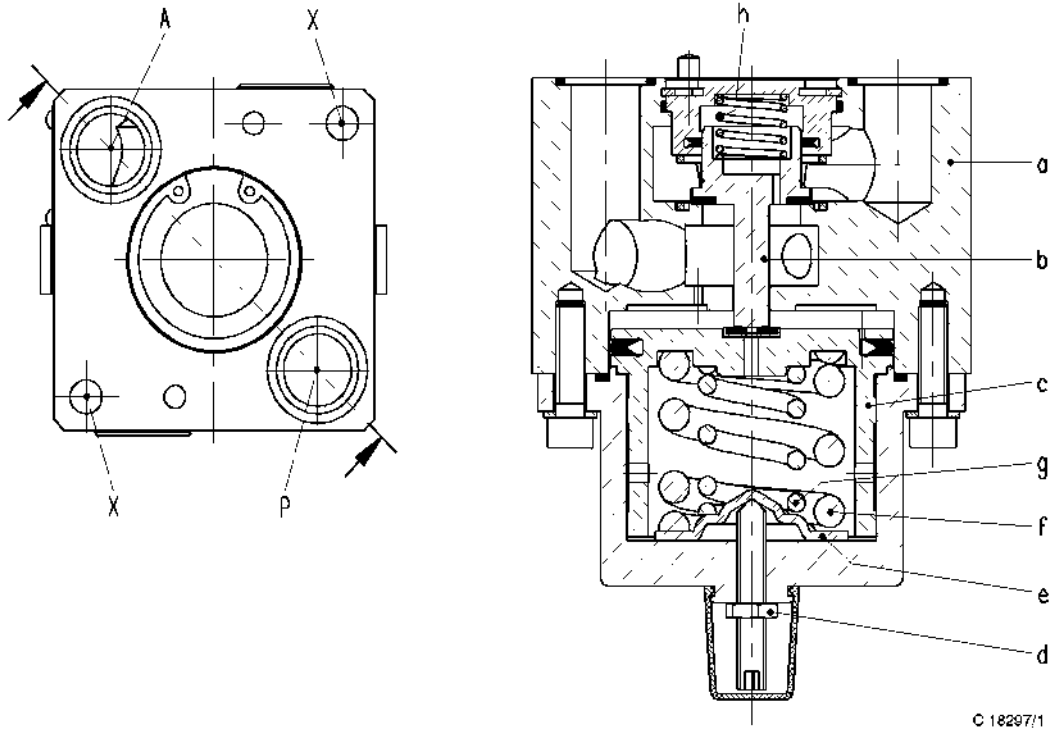
The DMV15/T pressure reducing valve consists essentially of:

- Housing (a)
- Valve head (b)
- Piston (c)
- Hex-head bolt (d) and spring retainer (e)
- Compression spring (f)
- Compression spring (g)
- Compression spring (h)

The pressure reducing valve is fastened to the onboard valve bracket by two machine screws passed through the mounting holes (X).

It is suitable for mounting on manifold panels, or for installation in pipeline systems on a mating valve bracket (item No. II39403).

The ports A and P are located on the pressure reducing valve's joining surface.



© 18297/1

- | | | | |
|----------|--------------------|----------|-------------------------------------|
| a | Housing | g | Compression spring |
| b | Valve head | h | Compression spring |
| c | Piston | X | Mounting hole |
| d | Hex-head bolt | A | Operating pressure (secondary side) |
| e | Spring retainer | P | Pipe pressure (primary side) |
| f | Compression spring | | |

Figure 1 Construction of the pressure reducing valve



4.3 Working principle

See Figure 2

Filling the secondary line and providing pressure protection

The compressed air at the higher level comes from the primary line P and flows through the open valve seat V1 to the secondary line A. At the same time, pressure is admitted to the piston (c) through the bore B1. Compressed air flows through the bore B3 into the chamber above the valve head (b), balancing out the pressure levels there.

The piston (c) describes a certain movement as soon as the pressure in the secondary line A and the resulting force across the piston (c) overcome the tension of the compression springs (f and g). The valve head (b) tracks the movement of the piston and closes the valve seat V1 when the chosen pressure setting is reached.

When the secondary pressure setting is exceeded, the piston (c) is lifted off the tappet of the valve head (b) against the thrust of the springs (f and g). The valve seat V2 is opened. Compressed air from the secondary line can flow through the open bore B2 and be discharged to atmosphere at the exhaust O. Once the pressure in the secondary line has fallen to the chosen value, the piston (c) is pushed back onto the tappet of the valve head (b). The valve seat V2 and hence the bore B2 are closed, thereby preventing the secondary air from being discharged any longer.

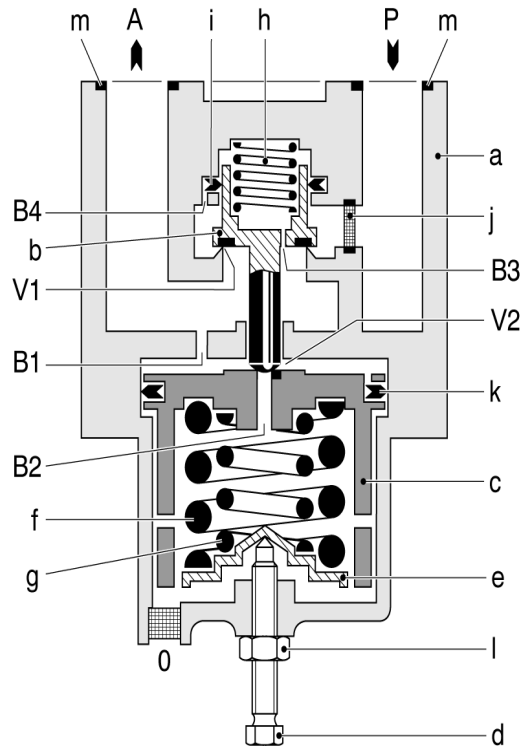
Recharging

If the pressure in the secondary line drops as a result of leakage or air consumption, the force on the piston (c) will fall, making the thrust of the springs (f and g) predominant. The piston (c) describes a certain movement, lifting the valve head (b) off the valve seat V1 via the tappet.

Compressed air from the primary line can continue flowing until the pressure in the secondary line has risen to the chosen setting again. As the pressure rises, the piston (c) moves against the springs (f and g), and the valve head (b) tracking this motion closes the valve seat V1.

Emptying

When the primary pressure is lowered below the pressure setting, the secondary line is vented through the bore B4, giving predominance to the spring force and lifting the valve head (b) off the valve seat V1.



C 18297/2

- | | | | |
|----------|--------------------|----------|-------------------------------------|
| a | Housing | j | Basket filter |
| b | Valve head | k | KNORR K-ring |
| c | Piston | l | Lock-nut |
| d | Hex-head bolt | m | O-ring |
| e | Spring retainer | B | Bore |
| f | Compression spring | V | Valve seat |
| g | Compression spring | A | Operating pressure (secondary side) |
| h | Compression spring | O | Exhaust bore |
| i | KNORR K-ring | P | Pipe pressure (primary side) |

Figure 2 Pressure reducing valve (schematic)



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



WARNING

Pneumatic system is under high pressure!

Particles flung outwards will, for instance, cause severe eye injuries.

Observe the safety regulations for pneumatic systems.

Prior to installation, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.

5.1.1 Requirements

The unit can be installed with standard tools.

A pressure gauge is required for function testing.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB (order number: ID No. 502647)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.

Provide for a free flow through the ports.



NOTE

To avoid grease ingress in the air passages, lubricate the seals with just a **thin** film of grease.



- Take the covers off the ports of the pressure reducing valve and valve bracket or manifold panel.
- Thoroughly clean the ports.
- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - Lubricate the seals with a **thin** film of RENOLIT KBS 1 grease.
- For all other units:
 - Lubricate the seals with a **thin** film of RENOLIT HLT2-KB grease.
- Locate the pressure reducing valve on the joining surface of the valve bracket or manifold panel and attach by the fasteners.
- Connect the supply of compressed air to the pressure reducing valve.

5.1.3 Leakage testing

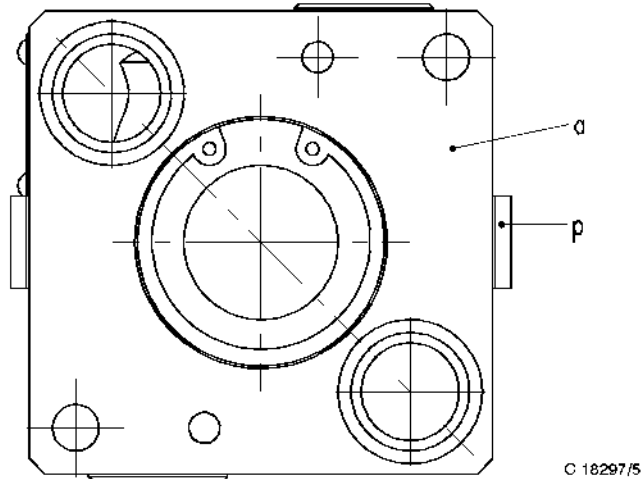
Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

- Vent the pressure reducing valve.
- Unscrew the screw plugs (Figure 3, p) from housing (a), and connect a pressure gauge to measure the pressure A (G 1/4 pipe thread).
- Charge the pressure reducing valve.
- As soon as the air supply pressure is applied to port P, the pressure gauge must indicate the lower pressure to which the pressure reducing valve is set.



a Housing

p Screw plug

Figure 3 Function testing

5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.



5.2.2 Procedure

- Turn off the supply of compressed air and vent all the compressed air pipes connected to the unit. Do not allow any more compressed air to reach the pressure reducing valve.
- Release the fasteners, and take the pressure reducing valve off the onboard valve bracket or manifold panel.
- Cover up the ports of the pressure reducing valve.
- Cover up the joining surface of the valve bracket or manifold panel unless a replacement unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own units. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packaging that complies with the specifications of Technical Information GD15904.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air discharging constantly between pressure reducing valve and bracket or flange surface	Fastening screws loose	Tighten the connections (observe the tightening torque) and test for leakage.	Section 5.1.3
	O-rings (m) damaged or missing	Remove the unit, exchange the seals and install the unit.	Section 5.2 5.1
No output pressure at secondary port A	No pressure at primary port P	Connect the supply of compressed air.	
	Unit defective	Remove the unit and ship to a KB SfS Service Center for repair.	Section 5.2
Pressure at secondary port A is lower than the unit's setting	Pressure at P lower than the setting	Check the supply of compressed air.	
	Unit defective	Remove the unit and ship to a KB SfS Service Center for repair.	Section 5.2
Air discharging constantly from exhaust port O			



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - E C 9 0 . 2 2

Rev. 00 - 08.03.2012 - en
.....

.....
Description

Distributor valve
STV200-...
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Implementation	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Authorized use of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	12
4.3	Working principle	15
5	Removal and installation	16
5.1	Installation	16
5.1.1	Requirements	17
5.1.2	Procedure	17
5.1.3	Leakage test	18
5.1.4	Functional check	18
5.2	Removal	18
5.2.1	Requirements	18
5.2.2	Procedure	18



6	Maintenance	19
6.1	Inspection	19
6.1.1	Interval	19
6.1.2	Special tools	19
6.1.3	Execution	19
6.2	Maintenance	19
6.3	Repair	20
6.4	Overhaul	20
6.4.1	Interval	20
7	Troubleshooting	21
7.1	Special tools	21
7.2	Execution	21
8	Disposal	22



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Implementation

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Regulation "Packaging, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with type designations:

STV200...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

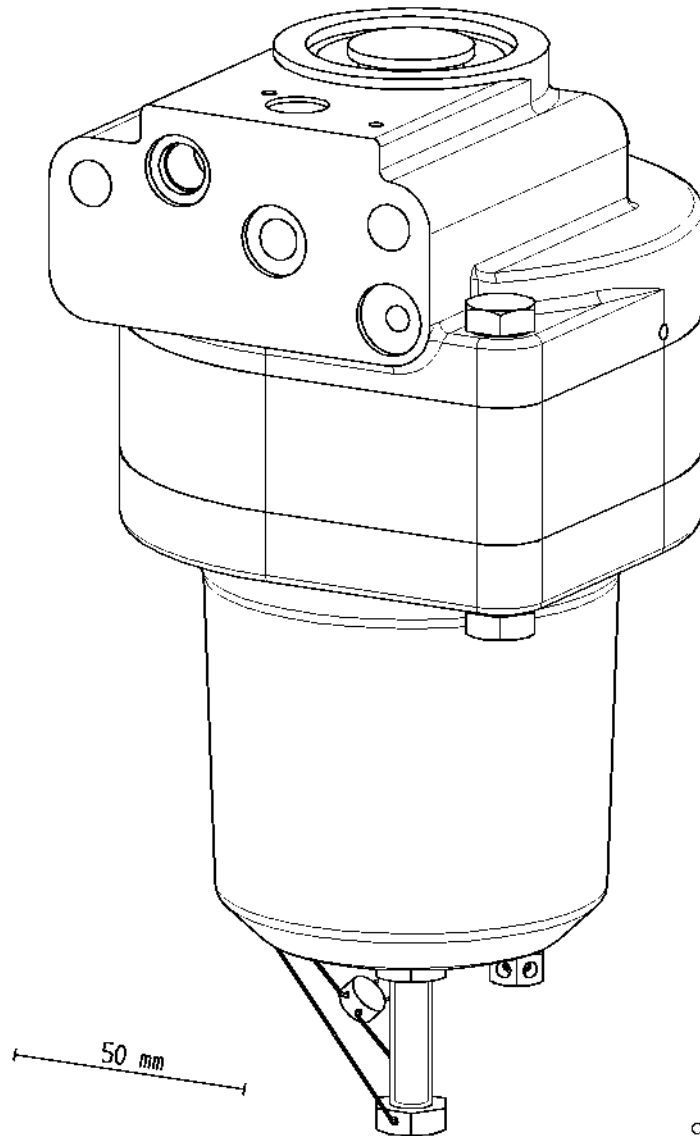
The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The unit controls the downstream pressure transformer for filling and venting the brake cylinder of the friction brake depending on the control pressure in the brake pipe.



C 170937/1

Figure 1 Distributor valve STV200-...
(typical view)



4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction

4.2 Construction

See Figure 2 and Figure 3

The unit consists essentially of:

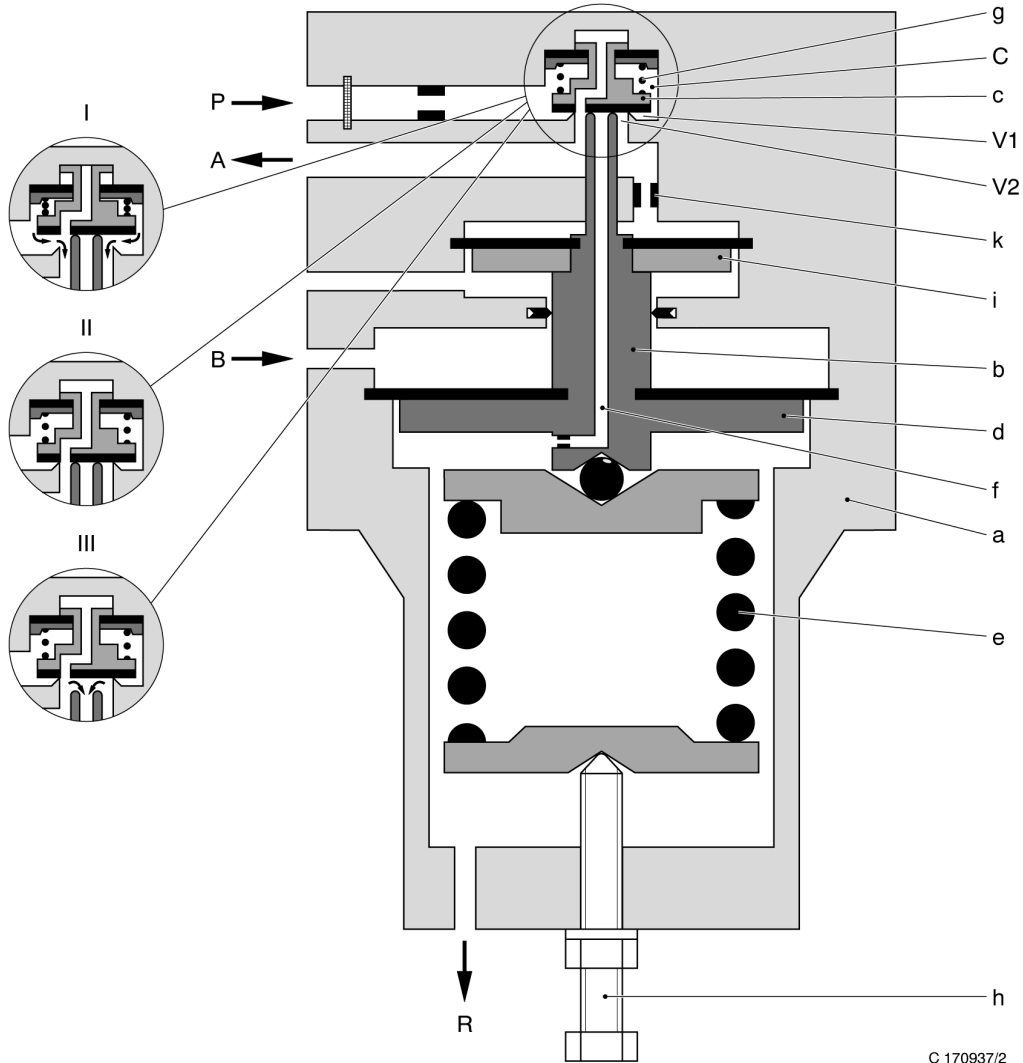
- Housing (a)
- Tappet (b)
- Valve tappet (c)
- Compression springs (e and g)
- Adjustment screw (h)

The housing (a) has an adapter flange. The adapter flange contains the ports for connecting the unit. The ports are sealed by O-rings.

The spring-loaded tappet (b) is mounted in the housing (a). Diaphragms clamped on the tappet (b) separate the different pressure chambers. The tappet (b) includes a hole (f). This hole enables a connection to be established between pressure room C and the exhaust R.

An additional pressure chamber has been created by installing the thrust plate (i) and the throttling orifice (k). Compressed air flows through the throttling orifice (k) from the precontrol pressure side to the thrust plate (i) and, generating an opposing force to the upwards movement of the tappet (b).

The adjustment screw (h) enables the necessary release pressure (x_2) to be set.



C 170937/2

- a Housing
- b Tappet
- c Valve tappet
- d bottom thrust plate of the tappet (b)
- e Compression spring
- f Bore
- g Compression spring
- h Adjustment screw
- i top thrust plate of the tappet (b)
- k Throttling orifice
- C Pressure chamber
- V... Valve seat

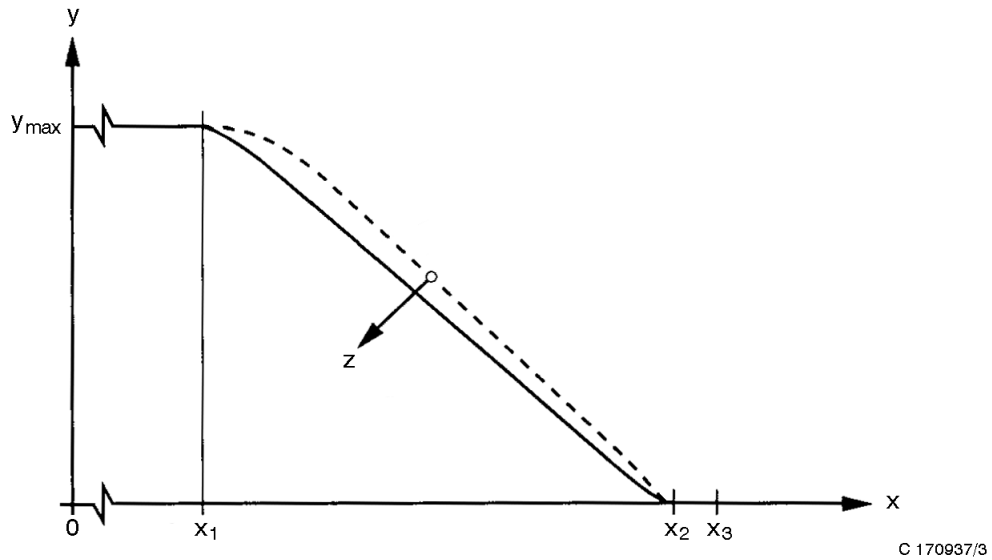
Settings:

- I Braking position
- II Stop brake or release step
- III Release position

Ports:

- B Brake pipe (control pressure)
- P Supply pressure (auxiliary reservoir pressure)
- R Vent
- A Precontrol pressure (to the downstream pressure transformer)

Figure 2 Distributor valve STV200 Schematic



x Pressure brake pipe
x₁ Full service braking
x₂ Release pressure
x₃ Working pressure

y Precontrol pressure for the pressure transformers
y_{max} Maximal value
z Increasing thrust plate size

Figure 3 Pressure curve chart STV200...



4.3 Working principle

See Figure 2 and Figure 3

The device can use the following three valve settings:

- Braking position - I
- Stop brake or release step - II
- Release position II

The course of the pressure curve (see Figure 3) depends on the size of the thrust plate (i).

Braking position - I

The control pressure B (brake pipe pressure) falls below the release pressure (x_2). The reduction in the control pressure B results in a reduction in the pressure force on the thrust plate (d) of the tappet (b). The pressure force falls below the value of the pressure force through the compression spring (e). This pressure difference causes the tappet (b) to move upwards. The valve tappet (c) is pushed upwards against the pressure force of the compression spring (g), which opens the valve seat V1. The valve seat V2 stays closed. The compressed air inlet P (supply port) is connected with the compressed air outlet A (precontrol pressure to the downstream pressure transformer), i.e. compressed air from the auxiliary reservoir flows through the precontrol pipe to the downstream pressure transformer, which fills the brake cylinder, thereby applying the brake.

Stop brake or release step - II

As soon as the force on the tappet (b) is balanced, the compression spring (g) presses on the valve tappet (c). The valve seats V1 and V2 are closed at the same time. The unit goes into the lap position, i.e. all compressed air connections are blocked

higher braking step:

A higher braking step is achieved by reducing control pressure B. Reducing control pressure B causes the unit to switch to braking position. Precontrol pressure A increases. Compressed air is added via the throttling orifice (k) and increases the opposing force on the thrust plate (i). The power balance on the tappet (b) is restored. The device is in lap position again.

higher release step:

A higher release step is achieved by increasing control pressure B. Increasing control pressure B causes the unit to switch to release position. The precontrol pressure A falls. Compressed air is removed via the throttling orifice (k) and decreases the opposing force on the thrust plate (i). The power balance on the tappet (b) is restored. The device is in lap position again.

Release position II

The control pressure B (brake pipe pressure) rises above the release pressure (x_2). The increase in the control pressure B results in an increase in the pressure force on the thrust plate (d) of the tappet (b). The pressure force rises above the value of the pressure force through the compression spring (e). This pressure difference causes the tappet (b) to move downwards. The valve tappet (c) is pushed downwards by the pressure force of the compression spring (g), which closes the valve seat V1. The valve seat V2 opens. The compressed air inlet P (supply port) is separated from the compressed air outlet A (precontrol pressure to the downstream pressure transformer). The precontrol pressure A is vented via the hole (f) in the tappet (b) on the exhaust R, i.e. the brake cylinder vents and releases the brake. The supply pressure P remains shut off to hold the pressure.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The directions in the installation drawing of the unit must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.
Provide for a free flow through the ports.



NOTE

If compressed air is blown into the exhaust "R", the membrane can come loose from thrust plate "d". This creates a permanent leak in the BP pressure.



NOTE

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.

- Take the covers off the ports of the unit and the onboard valve bracket or the manifold panel.
- Thoroughly clean the ports.
- Lubricate the O-rings with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings in their seats on the unit's flange.
- Locate the unit in its mounting position on the valve bracket or manifold panel and attach by fasteners through the unit's through-holes.
- Connect the supply of compressed air.



5.1.3 Leakage test

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Functional check

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Remove the fasteners, and take the unit plus O-rings off the valve bracket or the manifold panel.
- Cover up the unit's ports.
- Cover up the onboard ports unless an exchange unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Execution

See vehicle operator's instructions

6.2 Maintenance

Not required



6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Execution

Problem	Cause	Remedy	See
Incorrect or no output pressure	No or incorrect pneumatic activation from the unit	Test the unit for correct pneumatic control.	
	Adjustment screw (h) adjusted	Remove the unit and submit for repair.	
	Unit defective	Remove the unit and submit for repair.	Section 5.2
Air discharging constantly from the flange joint (between unit and bracket)	Fastening screws loose	Tighten the fastening screws (observe the tightening torque!) and test for leakage.	Section 5.1.3
	O-rings damaged or missing	Remove the unit, exchange the O-rings, install the unit and test for leakage.	Sections 5.2 and 5.1, respectively
Compressed air flows out of the exhaust R in braking position	Unit defective	Remove the unit and submit for repair.	Section 5.2
P-pressure flows out in release position			
No A-pressure flows off in release position			
The unit has no brake or release steps.			



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - K F 2 0 . 2 2

Rev. 05 - 16.11.2011 - en
.....

.....
Description

Mean pressure valve
MDV1
MDV1-T



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	10
4.2	Construction	10
4.3	Working principle	15
5	Removal and installation	19
5.1	Installation	19
5.1.1	Requirements	20
5.1.2	Procedure	20
5.1.3	Leakage testing	21
5.1.4	Function testing	21
5.2	Removal	21
5.2.1	Requirements	22
5.2.2	Procedure	22



6	Maintenance	23
6.1	Inspection	23
6.1.1	Interval	23
6.1.2	Special tools	23
6.1.3	Procedure	23
6.2	Servicing	24
6.2.1	Interval	24
6.2.2	Special tools	24
6.2.3	Procedure	24
6.3	Repair	24
6.4	Overhaul	24
6.4.1	Interval	25
7	Troubleshooting	26
7.1	Special tools	26
7.2	Procedure	26
8	Disposal	27



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Technical Information "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

I20871

I22950/X

I20871/K

I22950/X122

I20871/X67

I22950/X144

I22950

I61627

I22950/1



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The unit is designed exclusively to act as a pressure regulator for installation in pneumatic systems on rail vehicles.

4.1 Technical features

The unit is distinguished by the following features:

- The unit uses two individual levels to form a value that is the arithmetic mean of these two individual pressures.
- The mean pressure is set automatically by the higher of the two individual pressures. This mean pressure is, for instance, used as a load-dependent control signal that defines the brake cylinder pressure. The individual pressures are obtained from sensing or weighing valves, or from air spring bellows on vehicles with air suspension.
- The unit is quick and easy to exchange.

The letter "K" at the end of the item number denotes units with enhanced resistance to low temperatures.

The installation drawing contains the technical particulars of the unit.

4.2 Construction

See Figure 1, Figure 2 and Figure 3

In all the versions listed in Table 1 the actual basic mean pressure valve A is the one with item number I20871.

The basic mean pressure valve A of the version with item number I61627 is mounted on a valve bracket B containing the ports I and II for the individual pressures T1 and T2, and the port M for the mean pressure M. Consequently, the mean pressure valve can be used as a pipeline unit with G1/4" pipe threads.

Mean pressure valves with item numbers I22950... have the same valve bracket B which is, however, equipped additionally with sockets C and double nipples D for the G1/4" ports.

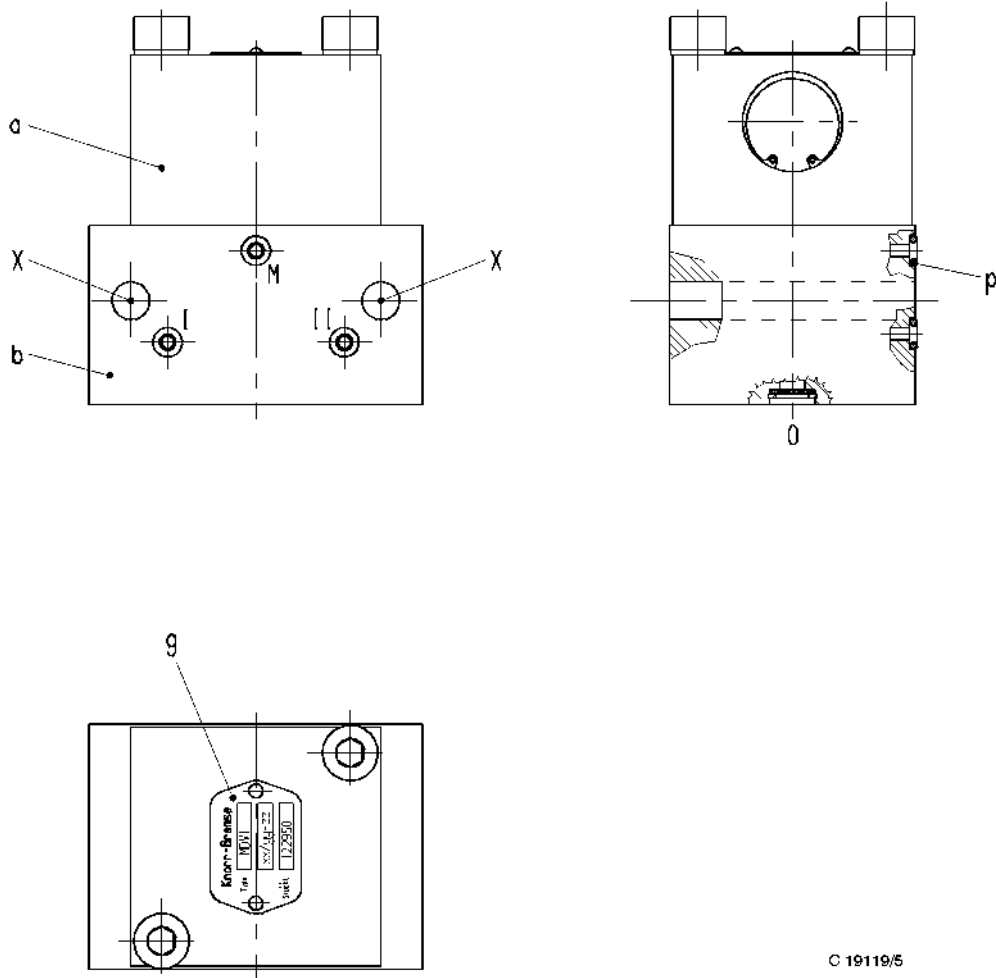
The supplementary letter X in the item number denotes different paintwork.

The housing of the mean pressure valve consists of an upper member (a) and a lower member (b) which are bolted together by two machine screws (r) giving an airtight joint.

The upper housing member (a) contains the piston (c) that acts as a double check valve, as well as the twin valve head (d) that is pushed into place by the compression spring (e).

The lower housing member (b) contains the differential piston (f).

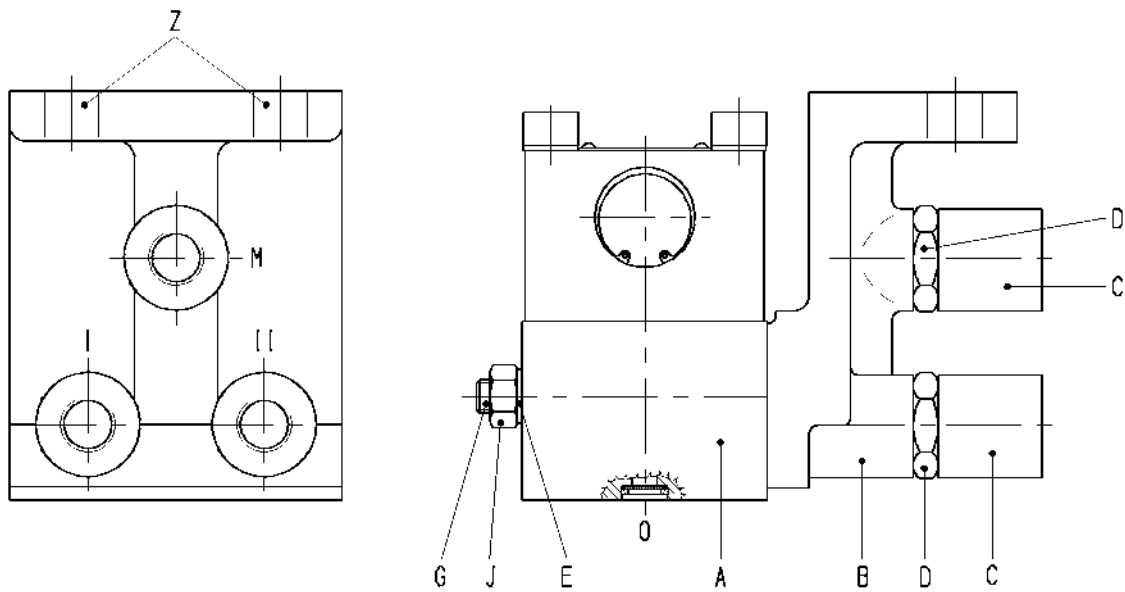
The mean pressure M is set automatically by the higher of the two individual pressures T1 and T2.



C 19119/5

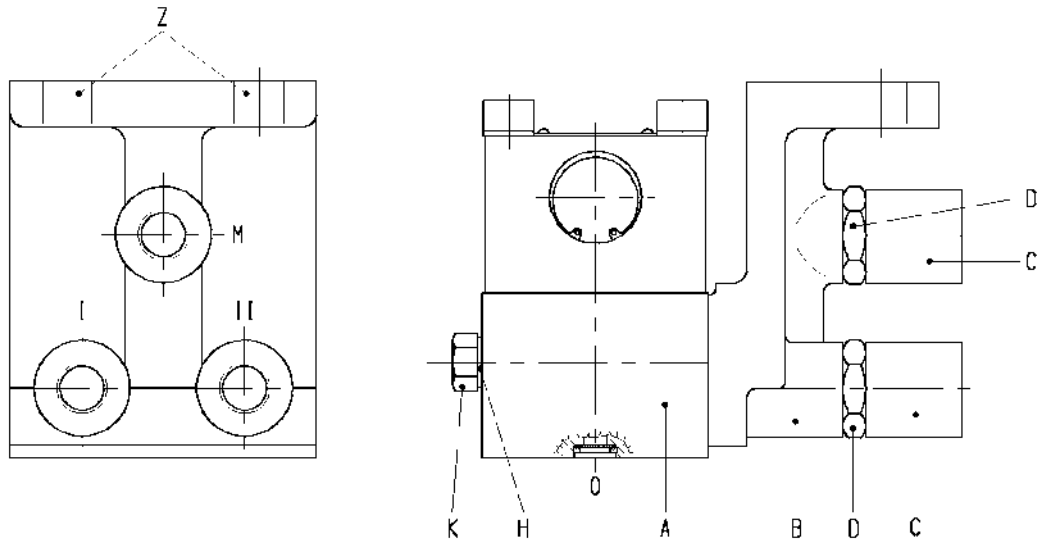
- | | | | |
|----------|----------------------|-----------|------------------------------|
| a | Upper housing member | I | Port for individual pressure |
| b | Lower housing member | II | Port for individual pressure |
| g | Name plate | M | Port for mean pressure |
| p | O-ring | O | Exhaust |
| | | X | Through-hole |

Figure 1 Mean pressure valve MDV1 - Basic version
(showing views of I20871)



- | | | | |
|----------|---------------------------|-----------|------------------------------|
| A | Basic mean pressure valve | J | Hexagon nut |
| B | Valve bracket | G | Stud |
| C | Socket | Z | Mounting holes |
| D | Double nipple | I | Port for individual pressure |
| E | Lock washer | II | Port for individual pressure |
| M | Port for mean pressure | O | Exhaust |

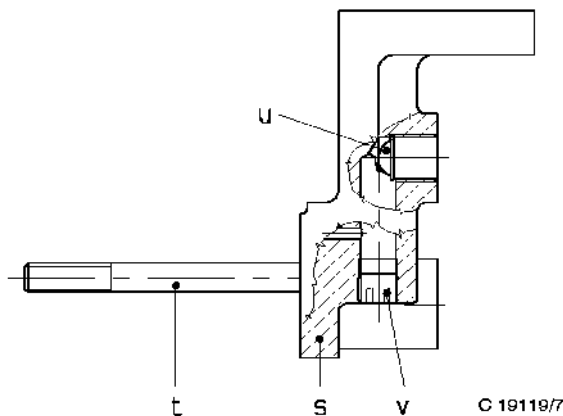
Figure 2 Mean pressure valve with a valve bracket
(showing I22950 with stud G and double nipple D)



C 19119/6

- | | | | |
|----------|---------------------------|-----------|------------------------------|
| A | Basic mean pressure valve | Z | Mounting holes |
| B | Valve bracket | I | Port for individual pressure |
| C | Socket | II | Port for individual pressure |
| D | Double nipple | M | Port for mean pressure |
| H | Locking ring | O | Exhaust |
| K | Hex-head bolt | | |

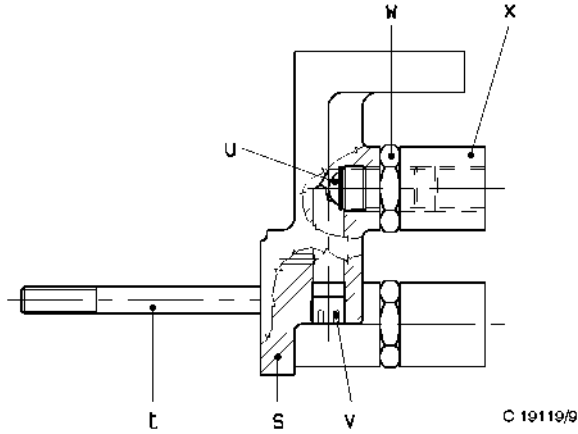
Figure 3 Mean pressure valve with a valve bracket (showing I22950/1 with hex-head bolt K and double nipple D)



C 19119/7

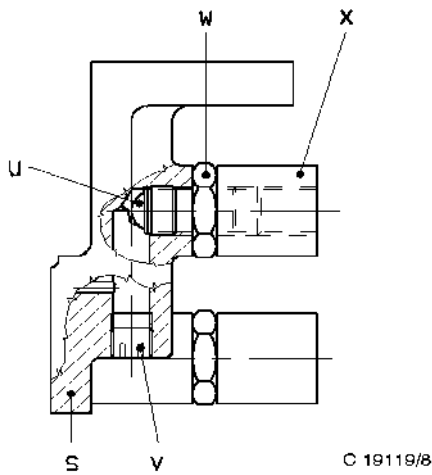
- | | | | |
|----------|---------|----------|---------------|
| s | Bracket | u | Wire strainer |
| t | Stud | v | Screw plug |

Figure 4 Valve bracket (with a stud, without a double nipple)



- | | | | |
|----------|---------------|----------|---------------|
| s | Valve bracket | v | Screw plug |
| t | Stud | w | Double nipple |
| u | Wire strainer | x | Socket |

Figure 5 Valve bracket
(with a stud, with a double nipple)



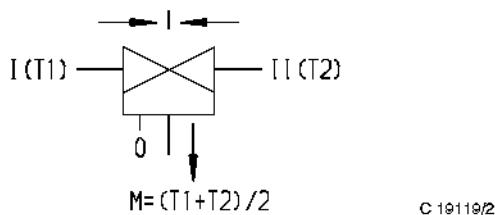
- | | | | |
|----------|---------------|----------|---------------|
| s | Valve bracket | w | Double nipple |
| u | Wire strainer | x | Socket |
| v | Screw plug | | |

Figure 6 Valve bracket
(for hex-head bolt, with a double nipple)



Item number	Version
I20871	Basic version designed as a flange-mounting unit without a valve bracket - see Figure 1 and Figure 9
I61627	Pipeline unit with a valve bracket on studs, without a double nipple - see Figure 1 and Figure 4
I22950	Pipeline unit with a valve bracket on studs, with a double nipple
I22950/X...	- see Figure 1 and Figure 5
I22950/1	Pipeline unit with a valve bracket on hex-head bolts, with a double nipple - see Figure 1 and Figure 6

Table 1 Mean pressure valves MDV1



- I Port for individual pressure
- II Port for individual pressure
- T1 Individual pressure

- T2 Individual pressure
- M Mean pressure
- O Exhaust

Figure 7 Functional diagram

4.3 Working principle

See Figure 8

The individual pressures T1 and T2 act on the back and front of the piston (c) which works as a check valve. The higher of the two individual pressures pushes the piston (c) onto that valve seat S1 or S2 that is located at the point of entry of the lower individual pressure, thereby shutting off the lower pressure from the chamber above the twin valve head (d).

The piston (c) is toggled between the valve seats S1 and S2 by the action of changes (e.g. to the payload) and by the fluctuations thereby induced in the individual pressures T1 and T2.

While the individual pressures T1 and T2 are acting on the piston (c), they simultaneously bear on the (equal-sized) annular surfaces F1 and F2 of the differential piston (f). The differential piston (f) is lifted together with the valve head (d) against the thrust of the compression spring (e) and opens the valve seat S3.



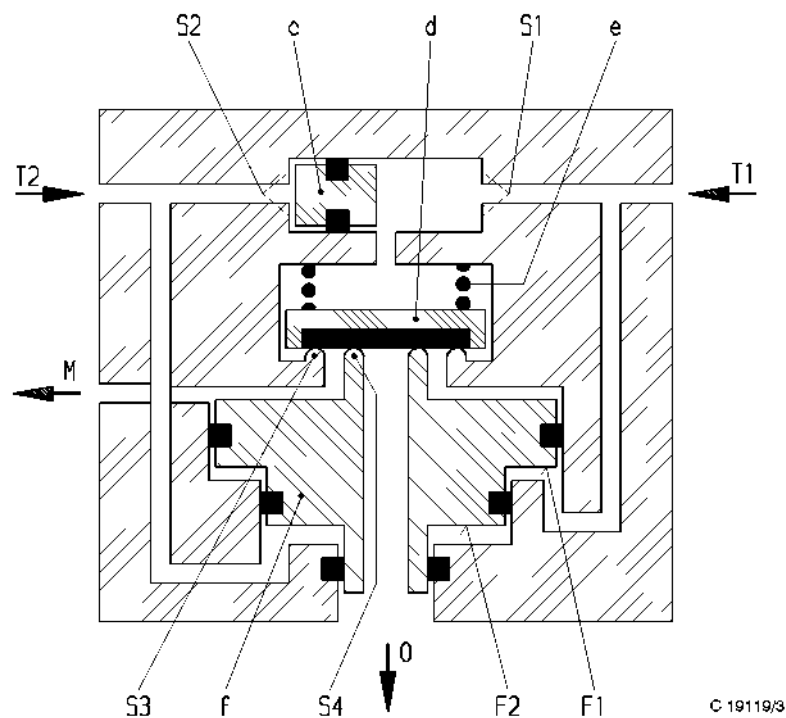
The higher of the two individual pressures T1 or T2 from the chamber above the twin valve head (d) flows through the open valve seat S3 into the annular chamber above the differential piston (f) whose area is as large as that of the annular surfaces F1 and F2.

Once this pressure has increased far enough to balance out the pressures acting on the annular surfaces F1 and F2, the twin valve head (d) goes to the lap position and closes the valve seat S3.

If one of the two individual pressures T1 or T2 falls, the differential piston (f) will be pushed downwards by the stronger force of the mean pressure M acting on the upper piston half, opening the valve seat S4 to atmosphere O.

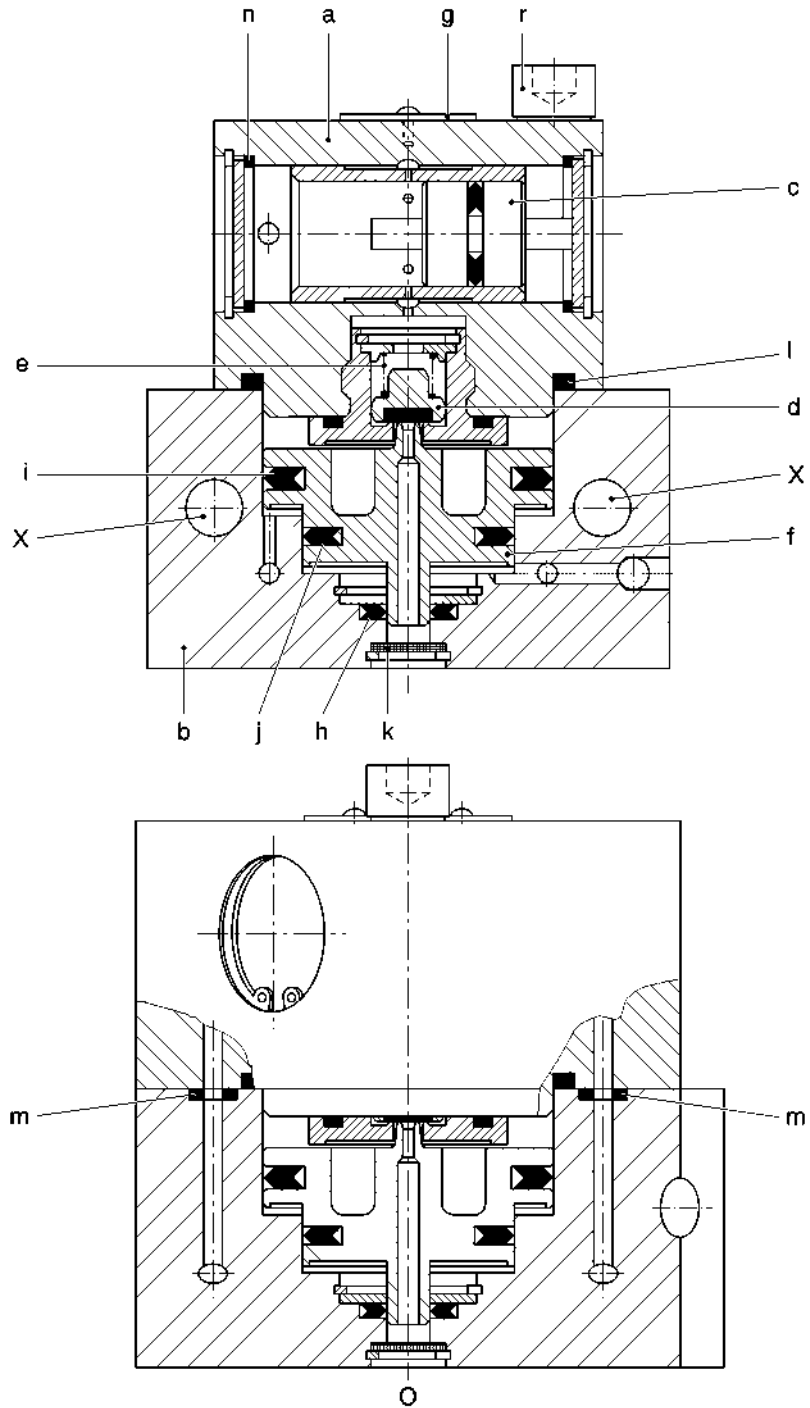
The mean pressure M is lowered continuously until the differential piston (f) reaches the lap position and closes the valve seat S4.

See also the schematic in Figure 7.



- | | | | |
|-----------|---------------------|-----------|--|
| c | Piston | O | Exhaust |
| d | Twin valve head | S1 | Valve seat for piston (c) |
| e | Compression spring | S2 | Valve seat for piston (c) |
| f | Differential piston | S3 | Valve seat for differential piston (f) |
| F1 | Annular surface | S4 | Valve seat for differential piston (f) |
| F2 | Annular surface | T1 | Individual pressure |
| M | Mean pressure | T2 | Individual pressure |

Figure 8 Functional diagram



C 19119/4



a	Upper housing member	j	KNORR K-ring
b	Lower housing member	k	Strainer
c	Piston	l	O-ring
d	Twin valve head	m	O-ring
e	Compression spring	n	O-ring
f	Differential piston	r	Machine screw
g	Name plate	O	Exhaust bore
h	KNORR K-ring	X	Through-hole
i	KNORR K-ring		

Figure 9 Mean pressure valve MDV1 - Basic version
(showing cross-sections of I20871)



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Do not install any unit that is older than four years. Verify the date of manufacture prior to use.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure

First-time installation with a valve bracket

- Take the covers off the ports of the unit's valve bracket and off the onboard air pipes.
- Thoroughly clean the ports.
- Attach the valve bracket plus unit to the onboard mounting bracket.
- Connect the onboard air pipes to the ports of the valve bracket.
- Connect the supply of compressed air.

Installation without a valve bracket

- Take the covers off the unit's ports and onboard compressed air pipes.
- Thoroughly clean the ports.



NOTE

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.



- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - Lubricate O-rings (p, Figure 1) with a **thin** film of RENOLIT KBS 1 grease.
- For all other units:
 - Lubricate O-rings (p, Figure 1) with a **thin** film of RENOLIT HLT2-KB grease.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.

- Put the greased O-rings (p, Figure 1) in their seats on the unit.
- Locate the unit on the valve bracket or onboard base plate and attach by:
 - lock washers E and hexagon nuts J on studs G - see Figure 2.
Tightening torque: 23 Nm.

or

- hex-head bolts K and locking rings H - see Figure 3.
Tightening torque: 20 Nm.
- Connect the supply of compressed air.

5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint and pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leakage testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



NOTE

Leave the valve bracket on board the vehicle. Only remove the valve bracket in case of damage.

Removal without a valve bracket

- Turn off the supply of compressed air and vent all the reservoirs and compressed air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Detaching the mean pressure valve:
 - Release hex-head bolts K and remove them together with the locking rings H and the mean pressure valve from the valve bracket or onboard base plate (see Figure 3).

or

- Unscrew the hexagon nuts J from studs G and remove them together with the lock washers E and the unit from the valve bracket or onboard base plate (see Figure 2).
- Cover up the unit's ports.
- Cover up the onboard ports unless a replacement unit is going to be fitted immediately after removal.

Removing the valve bracket

- Unscrew the onboard compressed air pipes from the ports of the valve bracket.
- Release the fasteners holding the valve bracket, and remove this bracket.
- Cover up the ports of the valve bracket.
- Cover up the onboard ports unless a replacement bracket is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions



6.2 Servicing

The exhaust port O must be checked and cleaned at regular intervals to prevent dirt getting inside the valve.

6.2.1 Interval

Activity	Interval
Sight-checking and cleaning the exhaust port O	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.2.2 Special tools

Not required

6.2.3 Procedure

See vehicle operator's instructions

6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own units. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packaging that complies with the specifications of Technical Information GD15904.



6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air discharging constantly between unit and bracket	O-ring (p) damaged or missing	Remove the unit, exchange and/or add O-rings (p), install the unit and test for leakage.	Sections 5.2, 5.1 and 5.1.3
Air discharging constantly between upper housing member (a) and lower housing member (b)	Unit defective	Remove the unit and ship to a KB SfS Service Center for repair.	Section 5.2
Air discharging constantly from the unit's strainer			
Unit delivers inadequate mean pressure M			
Unit delivers excessive mean pressure M			



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - C K 0 0 . 2 3

Rev. 05 - 01.02.2017 - en
.....

.....
Description

Brake pads
UIC
KRS
Standard sintered



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
02	23.10.2013	Revision history inserted		X				
		3.1	X					
		4.1, 4.2, 5.2, 6.2		X			X	
03	25.02.2016	5.3					X	
		6.2, 6.2.4, 6.2.5				X	X	
		6.1, 6.2.3		X				
04	25.04.2016	6.2.4		X	X			
		8		X				
05	01.02.2017	3.1, 4.1, 5.2.1, 6.2		X				
		6.2					X	



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Definitions	11
4.2	Technical features	13
5	Assembly	14
5.1	Requirements	14
5.2	Procedure	14
5.2.1	UIC and KRS pads for brake calipers (pneumatic and hydraulic)	15
5.2.2	Standard sintered pads	16
5.2.3	Crosswise mounted brake pads (roll-on/roll-off train)	16
5.2.4	KRS brake pads for hydraulic brake calipers	16
5.2.4.1	Vertically positioned brake pads (with two retaining pins)	17
5.2.4.2	Horizontally positioned brake pads	17
6	Maintenance	18
6.1	Inspection	18
6.1.1	Interval	18
6.1.2	Special tools	18
6.1.3	Implementation	18



6.2	Servicing	19
6.2.1	Interval	20
6.2.2	Special tools	20
6.2.3	Implementation	20
6.2.4	Overhaul / replacement	21
6.2.4.1	Service life	21
6.2.5	Storage condition	22
7	Disposal	23
8	Shipment	24



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses installation and maintenance of the brake pad on board.

2.1 Related documents

GD21121	Failure Catalogue
GD15904	Regulation "Packing, handling, transport and storage"
PRF8654/A	Test Instructions, pad overlap

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for brake pads:

- made of organic and sintered friction materials
- of the UIC and KRS type
- for use in pneumatic and hydraulic brake calipers



NOTE

Please contact KNORR-BREMSE Rail Services if the brake pad cannot be uniquely identified, e.g. because the item number is illegible.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The brake pad is that part of the brake unit that discharges kinetic energy by rubbing against the friction surface.

4.1 Definitions

- **Brake pad:** The brake pad is the component that generates the braking power and fits in the brake pad holder of a brake caliper or in a brake caliper. There is **one** brake pad at either side of the brake disc.
- **Types:** Depending on the field of application, the brake pads are subdivided into UIC and KRS types for pneumatic brake systems as well as versions for hydraulic brake systems. The UIC type complies with UIC Standard 541-3 of the International Union of Railway Operators (UIC). The KRS type (circular ring segment) is a special design developed by KNORR-BREMSE.
 - The UIC and KRS types of brake pad are generally split and consist of two mirror-imaged pad halves with a dovetail interface. A caliper holds two identical brake pads.

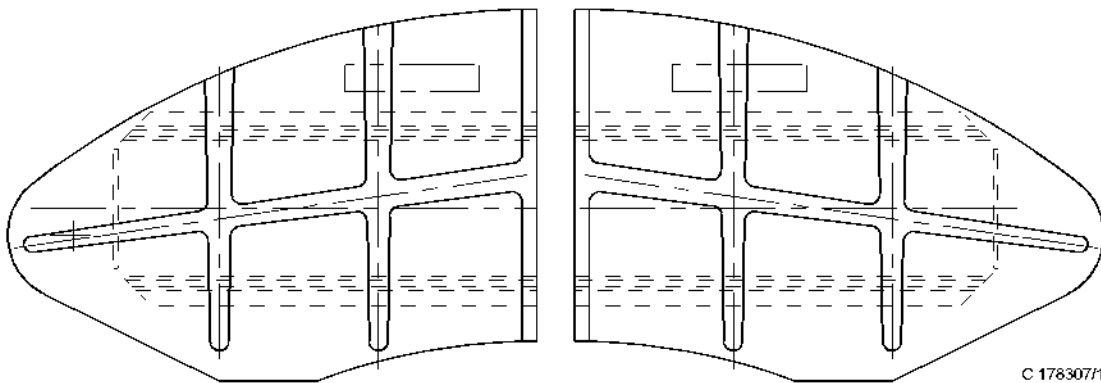
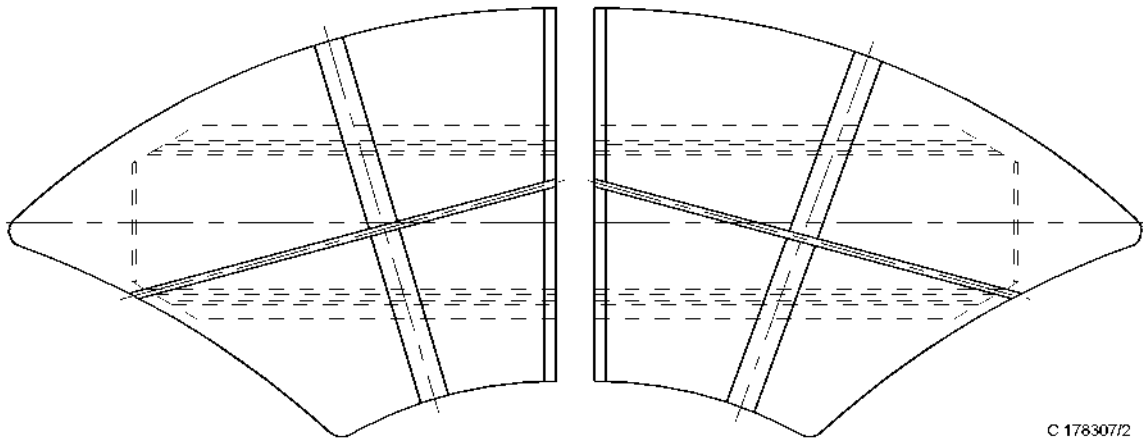


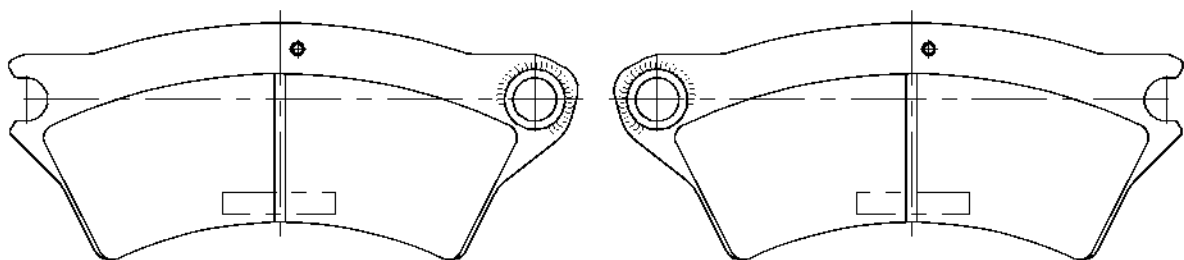
Figure 1 Typical representation of a - split - UIC type brake pad consisting of two pad halves



C 178307/2

Figure 2 Typical representation of a - split - KRS type brake pad consisting of two pad halves

- The sintered brake pad is also split and has a dovetail interface. The outer contour may differ from that of the UIC or KRS design.
- The brake pad for hydraulic applications is a solid component. A brake caliper may hold two identical or two mirror-imaged brake pads. Here again, the term KRS (circular ring segment) is used to describe the design.



C 178307/3

Figure 3 Typical representation of two mirror-imaged brake pads for a hydraulic brake system, one being a left brake pad and the other a right brake pad



4.2 Technical features

The service life of a brake pad will vary according to its thickness.

Once the condemning limit is reached, the brake pad is worn out and has to be replaced.

The condemning limit must never be exceeded. The brake pad has to be replaced in good time. The installation drawing of the brake pad shows the acceptable condemning limit.

A brake pad's condemning limit is always defined to ensure that all parts of a brake unit are guaranteed to function both when the friction partners comprising brake pad and brake disc are new and when they are worn.

Brake pads come with or without grooves. The aim of these grooves is to minimize the influence of wetness on the friction characteristics.

The grooves come in several different forms.



5 Assembly



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Requirements



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.

The unit can be installed with standard tools.

The vehicle builder's documents on installation - especially the data on fastening screws and tightening torques - must also be observed.

5.2 Procedure

Check the following points prior to installing new brake pads.



NOTE

To be stored outdoors, brake pads must be packed sufficiently well against moisture and exposure (sunlight). The characteristics of the pad will change if the pad is stored in any undue manner.

- The item number of the brake pads or brake pad halves must be compared with the item number from the system parts list. The item number is stated on the back of the brake pad.
- Brake pad halves: both halves of a pair have the same item number. One brake pad half is identified additionally by "L", the other by "R".
- The type of groove (pattern / quantity / plan view) must be checked against the purchase order.



- The brake pads or brake pad halves must have grooves of the same kind. Pairs of brake pads with different grooves are unacceptable.
- The item number must be stamped on the back of the brake pad in the specified manner (see related installation drawing).
- Material damage, such as incipient cracks, flaking or deficient bracket plates, must be checked and rated against Failure Catalogue GD21121.
- The surface treatment given to the bracket plates must be checked against the specifications in the installation drawing.
- Bracket plates without rustproofing are allowed only if stated expressly in the installation drawing.

5.2.1 UIC and KRS pads for brake calipers (pneumatic and hydraulic)

- Make sure that the two halves of a two-part brake pad match each other (same item number, and marked "L" and "R", respectively).
- Remove and install the brake pads as directed in the KNORR-BREMSE Description valid for the brake pad holders.



NOTE

When the pad holder is closed, the gate must bear fully on the base of the groove in the pad holder (see KNORR-BREMSE Description valid for the brake pad holder).

Only very little play (0.20 mm to 2.35 mm) is allowed in the longitudinal direction of the brake pads (i.e. viewing towards the dovetail interface).

Brake pads of different thickness (nominal size) must not be installed.

Please note:

- UIC and KRS pads usually consist of two brake pad halves.
- Accordingly, a brake caliper needs two brake pad halves marked "L" and two marked "R". These halves must be arranged as the mirror image of one another at each side (see installation drawing).
- Single-part brake pads, e.g. 300 cm² in size, are identical at both sides of the brake disc. These pads are also the mirror image of one another at each side.



5.2.2 Standard sintered pads

- The item number of the brake pad must be checked against that of the accompanying brake caliper (see related system parts list).
- Sintered pads usually consist of two brake pad halves.
- All other steps are as described in section 5.2.1.

5.2.3 Crosswise mounted brake pads (roll-on/roll-off train)

- Check the item number of the brake pad against that of the accompanying brake caliper (see related system parts list).
- Remove and install the brake pads as directed in the KNORR-BREMSE Description valid for the brake pad holder.



NOTE

When the bar is closed it must engage the recess in the gate (see KNORR-BREMSE Description valid for the brake pad holder).

Play is not allowed between the brake pad, pad holder and gate. If necessary, the brake pads must be swapped over.

5.2.4 KRS brake pads for hydraulic brake calipers

Please note:

Depending on their design, brake pads may be positioned horizontally or vertically.

Horizontally positioned brake pads must be lifted out for removal and installation, whereas the vertical type must be lowered or swivelled for this purpose.

The brake pads may be identical or different at left and right depending on how they are fastened and positioned.

The brake pads can be fixed in the brake caliper

- by two brake pad retaining pins,
- by one brake pad retaining pin or
- by a lock (without brake pad retaining pins).

Some brake pads have a coding pin on their bracket plate. This pin serves to prevent such brake pads from being installed incorrectly (refer also to the related installation drawing of the brake caliper).



5.2.4.1 Vertically positioned brake pads (with two retaining pins)

- Check the item number of the brake pads against that of the accompanying brake caliper (see related system parts list).
- Take out one retaining pin as directed in the installation drawing of the brake caliper.
- The left brake pad must be positioned in the caliper so as to make the pad surface point towards the brake disc friction surface. Push the guide (e.g. bore or sleeve) fully home onto the retracted retaining pin (watch out for any coding pins on the brake pads).
- Having withdrawn the retaining pin, push it through the bearing boss in the brake caliper and through the brake pad guide so as to lock the pad securely in place.
- Install the right brake pad in the same way and push the retaining pin to its end position.
- Fix the retaining pin as directed in the installation drawing of the brake caliper.
- The project-specific installation instructions valid for the brake caliper describe all other necessary steps.
- Push the brake pads onto the friction ring.

5.2.4.2 Horizontally positioned brake pads

Please note:

The horizontally positioned brake pads have identical mountings at both sides.

The bracket plate of the brake pad has a parallel guide that engages a slot-shaped recess in the brake caliper yoke, as well as a two-sided stop that fixes the brake pad in position next to the brake disc.

- Unlock the brake pad (see KNORR-BREMSE Description valid for the brake caliper).
- Insert the brake pad in such a way that the parallel guide on the bracket plate engages the caliper guide.
- Push the brake pad further home onto the yoke.
- Repeat these steps at the opposite side.
- Secure the brake pads by the locking mechanism.
- Special features regarding assembly are provided in the relevant installation drawing and discussed in the KNORR-BREMSE Description valid for the brake caliper.
- Push the brake pads onto the friction ring.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The brake pads must be exchanged without delay if a visual inspection reveals scorching, material deposits or unacceptable scoring in the friction surfaces of the brake discs.

The service life of brake pads depends on pad thickness, pad material, area, surface pressure, working temperature and mating friction parts.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Implementation

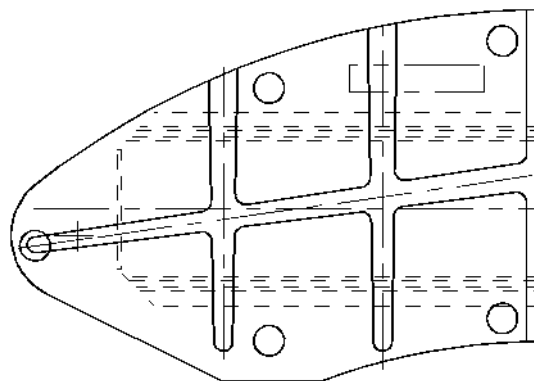
See vehicle operator's instructions



6.2 Servicing

Replacing the brake pads:

- The replacement intervals, i.e. the time from one pad replacement to the next, is defined by the vehicle operator according to practical experience. Weekly visual inspections to establish the state of the brake pads are recommended.
- Brake pads usually do not have a wear indicator.
- The acceptable condemning limit depends on the pad design.
- The residual thickness of a brake pad is always measured from the back of the pad to the friction surface at the thinnest place in the brake pad. The residual thickness is measured at a minimum of five places, as shown in the example for UIC brake pads in Figure 4.
- The limit specified as the residual thickness is indicated in the related installation drawing.



C 1783074

Figure 4 Measuring the residual thickness
Using UIC brake pads as an example

- Different operating effects may cause a difference in thickness (so-called slanting wear) between brake pad areas that are worn to greater or lesser degrees. The following limits apply to slanting wear:
 - 5 mm for organic UIC and KRS brake pads as well as for sintered brake pads
 - 3 mm for brake pads in hydraulic brake systems
- Minor flaking due to brief thermal overloading is allowed in the brake pad friction surface. Failure Catalogue GD21121 must be observed in this connection, and the damage rated accordingly.
- Hair cracks in the brake pad friction surface are allowed; pronounced cracks that influence the strength are not allowed anywhere in the surface of organic brake pads (UIC, KRS and hydraulic). Failure Catalogue GD21121 must be observed in this connection, and the cracks found must be rated accordingly.



Please note:

- The brake pad thickness is allowed to differ from one side of a pneumatic or hydraulic brake caliper to the other. At no time may the thickness be allowed to wear below the acceptable condemning limit.
- Used brake pad halves that are not worn out may only be combined as pairs if they have the same item number and their residual thickness differs by less than 0.4mm.
- Very severe shock and vibration loads on the vehicle can cause wear on the front face of the brake pad dovetail interface. The maximum permissible longitudinal play of two brake pads in a brake pad holder is 5 mm. When this limit is reached then the brake pads must be replaced before they have reached their usual wear limit.
- Metallic pins can already be seen in the organic friction area in the permitted pad thickness range (before reaching the condemning limit) for brake pads for hydraulic brake systems. These pins are part of the binding system between the friction material and back plate. This condition does not affect the coefficient of friction or damage the brake disc. Visual changes on the disk surface cannot be excluded.

6.2.1 Interval

Activity	Interval
Replacing the brake pads	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.2.2 Special tools

Not required

6.2.3 Implementation

The steps required for exchanging the brake pads are explained in the KNORR- BREMSE description valid for brake pad holders.



6.2.4 Overhaul / replacement

6.2.4.1 Service life

The service life time of brake pads made of organic material is limited to a maximum of eight years. The service life of brake pads and brake blocks made of sintered material is not restricted by time.

The storage period of organic brake pads is part of the service life and should not exceed four years. The maximum service life of eight years is the limiting factor for operational use.

Cyclic use of the friction brake is necessary to ensure that organic friction material retains its friction characteristics, and thus its braking performance, over the entire service life.

This applies especially to vehicles where other braking systems (e.g. electrodynamic brakes) provide the main braking force. Pure release braking at low speeds is usually insufficient for conditioning brake pads. To condition the brake pads, 2-3 operational replacement braking operations (purely pneumatic braking), applying medium deceleration (e.g. 0.7*maximum service brake deceleration) from about 2/3 of the maximum vehicle speed, should be performed at least once a week.



WARNING

The service life of a component depends not only time, but also on the number and intensity of actuations on the ambient conditions (such as vibration). The periods between replacement must therefore be defined primarily by the greatest load to which a component is exposed.



NOTE

The information on the service life refers to the date of manufacture of the component, which is visible on the component.



NOTE

How the characteristics and properties of the non-metallic component change in the course of time is a complex process which cannot be simply described by certain physical values, and which is also influenced by many parameters that in turn depend on one another.

The stated service life is therefore an empirical value gained from a wide variety of applications in several European countries. In special cases (e.g. strong corrosive exposure), the components may have a short service life.



6.2.5 Storage condition

The units must be stored in a closed, dry room under constant temperature conditions.

Reference values for storage:

- Room temperature
- Protected from direct sunlight
- Dry (relative atmospheric humidity $\leq 70\%$), free of greases, acids, bases and solvents

No regular routine function tests are needed while the items are in storage.



7 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.



8 Shipment

- The brake pads are packed in crates or on pallets in such a way that they cannot be damaged by shipment or exposure.
- Every crate or pallet bears the item number and the quantity of brake pads stored there (e.g. 50 pieces, C105255 / 35712; font size: 10 to 20mm).

Other forms of packaging or labelling are allowed after consultation with the purchaser.

- Brake pads shipped overseas must be protected additionally by seaworthy packaging.



NOTE

Brake pads must be shipped in accordance with the rules of Specification GD15904.

.....

.....

B - C T 6 0 . 2 6

Rev. 02 - 12.12.2016 - en

.....

.....

Description

Brake caliper units
RZTS...
RZTM...



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
01	02.07.2015	6.2.2		x				
02	12.12.2016	4.3.3					x	



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	11
3.3	Operator's commitment to due care	12
3.3.1	Assignment of personnel	12
3.3.2	Availability of the document	12
3.3.3	Amendments to the document	12
3.3.4	Spares and wearing parts	12
4	Technical description	13
4.1	Technical features	13
4.2	Construction	14
4.2.1	Brake caliper unit without a spring actuator for use as a service brake	14
4.2.2	Brake caliper unit with a spring actuator for use as a service and parking brake	19
4.3	Working principle	22
4.3.1	Applying the service brake	22
4.3.2	Applying the parking brake	25
4.3.3	Releasing the spring actuator with the emergency release gear	25
4.3.4	Re-activating the spring actuator	28
4.3.5	Using a double check valve to avoid mechanical overloading	31



5	Removal and installation	33
5.1	Installation	33
5.1.1	Requirements	34
5.1.2	Procedure	34
5.1.3	Leakage testing	36
5.1.4	Function test	36
5.2	Removal	38
5.2.1	Requirements	38
5.2.2	Procedure	38
6	Maintenance	41
6.1	Inspection	41
6.1.1	Interval	42
6.1.2	Special tools	42
6.1.3	Implementation	42
6.2	Servicing	43
6.2.1	Interval	43
6.2.2	Special tools and auxiliary materials	43
6.2.3	Implementation	44
6.3	Repair	45
6.4	Overhaul	45
6.4.1	Interval	45
7	Troubleshooting	47
7.1	Special tools	47
7.2	Implementation	47
8	Disposal	48



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

B-CI50.24	Description of pad holder with clamp
B-CV00.21	Description of Isobar400 brake shoe
GD15904	"Packaging, handling, transport and storage" regulations

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with type designations:

RZTM...

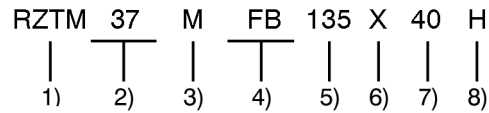
RZTS...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

The diagram in Figure 1 shows precisely how a standard type designation is composed. The type designation for a specific item number is given in the installation drawing.



C 164519/1

- | | |
|---|--|
| <p>1) Product group
RZTM: Brake caliper with (medium, side-to-side movement +/- 20 mm)</p> <p>2) Force [kN] at 3.8 bar
(see Table 1)</p> <p>3) Cylinder type
M: Diaphragm cylinder</p> | <p>4) Auxiliaries
FB: Spring-actuated brake with Bowden cable emergency release gear</p> <p>5) Brake disc thickness [mm]</p> <p>6) Accessories
X: Without accessories</p> <p>7) Pad thickness</p> <p>8) Bracket
H: horizontal</p> |
|---|--|

Figure 1 Type designation

See Figure 1

Number	Designation	Abbreviation	Meaning
1	Product group	RZTS	Brake caliper unit with wheel-mounted brake disc (narrow, side-to-side movement +/- 10 mm)
		RZTM	Brake caliper with (medium, side-to-side movement +/- 20 mm)
2	Force [kN] at 3.8 bar	29	M16"
		31	M18"
		34	M20"
		37	M22"
		41	M24"
		51	K27"
		57	K30"
3	Cylinder type	M	Diaphragm cylinder
		K	Packing-type cylinder



Number	Designation	Abbreviation	Meaning
4	Auxiliaries	X	Without auxiliaries
		H	with a handbrake
		F	With spring-actuated brake
		FB	With spring-actuated brake and emergency release gear
		FD	With spring-actuated brake and remote control for emergency release gear
		FS	With spring-actuated brake and emergency release gear with key
5	Brake disc thickness	-	-
6	Accessories	X	Without accessories
		E	With electrical indicator
		D	With integrated double check valve
		ED	With electrical indicator and double check valve
		ER	With electrical indicator and Y valve
7	Pad surface	30	300 cm ²
		35	350 cm ²
		40	400 cm ²
		IS	ISOBAR
8	Bracket	X	Without bracket
		L	left
		R	right
		H	horizontal
		A	Inclined

Table 1 Possible variants

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care



CAUTION

Beware of cleaning the unit improperly with a steam jet or high-pressure cleaner!
The unit will be damaged and/or its functionality impaired by corrosion.
Clean the unit by hand and without applying strong water pressure.

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.

Air of the following quality is needed for faultless brake operation:

- Solids class 3 according to DIN ISO 8573-1
- Oil content class 3 according to DIN ISO 8573-1
- Relative humidity < 35% based on ambient temperatures of -25°C to +50°C at a pressure of 8.5 to 10 bar
- Customary admixtures must be checked for compatibility with grease and rubber; ester oils, antifreeze and alcohols are unacceptable admixtures.



4 Technical description

The model RZT... brake caliper units are air-operated assemblies which, together with wheel-mounted brake discs, serve as friction brakes in rail vehicles. They form compact constructions which are therefore suited to confined spaces in the bogie.

4.1 Technical features

See , and Figure 2

The unit is distinguished by the following features:

- Modular construction consisting of separate brake cylinder and slack adjuster assemblies
- Compact, lightweight design occupying minimum space in the bogie
- Diaphragm or packing-type cylinders are used as brake actuators. Different cylinder sizes with identical outer dimensions can therefore be obtained (by variation of the effective diaphragm area)
- Spring actuator for the parking brake; this is integrated into the housing and has one or two actuator springs (depending on the requirements).
- The spring actuator can be mechanically released by manual operation of the Bowden cable or auxiliary release key
- Double check valve at the air supply port of the RZT... brake caliper units with a spring actuator; it serves to stop mechanical overloading by the compounded forces of the service brake and parking brake (as required)
- Torsionally rigid caliper levers of split construction
- Parallel links to better guide the brake pad holders (thereby reducing slanting wear across the brake pads)
- Eccentric shaft with bellows seal
- Caliper levers with few low-wear and low-noise, encapsulated joints and bearings
- Brake caliper unit suspended centrally from a pin (no hangers on the brake pad holders), allowing large lateral movements and tilting motions of the axle to be easily accommodated

The related installation drawing shows mating sizes and the dimensions of the brake caliper unit. It also contains information about the brake force that can be delivered.



4.2 Construction

4.2.1 Brake caliper unit without a spring actuator for use as a service brake

See Figure 2, Figure 3, Figure 4 and Figure 5

The functional components of this brake caliper unit are as follows:

- Housing (a)
- Diaphragm cylinder (e), RZT...M... (see Figure 3)
or
Packing-type cylinder (e), RZT...K... (see Figure 4)
- Caliper lever (g)
- Thrust-rod adjuster (h)
- Pad holder (i)

The housing (a) is mounted on the suspension pin (b) which is preferably fixed in a bracket (d). The bracket is bolted to the bogie frame.

If a suitable mounting fixture is provided on the bogie frame, the suspension pin can alternatively be fastened directly by this fixture.

The diaphragm or packing-type cylinder (e) is integrated into the housing (a), while the two identically shaped caliper levers (g) are articulated on hinges. At their free ends, the caliper levers carry one pad holder (i) each. (In addition to the holders shown in Figure 3 and Figure 4 for UIC-approved brake pads, KNORR-BREMSE can supply holders for ISOBAR brake pads as well.)

The opposite ends of the caliper levers are hinged to the thrust-rod slack adjuster (h).

The diaphragm cylinder (e) (see Figure 3) consists of the diaphragm (e1), the piston (e2) and the piston return spring (e3).

The alternatively used packing-type cylinder (e) (see Figure 4) consists of the packing (e1), the piston (e2) and the piston return spring (e3).

As shown in the figure, one of the caliper levers (g) swings on the pivot part (l1) of the eccentric shaft (l), which itself turns on needle bearings in the housing (a).

The other caliper lever swings on fixed pivots attached to the housing.

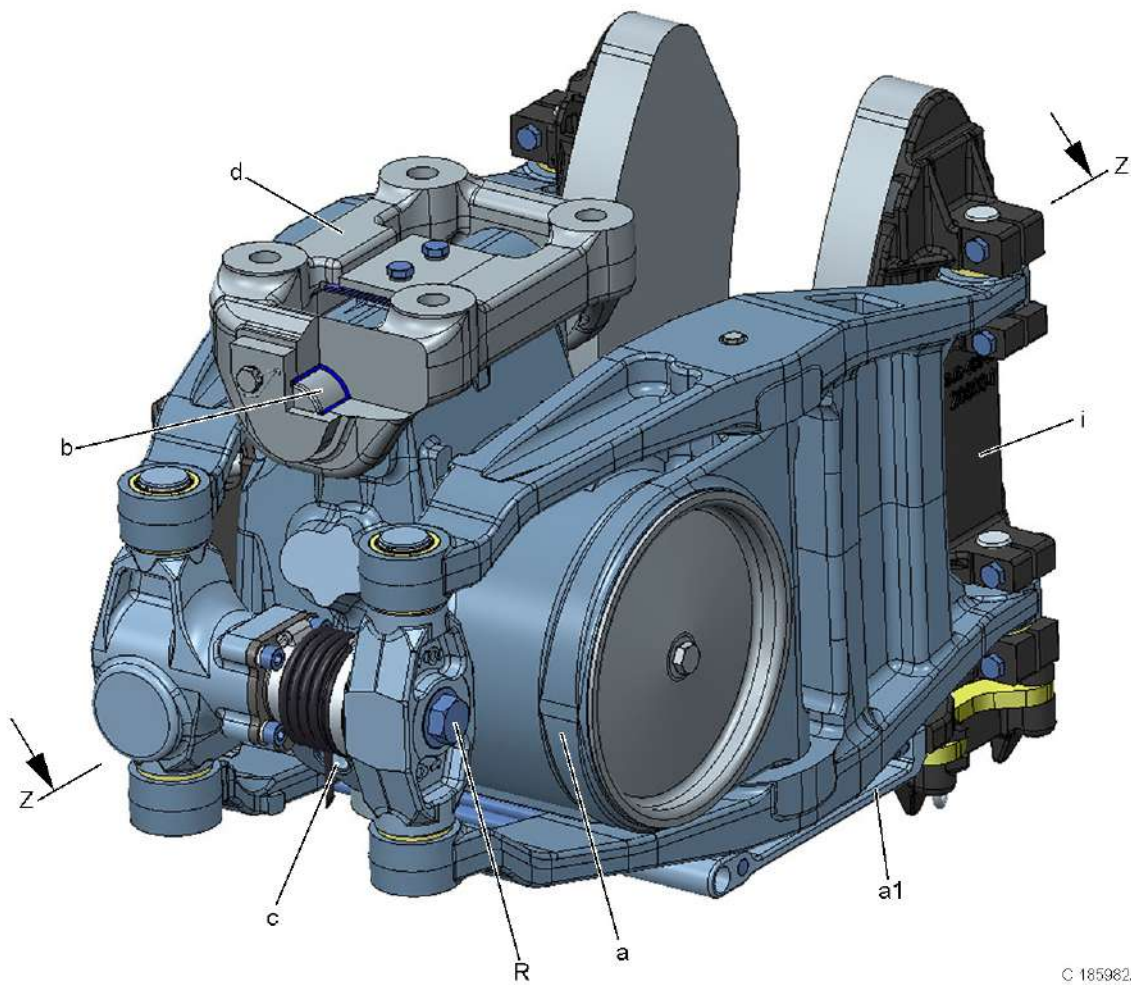
The housing is sealed by two bellows (l2), each fitted between the housing (a) and caliper lever(g).

The slack adjustment transmission mechanism is activated by way of the eccentric shaft (l) (see Figure 5). It consists of the thrust rod (n), the forked lever (p) plus roller lever (o), the drag lever (q) and the buffer spring (s).

The thrust rod (n) forms the link between the thrust-rod adjuster (h) and the transmission mechanism. The rod inlet at the thrust-rod adjuster end is sealed by rubber bellows to keep dirt out of the thrust-rod adjuster.



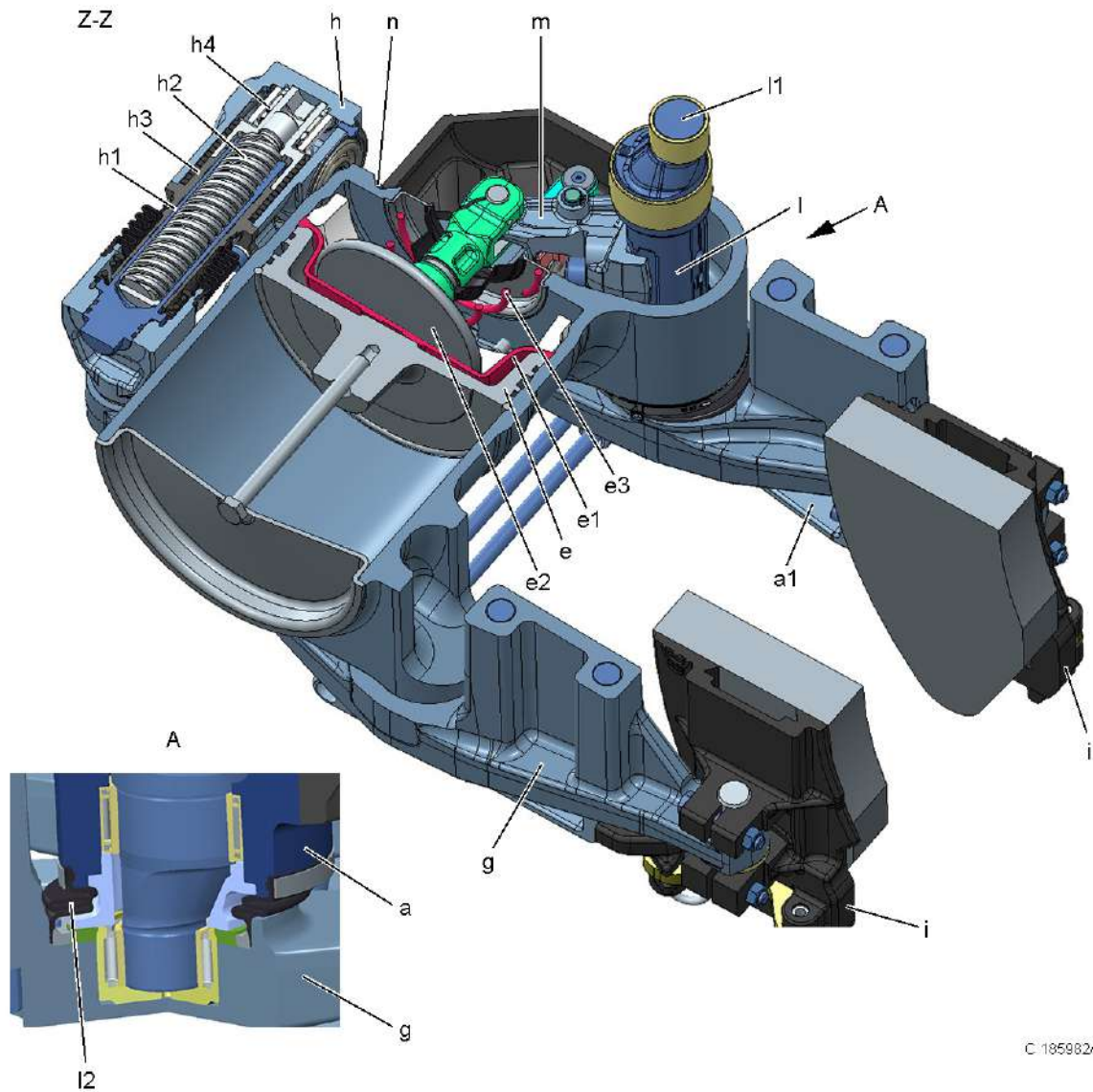
The thrust-rod adjuster (h) consists essentially of the spindle (h2), the tubular nut (h1), the sleeve freewheel (h4) and the torsion spring freewheel (h3), see also Figure 8.



© 185982/1

- | | | | |
|-----------|----------------|----------|-----------------------------------|
| a | Housing | i | Pad holder |
| a1 | Parallel link | C | Air supply port for service brake |
| b | Suspension pin | R | Hexagon reset head |
| d | Bracket | | |

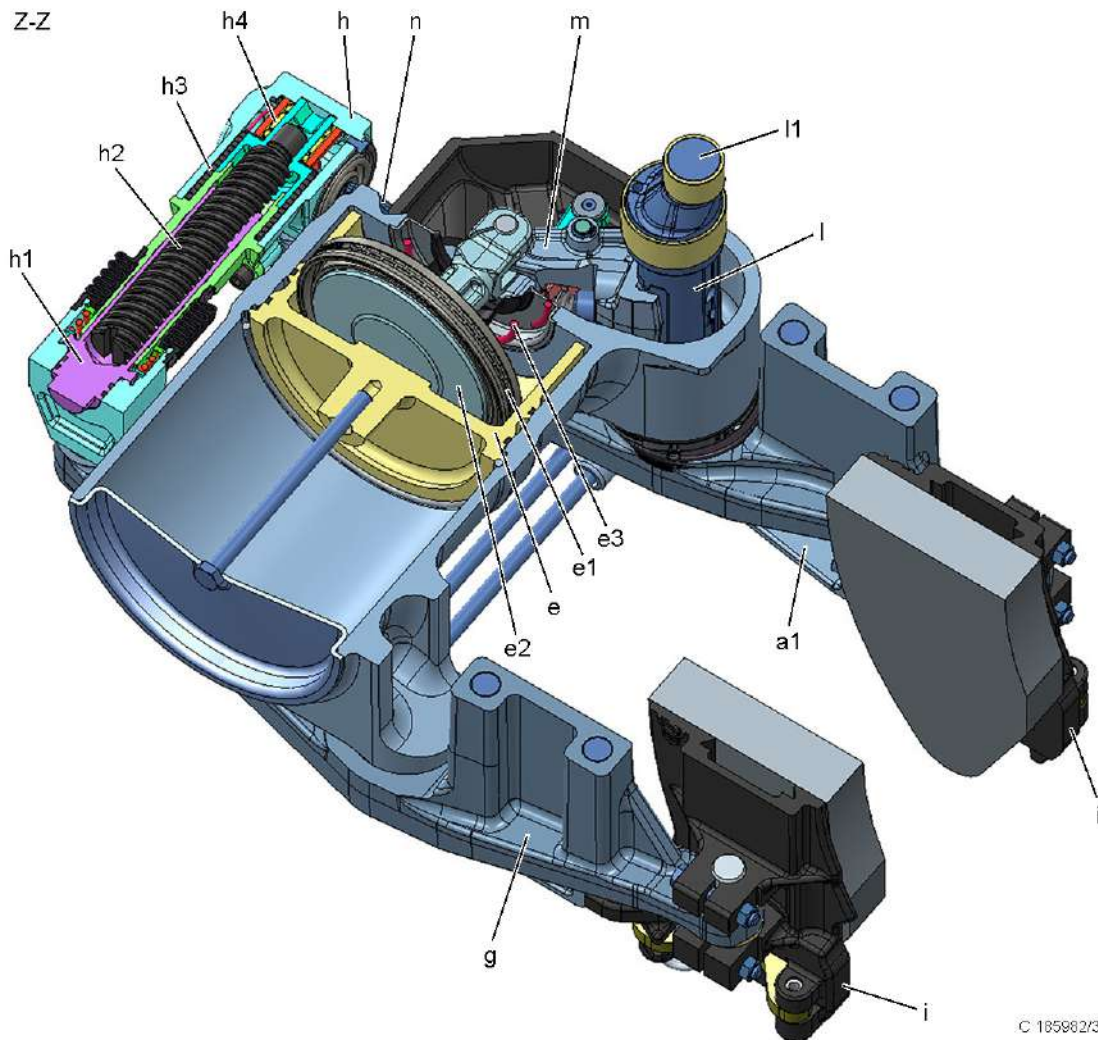
Figure 2 RZT.....X... without spring actuator



C 185982/2

- | | | | |
|-----------|----------------------|-----------|--------------------------|
| a | Housing | h2 | Spindle |
| a1 | Parallel link | h3 | Torsion spring freewheel |
| e | Diaphragm cylinder | h4 | Sleeve freewheel |
| e1 | Diaphragm | i | Pad holder |
| e2 | Piston | l | Eccentric shaft |
| e3 | Piston return spring | l1 | Eccentric pivot |
| g | Caliper lever | l2 | Bellows |
| h | Thrust-rod adjuster | m | Lever |
| h1 | pipe nut | n | Thrust rod |

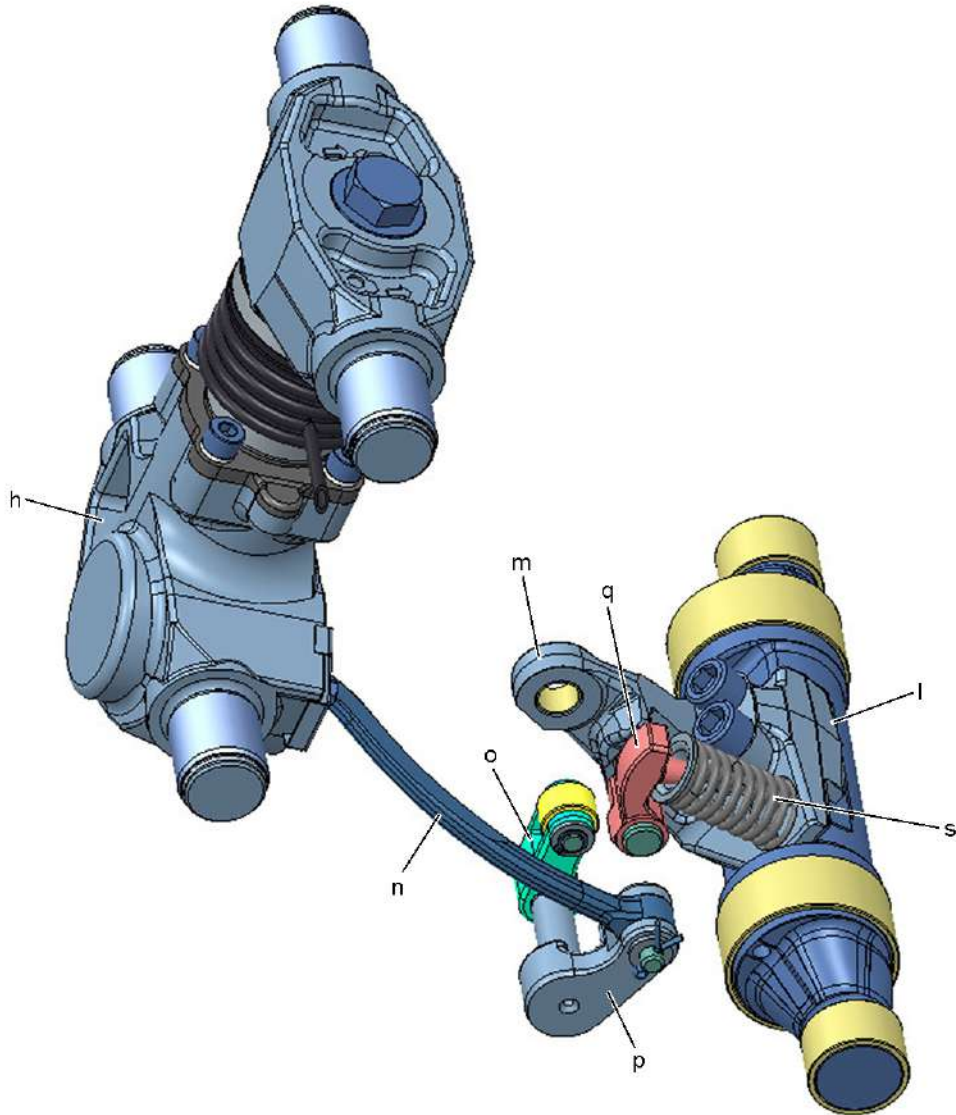
Figure 3 Section Z-Z from Figure 2 (showing the RZT...M.....X...with diaphragm cylinder)



© 185982/3

- | | | | |
|-----------|-----------------------|-----------|--------------------------|
| a1 | Parallel link | h2 | Spindle |
| e | Packing-type cylinder | h3 | Torsion spring freewheel |
| e1 | Packing | h4 | Sleeve freewheel |
| e2 | Piston | i | Pad holder |
| e3 | Piston return spring | l | Eccentric shaft |
| g | Caliper lever | l1 | Eccentric pivot |
| h | Thrust-rod adjuster | m | Lever |
| h1 | pipe nut | n | Thrust rod |

Figure 4 Section Z-Z from Figure 2
(showing the RZT...K.....X... with packing-type cylinder)



C 185982/4

- h** Thrust-rod adjuster
- l** Eccentric shaft
- m** Lever
- n** Thrust rod

- o** Roller lever
- p** Forked lever
- q** Drag lever
- s** Buffer spring

Figure 5 Slack adjustment mechanism



4.2.2 Brake caliper unit with a spring actuator for use as a service and parking brake

See Figure 6 and Figure 7

The version equipped with a spring actuator acts both as a service brake and as a parking brake which works automatically in the absence of compressed air.

The functional components of this brake caliper unit are as follows:

- Housing (a)
- Diaphragm cylinder (e), RZT...M... (see Figure 7)
or
Packing-type cylinder (e), RZT...K... (see Figure 4)
- Caliper lever (g)
- Thrust-rod adjuster (h)
- Pad holder (i)
- Spring actuator (t)

The diaphragm or packing-type cylinder assembly (e) is integrated into the housing and is identical to the construction used in the RZT version without a spring actuator.

The spring-actuated brake is an air-powered parking brake. When the parking brake is applied, the force of the actuator springs (t3) and (t4) is transmitted through the cone coupling (Y, see Figure 11), the nut (t6) and the screw spindle (t5) to the piston (e2) in the brake caliper unit's diaphragm or packing-type cylinder (e).

The spring actuator has manual emergency release gear (N) to release the parking brake of a parked vehicle not connected to the compressed air supply.

The caliper levers (g), the thrust-rod adjuster (h), and the transmission mechanism for slack adjustment are designed and configured identically to those of the RZT version without a spring actuator.

In an emergency, the spring actuator (t) can be released either by remote control using a cable connected to the emergency release gear (t1), or directly by an emergency release key that can be plugged into the unit.

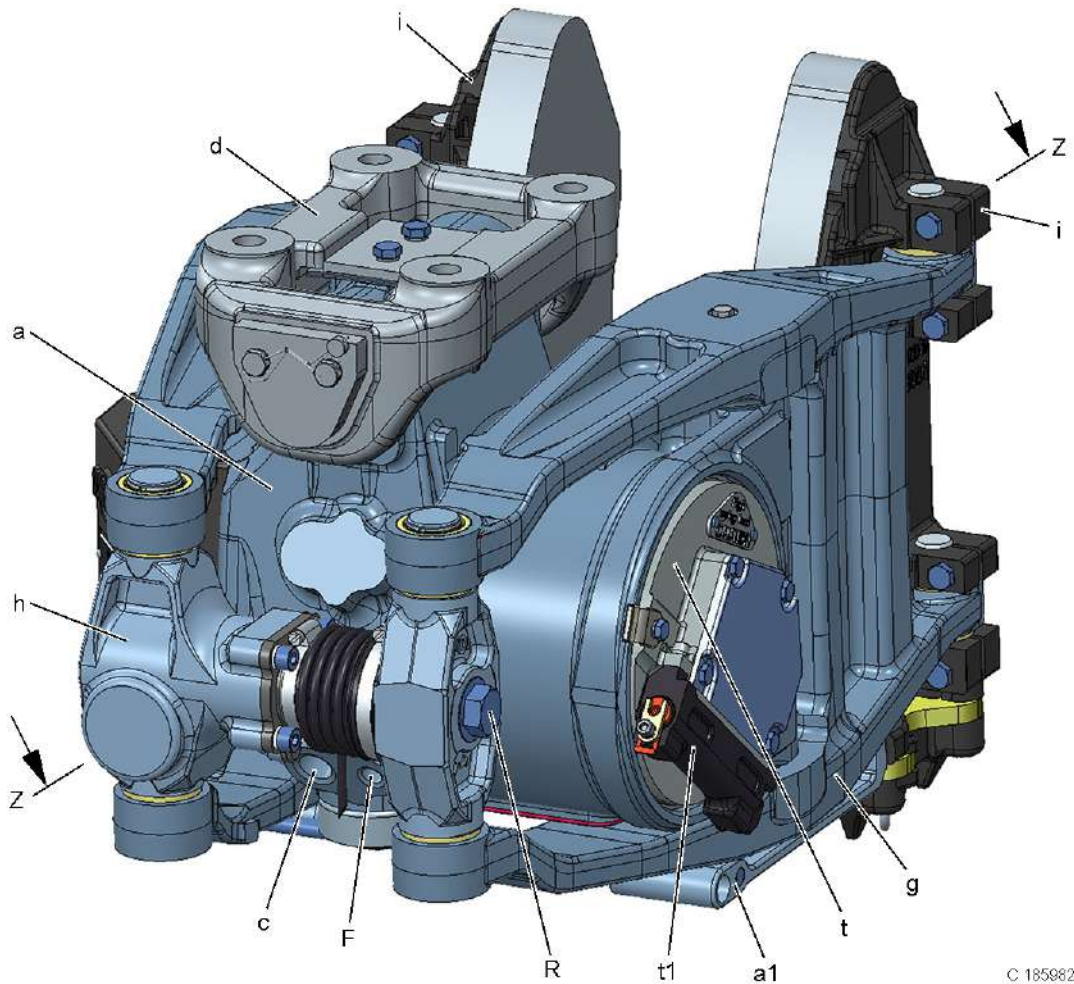
The version of the brake caliper unit that features a bursting hose safety device has a sensor piston integrated into the cover of the spring actuator (t), and a choke (D_F) located in the air passage of port F (see Figure 12). The sensor piston prevents the parking brake from being applied in response to a fast release pressure drop at port (F) (e.g. as a result of a hose bursting). The sensor piston automatically induces auxiliary release in the spring actuator.



NOTE

All the brake caliper units described above can be equipped with an electric signal generator.

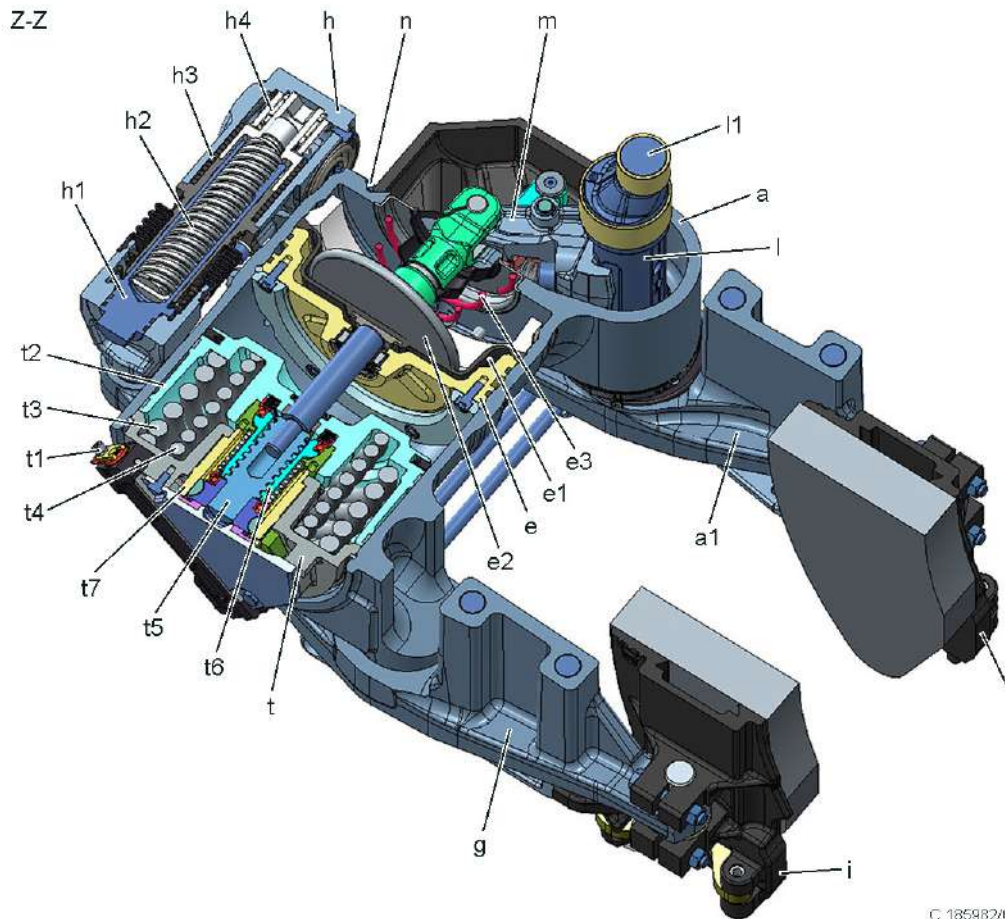
This signal generator serves to signal the **BRAKES RELEASED** and **BRAKES NOT RELEASED** positions to the driver in the vehicle's cab.



C 185982/5

- | | | | |
|-----------|---------------------|-----------|-----------------------------------|
| a | Housing | t | Spring actuator |
| a1 | Parallel link | t1 | Emergency release gear |
| d | Bracket | C | Air supply port for service brake |
| g | Caliper lever | F | Air supply port for parking brake |
| h | Thrust-rod adjuster | R | Hexagon reset head |
| i | Pad holder | | |

Figure 6 RZT...M.....F... with spring actuator (diaphragm cylinder)



© 185982/6

a	Housing	l	Eccentric shaft
a1	Parallel link	l1	Eccentric pivot
e	Diaphragm cylinder	m	Lever
e1	Diaphragm	n	Thrust rod
e2	Piston	t	Spring actuator
e3	Piston return spring	t1	Emergency release gear
g	Caliper lever	t2	Piston
h	Thrust-rod adjuster	t3	Actuator spring 1
h1	pipe nut	t4	Actuator spring 2 (not in every version)
h2	Spindle	t5	Screw spindle
h3	Torsion spring freewheel	t6	Nut
h4	Sleeve freewheel	t7	Gear wheel
i	Pad holder		

Figure 7 Section Z-Z from Figure 6
 (The RZT...M.....F... with diaphragm cylinder is illustrated. The differences to version RZT...K.....F... with packing-type cylinder can be seen in Figure 4, the spring actuator is identical in all versions)



4.3 Working principle

4.3.1 Applying the service brake

See Figure 2, Figure 3, Figure 4, Figure 5, Figure 7 and Figure 8

Brake pad clearance larger than setting

The diaphragm or packing-type cylinder (e) is charged by brake pressure C. The piston (e2) then performs a stroke and turns the eccentric shaft (l) via the leve (m). The caliper lever (g) mounted on the eccentric pivot (l1) follows the eccentric shaft (l) to the braking position. The opposite caliper lever (g), being joined to the thrust-rod adjuster (h), also travels to the braking position.

As soon as the piston stroke exceeds the brake pad clearance setting, the drag lever (q), which turns on the lever (m), starts applying pressure to the roller lever (o). As the piston stroke progresses, the thrust rod (n) is moved by the roller lever (o) and the connected forked lever (p) (see Figure 5).

The thrust rod (n) engages the sleeve freewheel (h4) of the thrust-rod adjuster (h), causing the spindle (h2) to turn (see Figure 8).

The tubular nut (h1) then travels axially along the spindle (h2), making the thrust-rod adjuster grow longer.

At the same time, the clearance between the pads and the brake disc decreases as the length of the thrust-rod adjuster increases.

The thrust-rod adjuster (h) is a single-acting unit controlled as a function of force. This means that

- automatic slack adjustment is provided in only one direction, hence single-acting (increasing adjuster length signifies decreasing pad clearance)
- the pad clearance is adjusted by piston thrust, being kept constant even when the caliper components yield elastically by different amounts under the action of changing clamping forces, hence, a force-controlled slack adjuster.

Brake pad clearance equal to setting

The diaphragm or packing-type cylinder (e) is charged by brake pressure C. The piston (e2) then performs a stroke and turns the eccentric shaft (l) via the leve (m). The caliper lever (g) mounted on the eccentric pivot (l1) follows the eccentric shaft to the braking position. The opposite caliper lever (g), being joined to the thrust-rod adjuster (h), also travels to the braking position.

The brake pads are touching the brake disc. Brake force is built up.

The drag lever (q), which turns on the lever (m) (see Figure 5) starts applying pressure to the roller lever (o).

However, the thrust rod (n) and the lever combination comprising forked lever (p) and roller lever (o) are unable to move because the spindle (h2) cannot be displaced as long as the brake pads are applied.

The thrust-rod adjuster does not provide slack adjustment.

The torsion spring freewheel (h3) in the thrust-rod adjuster (h) suppresses any movement in the opposite direction and, hence, prevents the adjuster from growing shorter.



The thrust-rod adjuster in this particular model acts like a rigid rod when the brakes are applied from the correct pad clearance. An additional piston stroke to switch couplings within the adjustment mechanism (as is commonly needed in other kinds of slack adjusters) is not required in this construction. Compressed air is saved in this way.

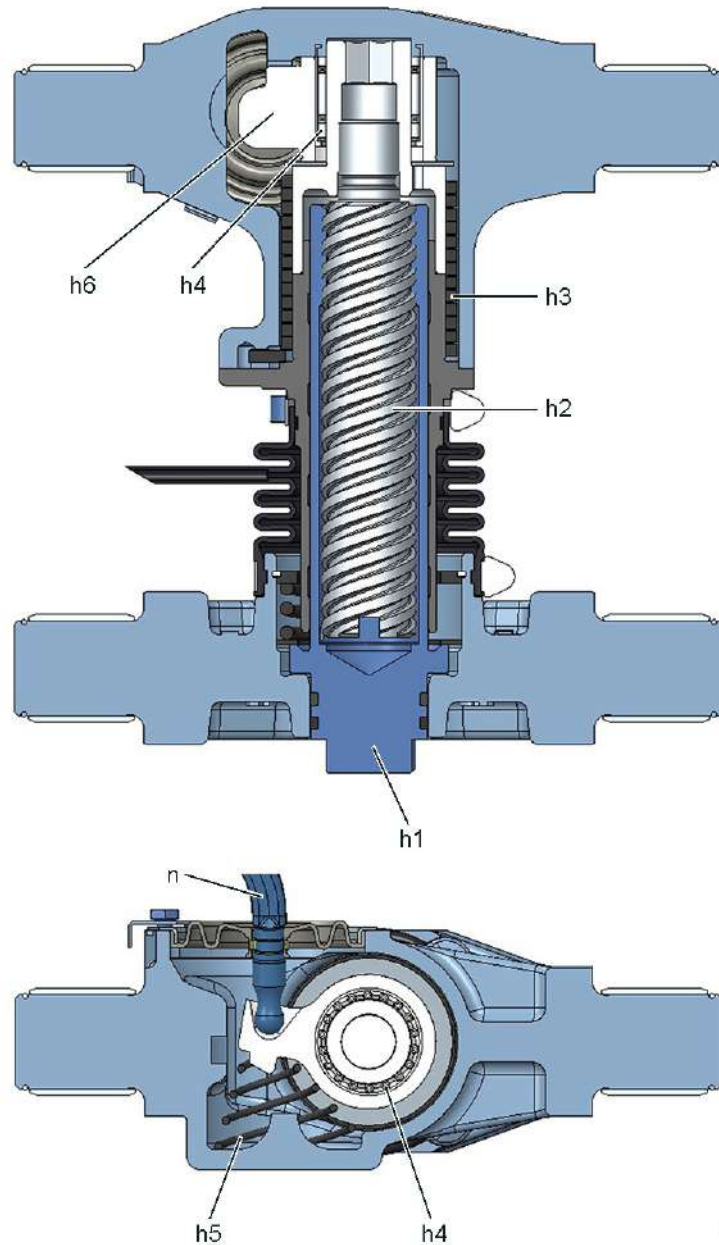
Slack adjustment (braking)

The pad and disc wear caused by braking is corrected by the growing stroke of the piston (e2). The eccentric shaft (l) is turned onwards and the drag lever (q), which is supported by the roller lever (o), is moved against the force of the buffer spring (s). The tension in the buffer spring increases.

The thrust-rod adjuster (h) is unable to correct the slack because the brake pads are applied and the brake force is effective.

When the brakes are released, the eccentric shaft (l) is turned back with the retracting piston (e2). The buffer spring (s) expands in the process and acts on the thrust rod (n) through the drag lever (q) and the assembly consisting of roller lever (o) and forked lever (p). As the brake force relaxes, the spindle (h2) continues turning in the thrust-rod adjuster until the caliper levers (g) have been adjusted by extension and the slack has been corrected.

The brake pad clearance reached at the end of braking is once more equal to the chosen setting. The service brake is ready for braking again.



C 185982/7

- | | | | |
|-----------|--------------------------|-----------|----------------------------|
| h1 | pipe nut | h5 | Reset spring for the drive |
| h2 | Spindle | h6 | Adjusting lever |
| h3 | Torsion spring freewheel | n | Thrust rod |
| h4 | Sleeve freewheel | | |

Figure 8 Thrust-rod adjuster h and drive – sectional view



4.3.2 Applying the parking brake

See Figure 7 and Figure 11

The spring actuator is applied when the pressure chamber of the spring-actuated cylinder (t) is vented through the port (F). As a result, the counteracting force from the piston (t2) on the actuator springs (t3) and (t4) falls to zero.



CAUTION

Beware of incorrect handling!

The unit will be damaged and/or its functionality impaired.

Compounding the parking brake (spring actuator) and service brake (diaphragm or packing-type cylinder(e)) must be avoided!

The force of the expanding actuator springs (t3) and (t4) is transmitted through the piston (t2), the cone coupling (Y, see Figure 11), the nut (t6) and the screw spindle (t5) to the piston (e2) of the diaphragm or packing-type cylinder (e) and pushes this piston to the braking position. The brake pads are then applied to the brake disc.

The screw spindle (t5) has a non-selflocking thread through which the actuator springs (t3) and (t4) exert a force and torque that tries to unscrew the screw spindle (t5) upwards and out of the nut (t6). This torque is, however, intercepted via the frictional engagement within the closed cone coupling (Y), and by the pawl (t12, see Figure 9) arresting the gear wheel (t7). Consequently, the screw spindle (t5) and the nut (t6) are unable to rotate against each other.

4.3.3 Releasing the spring actuator with the emergency release gear

See , , , and Figure 5

The parking brake is engaged and the spring actuator piston (t2) is in the braking position.

When the pawl (t12) is actuated, the gear wheel (t7) is released and the torque restraint on the screw spindle (t5) is cancelled. The torque generated by the strong, downward directed force of the actuator springs (t3) and (t4) and the non-selflocking thread of the screw spindle (t5) cannot be restrained any longer by the pawl (t12). As a result, the screw spindle (t5) and the gear wheel (t7) are made to rotate quickly. This in turn causes the screw spindle (t5) to unscrew upwards from the nut (t6). At the same time, the piston (t2) continues moving downwards and displaces the air from the spring actuator (t). The actuator springs (t3) and (t4) are relaxed far enough to make the piston (t2) reach the bottom of the cylinder, preventing them from exerting any more force on the screw spindle (t5).

Once the pawl (t12) is lifted off the gear wheel and the spring actuator piston (t2) is no longer in the release position, the compression spring (t13) pushes the locking pin (t11) into a cutout in the pawl (t12). This latches the pawl (t12) in the raised position and prevents it from engaging with the gear wheel (t7).

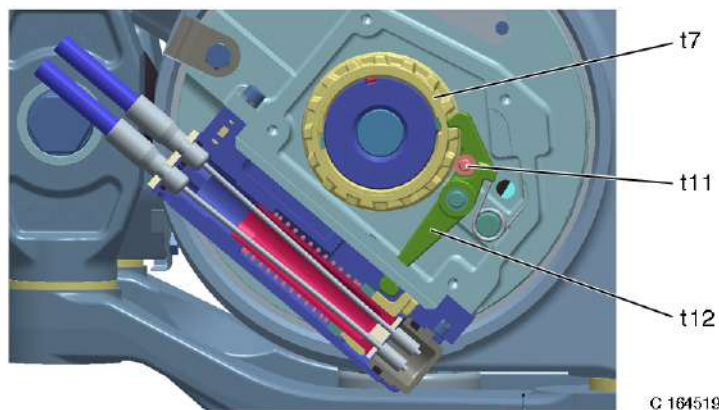
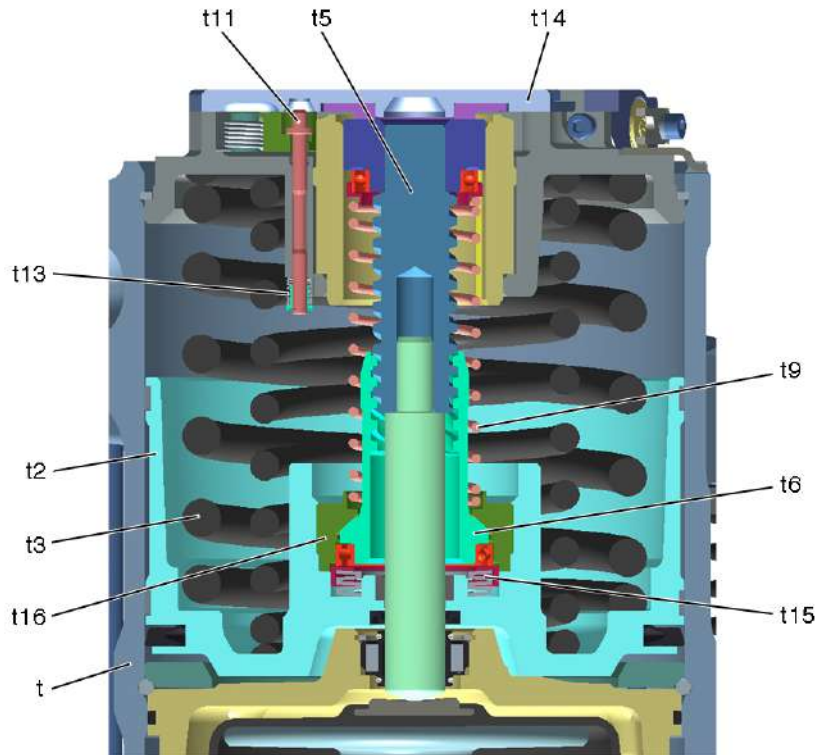
The opposing force from the service brake cylinder piston (e2) acting on the screw spindle (t5), and the thrust of the compression spring (t9) jointly cause the screw spindle (t5) to continue screwing out of the nut (t6) and strike the cover (t14), even after the piston (t2) has been brought to bear.



The momentum of the rotating parts now causes the nut (t6) to screw downwards along the screw spindle (t5) against the thrust of the Belleville springs (t15), thereby opening the cone coupling (Y). This action cancels the frictional engagement between nut (t6) and the cone ring of the piston (t2). The nut (t6) now starts rotating as well, turning together with the screw spindle (t5) and the gear wheel (t7) until its momentum has been worn down entirely by internal friction.

The parking brake is now emergency released.

The emergency release gear (t1) can be operated either via one or two control cables or via a key plugged directly into the brake caliper unit. In order to prevent operational problems, the lever for the emergency release device is pulled as far as it will go and held in that position for 3 s.



© 164519/7

- | | | | |
|-----------|--------------------|------------|--------------------|
| t | Spring actuator | t11 | Locking pin |
| t2 | Piston | t12 | Pawl |
| t3 | Actuator spring | t13 | Compression spring |
| t5 | Screw spindle | t14 | Cover |
| t6 | Nut | t15 | Belleville spring |
| t7 | Gear wheel | t16 | Taper ring |
| t9 | Compression spring | | |

Figure 9 Spring actuator released by emergency means



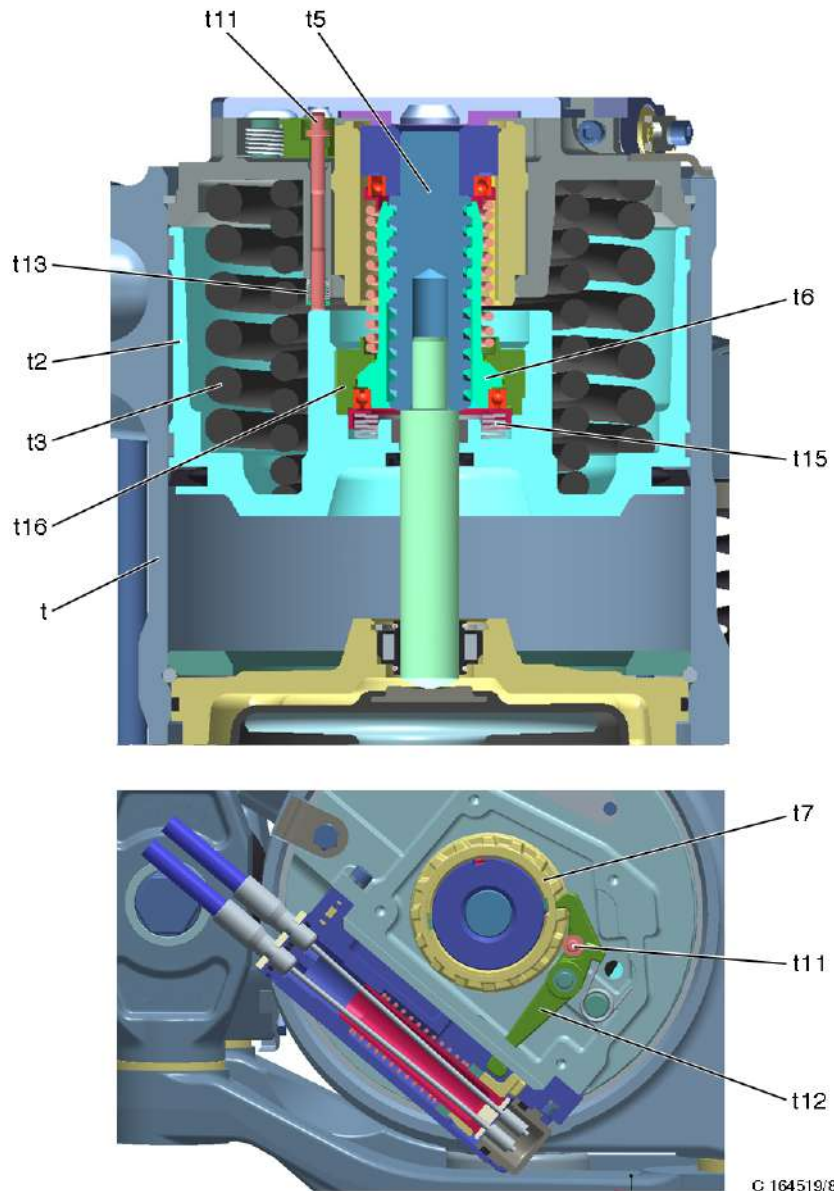
4.3.4 Re-activating the spring actuator

See Figure 10

Having been released with the emergency gear, the spring actuator is not ready for brake application.

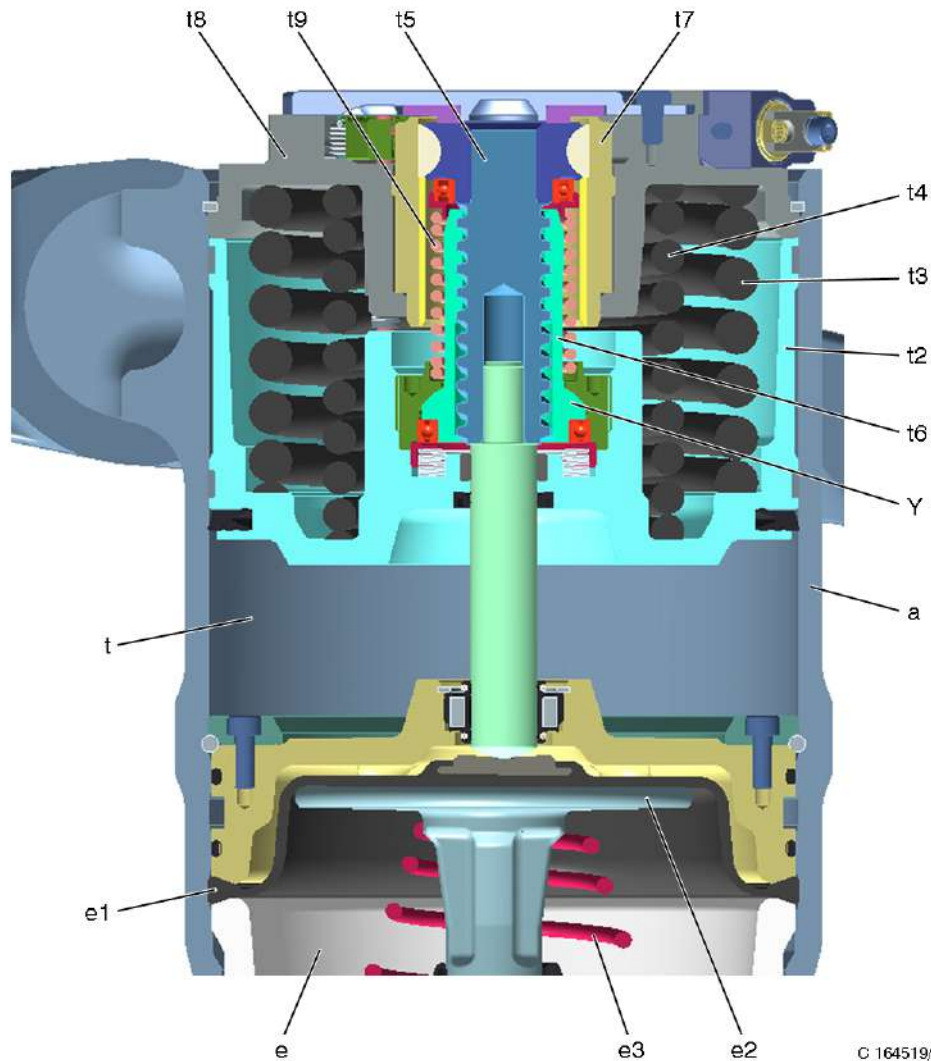
Release pressure is admitted to the spring actuator (t) through the port F (see Figure 6) to cancel the emergency release state. This action pushes the piston (t2) upwards against the thrust of the actuator springs (t3) and (t4), opening the coupling (Y, see Figure 11) against the force of the Belleville springs (t15). This removes the frictional engagement in the cone coupling (Y) and the nut (t6) is able to rotate again. Having a non-selflocking thread, the nut screws upwards on the screw spindle (t5) as the piston (t2) continues going upwards. The locking pin (t11) is pushed upwards at the end of the upward movement of the piston (t2). The pawl (t12) then engages the gear wheel (t7), once again preventing both the latter and the screw spindle (t5) from turning any further. The toothed cone coupling (Y) closes once the piston finishes moving.

In the end position reached in Figure 11, the actuator springs (t3) and (t4) are tensioned and the spring actuator is ready for braking again.



- | | | | |
|-----------|-----------------|------------|--------------------|
| t | Spring actuator | t11 | Locking pin |
| t2 | Piston | t12 | Pawl |
| t3 | Actuator spring | t13 | Compression spring |
| t5 | Screw spindle | t15 | Belleville spring |
| t6 | Nut | t16 | Taper ring |
| t7 | Gear wheel | | |

Figure 10 Re-activating the spring actuator



- | | | | |
|-----------|----------------------|-----------|--------------------|
| a | Housing | t4 | Actuator spring |
| e | Diaphragm cylinder | t5 | Screw spindle |
| e1 | Diaphragm | t6 | Nut |
| e2 | Piston | t7 | Gear wheel |
| e3 | Piston return spring | t8 | Cover |
| t | Spring actuator | t9 | Compression spring |
| t2 | Piston | Y | Cone coupling |
| t3 | Actuator spring | | |

Figure 11 Releasing the spring actuator with the emergency gear
(This view shows the RZT...M.....F... with a diaphragm cylinder. The spring actuator in the version with a packing-type cylinder is of identical construction.)



4.3.5 Using a double check valve to avoid mechanical overloading

The double check valve shown in Figure 12 is used to protect RZT components from mechanical overloading caused otherwise by the compounded forces of the service and parking brakes.

The double check valve is a self-contained, operational component that is flange-mounted on the brake caliper unit's union for ports C and F. It is inserted upstream of the cylinder chambers of the service brake and spring actuator.

The double check valve consists essentially of the valve body (v1) and liner, and the piston (v2). Located at the ends of the liner are seals to shut off the piston seat in the end positions.

The working principle of the double check valve is as follows.

Service and parking brakes released

- Release pressure is applied to port F, port C is unloaded.
- The release pressure pushes the piston (v2) to the end position at C (as shown in Figure 12). The path from the port F to the spring-actuated cylinder is open, and the spring actuator is charged by release pressure. Compressed air is unable to flow from F to C because the seat of the piston (v2) is sealed in the end position.

Service brake applied, parking brake released

- Release pressure is applied to port F, brake pressure to port C.
- When the service brake is applied, the piston (v2) dwells in the end position shown here, as long as the brake pressure C is lower than the release pressure F. The piston (v2) goes to the end position at F when the brake pressure rises above the level of the release pressure. The path from the port F to the spring actuator is closed because the seat of the piston (v2) is sealed in the end position. The higher pressure C is now applied to the spring actuator via the connecting bore to the piston liner and holds the actuator in the release position.

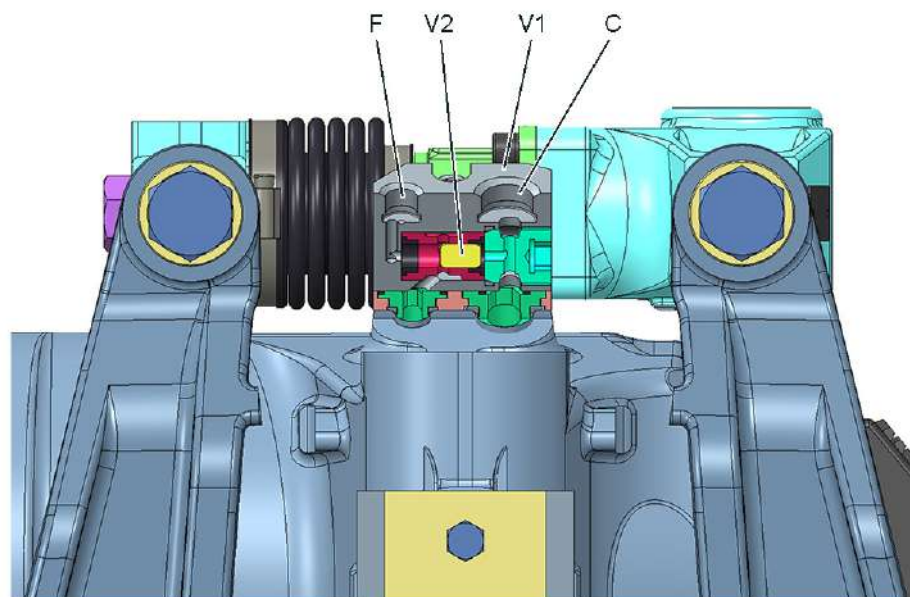
Service brake released, parking brake applied

- The pressure is unloaded from port F and port C.
- The parking brake is applied because there is no pressure at port F. Port C is unloaded as well. The position of the piston (v2) does not affect the operation of the brake caliper unit in this state.



Service and parking brakes applied

- Port F is unloaded and brake pressure is applied to port C.
- The piston (v2) goes to the end position at F when brake pressure is present at the port C. The path from the port F to the spring actuator is closed because the seat of the piston (v2) is sealed in the end position. The spring actuator communicates with the port C via the connecting bore and the piston liner. The pressure C is applied both to the service brake piston and to the parking brake piston. The piston thrust developing inside the spring actuator counteracts the force of the actuator springs and reduces their effect. Consequently, the forces of the two brakes are not fully compounded, and the parts of the brake caliper unit are not overloaded mechanically. When the pressure C rises to the level of the release pressure F, the spring actuator goes to the release position and does not transmit any more force outwardly. The service brake piston supplies the whole of the brake force. The force of the actuator springs is reactivated when the pressure C is reduced.



C 185982/8

v1 Valve housing
v2 Piston

C Air supply port for service brake
F Air supply port for parking brake

Figure 12 Double check valve



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



WARNING

Beware of electric shock from the brake caliper unit with a limit switch!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements



WARNING

Beware of a moving vehicle!

Beware of a vehicle moving unintentionally.

Arrest an unbraked vehicle securely in place before starting work.



WARNING

Beware of unsuitable lifting gear!

Falling objects will cause personal injuries and damage to equipment.

Do not dwell under hanging loads.

Use suitable lifting tackle.

Attach the lifting gear to balance the unit in its centre of gravity.

Use lifting gear that is suited to the weight of the unit.

The work of installing the brake caliper unit must always be left to suitably qualified personnel authorized by the vehicle builder or operator.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure

See Figure 2 to Figure 6



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.



NOTE

Before installing the unit, set the caliper to its maximum possible opening. To do so, turn the hexagon reset head R (Figure 2 and Figure 6) far enough clockwise with a 24mm wrench to screw the slack adjuster back home.

Observe the particulars in the installation drawing.



NOTE

Install the brake caliper unit without brake pads. Only insert and lock the brake pads in their holders after installing the brake caliper unit (read the related Description of the brake pad holders).

Install the brake caliper unit in the steps described below. As you proceed, refer to the bogie builder's instruction manual and the installation drawing of the brake caliper unit.



WARNING

Beware of unsuitable lifting gear!
Falling objects will cause personal injuries and damage to equipment.
Do not dwell under hanging loads.
Use suitable lifting tackle.
Attach the lifting gear to balance the unit in its centre of gravity.
Use lifting gear that is suited to the weight of the unit.

- Pick up the brake caliper unit in a suitable fixture, hoist it into the bogie and mount there by the fastening screws as directed in the installation drawing.
- Insert and lock the brake pads in their holders (i) (refer to the KNORR-BREMSE Description valid for the matching brake pad holder).
- Brake caliper units with a parking brake and remote control: The related installation drawing shows how to join the remote control cable to the auxiliary release gear on the spring actuator.



WARNING

Danger of electrocution at the brake calliper unit with limit switches!
Danger of physical injuries that may have fatal consequences.
The work of connecting cables in the electrical system must always be left to specially trained and authorized personnel.

Version RZT.....E.

See Figure 13

- Plug connector case (59.4.1) into mounting base (59.3), and tighten the hex-head bolts (59.4.2). The tightening torque for hex-head bolts (59.4.2) is 0.5 Nm.
Connect the ground cable to hex-head bolt (59.24), and attach the cable to cable holder (59.5). Follow the assembly sequence shown in Figure 13 for the hex-head bolt. The tightening torque for hex-head bolt (59.24) is 20 Nm.



WARNING

Beware of unexpected brake caliper movements and unintentional brake operation!
Danger of crushing!
Prior to checking the clearance at the brake disc, make sure that the vehicle brakes are released and locked in the driver's cab to prevent any application.



- After completion of installation, set the clearance between brake pads and brake disc to the vehicle's specific value by turning the hexagon head R (Figure 2 and Figure 6).

5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

Carry out the following function tests after attaching the brake caliper unit.

- Connect the supply of compressed air, and select the maximum working pressure.
- Charge the spring actuator (if included) with release pressure.
- Apply and release the service brake several times, while checking it for correct operation.
- Apply the spring parking brake (if included) and check the emergency release functionality. Release the parking brake by operating the emergency release gear.
- Switch on the power supply to the electric signal generator (if included), and check the signaling function in the driver's cab while applying and releasing the brakes.



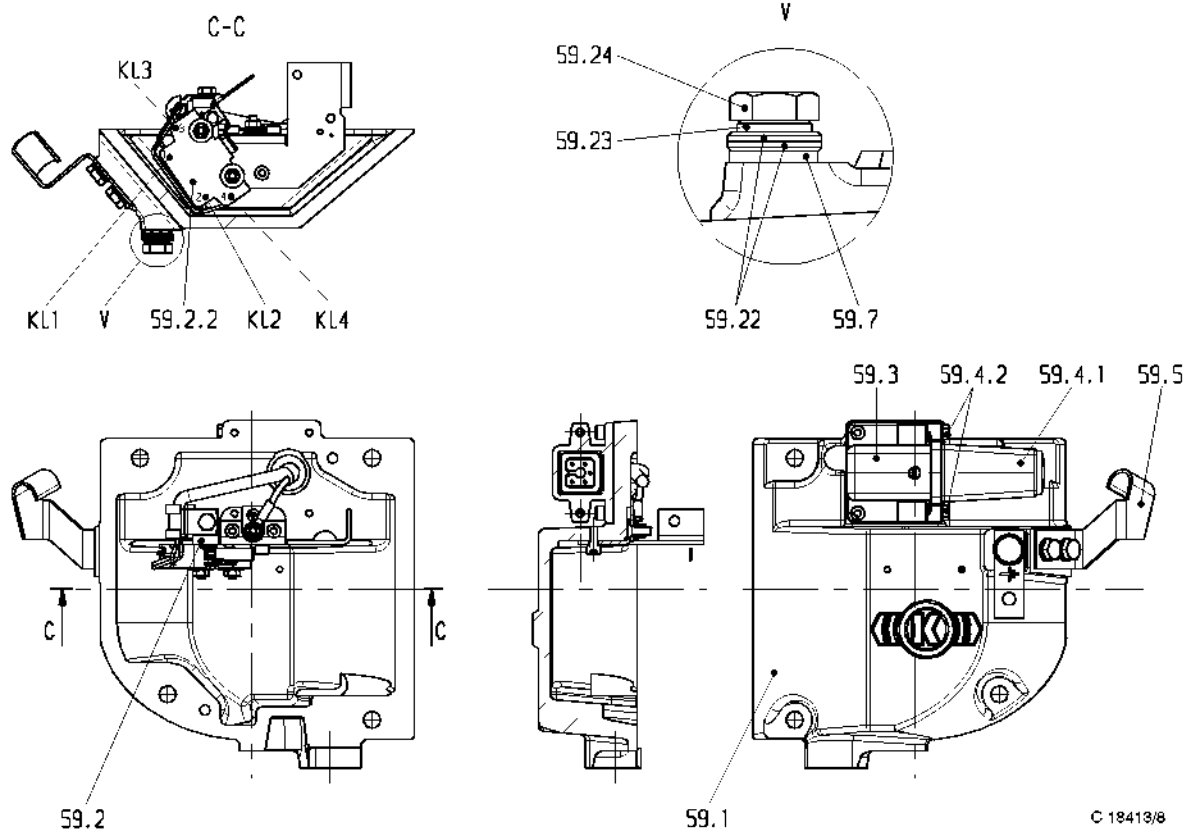
WARNING

Beware of unexpected brake caliper movements and unintentional brake operation!

Danger of crushing!

Prior to checking the clearance at the brake disc, make sure that the vehicle brakes are released and locked in the driver's cab to prevent any application.

- Check the clearance between the brake pads and brake disc. The reading must match the value specified for the vehicle.



- 59.1 Cover
- 59.2 Mounting plate and switch
- 59.2.2 Snap-action switch
- 59.3 Mounting base
- 59.4.1 Connector case
- 59.4.2 Hex-head bolt
- 59.5 Cable holder
- 59.7 Ground tag

- 59.22 Disc
- 59.23 Spring washer
- 59.24 Hex-head bolt
- KI1 Terminal 1
- KI2 Terminal 2
- KI3 Terminal 3
- KI4 Terminal 4

Figure 13 Cover and switch (59)



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.



WARNING

Beware of unsuitable lifting gear!
Falling objects will cause personal injuries and damage to equipment.
Do not dwell under hanging loads.
Use suitable lifting tackle.
Attach the lifting gear to balance the unit in its centre of gravity.
Use lifting gear that is suited to the weight of the unit.

5.2.1 Requirements

The unit can be removed with standard tools.

Suitable lifting gear and supporting fixtures for brake caliper units must be used for removal.

5.2.2 Procedure

See Figure 2 to Figure 8



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the housing securely with a suitable tool, such as an open-end wrench.



WARNING

Hot surfaces!

Beware of burning your skin on hot brake discs.

Let the surfaces cool down.

Wear gloves for protection.



WARNING

Beware of electric shock from the brake caliper unit with a limit switch!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.



WARNING

Beware of unexpected movements by the brake caliper unit!

Danger of crushing!

Entirely vent the brake cylinder and, if included, the spring-actuated cylinder as well.

Unload all pressure from ports C and F.

Release the spring-actuated cylinder manually by operating the emergency release gear N, and secure the vehicle brakes to avoid their actuation.

- Remove the brake caliper units in the following steps.



CAUTION

Beware of tightening the spindle in the wrong direction!

The thrust-rod adjuster spindle may be ripped off if the wrench is turned incorrectly in the counter-clockwise direction.

Turn the hexagon reset head R (Figure 2 and Figure 6) far enough clockwise with a 24 mm wrench to screw the slack adjuster back home.

- Remove brake pads (k) from their holders (i) as directed in the KNORR-BREMSE description valid for the relevant brake pad holder.

Version RZT.....E.

See Figure 13

- Disconnect the ground cable and remove the connector.



All versions

- Disconnect the air pipes from brake cylinder port C and spring actuator port F.
- Release and detach the remote control for the emergency release gear N (if included) from the brake caliper unit as directed in the related installation drawing and Overhaul Instructions.



WARNING

Beware of unsuitable lifting gear!

Falling objects will cause personal injuries and damage to equipment.

Do not dwell under hanging loads.

Use suitable lifting tackle.

Attach the lifting gear to balance the unit in its centre of gravity.

Use the allowed points and surfaces for picking up and putting down the unit (see installation drawing).

Use lifting gear that is suited to the weight of the unit.

Observe all the rules and safety regulations for using and handling lifting gear.

- Take hold of the brake caliper unit in a suitable supporting fixture.
- Remove the bracket from the bogie, and hoist the brake caliper unit out of the vehicle. Alternatively, first remove the suspension pin and then detach the bracket from the vehicle as shown in the installation drawing. Reattachment of the signal wire with lead seal (wound around the hex-head bolts (v)) after removal is at the discretion of the vehicle operator.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection



CAUTION

Beware of using unacceptably worn brake pads!

The unit will be damaged and functionality impaired, e.g. the brakes will be overheated and brake force reduced.

The brake pads must not be allowed to wear below the minimum acceptable thickness specified in the documents valid for the brake pads.

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

- Checking the external condition and function
- Inspect the brake caliper unit, especially the bellows, for damage
- Checking the joints and pins for freedom of movement
- Checking the brake pads



6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Implementation



WARNING

Hot surfaces!

Beware of burning your skin on hot brake discs.

Let the surfaces cool down.

Wear gloves for protection.

See vehicle operator's instructions.



6.2 Servicing

See , and Figure 2

The following servicing steps must be taken regularly to ensure that the brake caliper units will be maintained in an orderly condition until the next overhaul.

- Check release bore for free passage and clean the dust filter (optional).
- Inspect the brake caliper unit, especially the bellows, for damage.
- Check the brake pads for their remaining thickness. The brake pads must be exchanged before they wear below their minimum thickness specification.

The intervals at which the above inspection activities are needed are project-specific and must account for the vehicle operator's instructions and experience.



CAUTION

Beware of using unacceptably worn brake pads!

The unit will be damaged and functionality impaired, e.g. the brakes will be overheated and brake force reduced.

Never let the brake pads wear below the minimum acceptable thickness specified in the documentation for the brake pad holders.



WARNING

Hot surfaces!

Beware of burning your skin on hot brake discs.

Let the surfaces cool down.

Wear gloves for protection.

6.2.1 Interval

Activity	Interval
Replacing the brake pads	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.2.2 Special tools and auxiliary materials

The following utilities are needed; they can be purchased from KNORR-BREMSE by their order numbers:

- OMNI VISC 1050 adhesive (order number: ID No. 506367)
- OKS 2611 cleaner (order number: ID No. 506339)



6.2.3 Implementation



WARNING

Beware of unexpected movements by the brake caliper unit!

Danger of crushing!

Entirely vent the brake cylinder and, if included, the spring-actuated cylinder as well.

Unload all pressure from ports C and F.

Release the spring-actuated cylinder manually by operating the emergency release gear N, and secure the vehicle brakes to avoid their actuation.



NOTE

Before attempting to exchange the brake pads, set the caliper to its maximum possible opening by turning the hexagon head R.

Always release the brakes before opening the mechanism that locks the brake pad holders.

Clean the dust filter in the following steps, while referring to Figure 14 for support.

- Unscrew the 24mm filter socket (u) and remove the protective cap (x).
- Remove filter (v) from the filter socket.
- Poke out the breather holes with a rod-like tool.
- Wash filter (35) in a suitable cleaning liquid and place in the filter socket.
- Fit the protective cap (x) onto the filter socket (u)
- Clean the thread of the filter socket (u) with OKS 2611, then coat with OMNIVISC 1050 and screw into the housing.
Tightening torque = 20 Nm according to DIN25201-2-B, risk class M.

The steps required for exchanging the brake pads are explained in the KNORR- BREMSE description valid for brake pad holders.



WARNING

Beware of unexpected brake caliper movements and unintentional brake operation!

Danger of crushing!

Prior to checking the clearance at the brake disc, make sure that the vehicle brakes are released and locked in the driver's cab to prevent any application.

Having completed the replacement, set the clearance between brake pads and brake disc to the vehicle's specific value by turning the hexagon head R (see Figure 2, Figure 3 and Figure 5).

Repeatedly apply and release the vehicle brakes with the new brake pads and check them for correct operation (see Section 5.1.4).



Finally check the clearance once again. The reading must match the value specified for the vehicle.



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

The brake pads are made of inorganic materials.

Arrange for the disposal of worn and discarded brake pads in accordance with national regulations.

6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

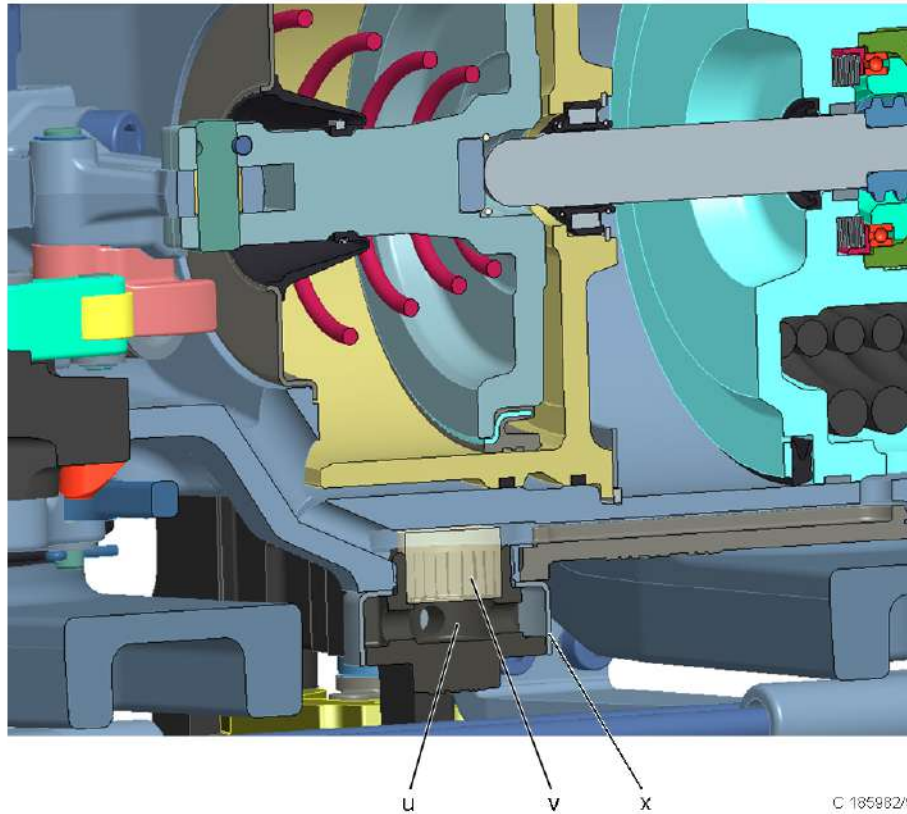
KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhauling random sample	After not more than 3 years' service
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



- | | | | |
|---|----------------|---|--------|
| u | Filter socket | v | Filter |
| x | Protective cap | | |

Figure 14 RZT..M...F... with a spring actuator



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Implementation

Problem	Cause	Remedy	See
On an RZT with a spring actuator, air discharges constantly from the filter socket plug (u, see Figure 14).	Brake caliper unit defective	Remove the brake caliper unit and submit for repair.	Section 5.2
Air discharges constantly from port C when the service brake is operated.	Connection leaking	Tighten the connection and/or exchange the seal, and test for leakage.	Section 5.1.3
Air discharges constantly from port F of a pneumatically released parking brake.			
Brake force too strong or too weak	Brake cylinder pressure too high/too low	Test the brake system.	
	Brake caliper unit defective	Remove the brake caliper unit and submit for repair.	Section 5.2
Brake pads wearing unevenly on one-side	Brake shoes or brake caliper in the bogie not parallel to the brake disc	Check the brake caliper mounting and correct the cause of the angular irregularity.	Section 5.2
	Caliper lever stiff to move	If not possible, remove the brake caliper unit and submit for repair.	
Little or no brake shoe clearance after new brake pads have been fitted	Thrust-rod adjuster not screwed back entirely with hexagon reset head R	Set the caliper to its maximum possible opening by turning hexagon reset head R (see Figure 3).	
	Brake caliper unit hard to move	Check all joints and pins for freedom of movement. If necessary, clean and regrease.	



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - C M 0 0 . 2 2

Rev. 10 - 23.07.2014 - en
.....

.....
Description

Wheel-mounted brake disc with keyed
plug centring



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
09	02.09.2013	Revision history started		X				
		4.1, 4.3, 5.1, 5.1.2.5, 6.1.3.1, 6.1.3.4		X			X	X
10	23.07.2014	5.1.2.3					X	
		6.1.3.1				X	X	
		6.1.3.4				X	X	



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Authorized use of the product	10
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	11
4.2	Construction	12
4.3	Working principle	13
5	Removal and installation	19
5.1	Installation	19
5.1.1	Requirements	20
5.1.2	Procedure	21
5.1.2.1	Preparatory activities	21
5.1.2.2	Attaching the solid wheel-mounted brake disc	25
5.1.2.3	Attaching a split wheel-mounted brake disc	27
5.1.2.4	Torque-controlled tightening	30
5.1.2.5	Angle-controlled tightening	31
5.1.3	Function testing	33
5.2	Removal	33
5.2.1	Requirements	34
5.2.2	Procedure	34



6	Maintenance	38
6.1	Inspection	38
6.1.1	Interval	39
6.1.2	Special tools	39
6.1.3	Procedure	39
6.1.3.1	Inspecting for cracks	39
6.1.3.2	Inspecting for scorch marks, material deposits and flaking	42
6.1.3.3	Inspecting the bolted fasteners	43
6.1.3.4	Checking for wear	43
6.2	Servicing	46
6.2.1	Interval	46
6.2.2	Special tools	46
6.2.3	Procedure	46
6.3	Repair - facing off	47
6.4	Replacement	47
6.4.1	Interval	47
7	Troubleshooting	48
7.1	Special tools	48
7.2	Procedure	48
8	Disposal	49
9	Annex	50



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the brake disc and discusses operation, installation, removal, function testing and maintenance.

2.1 Related documents

GD10357 Instruction manual: Re-installing used wheel-mounted brake discs

GD15904 Technical Information "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

Provided no other document is explicitly mentioned in the installation drawing, the present document is valid for units with type designations:

RxxxRxxxLGxx

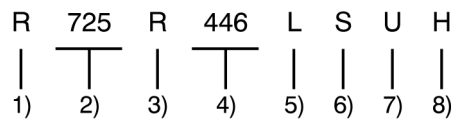
RxxxRxxxLFxx

RxxxRxxxLKxx

RxxxRxxxLAXx

RxxxRxxxLSxx

The diagram in Figure 1 shows precisely how a standard type designation is composed. To find the type designation referenced to a certain item number please refer to the installation drawing.



C 17951/13

- | | |
|--|--|
| <p>1) Product group
R: Wheel-mounted brake disc</p> <p>2) D_A (mm)
Outside diameter of wheel-mounted brake disc (last 3 digits, e.g. 085 for 1085mm)</p> <p>3) Joint
R: Middle of the friction surface</p> <p>4) D_I (mm)
Inside diameter of wheel-mounted brake disc (3 places)</p> <p>5) Design
L: Keyed plug centring</p> | <p>6) Material of friction ring
G: Grey cast iron
K: Nodular cast iron
S: Cast steel
F: Forged steel
A: Aluminium</p> <p>7) Variant
G: Split
U: Solid
K: Split and solid combined</p> <p>8) Field of application
H: Hydraulics
P: Pneumatics</p> |
|--|--|

Figure 1 Type designation



3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

The interface between wheel and wheel-mounted brake disc must agree with the particulars in the installation drawing.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The wheel-mounted brake disc is that part of the vehicle brake system that serves to convert kinetic energy into heat by means of friction.

4.1 Technical features

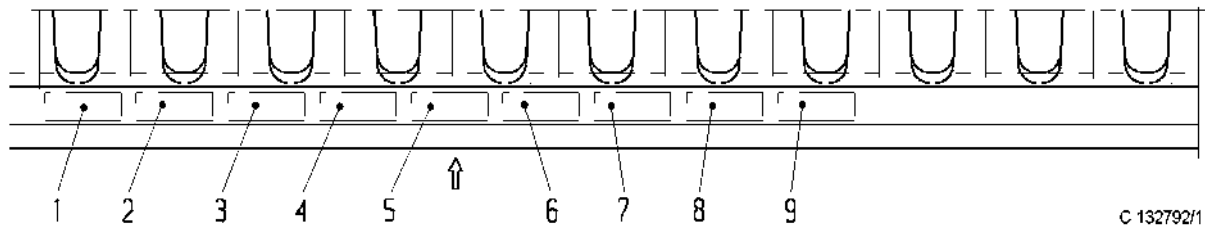
This special construction has been engineered to withstand extraordinary thermal and mechanical loads and also to minimize the overall weight. The precise construction of the wheel-mounted brake discs is illustrated in Figure 4 to Figure 8.

Depending on what purpose the wheel-mounted brake discs are to serve, they may be made from grey cast iron, nodular cast iron, cast steel, steel or aluminium.

The wheel-mounted brake discs come in two versions, one is split (with two ring segments), the other is solid. Split wheel-mounted brake discs are locked positively together by link rings (see Figure 8) or by joining bolts (see Figure 7). The type of disc to be used depends on the application.

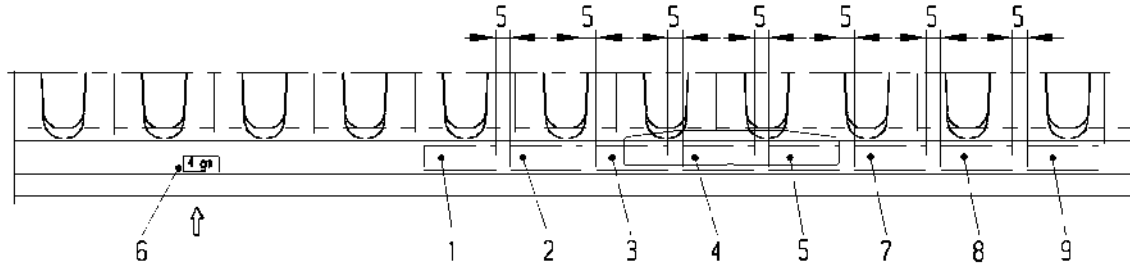
The wheel-mounted brake discs may be operated and stored only at an ambient air temperature of -55°C to +65°C. The wheel-mounted brake discs must be protected from humidity and wetness while in storage.

The positioning and meaning of the stamps on the friction rings are represented and explained in Figure 2 and Figure 3.



- | | | | |
|---|---|---|--|
| 1 | Order number, KNORR-BREMSE in-house (6 places) | 6 | Residual unbalance "U" (e.g. 3 gm) |
| 2 | Cons. serial No. (not more than 4 places) | 7 | Product number (optional) |
| 3 | Week/year of manufacture (e.g. 23/96) | 8 | Drawing No. of the friction ring |
| 4 | KNORR-BREMSE company logo | 9 | Acceptance stamp (optional) |
| 5 | Mark of origin, e.g. 02 for site of mechanical production | ↑ | Position of residual unbalance (= middle of the stamp) |

Figure 2 Positioning of the stamp
1st possibility



C 132792/2

- | | |
|---|---|
| <p>1 Order number, KNORR-BREMSE in-house (6 places)</p> <p>2 Cons. serial No. (not more than 4 places)</p> <p>3 Week/year of manufacture (e.g. 23/96)</p> <p>4 KNORR-BREMSE company logo</p> <p>5 Mark of origin, e.g. 02 for site of mechanical production</p> | <p>6 Residual unbalance "U" (e.g. 3 gm)</p> <p>7 Product number (optional)</p> <p>8 Drawing No. of the friction ring</p> <p>9 Acceptance stamp (optional)</p> <p>↑ Position of residual unbalance</p> |
|---|---|

If space is short, the residual unbalance is located at pos. 6 (away from the disc identifier). A smaller stamp font is used in this case for the residual unbalance.

Figure 3 Positioning of the stamp
2nd possibility

4.2 Construction

See Figure 4, Figure 5 and Figure 6

The wheel-mounted brake disc consists of two friction rings (3) which are termed inner or outer according to where they are positioned relative to the wheel flange (S). The friction ring thickness (e) and the number and geometry of the cooling ribs are rated to keep the temperature of the friction ring within the allowed range and to minimize the thermal and mechanical stresses. As well as carrying off the heat, these cooling ribs serve to brace the friction rings against the wheel.

To fasten and centre the brake disc on the wheel and to transmit the braking torque, the brake disc usually has 6 keyed plugs (2) and 12 or 18 bolted fasteners (4, 5 and 6).

Keyed plugs (2) are cylindrical components with O-rings (1) holding them in the right position during assembly. Their flattened ends engage keyway grooves (Z) at the rear side of the friction rings. As well as serving to centre the friction rings both on the wheel and relative to one another, the keyed plugs prevent the friction rings from turning singly and subjecting the bolted fasteners to bending stresses.

The bolted fasteners consist of sleeves or spring washers, nuts and bolts (see Figure 4) which differ according to the precise brake disc design. The bolted fasteners are primarily designed to fix the friction rings on the wheel. But they must also withstand considerable mechanical loads caused by brake operation, and permit a certain amount of thermal expansion due to a defined bolt tensioning force.

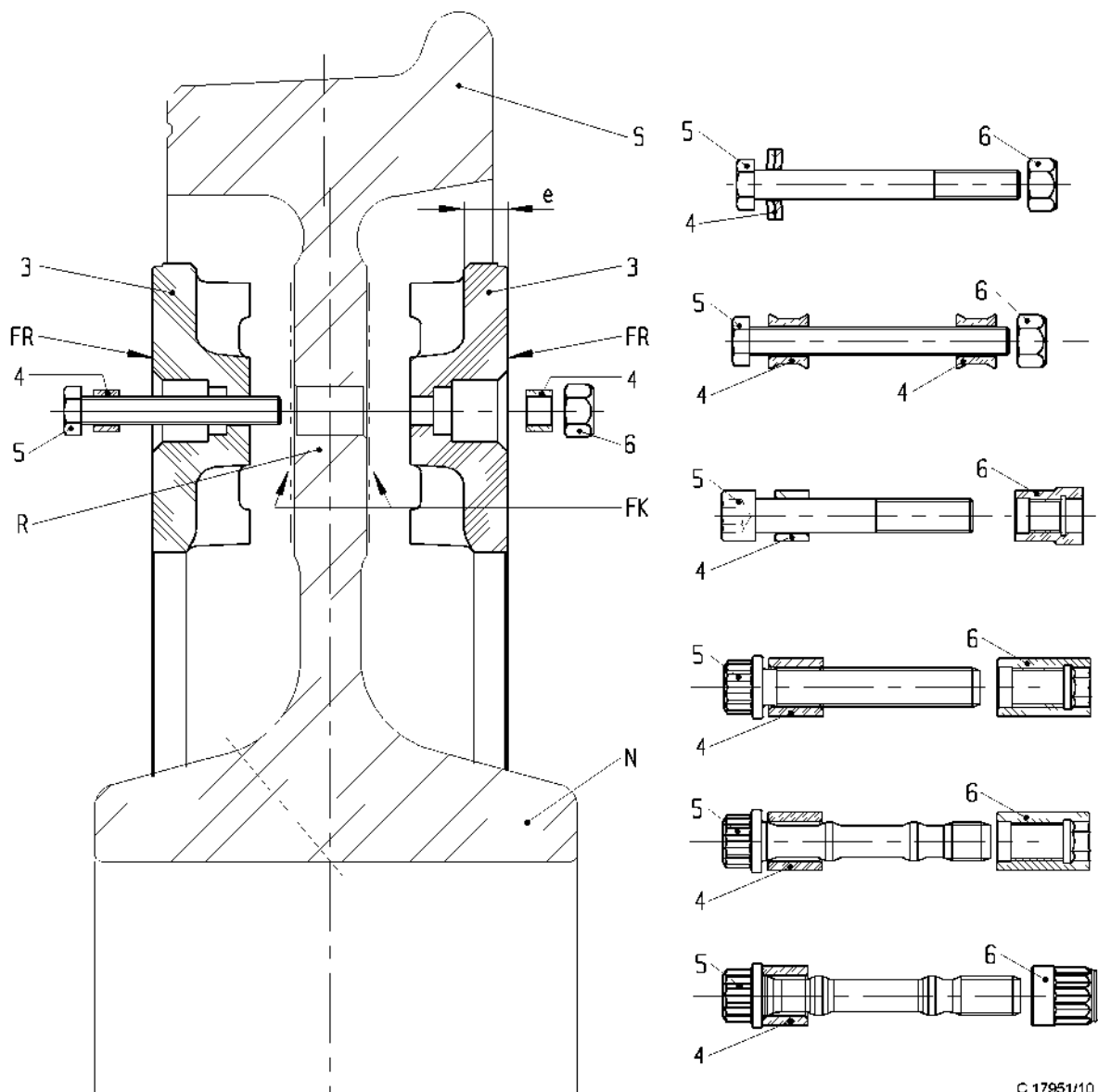


4.3 Working principle

Braking heats up the wheel-mounted brake discs as they rub against the brake pads. The discs are cooled by a stream of air generated by the fanning effect of the rotating wheel.

The air flows between the brake disc and wheel web, passes through the radially arranged cooling ribs and carries off the heat in the process.

Some of the heat is transferred to the wheel. This aspect must be considered when the wheel is being designed and engineered.

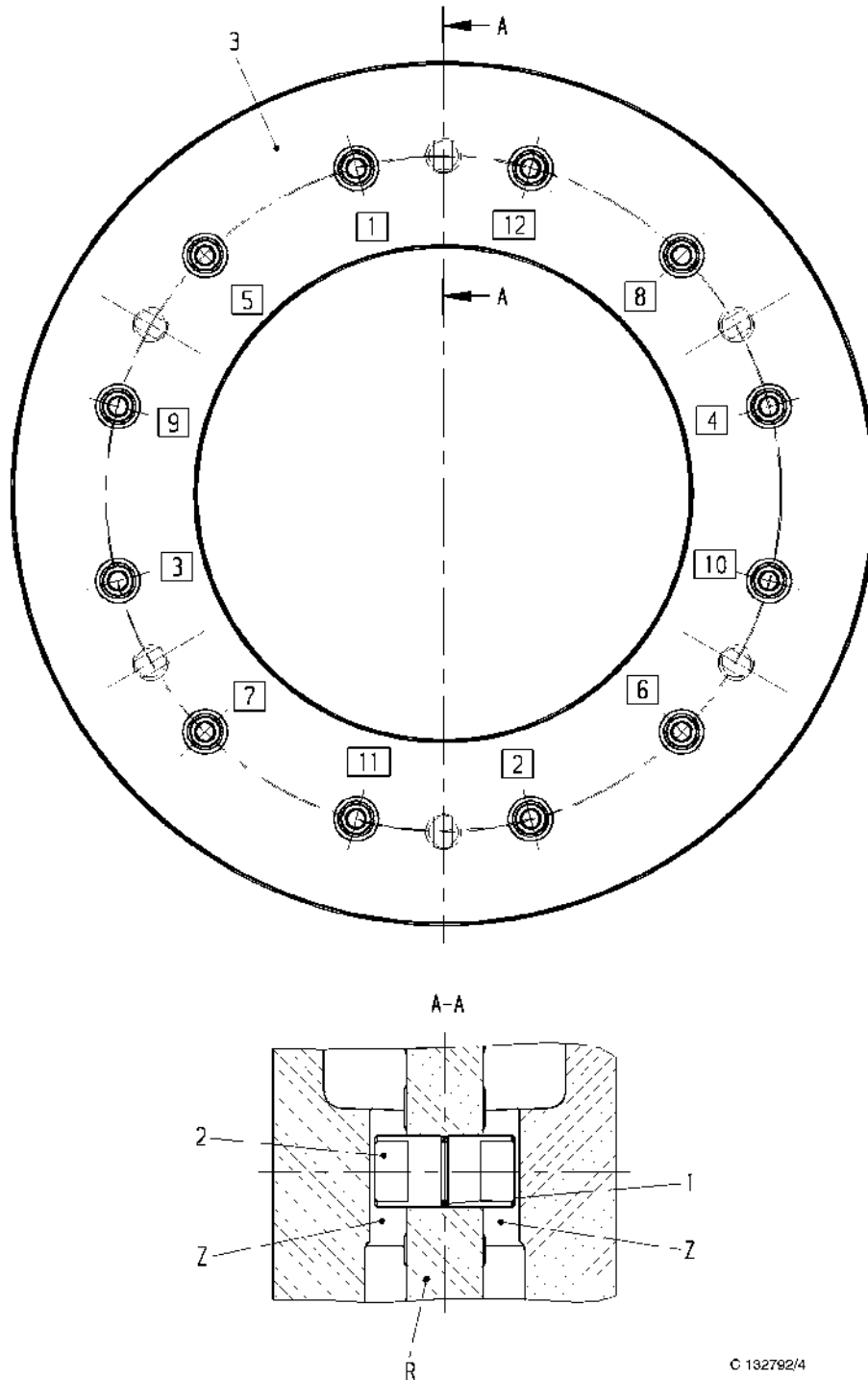




- 3 Friction ring (outer, inner)
- 4 Sleeve or spring washer
- 5 Bolt
- 6 Nut
- e Friction ring thickness

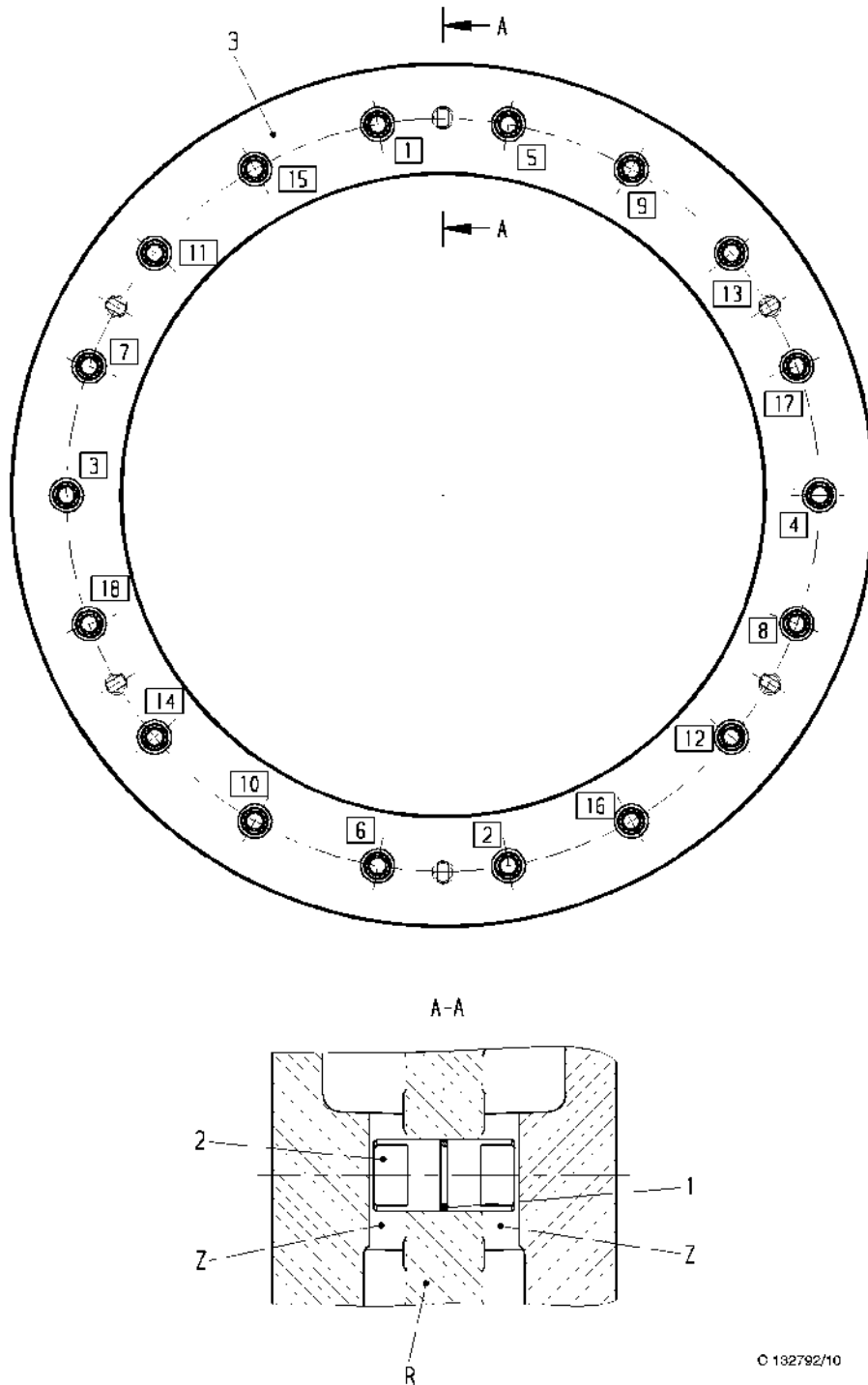
- FK Contact surfaces on the wheel
(coated with Molykote D 321 R)
- FR Friction surface
- N Wheel hub
- R Wheel web
- S Wheel flange

Figure 4 Typical wheel-mounted brake disc
(Typical types of bolted fasteners)



- | | | | |
|---|---------------|--------------|-------------------------------|
| 1 | O-ring | R | Wheel web |
| 2 | Keyed plug | Z | Keyway groove |
| 3 | Friction ring | Digit | Sequence for cross-tightening |

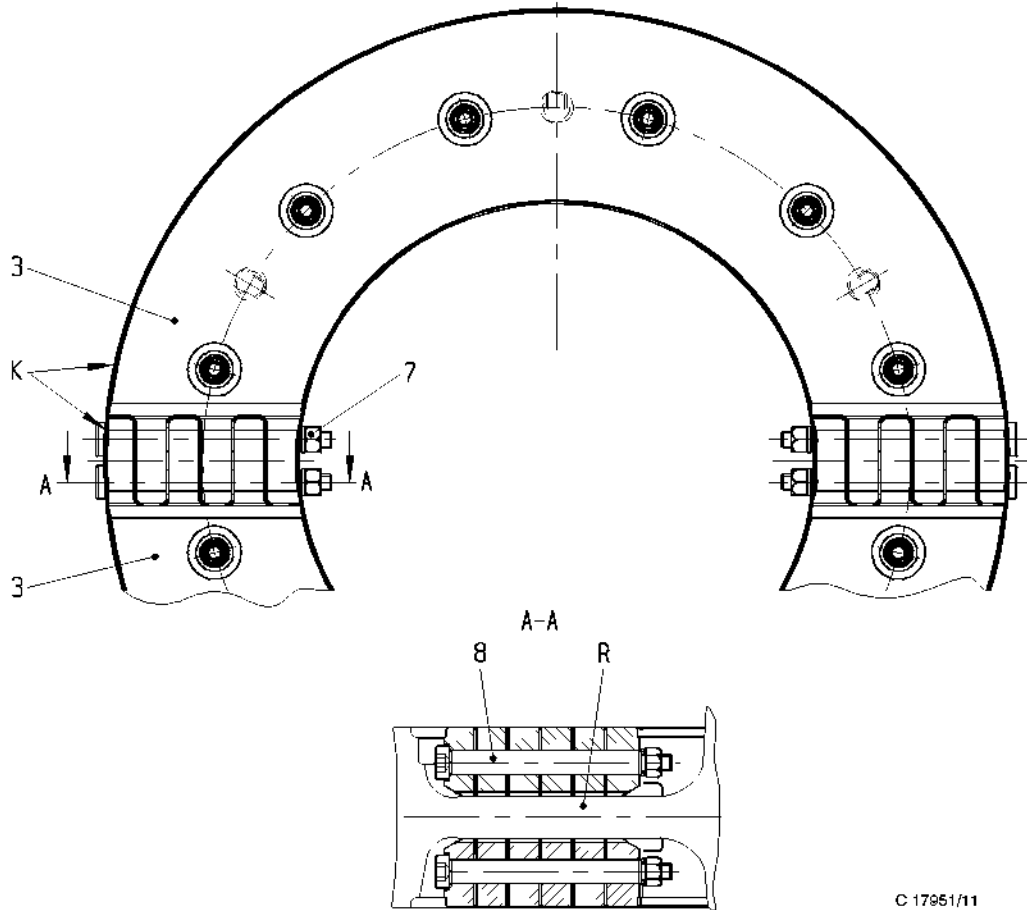
Figure 5 Wheel-mounted brake disc with 12 bolted fasteners



© 132792/10

- | | | | |
|---|---------------|--------------|-------------------------------|
| 1 | O-ring | R | Wheel web |
| 2 | Keyed plug | Z | Keyway groove |
| 3 | Friction ring | Digit | Sequence for cross-tightening |

Figure 6 Wheel-mounted brake disc with 18 bolted fasteners

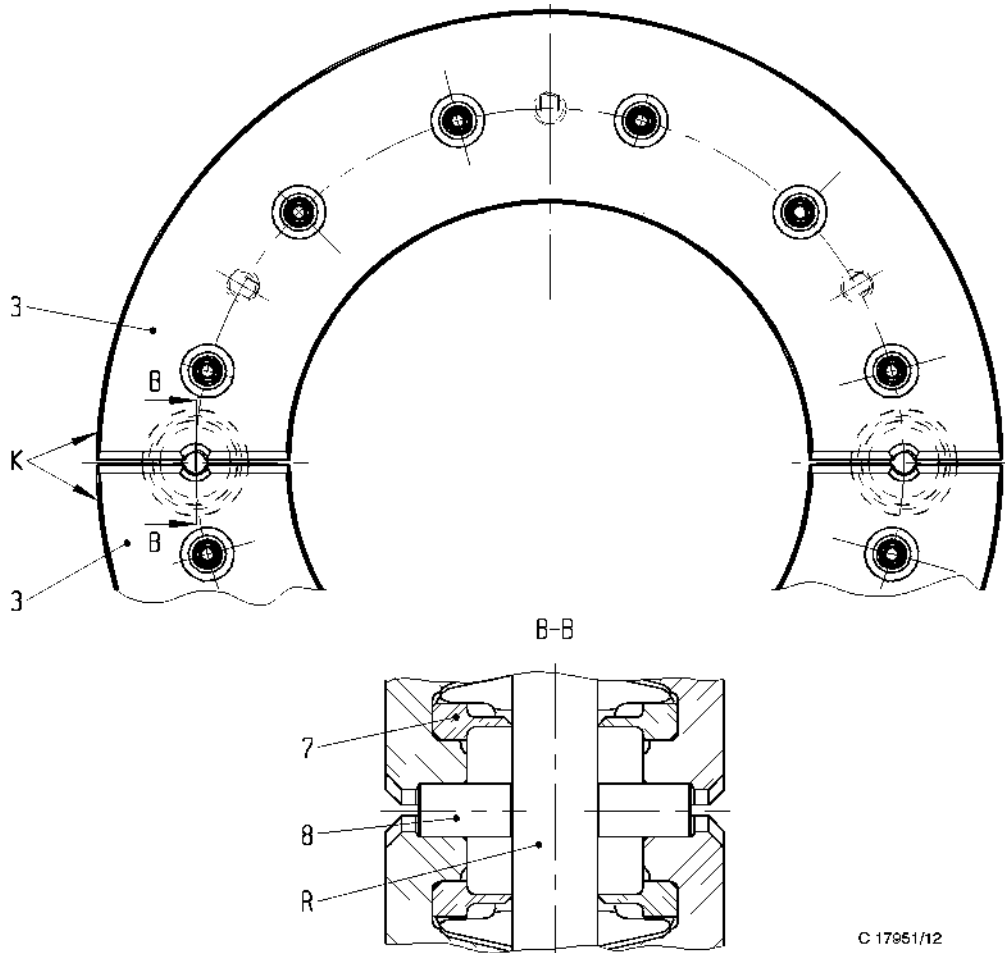


C 17951/11

- 3 Friction ring segment
- 7 Lock-nut
- 8 Joining bolt

- K Serial number identifying a pair of segments
- R Wheel web

Figure 7 Typical construction of a split wheel-mounted brake disc (bolt division)



C 17951/12

3 Friction ring segment

7 Link ring

8 Joining bolt

K Serial number identifying a pair of segments

R Wheel web

Figure 8 Typical construction of a split wheel-mounted brake disc (ring division)



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.



WARNING

Beware of toppling!

Danger of crushing or fracturing limbs.

Prop up the wheel and friction rings in a stable position.

5.1 Installation



DANGER

Beware of using friction rings that are partly worn down!

Partly worn friction rings of steel or nodular cast iron may change shape like Belleville springs as the loads are applied during service.

The bolted fasteners might possibly not have enough pretensioning force to push the friction rings hard against the wheel web when the rings are re-installed.

Imaginable effects: Bad bolted fasteners, damage to the vehicle, derailment due to loss of the brake disc!

Observe the procedure defined by GD10357 for re-installing used friction rings made of steel or nodular cast iron. Split friction rings must never be re-installed.

Used friction rings made of grey cast iron can be re-attached in the same way as new friction rings.



DANGER

Beware of using spent bolted fasteners!

The bolted fasteners might be damaged or possibly broken.

Reassembled fasteners cannot be guaranteed to hold reliably by the required bolt pretensioning force.

Imaginable effects: Loss of functionality, damage to the vehicle, derailment due to loss of brake discs.

Always use new bolted fasteners (such as bolts, spring washers, sleeves and keyed plugs).

Replacement brake discs come together with all bolted fasteners. Bolted fastener kits containing all the necessary fastening parts can also be ordered singly.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



NOTE

The whole process of installing any wheel-mounted brake disc must be recorded step by step (see Checklist in the Annex).

The assembly team is responsible for installing the parts and recording the necessary data.

5.1.1 Requirements



NOTE

The work must be done in suitably equipped workshops. Lifting gear rated for detaching and attaching vehicle wheels, friction rings and wheel-mounted brake discs is required for these activities.

Apart from standard tools you will require the following equipment and tools:

- Suitable lifting gear for wheels and friction rings
- Calibrated screwing system or torque wrenches that are suitable for torque-controlled tightening
- Dial gauge suitable for measuring the wobble of wheel-mounted brake discs in situ

The following lubricants are needed; they can be purchased from KNORR-BREMSE by their order numbers:

- MOLYKOTE D-321 R grease (order number: ID No. 461721)
- Hydraulic fluid: HLPD 32 conforming to DIN 51524-2

Additional utilities may be named in the installation drawing.



5.1.2 Procedure

5.1.2.1 Preparatory activities

See Figure 9 and the related installation drawing



DANGER

Bolted fasteners might loosen or possibly be broken.

Imaginable effects: Loss of functionality, damage to the vehicle, derailment due to loss of friction ring.

All contact surfaces and mating surfaces on the bolted fasteners and friction rings, as well as the contact surfaces of the wheel web must be level, clean and metallically bright. In particular, they must not display any dents or burrs, dirt, old MOLYKOTE, rust, anticorrosives or paint. If necessary, cautiously smooth off and clean the relevant surfaces.



CAUTION

Beware of installing the wrong parts!

Safety will be diminished and functionality restricted.

Check the item numbers and quantity of parts placed in readiness against the parts list.



CAUTION

Beware of installing damaged parts!

Safety will be diminished.

Carefully sight-check all parts of the brake disc.

Preparatory activities on the wheel

- Thoroughly clean the contact surfaces.
 - The contact surfaces of wheel web (A) - see Figure 9 and the related installation drawing - must be clean and metallically bright. They must not reveal any trace of paint, dirt or rust.
- Make sure that parallel misalignment, wobble and surface roughness do not exceed the values stated in the installation drawing. This applies to previously used wheels as well.



WARNING

Beware of using auxiliary products and working materials incorrectly!

The skin or respiratory tracts may be harmed or inflamed.

It is vital to observe the manufacturer's safety codes and directions for use.

- Degrease the contact surfaces of wheel web (A, Figure 9) using a non-corrosive cleaning substance that will not damage the surfaces.



- If necessary, mask the wheel web so that all the contact surfaces (A, Figure 9) can be coated with Molykote D321 R and all other parts of the wheel are protected from it.
- To avoid tear drops forming on the contact surfaces, please plug the holes for screw fasteners and keyed plugs with foam stoppers prior to coating the surfaces with Molykote D 321 R.



NOTE

Make sure that Molykote D 321 R is well mixed and shaken - because it dissociates when left to stand.

- Apply Molykote D 321 R anti-friction lacquer to the contact surfaces of wheel web (A, Figure 9), preferably by spraying. Other suitable methods may be used. The dried coat must be 5µm to 20µm thick regardless of the method used (corresponding to the Dow Corning Molykote D 321 R data sheet).
 - The coating procedure must be equivalent to that of painting; the final coat must be thin, even and uniform. The contact surfaces must be covered with Molykote **by their full area**. Do not allow tear drops to form.



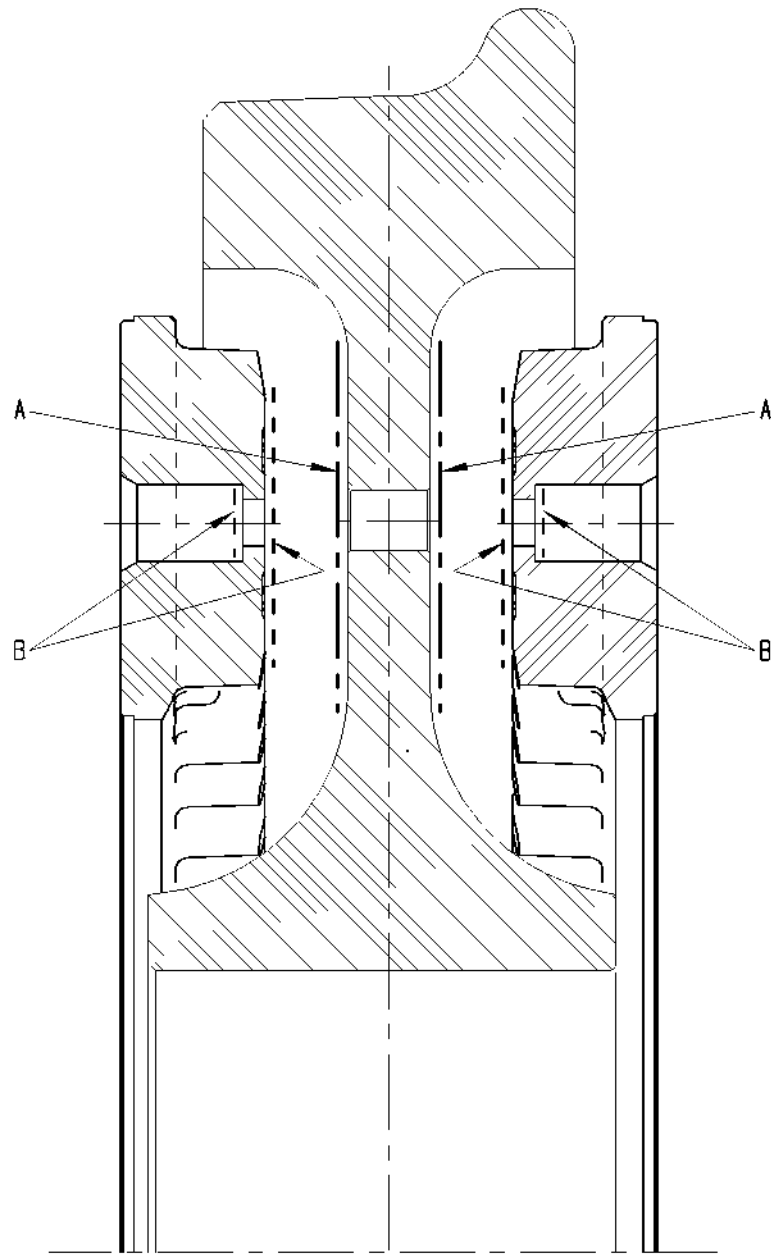
NOTE

The surface treatment must guarantee a coat of the specified thickness. The coat thickness must be checked.

- Confirmation that the dried coat is of the specified thickness must be verified and recorded for every wheel. Verification must comprise six measurements of the coat thickness in the region of the keyed plug holes on each side of the wheel. A certificate showing that verification has been completed and that the dried coat meets the thickness requirement will be sufficient proof.
- Prior to installing the friction ring, let the coat dry for 30 minutes at least.

Preparatory activities on the brake disc

- Inspect the contact surfaces at the back, as well as the surfaces mating with the bolted fasteners at the front of the friction rings (B, see Figure 9) for irregularities such as burrs or indentations that might have been caused by shipment. If necessary, smooth them off with due caution.
- The contact and mating surfaces (B, see Figure 9) must be metallically bright. In particular, they must not display any trace of anticorrosives, dirt or rust. If necessary, clean them quite thoroughly.



C 132792/5

A Contact surfaces of the wheel web (coat only these surfaces with Molykote D321 R; see Section 5.1.1)

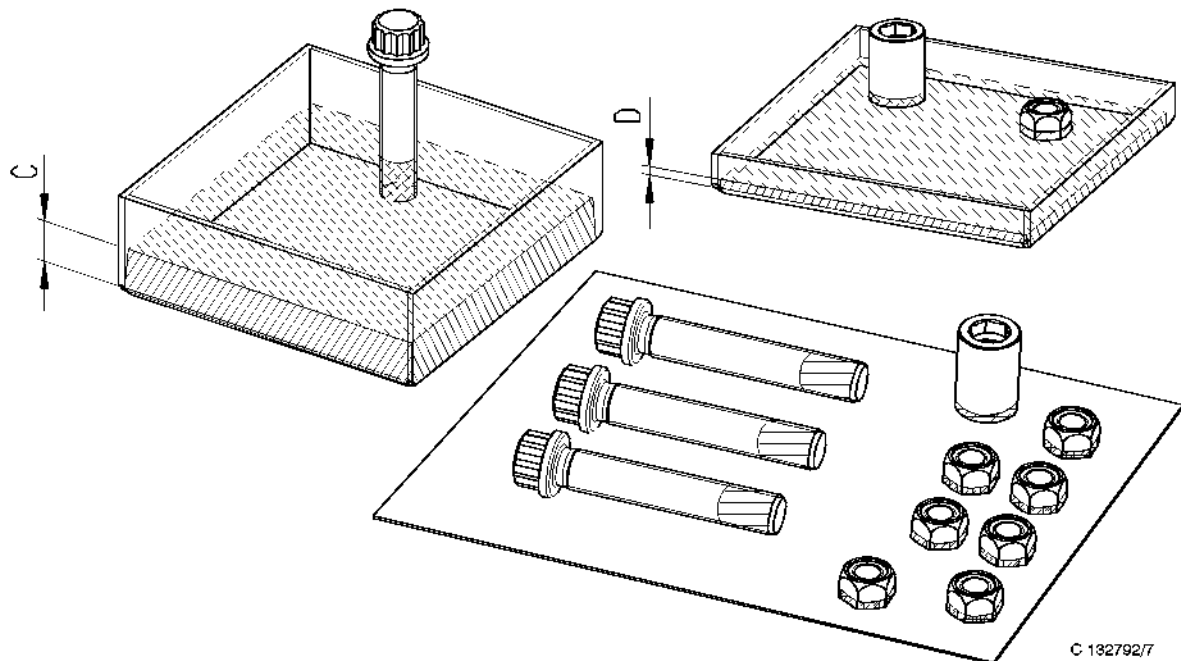
B Contact surfaces of the friction rings and surfaces mating with bolted fasteners

Figure 9 Contact surfaces



Only if the related installation drawing of the brake disc specifies oiling for the fastening parts:

- Immerse the bolts - with their threads pointing downwards - into a vessel of HLPD 32 hydraulic fluid (15-20mm deep) and make them touch the bottom (see C, Figure 10).
- Immerse the nuts - with their contact surfaces pointing downwards - into a vessel of HLPD 32 hydraulic fluid (2-4mm deep) and make them touch the bottom (see D, Figure 10).
- Nuts and bolts need only be immersed briefly in oil, yet may be left in the oil until they are going to be used. Prior to using nuts and bolts, put them down on a clean, absorptive material for a period of at least one minute to allow excess fluid to drip off. If the nuts and bolts are left to stand for more than one hour they will have to be re-oiled.



C Fluid 15 - 20mm deep

D Fluid 2 - 4 mm deep

Figure 10 Oiling the nuts and bolts



NOTE

Make sure that the wheel and the parts of the brake disc remain in the condition described in Section 5.1.2 during installation as well.

Dust or dirt on the contact surfaces or parts of the bolted fasteners is not acceptable.



NOTE

Install all parts precisely as shown in the installation drawing.

Make especially sure that all parts are pointed and installed in the correct direction.



CAUTION

Beware of unbalancing the wheelset by installing the parts incorrectly!

Wheelset reported as unbalanced, subsequent activity required.

Install the friction ring so as to stagger its residual unbalance by as near as possible to 180° from that of the wheelset or axle.

Wheel-mounted brake discs come balanced from the factory. The residual unbalance is stamped at its precise location in the outer rim of the friction rings (see Figure 2 and Figure 3).

5.1.2.2 Attaching the solid wheel-mounted brake disc

See Figure 4, Figure 5, Figure 6



NOTE

Solid wheel-mounted brake discs can only be attached after the wheels have been detached.



NOTE

The preparatory activities set out in Section 5.1.2.1 must have been completed by now.

Horizontal mounting

The next section describes how to mount the friction rings horizontally. For details of vertical mounting please refer to the paragraph "Vertical mounting".

- Using suitable lifting gear, put the first friction ring down horizontally by its friction surface (FR) on a suitable jig. The jig must provide the space required for installing the bolted fasteners.



NOTE

The keyed plugs must engage the keyway grooves. If the keyed plugs are displaced by an angle of 30° they will not engage - the screw holes will in fact be in line with the wheel, but the keyed plugs will not be in line with the disc. Also, remember to correctly position the unbalance of the friction ring and wheel.

- Position the wheel on the friction ring using suitable lifting gear.
- Draw O-rings (1) onto keyed plugs (2).



- Fit keyed plugs (2) in their holes in the wheel web and align radially by turning with an open-end wrench. The cylindrical part of keyed plugs (2) must distinctly remain inside the hole in the wheel web. Verify this state by feeling with your finger tips. Only the flattened ends must project beyond both sides of the wheel web.
- Locate the second friction ring (3) on the wheel. Make sure that all the keyed plugs (2) engage the keyway grooves.
- Fasten the friction rings (3) by inserting the fasteners (4, 5 and 6) as shown in the installation drawing. Just hand-wrench all the nuts (6) (<7 Nm).
- Use the tightening procedure described in Section 5.1.2.5. The type of tightening is defined in the related installation drawing.

Vertical mounting

The next section describes how to mount the friction rings vertically. For details of horizontal mounting please refer to the paragraph "Horizontal mounting".

- Using suitable lifting gear, position the wheel vertically on a suitable jig and prop up stably.
- Draw O-rings (1) onto keyed plugs (2).
- Fit keyed plugs (2) in their holes in the wheel web and align radially by turning with an open-end wrench. The cylindrical part of keyed plugs (2) must distinctly remain inside the hole in the wheel web. Verify this state by feeling with your finger tips. Only the flattened ends must project beyond both sides of the wheel web.



NOTE

The keyed plugs must engage the keyway grooves. If the keyed plugs are displaced by an angle of 30° they will not engage - the screw holes will in fact be in line with the wheel, but the keyed plugs will not be in line with the disc. Also, remember to correctly position the unbalance of the friction ring and wheel.

- Using suitable lifting gear, position both friction rings (3) on both sides of the wheel and secure so that they cannot fall off. Make sure that all the keyed plugs (2) engage the keyway grooves!
- Fasten the friction rings (3) by inserting the fasteners (4, 5 and 6) as shown in the installation drawing. Just hand-wrench all the nuts (6) (<7 Nm).
- Use the tightening procedure described in Section 5.1.2.5. The type of tightening is defined in the related installation drawing.



5.1.2.3 Attaching a split wheel-mounted brake disc



NOTE

There is no need to detach the wheels for installing split wheel-mounted brake discs. Make sure there is enough space for installation. If necessary, remove any adjoining parts (e.g. brake pads).



NOTE

The preparatory activities set out in Section 5.1.2.1 must have been completed by now.



CAUTION

Beware of incorrect installation!

Wheelset reported as unbalanced, subsequent activity required.

The discs must be put together on the wheel in a pair of segments identified by the same serial number K (see Figure 7 and Figure 8). Make sure that the unbalance on the wheel is opposite to that of the split disc.

Ring division

See Figure 8

- Draw O-rings (1) onto keyed plugs (2).
- Fit keyed plugs (2) in their holes in the wheel web and align radially by turning with an open-end wrench. The cylindrical part of keyed plugs (2) must distinctly remain inside the hole in the wheel web. Verify this state by feeling with your finger tips. Only the flattened ends must project beyond both sides of the wheel web.



NOTE

The keyed plugs must engage the keyway grooves. If the keyed plugs are displaced by an angle of 30° they will not engage - the screw holes will in fact be in line with the wheel, but the keyed plugs will not be in line with the disc. Also, remember to correctly position the unbalance of the friction ring and wheel.



NOTE

The installation drawing shows how the friction ring segments are arranged. The division levels of the inner and outer friction rings of some brake discs are staggered by a certain angle (e.g. 60°).

- Place two link rings (7) on one friction ring segment and position on the wheel at the bottom. The installation drawing shows where the link rings are fitted. Secure the friction ring segment on the wheel so that it cannot fall off.



NOTE

Always assemble a split wheel-mounted brake disc from the pair of segments that are identified by the same serial number "K" (see Figure 8).

- Place two link rings (7) on the first segment of the second pair of segments. Position the friction ring segment on the opposite side of the wheel and also at the bottom. Secure both segments so that they cannot fall off.
- Fasten both friction ring segments by inserting the fasteners (4, 5 and 6) as shown in the installation drawing. Hand-wrench all the nuts (<7 Nm).
- Place both joining bolts (8) in the half-shells on the end faces of the mounted disc segments.
- Position the other two friction ring segments (3) on both sides of the wheel and secure so that they cannot fall off.
- Fasten the friction ring segments by inserting the fasteners (4, 5 and 6) as shown in the installation drawing. Hand-wrench all the nuts (<7 Nm).
- Use the tightening procedure described in Section 5.1.2.5. The type of tightening is defined in the related installation drawing.

Bolt division

See Figure 7

- Coat all the joining bolts (8) with Molykote D 321 R.



NOTE

Knorr-Bremse SfS recommends the use of the following provisional assembly fasteners (see Figure 11) for brake discs with M12 bolted fasteners. Depending on the mounting scenario or the size of the fasteners, it may be necessary to configure the provisional assembly fasteners in a different way:

6 bolts M12x150 (or threaded rods with nuts)

6 sleeves 12 / 20 x 60 (di / da / l)

12 washers

2 bolts M16x180 with nuts

- Proceeding as shown in Figure 11, put one provisional assembly fastener (a total of three) in every second screw hole of the first friction ring segment.
- Place the first friction ring segment on the wheel at the bottom and hand-wrench the three provisional assembly fasteners at the nut end. Leave enough space for installing the joining bolts (8), and position the points of unbalance correctly.
- Add three provisional assembly fasteners to the second friction ring segment of this pair of segments as shown in Figure 11, and arrange on the same side of the wheel at the top. Hand-wrench the provisional assembly fasteners at the nut end.



- To align the segments, insert two M16x180 provisional assembly fasteners in the holes for the joining bolts (one at each side of the division). Secure the provisional assembly fasteners by hand-wrenching the nuts.
- Insert joining bolts (8) in the vacant holes. Observe the particulars in the installation drawing as regards how to point the fasteners. Tapping cautiously with a plastic-headed hammer may be useful. Install the washers and nuts. Hand-wrench the nuts (<7 Nm).
- Replace the M16x180 provisional assembly fasteners with joining bolts (8). Install the washers and nuts. Hand-wrench the nuts (<7 Nm).
- Install the lock-nuts (7) belonging to joining bolts (8) and torque to the value specified in the installation drawing. Hold the bolt heads tight for counter-support.



WARNING

Beware of parts dropping or toppling!

Danger of crushing limbs or fracturing bones, and damage to the axle.

Secure the wheel-mounted friction rings/segments.

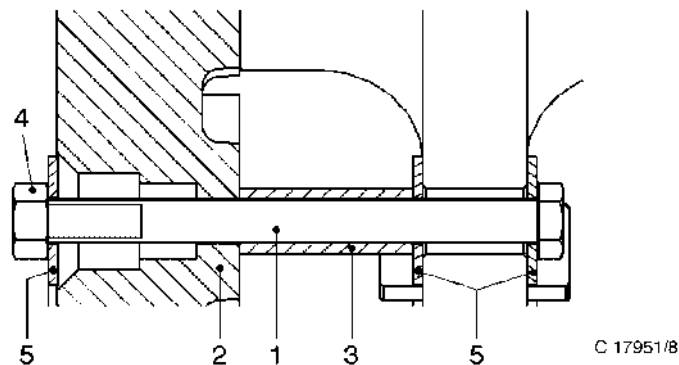
- Take out the six provisional assembly fasteners, and put down the friction ring cautiously on the axle. Cover up the axle beforehand to avoid damage and scratching.



NOTE

If the second friction ring is also a split construction, repeat the procedure described above for the second friction ring.

- Fasten the friction ring on the wheel as described in Section 5.1.2.2, under the heading "Vertical mounting". Additionally note how to arrange the division levels of the friction ring segments (cf. installation drawing).



- | | | | |
|---|---------------------------|---|--------|
| 1 | Provisional assembly bolt | 4 | Nut |
| 2 | Friction ring | 5 | Washer |
| 3 | Sleeve | | |

Figure 11 Provisional assembly bolts



5.1.2.4 Torque-controlled tightening



DANGER

Beware of incorrect installation!

Incorrect torquing might return the wrong bolt tensioning force!

Fasteners might be damaged or possibly broken.

Possible consequences: Loss of functionality, damage to the vehicle, derailment due to loss of wheel-mounted brake discs.

Tighten the bolted fasteners cautiously using a calibrated screwing system or torque wrench as described below.

It is vital to observe all standards (e.g. DIN 25201, risk class) as well as the values and tolerances stated in the installation drawing specific to a given item number.



NOTE

The specified tightening sequence (see Figure 5 and Figure 6) can best be identified by easily removed marking next to the corresponding holes on a friction ring.

Step 1: Preassembly

- Tighten all the bolted fasteners in the sequence shown in Figure 5 and Figure 6 to 50% of the torque value stated in the related installation drawing. Always tighten the nuts and hold the bolts tight for counter-support.
- Record the preassembly procedure in the Checklist (see Annex) after all the bolted fasteners have been correctly preassembled. It is not necessary to record the tightening torque used for preassembly.

Step 2: Final assembly

- Tighten all the bolted fasteners in the sequence shown in Figure 5 and Figure 6 to 100 % of the torque value stated in the related installation drawing. Observe the specifications in DIN 25201-2-B. Always tighten the nuts and hold the bolts tight for counter-support.

Step 3: Checking the torque and marking

- Check the torque at 100% of the tightening torque stated in the related installation drawing. The torque must be checked by a second person other than the first mechanic. Manual torquing by a hand tool is sufficient. None of the nuts may turn, otherwise repeat Step 3 for all of the bolted fasteners in the brake disc. Bolted fasteners turning out of place must be recorded in the Checklist (see Annex)
- Mark the finished bolted fasteners by drawing a dab of paint across the nut and screw thread. If necessary, cautiously remove oil from the relevant surface (and from this surface only!) using a solvent.



NOTE

The solution must not damage the surface treatment of the bolted fasteners or corrode the friction rings. In case of doubt, test the solution on comparable parts.

- If required: Remove the oil from the friction surfaces of the brake disc.
- Having tightened the fasteners by torque control, perform the function test described in Section 5.1.3.

5.1.2.5 Angle-controlled tightening



DANGER

Beware of incorrect installation!

Incorrect torquing might return the wrong bolt pretensioning force!

Fasteners might be damaged or possibly broken.

Possible consequences: Loss of functionality, damage to the vehicle, derailment due to loss of wheel-mounted brake discs.

Tighten the bolted fasteners cautiously using a calibrated screwing system or torque wrench as described below.

It is vital to observe all standards (e.g. DIN 25201, risk class) as well as the values and tolerances stated in the installation drawing specific to a given item number.



NOTE

The specified tightening sequence (see Figure 5 and Figure 6) can best be identified by easily removed marking next to the corresponding holes on the friction surface.

Step 1: Preassembly (torque-controlled tightening)

- Cross-tighten all the bolted fasteners in accordance with DIN 25201, risk class H (torque-controlled tightening). Tighten the bolted fasteners in the sequence shown in Figure 5 and Figure 6. Observe the tightening torque specified in the related installation drawing for preassembly. Always tighten the nuts and hold the bolts tight for counter-support.
- Record the preassembly procedure in the Checklist (see Annex) after all the bolted fasteners have been correctly preassembled. It is not necessary to record the tightening torque used for preassembly.



Step 2: Final assembly (angle-controlled tightening)

- Release bolted fastener No. 1 (see Figure 5 and Figure 6). Leave all other bolted fasteners tight.



DANGER

Beware of incorrect installation!

If the wheel or bolt turns in the course of angle-controlled tightening, the bolted fastener might be torqued to the wrong tightening angle.

False bolt pretensioning forces can damage the bolt, lead to loss of functionality, damage the vehicle and cause derailment due to the loss of wheel-mounted brake discs.

Make sure that neither the wheel nor the bolts can turn when the bolted fasteners are being tightened. Always hold the bolt tight and turn the nut for torquing.

- Retighten the bolted fastener in accordance with DIN 25201, risk class H (angle-controlled tightening). Tighten nut (6) to the threshold torque defined in the related installation drawing. Do not interrupt the subsequent tightening process! Counting the angle starts now. Without interrupting, turn the nut (6) onwards by the additional angle stated in the installation drawing.
- Record the actual tightening angle and the resulting tightening torque in the Checklist (see Annex). The resulting tightening torque must be within the range of the reference quantity given in the installation drawing.



DANGER

Beware of incorrect installation!

The resulting tightening torque is not within the range of the reference quantity given in the installation drawing.

Possible consequences: Bolts damaged or broken, loss of functionality, damage to the vehicle, derailment due to loss of wheel-mounted brake discs.

The affected bolted fastener must be exchanged for a new one. Advise KNORR-BREMSE in case of faults that occur repeatedly.

- Mark the ultimately tightened bolted fastener with a dab of paint at the place shown in the installation drawing. If necessary, cautiously remove oil from the relevant surface (and from this surface only!) using a solvent.



NOTE

The solution must not damage the surface treatment of the bolted fasteners or corrode the friction rings. In case of doubt, test the solution on comparable parts.

- Repeat all the final assembly steps for bolted fasteners 2 to 12 or 18 in the sequence shown in Figure 5 and Figure 6.



5.1.3 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

- Measure the amount of wobble. The reading must agree with the value stated in the installation drawing.



NOTE

If the wobble exceeds its specification, release and clean all the bolted fasteners, and check the condition of all contact surfaces. Then re-install the friction ring as described in Section 5.1, but turn it by 60° from its original position. It is not possible to install the friction ring at a position displaced by 30° from the original one! Note the position of the residual unbalance. Once again check the tightening torque and wobble as described above.

- Prior to placing the brake disc in service, perform a test run to check the brake system for correct operation.

5.2 Removal



WARNING

Hot surfaces!

Beware of burning your skin on hot brake discs.

Let the surfaces cool down.

Wear gloves for protection.



WARNING

Beware of parts dropping or toppling!

Danger of crushing limbs or fracturing bones.

For the purposes of removal, secure the wheel-mounted friction rings and segments so that they cannot fall off.



5.2.1 Requirements



NOTE

Wheel-mounted brake discs will only need to be removed if replacement is warranted by their condition or wear.



NOTE

The work must be done in suitably equipped workshops. Lifting gear rated for detaching and attaching vehicle wheels, friction rings and wheel-mounted brake discs is required for these activities.

The unit can be removed with standard tools.

5.2.2 Procedure

Detaching solid wheel-mounted brake discs from a detached wheel

See Figure 4, Figure 5 and Figure 6

All the wheel-mounted brake discs covered by the validity of this document can generally be removed in the following steps from wheels that have been detached.

- Take out two diagonally opposite bolts (5), and put a 12mm x 200mm rod through each of the vacant wheel holes in order to support the brake discs.
- Take out all the other bolts (5).
- Remove the friction rings from both sides of the wheel.
- Pull all the keyed plugs (2) out of the wheel web, and draw the O-rings (1) off the keyed plugs.

Detaching solid grey cast iron wheel-mounted brake discs

See Figure 4, Figure 5 and Figure 6

Solid grey cast iron wheel-mounted brake discs can be removed either from wheels that have been detached, or by using a right-angle grinder. The right-angle grinder cannot be purchased from KNORR-BREMSE.

For this purpose, cut apart the inner wheel-mounted friction ring with the right-angle grinder after detaching the outer friction ring.

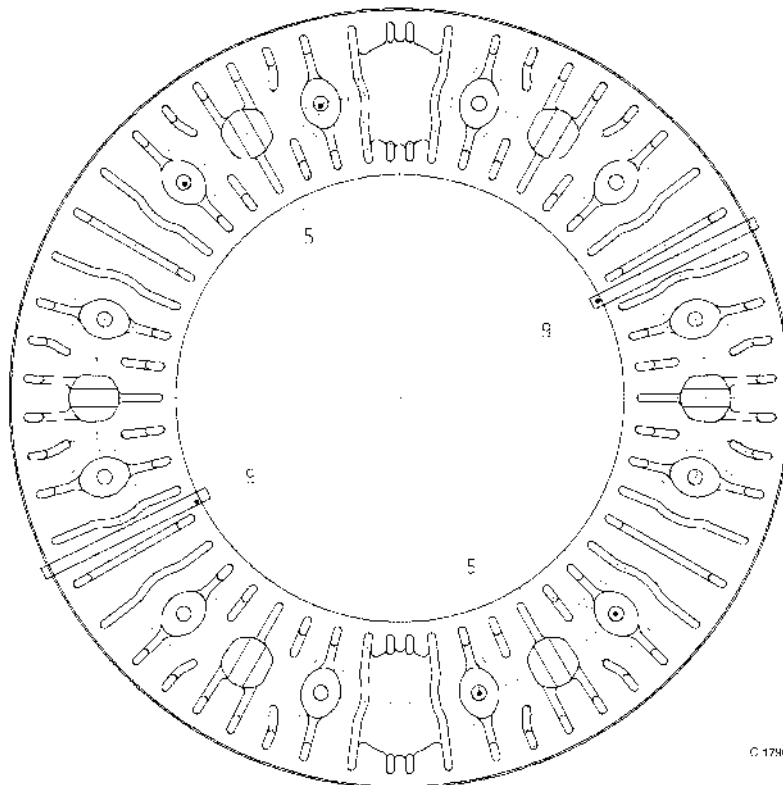


Detaching solid aluminium wheel-mounted brake discs

See Figure 12

Solid aluminium wheel-mounted brake discs can also be removed while the wheels are still in place.

- Release the bolted fasteners (4, 5 and 6) in the wheel-mounted brake disc, and detach the outer friction ring in the manner described above.
- Install four bolted fasteners (5, see Figure 12) and hand-wrench as shown there.
- Put 2 flat steel bars measuring about 160x10x40mm (9, see Figure 12) between the wheel and wheel-mounted brake disc.
- Increase the tightening torque of the bolted fasteners in 10 Nm increments around the circumference until the friction ring breaks apart across the two flat steel bars.
- Take out the bolted fasteners, and remove the broken halves of the friction ring.



© 17907 9

5 Fastener

9 Flat steel bar

Figure 12 Detaching solid aluminium wheel-mounted brake discs



Detaching split wheel-mounted brake discs (ring division)

See Figure 4 and Figure 8

There is no need to detach the wheels in order to remove split wheel-mounted brake discs.

- Remove two bolts (5) from the upper friction ring segments (3). To prevent the segments from dropping, put two provisional assembly bolts (M12x150mm) through the vacant wheel holes and fasten by their nuts.
- Take all the other bolts (5) out of the upper friction ring segments.
- Take the upper friction ring segments off both sides of the wheel after withdrawing the provisional assembly bolts.
- Remove the joining bolts (8).
- Remove two bolts (5) from the lower friction ring segments (3). To secure the segments, put two provisional assembly bolts (M12x150mm) through the vacant wheel holes and fasten by their nuts.
- Take all the other bolts (5) out of the lower friction ring segments.
- Take the lower friction ring segments off both sides of the wheel after withdrawing the provisional assembly bolts.
- Draw the link rings (7) off the friction ring segments.
- Pull all the keyed plugs (2) out of the wheel web, and draw the O-rings (1) off the keyed plugs.



Detaching split wheel-mounted brake discs (bolt division)

See Figure 4 and Figure 7



WARNING

Beware of parts dropping or toppling!

Danger of crushing limbs or fracturing bones, and damage to the axle.

Do not allow the inner friction ring to slip off the keyed plug centring.

Secure the wheel-mounted friction rings/segments.

- Remove bolts (5) from the friction rings.
- Protect the axle with a semicircular shell of wood or plastic to support the friction ring.
- Remove the outer friction ring, while pressing the inner ring gently against the wheel. This ring is centred on the wheel by the keyed plugs.
- Take the inner friction ring off the wheel and hang it over the protected axle.
- If the friction ring is joined by two bolts instead of four, remove the lock-nuts (7), knock the joining bolts (8) out of their holes using a steel rod (D=14mm), and detach both halves of the friction ring.
- The following steps will be needed for removal if the friction ring halves are joined by four bolts. Remove one lock-nut (7) from each of the two divisions, and knock out the accompanying joining bolt (8) using a steel rod (D=14mm).
- For safety, now substitute M16x180mm nuts and bolts for the two bolts that have been removed.
- Now remove the other two lock-nuts (7) and joining bolts (8) in the same way.
- Take out both M16x180 bolts, and remove both friction ring segments (3).
- Pull all the keyed plugs (2) out of the wheel web, and draw the O-rings off the keyed plugs.

If the bolts prove difficult to remove, one friction ring segment can be cut apart using a right-angle grinder. This will make the bolts easier to take out at the division.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The external condition of the unit, and the system functionality for which the unit is used must be checked at regular intervals as specified by the vehicle operator.



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.



WARNING

Hot surfaces!

Beware of burning your skin on hot brake discs.

Let the surfaces cool down.

Wear gloves for protection.



6.1.1 Interval

Activity	Interval
External condition, wear, cracking and damage	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

To avoid doing any unnecessary work, it is best to inspect the brake discs in the sequence described here.

6.1.3.1 Inspecting for cracks

The wheel-mounted brake discs must be checked against the following particulars and the examples shown in Figure 13 to Figure 15.

The critical crack lengths stated in the following relate to a standard brake disc with a swept width "W" of 145mm (see Figure 14). The critical crack lengths must be adapted as follows for any other swept width "W".

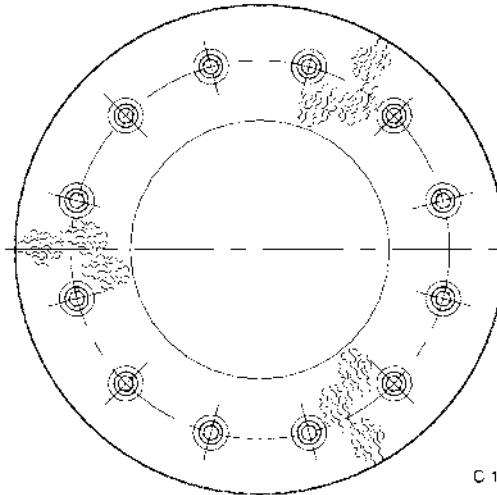
"W" = 100mm, value stated below for the critical crack length "a < 80mm" (valid for "W" = 145mm)

⇒ $80\text{mm} \cdot 100/145 \Rightarrow a < 55\text{mm}$ (valid for "W" = 100mm)

Hair cracks

The friction surfaces of brake discs exposed to severe thermal stresses gradually develop finely ramified cracks of just minor depth (so-called hair cracks). These cracks are largely uncritical for operation and appear randomly in the whole friction ring (see Figure 13).

Hair cracks of up to 10mm in length are acceptable in the area where split friction rings are joined (Figure 7 and Figure 8).



C 16877:3

Figure 13 Typical hair cracks

Incipient cracks

Incipient cracks are cracks that do not extend from the inside rim of the friction ring to the outside rim. Figure 14 shows two different kinds of incipient cracks:

- "a" - The crack is at least 10mm away from the inside and/or outside rim of the friction ring.
- "b" - The crack touches the inside or outside rim of the friction ring, or is less than 10mm away from it.

If two or more incipient cracks (not hair cracks) are less than 7mm apart at one point, they must be regarded as a combined crack whose length corresponds to the distance between the two crack tips which are furthest apart from one another. If one of these cracks corresponds to type "a" and the other to type "b", the combined crack must be regarded as a type "b" crack.

Incipient cracks with a length of:

- $a < 80\text{mm}$
- $b < 60\text{mm}$

are **acceptable**. The friction surfaces may contain several randomly arranged incipient cracks.

Incipient cracks with a length of:

- $80\text{mm} < a < 100\text{mm}$
- $60\text{mm} < b < 80\text{mm}$

are **conditionally acceptable**. A minimum distance of 50mm from the nearest conditionally acceptable incipient crack is mandatory. Brake discs containing conditionally acceptable incipient cracks may continue to be used until the next checkup. If so required by the state of the brake disc, the intervals between inspections will have to be shortened.

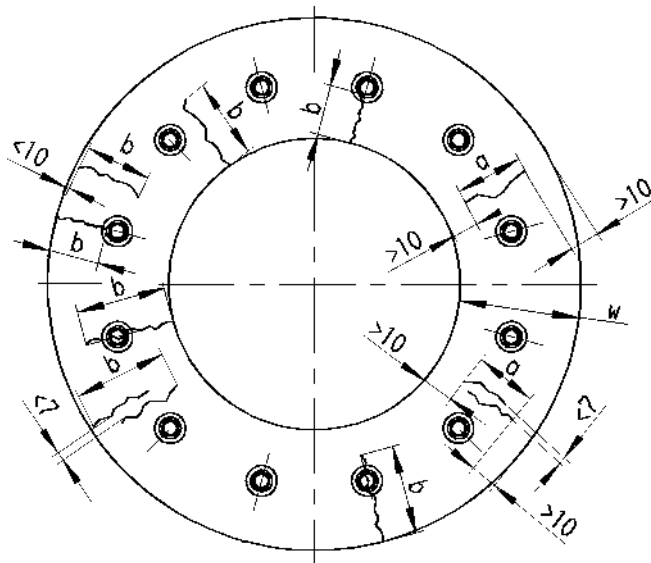


Incipient cracks with a length of:

- $a > 100\text{mm}$
- $b > 80\text{mm}$

are **not acceptable**. Friction rings with unacceptable incipient cracks must be exchanged at the very first opportunity.

Incipient cracks are **unacceptable** in the area where split friction rings are joined (Figure 7 and Figure 8).



C 132702/8

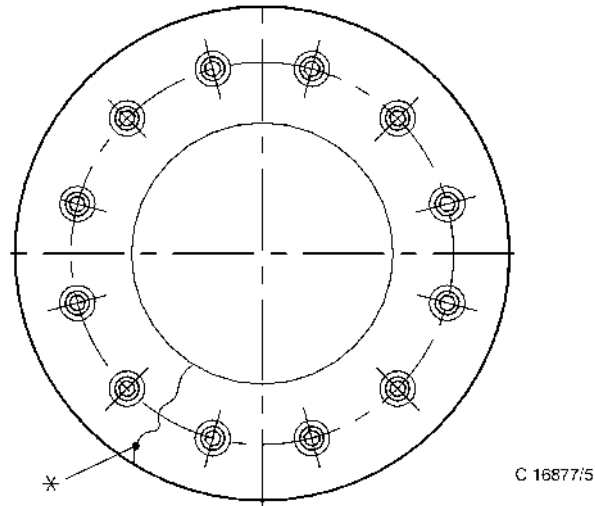
Figure 14 Typical incipient cracks

Through-cracks

Through-cracks are cracks that extend from the inside rim to the outside rim of the friction ring, or cracks that start at the rim and pass through the ring as far as the cooling ribs.

Through-cracks in the brake disc are **unacceptable** (see Figure 15).

Any brake disc with such cracks must be **immediately** exchanged. It cannot be used any longer.



* Through-crack

Figure 15 Typical through-crack

6.1.3.2 Inspecting for scorch marks, material deposits and flaking

The friction rings of the wheel-mounted brake discs must be inspected for scorch marks, material deposits and flaking.

Scorched wheel-mounted brake discs may continue to be used provided they do not have any through-cracks or major incipient cracks. If any such wheel-mounted brake disc is retained for further use, it must be given extra visual inspections between the specified servicing appointments.

Scorch marks on wheel-mounted brake discs are caused by rapidly rising temperatures. The cause of the trouble must be traced and corrective action taken to avoid damage. One or more of the following symptoms may appear:

- Brake pads worn unevenly
- Brake pads defective (e.g. because of overheating):
 - Exchange the brake pads for new ones.
- Brake pads of unsuitable material:
 - Install brake pads of the specified kind.
- Onboard brake control unit not working correctly:
 - Check and repair the brake control unit.
- The amounts of wobble and parallel misalignment exceed the values specified in the installation drawing of the wheel-mounted brake disc (chattering during brake application):
 - Trace and correct the causes.



6.1.3.3 Inspecting the bolted fasteners

Sight-check the bolted fasteners. Loose wheel-mounted brake discs signify a loss of bolt pretensioning force and must be examined more precisely.



NOTE

For the purpose of inspecting the bolted fasteners, a tightening torque of 90% of the torque value specified in the installation drawing may be applied.

Such a situation must be reported to KNORR-BREMSE.

6.1.3.4 Checking for wear



NOTE

A steel straightedge applied to the friction surfaces of the friction ring may prove useful for checking for wear.

- Check the wear limit "T" on both friction rings of the brake disc using the straightedge (see installation drawing and Figure 16).



WARNING

Brake discs worn out.

Brake pads might come into contact with the bolted fasteners once the wear limit "T" is reached!

This might lead to damage to the bolted fasteners or to loss of the brake disc!

Immediately exchange the brake disc as soon as the wear limit "T" is reached at the point worn most on a friction ring. This applies equally to the concave wear "H" and the slanting wear "S" (see below).



NOTE

If the two sides have worn by a difference of more than 2mm, the friction rings will have to be faced off in accordance with Section 6.3 to avoid differing thermal behaviour. This is also true if the wear limit "T" has not yet been reached.

Not being completely covered by the pad, the brake disc suffers gradually from what is called concave wear, which means the disc wears less near the edges than in the middle of the friction surface.

- Measure the concave wear "H", e.g. using a straightedge (see Figure 16).

Slanting wear "S" may also occur during service. This means the disc wears more severely at the inside or outside rim.

- Measure the slanting wear "S", e.g. using a straightedge (see Figure 16).

Scoring may, for example, be caused by hard inclusions in the pad. In case of scoring, the brake pad must be sight-checked and exchanged if so required.



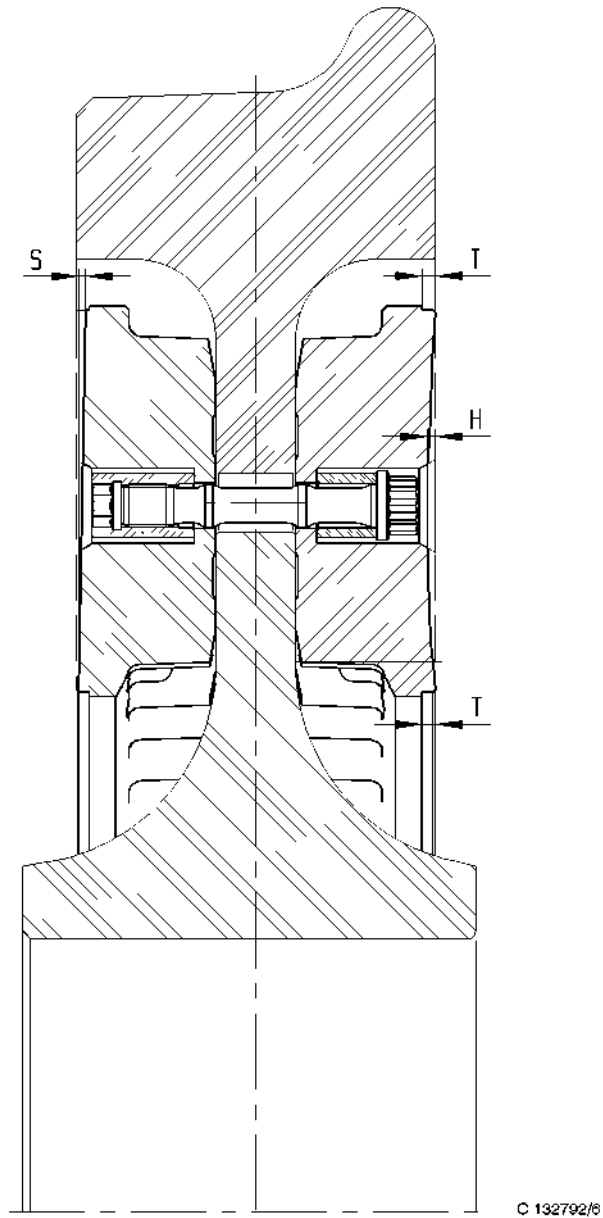
NOTE

Brake discs exceeding the limits allowed for concave wear, slanting wear or scoring must be faced off in accordance with Section 6.3 to avoid damage.

Slanting wear S, concave wear H and scoring must be checked against the following criteria.

- Use of sintered pads:
 - Concave wear "H" = 1 mm max.
 - Slanting wear "S" = 1 mm max.
 - Scoring = maximum of 1mm deep

- Use of organic pads:
 - Concave wear "H" = 2mm max.
 - Slanting wear "S" = 2mm max.
 - Scoring = maximum of 2 mm deep



H Concave wear
S Slanting wear

T Condemning limit

Figure 16 Checking the wheel-mounted brake disc for wear



6.2 Servicing

6.2.1 Interval

Activity	Interval
Cleaning the cooling ribs	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.2.2 Special tools

Not required

6.2.3 Procedure



WARNING

Beware of parts and particles flung outwards!

Irreversible eye injuries.

Wear goggles.

The cooling ribs must be inspected for dirt deposits and, if necessary, cleaned with compressed air.



6.3 Repair - facing off

The wheel-mounted brake discs must be left on the wheel for facing off.



NOTE

Friction rings may be faced off only if the following conditions are satisfied.

The crack criteria do not require the brake disc to be exchanged (see Section 6.1.3.1).

The wear limit "T" will not be reached by facing off (see Section 6.1.3.4).

After facing off, the friction rings must not differ by more than 2mm in thickness (see "e", Figure 4). The installation drawing for each specific wheel-mounted brake disc indicates the acceptable amounts of wobble and parallel misalignment, and specifies the friction surface finish.

Having been faced off, the brake disc must meet the specifications in Section 6.1 and in the relevant installation drawing.

Checking after facing off:

- Measuring the wobble on both friction rings
- Checking the surface finish
- Inspecting the brake disc in accordance with Section 6.1

6.4 Replacement

There is no provision for overhauling the unit. The unit must be exchanged in accordance with the directions in Section 6.4.1.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

There is no provision for overhauling the brake disc.

If the inspection according to Section 6.1 prohibits any further use of the brake disc, the latter must be replaced in accordance with Section 5.



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Chattering during brake application	Major wear in the middle of the brake disc	Face off the wheel-mounted brake discs.	Section 6.3
Friction ring surface damaged, severely worn	Brake pads severely worn, or brake application without pads	Face off the wheel-mounted brake discs.	Section 6.3



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.



9 Annex

Installation record

Name of the technician in charge	
Date	
Serial No. of the wheel (or wheelset)	
Serial No. of the friction rings (inner / outer) Record positions 1, 2, 3 (Figure 2 or Figure 3) on each wheel-mounted friction ring	
Parts agree with parts list	Sig.:
Surface roughness, wobble and parallel misalignment of wheel member according to installation drawing	Sig.:
Contact surfaces metallically bright	Sig.:
Contact surfaces of wheel member and keyed plugs coated with Molykote D321 R	Sig.:
Threads and mating surfaces of all fasteners oiled	Sig.:
All keyed plugs installed according to installation drawing	Sig.:
2 friction rings positioned according to installation drawing	Sig.:
All fasteners installed according to installation drawing. Separate sheet called "Record of actual torques and angles" also completed	Sig.:
Wobble checked against installation drawing	Sig.:

Approved by:



Record of actual torques and angles

Preassembly:

	All the bolted fasteners have been preassembled in accordance with Section 5.1 and the installation drawing.
--	--

Final assembly:

Bolt No.	Resulting torque [Nm]	Torquing angle of 50% to 100% of the torque [°]
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		

.....
.....
B - F R 1 2 . 2 4

Rév. 00 - 08.04.2010 - fr
.....

.....
Description

Robinet de mécanicien
FBS1-5-SB2



Adresse

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

Ce document a été créé en langue allemande.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Contenu

1	Informations générales	5
1.1	Modifications techniques	5
1.2	A qui s'adresse cette documentation?	5
1.3	Avertissements et conseils d'utilisation	6
2	Introduction	7
2.1	Documents relatifs au projet	7
3	Informations de sécurité essentielles	8
3.1	Champ d'application	8
3.2	Utilisation correcte	8
3.3	Code de déontologie de l'exploitant	8
3.3.1	Personnel	8
3.3.2	Mise à disposition de la documentation	8
3.3.3	Compléments à la documentation	9
3.3.4	Pièces de rechange et pièces d'usure	9
4	Description technique	10
4.1	Caractéristiques techniques	10
4.2	Structure	11
4.3	Mode de fonctionnement	13
5	Montage et démontage	16
5.1	Montage	16
5.1.1	Exigences	17
5.1.2	Procédure	17
5.1.3	Essai d'étanchéité	18
5.1.4	Essai fonctionnel	18
5.2	Démontage	19
5.2.1	Exigences	19
5.2.2	Procédure	19



6	Maintenance	21
6.1	Contrôles	21
6.1.1	Intervalle	21
6.1.2	Outillage spécial	21
6.1.3	Exécution	21
6.2	Entretien	22
6.3	Maintenance corrective	22
6.4	Révision	22
6.4.1	Intervalle	22
7	Recherche de pannes	23
7.1	Outillage spécial	23
7.2	Exécution	23
8	Elimination	24



1 Informations générales



DANGER

Veillez lire ce document attentivement et dans son intégralité afin d'assurer une exploitation fiable et d'éviter les dommages corporels et les dégâts matériels!

1.1 Modifications techniques

KB SfS se réserve le droit d'apporter à tout moment et sans préavis des modifications à l'équipement, objet du présent document, ou à ce document.

1.2 A qui s'adresse cette documentation?

Cette documentation s'adresse à des techniciens de service formés par KB SfS qui

- en raison de leurs connaissances et de leur expérience sont à même d'effectuer de manière experte et en respectant la sécurité
 - le montage et le démontage de l'équipement,
 - les contrôles, l'entretien et la recherche de pannes sur l'équipement,
- ont lu entièrement cette documentation et l'ont comprise
- sont familiarisés avec les prescriptions de sécurité et la prévention des accidents pour ce type d'interventions.



REMARQUE

Cette documentation s'adresse également à d'autres groupes cibles, tels que les ingénieurs de projet.

Ces autres groupes cibles ne peuvent cependant prétendre à des informations exhaustives.



1.3 Avertissements et conseils d'utilisation

Dans ce document, les avertissements sont différenciés selon les niveaux de danger suivants:



DANGER

Le non-respect de ces consignes provoque des dommages corporels irréversibles qui peuvent, le cas échéant, entraîner la mort.



AVERTISSEMENT

Le non-respect de ces consignes peut provoquer des blessures corporelles irréversibles et, le cas échéant, entraîner la mort.



ATTENTION

Le non-respect de ces consignes peut provoquer des dommages corporels et/ou des dégâts sur les équipements ou l'environnement.

Explication de la structure des consignes de sécurité en prenant comme exemple le pictogramme DANGER:



DANGER

Source du danger

Conséquence du danger

Remèdes

Les conseils d'utilisation ne contiennent pas d'indications relevant de la sécurité et sont uniquement listés dans le but de fournir un aperçu complet.



REMARQUE

Les remarques vous donnent des astuces judicieuses ainsi que des informations supplémentaires concernant l'équipement.

Des avertissements figurant dans d'autres chapitres de cette description attirent votre attention sur les différents risques que recèlent les différentes applications. Les avertissements et conseils d'utilisation précèdent généralement le texte de description de l'application.



2 Introduction

Cette description contient des données spécifiques à l'appareil et informe sur le fonctionnement, le montage, le démontage, l'essai fonctionnel et les travaux de maintenance effectués sur l'appareil à l'état monté.

2.1 Documents relatifs au projet

C134636	Plan de montage du robinet de mécanicien FBS1-5-SB2
N65981/3	Schéma électrique
GD15719	Information technique - Dispositif d'actionnement modulaire Motion Controller Kit
WB420332A	Aperçu des couples de serrage prescrits



3 Informations de sécurité essentielles

3.1 Champ d'application



AVERTISSEMENT

Remarque de validité (numéro de référence ou désignation abrégée du type) non respectée!

Les conséquences peuvent être des dommages aux personnes et des dégâts sur l'appareil.

Toujours respecter les remarques de validité mentionnées dans le document. Le numéro de référence ou la désignation abrégée de type indiqués sur la plaque signalétique doivent correspondre à la remarque de validité mentionnée dans le document.

Le présent document s'applique aux équipements portant le numéro de référence:

II67813



REMARQUE

Si l'équipement ne peut plus être identifié de façon univoque - par exemple si la plaque signalétique est illisible ou introuvable - veuillez vous adresser à un Service Center KB SfS.

3.2 Utilisation correcte

L'appareil cité au chapitre 3.1 ne peut être utilisé que dans le système afférent conçu par KB SfS pour le véhicule respectif.

Toute autre possibilité d'utilisation et d'application ainsi que les modifications, les appareils rapportés ou les transformations peuvent menacer la sécurité, la fiabilité et le fonctionnement du système et excluent tout droit à la garantie vis-à-vis de KB SfS. La responsabilité appartient alors à l'exploitant.

Si d'autres possibilités d'utilisation et d'application sont envisagées, il est nécessaire de contacter KB SfS.

3.3 Code de déontologie de l'exploitant

3.3.1 Personnel

L'exploitant doit veiller à ce que le personnel intervenant soit qualifié pour les interventions prévues conformément à la définition du groupe cible.

3.3.2 Mise à disposition de la documentation

L'exploitant doit veiller à ce que la présente documentation soit toujours à portée de la main du personnel intervenant et soit complète, actuelle et bien lisible.



3.3.3 Compléments à la documentation

L'exploitant doit veiller à ce que le présent document soit tenu à jour régulièrement par l'ajout ou le remplacement de consignes en raison des points suivants sur le lieu d'intervention respectif:

- prescriptions légales relatives à la prévention des accidents
- prescriptions légales relatives à la protection contre les accidents
- prescriptions des caisses de prévoyance contre les accidents

3.3.4 Pièces de rechange et pièces d'usure

L'exploitant doit veiller à ce que seules des pièces d'origine KB SfS ou des pièces de rechange ou des pièces d'usure autorisées par KB SfS soient utilisées.

Le montage de pièces de rechange non autorisées peut entraver la sécurité et la fiabilité de l'appareil individuel et du système total et exclut le droit à la garantie de la part de KB SfS.



4 Description technique

L'équipement sert à la commande, en fonction de la position, du frein automatique à air comprimé et à action indirecte modérable au desserrage.

4.1 Caractéristiques techniques

L'équipement présente les caractéristiques suivantes:

- Modèle pour montage sur le pupitre de conduite
- Disposition compacte des sous-ensembles fonctionnels dans un corps
- remplacement simple et rapide de l'équipement
- identification rapide des défauts puisque toutes les fonctions sont réunies dans l'équipement
- Modèle avec soupape de frein à action rapide à actionnement par liaison à engagement positif
- exécution avec levier d'actionnement
- Niveau d'actionnement vertical du levier de commande
- Actionnement de huit commutateurs électriques

Code du type

FBS1-5-SB2

- F - Dispositif d'actionnement
- B - Levier de frein
- S - Position déterminante
- 1 - Dispositif de levier unique
- 5 - Numéros de variantes continus
- SB2 - Soupape de frein à action rapide et directe

Les caractéristiques techniques de l'équipement ainsi que les informations techniques sont indiquées sur le plan de montage.



4.2 Structure

Voir Fig. 1, Fig. 2, Fig. 3

Dans le corps (a) se trouvent:

- l'arbre à cames (b) avec les cames d'actionnement
- le crantage (c)
- les interrupteurs électriques instantanés (d)
- la soupape de frein à action rapide (e)
- l'arbre (g) avec le levier d'actionnement (f)
- l'engrenage cylindrique (h)

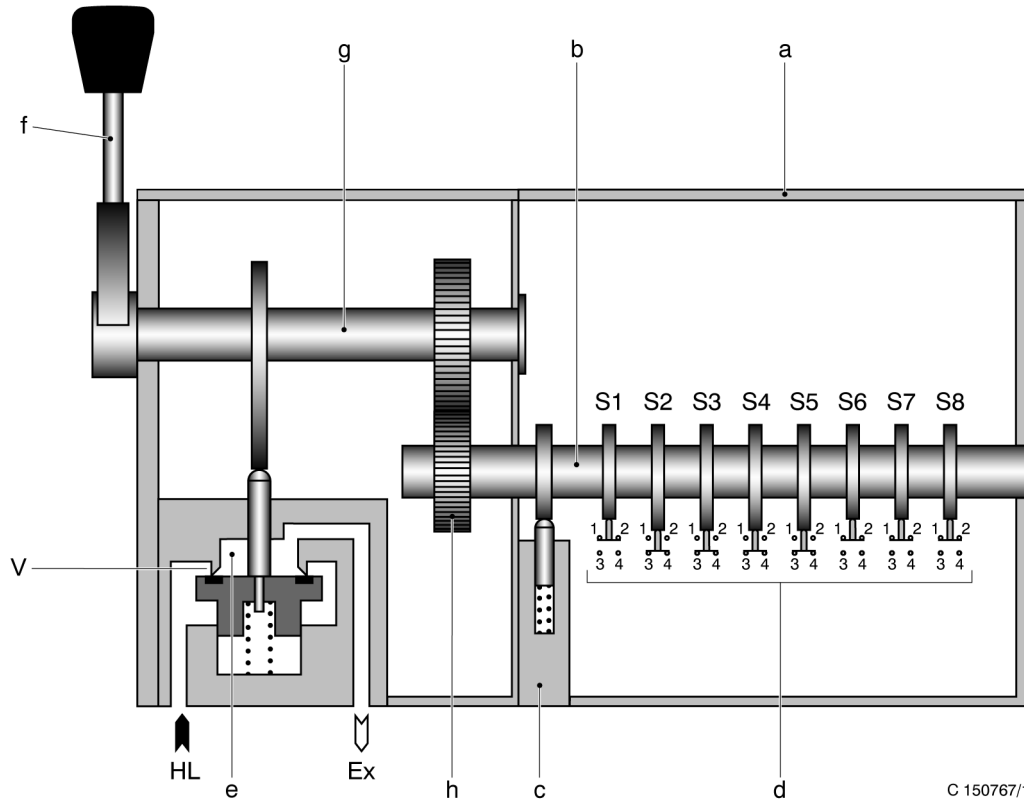
L'équipement est doté d'interrupteurs électriques instantanés (d). Le nombre d'interrupteurs instantanés et la position de commutation de chaque interrupteur instantané (d) dépendent de la position du levier d'actionnement (f) et figurent sur le plan de montage.

L'arbre à cames (b) et l'arbre (g) sont équipés de roues cylindriques. Elles forment l'engrenage cylindrique (h). La rotation du levier d'actionnement (f) est transmise à l'arbre à cames (b) par l'engrenage cylindrique (h).

Le levier d'actionnement (f) peut être placé dans différentes positions. Une fonctionnalité est attribuée à chaque position du levier d'actionnement (voir plan de montage).

Les différentes positions du levier d'actionnement (f) sont réalisées soit par impulsions soit arrêtées sur crans. Le schéma de crantage figure sur le plan de montage.

La soupape de frein à action rapide (e) n'est pas pilotée, c'est-à-dire que la conduite générale est purgée directement par la purge de la conduite présente sur l'équipement.



- | | | | |
|----------|----------------------------------|-----------|-----------------------|
| a | Corps | V | Siège de soupape |
| b | Arbre à cames | | Raccords pneumatiques |
| c | Crantage | Ex | Purge |
| d | Interrupteur instantané | CG | Conduite générale |
| e | Soupape de frein à action rapide | | |
| f | Levier d'actionnement | | |
| g | Arbre | | |
| h | Engrenage cylindrique | | |

Fig. 1 Robinet de mécanicien FBS1-5-SB2
(Schéma)



4.3 Mode de fonctionnement

Voir Fig. 1

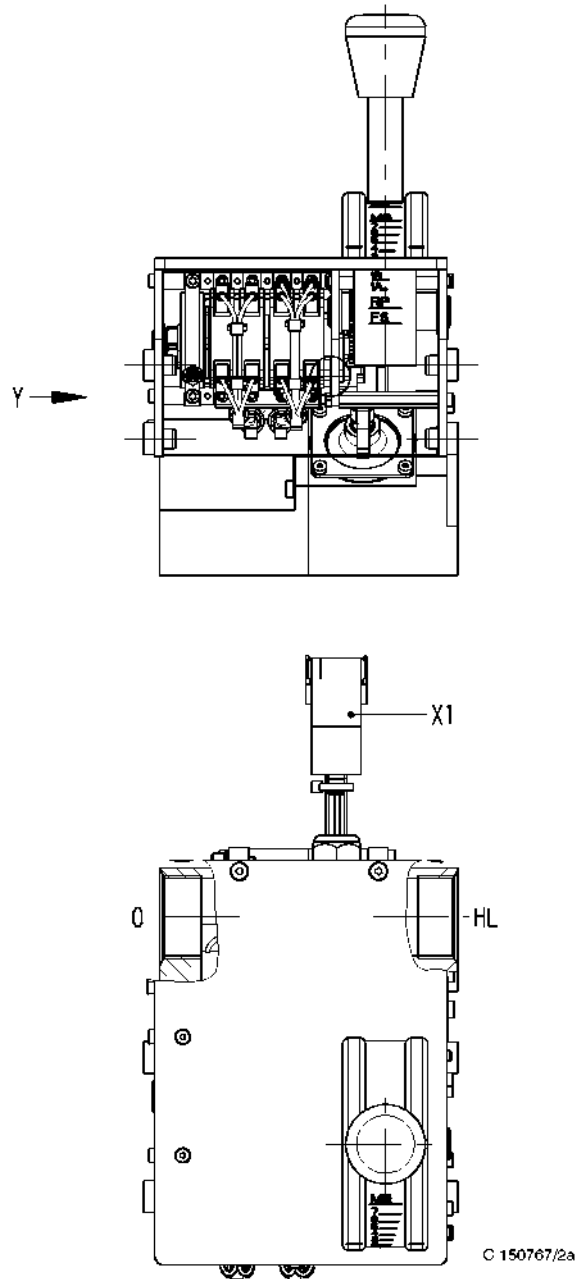
L'arbre (g) est tourné en fonction de la position (angle) du levier d'actionnement (f). Le mouvement de rotation est transmis par le biais de l'engrenage cylindrique (h) à l'arbre à cames (b). Des disques à cames sont placés de manière fixe sur l'arbre à cames (b). Ces disques à cames sont en contact avec les galets palpeurs des interrupteurs instantanés (d) et actionnent ainsi ces interrupteurs instantanés (d). Cela provoque l'ouverture ou la fermeture des contacts raccordés.

Pour la position de l'interrupteur concerné, voir le plan de montage.

En position de commutation SB, la soupape de frein à action rapide (e) peut être également actionnée. Le siège de soupape V est ouvert et la pression HL est purgée.

C'est par le crantage (c) que s'effectue l'enclenchement dans les positions crantées du levier d'actionnement.

Les signaux électriques sont transmis à la commande de freinage via le connecteur de transfert X1. Pour connaître l'affectation des connecteurs, se référer au schéma électrique.

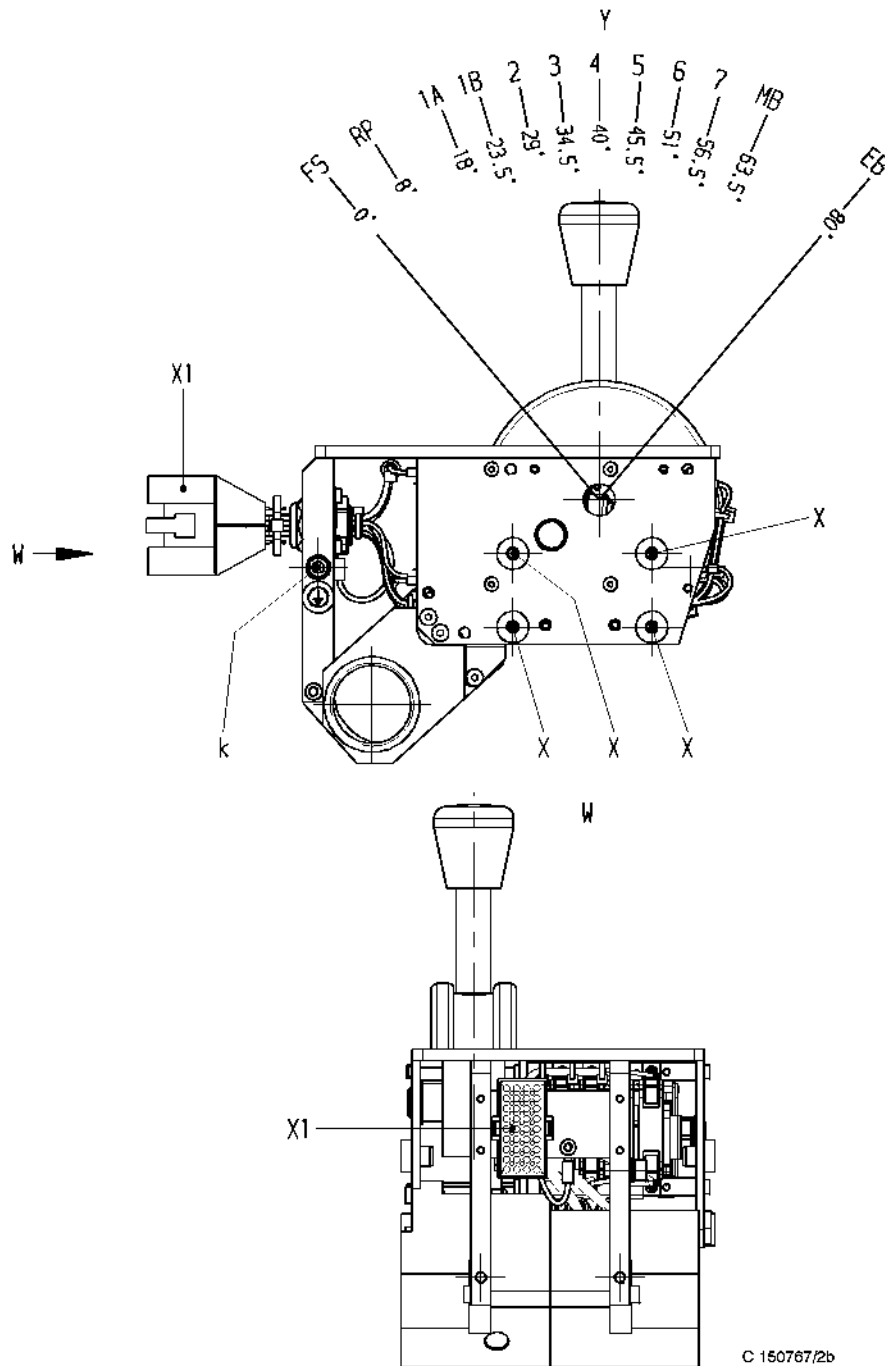


O Purge

CG Conduite générale

X1 Connecteur de transfert

Fig. 2 Robinet de mécanicien FBS1-5-SB2



k Vis de mise à la terre

X Points de fixation

X1 Connecteur de transfert

Fig. 3 Robinet de mécanicien FBS1-5-SB2



5 Montage et démontage

Voir Fig. 2 et Fig. 3



DANGER

Véhicule non sécurisé!

Déplacement intempestif d'un véhicule avec dommages aux personnes.

Respecter impérativement les prescriptions de l'entreprise portant sur la sécurisation des véhicules.

5.1 Montage



ATTENTION

Risque d'encrassement du système pneumatique!

Panne de fonctions de l'équipement ou de fonctions du système.

Empêcher l'infiltration d'impuretés lors du montage, le cas échéant purger les conduites du système pneumatique.



ATTENTION

Non-respect des instructions de montage!

Restriction de la sécurité et des fonctions.

Prise en compte des instructions ou des plans de montage.



ATTENTION

Montage d'équipements non contrôlés!

Réduction de la sécurité et des fonctions.

Avant de procéder au montage des équipements, s'assurer que seuls des équipements contrôlés sont utilisés.

Avant l'autorisation d'utilisation du véhicule, s'assurer que le système a été contrôlé et déclaré correct.



REMARQUE

Lors de l'utilisation de produits de nettoyage, de produits d'étanchéité, de colles, de matières consommables, de produits auxiliaires, etc., respecter impérativement les consignes de sécurité ainsi que les instructions de traitement des fabricants.



5.1.1 Exigences

Effectuer le montage à l'aide d'outils standard.

L'équipement est prévu pour le montage dans le pupitre de conduite du véhicule. Le lieu de montage doit par conséquent être prévu dès la conception du véhicule.

Respecter les remarques relatives à la position de montage et aux espaces de dégagement figurant dans le plan de montage de l'appareil.

Pour le montage, tout spécialement pour les données concernant les vis de fixation et les couples de serrage, consulter en plus les documents correspondants du constructeur du véhicule.

Les graisses suivantes sont requises et sont disponibles auprès de KB SfS sous le numéro de référence indiqué:

- Lubrifiant STABURAGS NBU 30 PTM (n° de commande: n° id. 503318)
- Lubrifiant RENOLIT L20 (n° de commande: n° id. 506043)

5.1.2 Procédure



DANGER

Haute tension!

Risque de blessures corporelles entraînant la mort.

Avant de commencer les travaux, couper l'alimentation électrique du véhicule et la protéger contre toute remise en marche intempestive.

Ne pas brancher ni débrancher le connecteur lorsqu'il se trouve sous tension.



ATTENTION

Danger en cas de montage incorrect de l'équipement!

Dégâts matériels ou restrictions fonctionnelles.

Lors du montage de l'équipement, exercer une contre-pression à l'aide d'un outil approprié, tel qu'une clé à fourche.



REMARQUE

Dans la mesure où ceci n'est pas mentionné expressément dans le texte qui suit, serrer tous les raccords vissés **uniformément** conformément aux prescriptions du document WB420332A – à partir de quatre points de fixation à serrer en croix.



DANGER

Raccords fermés ou bouchés!

Panne fonctionnelle de l'équipement ou du système pouvant entraîner une défaillance du système de freinage.

Assurer le passage libre sur les raccords.



- Enlever les caches des raccords pneumatiques de l'équipement et des conduites pneumatiques côté véhicule.
- Nettoyer soigneusement les raccords pneumatiques.
- Positionner l'équipement sur le pupitre de conduite et le monter à l'aide des éléments de fixation.
- Graisser **légèrement** le filetage des conduites pneumatiques côté véhicule avec du STABURAGS NBU 30 PTM.
- Visser les conduites pneumatiques côté véhicule dans les raccords pneumatiques de l'équipement.
- Graisser **légèrement** le filetage de la vis de mise à la terre (k) avec du RENOLIT L20.
- Fixer le câble de mise à la terre côté véhicule sur l'équipement en utilisant la vis de mise à la terre (k).
Couple de serrage: voir plan de montage
- Brancher et sécuriser la prise de l'équipement côté véhicule sur le connecteur de transfert X1 de l'équipement.
- Assurer la production d'air comprimé de l'équipement.
- Etablir l'alimentation électrique.

5.1.3 Essai d'étanchéité



DANGER

Haute tension!

Risque de blessures corporelles entraînant la mort.

L'équipement, doté de composants électriques, doit être contrôlé exclusivement par du personnel spécialement formé et autorisé.

Exclure tout contact d'un produit d'essai d'étanchéité avec les composants électriques sous tension.

Contrôler l'étanchéité à l'aide d'un produit de contrôle de l'étanchéité. Faute de produit approprié, l'essai peut aussi être exécuté avec de l'eau savonneuse.

- Contrôler l'étanchéité au niveau des raccords de conduites à la pression de service maximale autorisée. Aucune bulle d'air ne doit se former.
- Après l'essai, enlever immédiatement toute trace de produit de contrôle ou de savon.

5.1.4 Essai fonctionnel

L'appareil fait partie intégrante d'un système et doit être contrôlé en rapport avec le système conformément à une notice de l'administration du chemin de fer/du constructeur du véhicule.



5.2 Démontage



AVERTISSEMENT

Le système pneumatique est sous haute pression!
Les particules projetées provoquent p. ex. de graves lésions oculaires.
Respecter les prescriptions de sécurité relatives aux installations pneumatiques.
Avant le démontage, mettre le système (ou partie du système) hors pression.



ATTENTION

Risque d'encrassement du système pneumatique!
Panne de fonctions de l'équipement ou de fonctions du système.
Empêcher l'infiltration d'impuretés lors du montage, le cas échéant purger les conduites du système pneumatique.

5.2.1 Exigences

Effectuer le démontage à l'aide d'outils standard.

5.2.2 Procédure



DANGER

Haute tension!
Risque de blessures corporelles entraînant la mort.
Avant de commencer les travaux, couper l'alimentation électrique du véhicule et la protéger contre toute remise en marche intempestive.
Ne pas brancher ni débrancher le connecteur lorsqu'il se trouve sous tension.



ATTENTION

Danger en cas de démontage incorrect de l'équipement!
Dégâts matériels ou restrictions fonctionnelles.
Lors du démontage de l'équipement, exercer une contre-pression à l'aide d'un outil approprié, tel qu'une clé à fourche.

- Interrompre la production d'air comprimé, purger toutes les conduites pneumatiques raccordées et tous les réservoirs. L'équipement doit être dépourvu d'air comprimé.
- Couper l'alimentation électrique et protéger l'équipement contre toute remise en marche intempestive. L'équipement ne doit plus être sous tension.



- Retirer la prise électrique de l'équipement côté véhicule du connecteur de transfert X1 de l'équipement; pour ce faire, ôter la sécurité de la prise puis retirer la prise.
- Dévisser la vis de mise à la terre (k) de l'équipement et ôter le câble de mise à la terre côté véhicule.
- Visser de nouveau la vis de mise à la terre (k) sur l'équipement.
- Débrancher les conduites pneumatiques côté véhicule des raccords pneumatiques de l'équipement.
- Dévisser les éléments de fixation de l'équipement et sortir celui-ci du pupitre de conduite.
- Recouvrir les raccords pneumatiques de l'équipement.
- Si aucun équipement de remplacement n'est mis en place immédiatement après le démontage, recouvrir les conduites pneumatiques côté véhicule.
- Sécuriser le câble de raccordement côté véhicule ainsi que le câble de mise à la terre.



6 Maintenance

KB Sfs subdivise généralement les opérations de maintenance comme suit:

- Inspection
- Entretien
- Maintenance corrective
- Révision

Les intervalles nécessaires pour les interventions décrites ci-après dépendent des exigences légales du service, des conditions de service de l'appareil et des effets de l'environnement dans la région d'exploitation des véhicules. Une indication générale ne portant pas sur un projet spécifique d'un intervalle n'est possible que de manière limitée.

Pendant la durée de vie, KB Sfs peut effectuer un contrôle de l'état des appareils à intervalles réguliers pour ses clients, afin de définir en commun les intervalles optimaux pour les travaux de maintenance du projet. L'intervalle à appliquer spécifique au projet découle des prescriptions mentionnées dans le tableau. La première prescription est plus importante que les prescriptions subordonnées dans l'ordre d'apparition.

6.1 Contrôles

L'aspect extérieur de l'équipement et la réalisation de sa fonction dans le système doivent être contrôlés à intervalles réguliers conformément aux prescriptions de l'exploitant du véhicule.

6.1.1 Intervalle

Intervention	Intervalle
Contrôles	1. Conformément à l'expérience spécifique au projet de l'exploitant du véhicule
	2. Conformément au plan de maintenance spécifique au projet (si existant)*
* L'élaboration d'un éventuel plan de maintenance spécifique au projet doit être effectuée conjointement par le client et KB Sfs.	

6.1.2 Outillage spécial

N'est pas nécessaire

6.1.3 Exécution

Voir les prescriptions de l'exploitant du véhicule



6.2 Entretien

N'est pas nécessaire

6.3 Maintenance corrective

Si une panne de l'appareil ne peut être éliminée par les mesures décrites au chapitre 7.2, contacter un Service Center KB SfS.

6.4 Révision

Chez KB SfS, la sécurité et la qualité sont prioritaires.

Afin de garantir cet état de fait, KB SfS propose la révision de ses appareils. La révision est effectuée conformément aux aspects de sécurité des processus de production de KB SfS en tant que fabricant de première monte.

L'expérience nécessaire et l'équipement technique pour une exécution correcte de la révision sont donnés dans les Service Center de KB SfS.

6.4.1 Intervalle

Pour déterminer l'intervalle jusqu'à la prochaine révision, en fonction des conditions de service, il est recommandé de contrôler le fonctionnement et l'état de quelques appareils pris au hasard après une certaine durée d'exploitation et de les désassembler pour contrôler leur degré d'usure.

Intervention	Intervalle
Révision	1. Conformément à l'expérience spécifique au projet de l'exploitant du véhicule
	2. Si existant, conformément au plan de maintenance spécifique au projet*
* Si un plan de maintenance spécifique au projet est élaboré, il doit l'être conjointement par le client et KB SfS.	



7 Recherche de pannes

En cas de dysfonctionnements de l'appareil, rechercher les causes possibles sur l'appareil à l'état monté. Les causes constatées peuvent être éliminées par le biais des conseils proposés afin d'y remédier.

7.1 Outillage spécial

N'est pas nécessaire

7.2 Exécution

Défaut	Cause	Elimination	Voir
L'équipement ne fonctionne pas	Absence d'activation pneumatique de l'équipement	Contrôler l'activation pneumatique de l'équipement.	
	Absence d'activation électrique de l'équipement	Contrôler les raccords enfichés.	
		Contrôler l'activation électrique de l'équipement.	
	Equipement défectueux	Démonter l'équipement, puis le remettre au service de maintenance corrective.	Section 5.2
De l'air s'échappe en permanence au niveau du raccord pneumatique.	Raccord non étanche	Resserrer le raccord (respecter le couple de serrage prescrit!) et vérifier l'étanchéité.	Section 5.1.3
De l'air s'échappe en permanence de la purge.	Equipement défectueux	Démonter l'équipement, puis le remettre au service de maintenance corrective.	Section 5.2
Le levier d'actionnement ne tient pas dans le crantage.			
Le levier d'actionnement est difficile à bouger			
Les commutateurs ne commutent pas ou pas correctement.			
Autres défauts			



8 Elimination



ATTENTION

Elimination non conforme de produits nuisibles à l'environnement!

Nuisances superflues de l'environnement et punissables par la loi.

Respecter les prescriptions d'élimination des administrations compétentes.

Les équipements de KB SfS se composent pour l'essentiel de pièces en métal, en caoutchouc et en matière plastique. A cela s'ajoutent les composants électroniques, les produits auxiliaires et les matières consommables.

Tous les matériaux doivent être, autant que possible, complètement séparés les uns des autres afin de permettre une élimination conforme. Lors de l'élimination, respecter les prescriptions nationales.

.....
.....
B - H E 1 0 . 4 0

Rev. 03 - 01.09.2014 - en
.....

.....
Description

Anti-skid valve
GV12-3
GV12-3S



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
02	13.06.2012	Revision history started		x				
		3.1	x					
		2.1, 4, 4.1, 4.2, 5.1.1, 5.1.2, 5.2.2					x	
		5.1						x
03	01.09.2014	2.1, 5.1.2, 5.2.2, 6.2, 7.2					x	
		3.1	x					
		4.2, 4.3, 5.1.1, 6, 6.1, 6.3, 6.4, 7		x				



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	12
4.3	Working principle	15
5	Removal and installation	22
5.1	Installation	22
5.1.1	Requirements	23
5.1.2	Procedure	23
5.1.3	Leakage testing	25
5.1.4	Function test	25
5.2	Removal	26
5.2.1	Requirements	26
5.2.2	Procedure	26



6	Maintenance	28
6.1	Inspection	28
6.1.1	Interval	28
6.1.2	Special tools	28
6.1.3	Procedure	28
6.2	Servicing	29
6.3	Repair	29
6.4	Overhaul	29
6.4.1	Interval	29
7	Troubleshooting	30
7.1	Special tools	30
7.2	Procedure	30
8	Disposal	32



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

B-IS30.24 Description of pressure sensor DG10

GD15904 Specification "packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

II34652/.....A

II64108/...S

II62473/...

II69733/...

II64108/...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

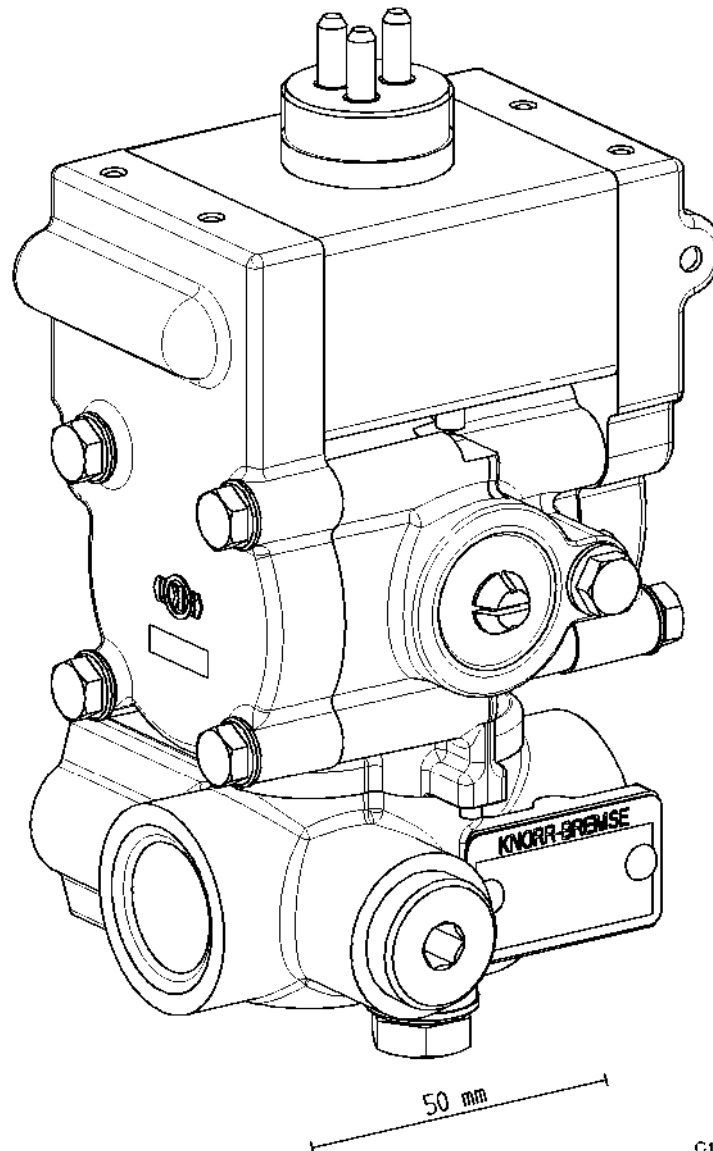
The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The unit is an integral part of the electronic wheel slide protection system designed for rail vehicles with direct-acting brake cylinders.



C13432/5

Figure 1 Anti-skid valve GSV12-3
(the unit with item number I164108/... is shown here by way of example)



4.1 Technical features

The unit is distinguished by the following features:

- The anti-skid valve is an integral part of the electronic wheel slide protection system for rail vehicles.
- It operates as an actuator in the wheel slide control loop.
- The anti-skid valve is driven by the electronic switching device.
- It is designed to reduce the brake cylinder pressure C step by step, and increase it again to the value D set by the distributor valve.

The installation drawing that goes with the unit contains the technical particulars of the unit.

4.2 Construction

See Figure 2 and Figure 3

The unit operates as an actuator in the wheel slide control system and is triggered by the electronic switching device. This influences the brake cylinder pressure in such a way that the brake force can be decreased step by step and then increased again to the value set by the brake control unit.

The anti-skid valve is pneumatically connected via the D port to the distributor valve or the pressure transformer, and via the C port to the brake cylinder that is being controlled.

The unit is connected electrically to the wheel slide protection electronics by a three-core cable.

The anti-skid valve has a three-pin plug by which it can be disconnected. The two wires II and III serve to drive the two valve magnets for venting and charging, while the wire I is the common return.

The unit consists essentially of a body (d) with two switching diaphragms, a twin valve magnet, two side plates joining the valve magnet to the body (d), and a valve bracket.

The body (d) has two valve seats (VD and VC). Each of them can be opened or closed by a diaphragm.

The D-diaphragm can open or close the path from the D-chamber (from the distributor valve) to the C-chamber (to the brake cylinder).

The C-diaphragm can link the C-chamber to O (atmosphere).

The twin valve magnet consists of two 3/2-way magnet valves (VM1 and VM2) whose coils share a common plastic casing. The contact pins by which the unit is connected electrically are integrally cast into the body (d).

When the two magnet armatures are deenergised, they seal the outer valve seats under the action of the armature springs; the inner valve seats are open (see Figure 3).

The two side plates contain the control chambers SD and SC for the diaphragms, and the feeders to the twin valve magnet.



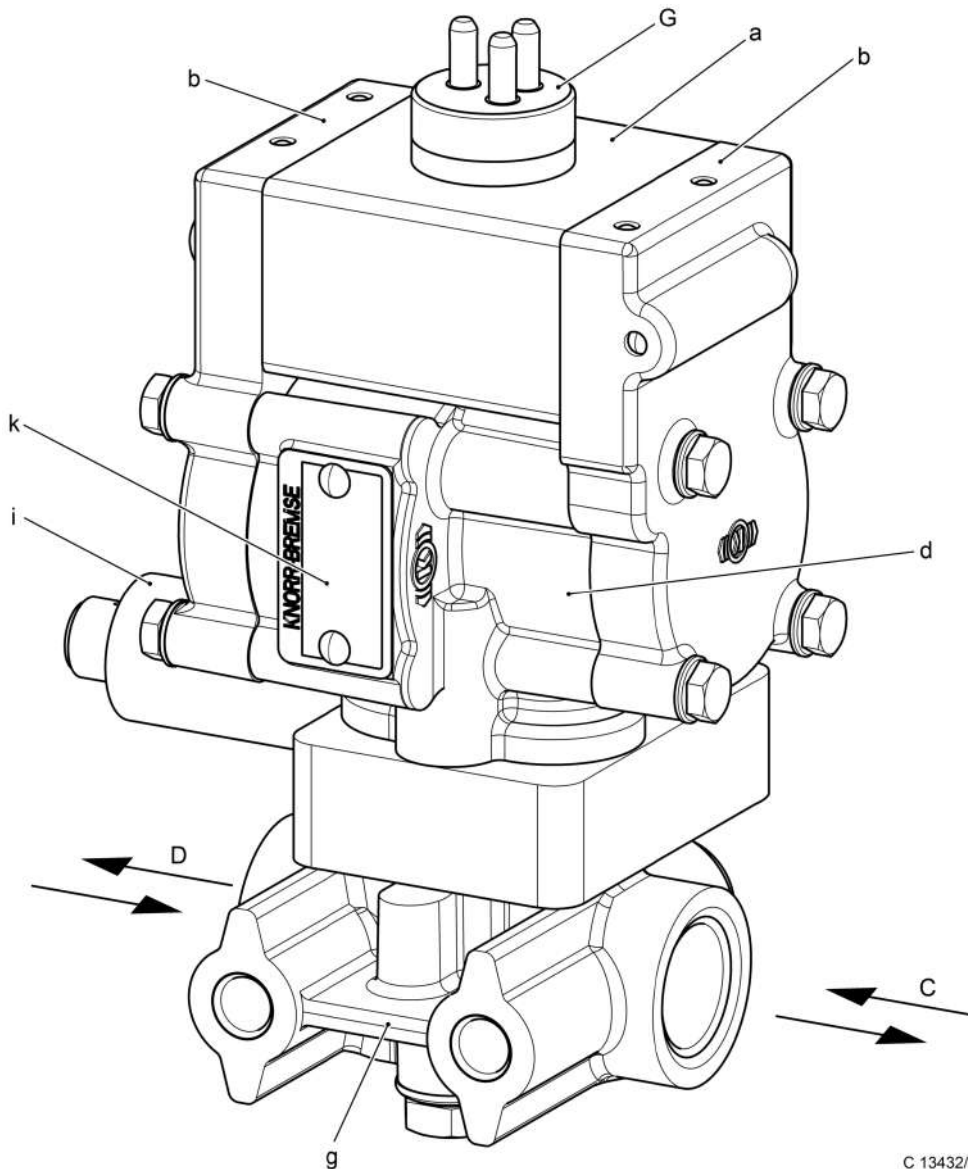
The anti-skid valve is screwed to a valve bracket. This has the two pipe threads for ports D and C. The chokes dD and dC are readily accessible after the anti-skid valve has been detached from the valve bracket (not every version contains the chokes). They are screwed into the valve bracket.

Units with the item number II64108/0060024S as equipped additionally with a pressure sensor (i). The brake sensor pressure is monitored electrically by the pressure sensor (i).



NOTE

The documents listed in Section 2.1 deal with the construction of the component assemblies used in the unit.



C 13432/6



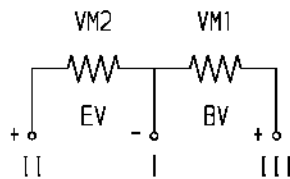
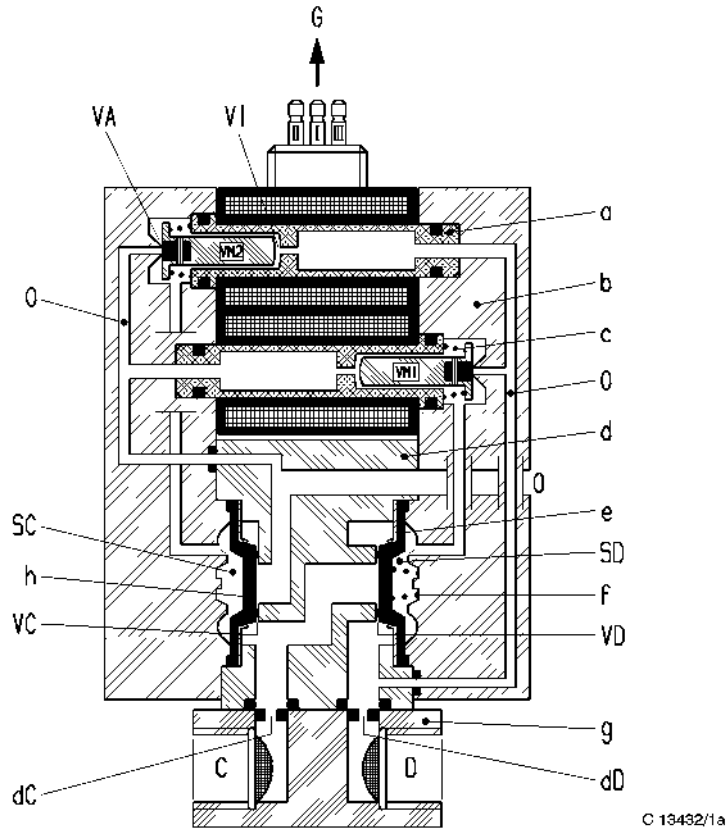
- | | | | |
|----------|-----------------|----------|--|
| a | Valve magnet | C | Port - brake cylinder |
| b | Side plate | D | Port - distributor valve or pressure transformer |
| d | Housing | G | Electric connection - wheel slide control unit |
| g | Valve bracket | | |
| i | Pressure sensor | | |
| k | Name plate | | |

Figure 2 Anti-skid valve GV12-3S
(the unit with item number II64108/0060024S is shown here by way of example)



4.3 Working principle

See Figure 3, Figure 4, Figure 5 and Figure 6





a	Twin valve magnet (VM1 and VM2)	C	Port - brake cylinder
b	Side plate	D	Port - distributor valve or pressure transformer
c	Armature spring	G	Electric connection - wheel slide control unit
d	Housing	O	Venting hole
dC	Choke (not in every version)	SC	Control chamber
dD	Choke (not in every version)	SD	Control chamber
e	D-diaphragm	VA	Outer valve seat
f	Compression spring	VC	Valve seat
g	Valve bracket	VD	Valve seat
h	C-diaphragm	VI	Inner valve seat
		VM1	Valve magnet
		VM2	Valve magnet

Figure 3 Anti-skid valve GV12-3
(schematic, brakes released - valve pressure unloaded)

Brake application and release without wheel slide protection (valve magnets VM1 and VM2 are not energised)

a) Brakes released (see Figure 3):

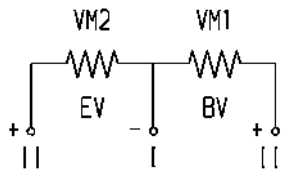
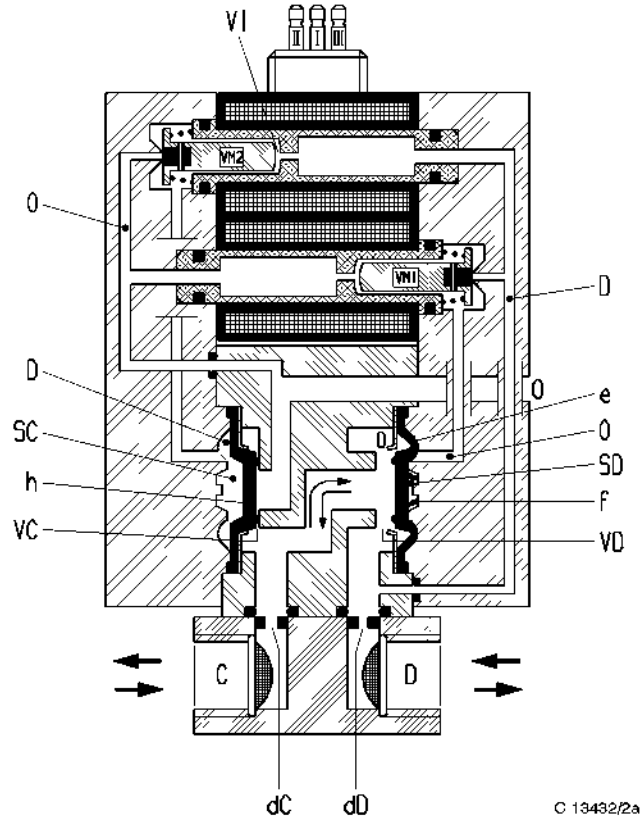
- The valve pressure is unloaded. The compression spring (f) holds the D-diaphragm (e) on the valve seat VD.

b) Brake application (see Figure 4):

- The D-pressure acts on the D-diaphragm (e). The latter is pushed to the right end position against the compression spring (f) because the control chamber SD is still unloaded. The valve seat VD is open.
- In contrast, the control chamber SC is charged by D-pressure through the open inner valve seat VI of the valve magnet VM2. The D-pressure (relative to the area of the valve seat VC) exerts a closing force on the C-diaphragm (h). The valve seat VC is closed. The passage from D to C is open. The vehicle brakes can be freely applied in this condition.

c) Releasing the brakes (see Figure 4):

- The valve stays in position even when the brakes are released, i.e. the passage between D and C is quite clear. Only when a low D-pressure is present, does the D-diaphragm (e) close as soon as the spring force predominates over the D-pressure (relative to the effective diaphragm area).
- The C-pressure is then discharged entirely through the valve seat VC as the D-pressure continues falling.



- | | | | |
|-----------|------------------------------|------------|--|
| dC | Choke (not in every version) | C | Port - brake cylinder |
| dD | Choke (not in every version) | D | Port - distributor valve or pressure transformer |
| e | D-diaphragm | O | Venting hole |
| f | Compression spring | SC | Control chamber |
| h | C-diaphragm | SD | Control chamber |
| | | VC | Valve seat |
| | | VD | Valve seat |
| | | VI | Inner valve seat |
| | | VM1 | Valve magnet |
| | | VM2 | Valve magnet |

Figure 4 Anti-skid valve GV12-3 (schematic, a) Brake application and release without wheel slide protection - b) Re-braking with wheel slide protection, valve magnets VM1 and VM2 not energised)



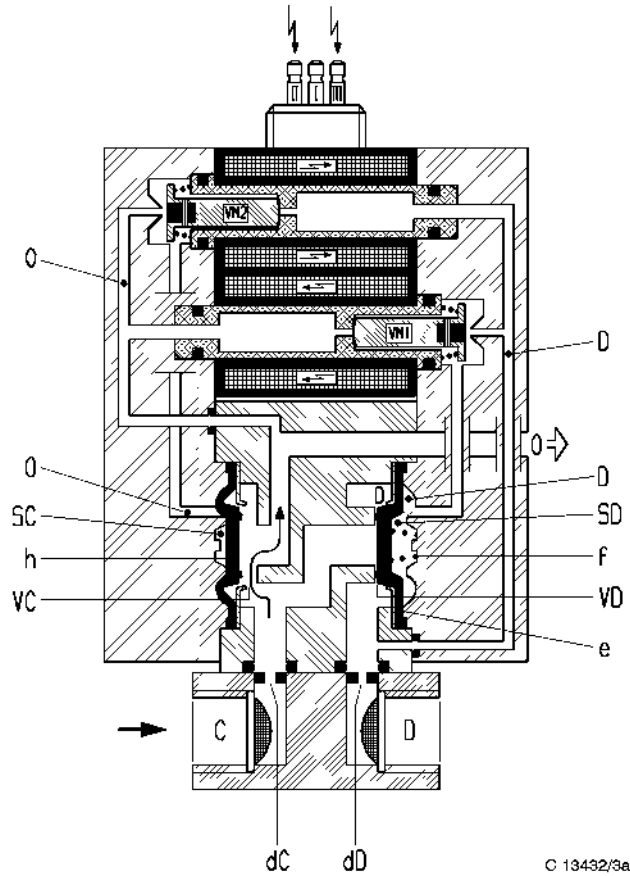
Brake release and re-braking with wheel slide protection

a) Brake release with wheel slide protection (see Figure 5):

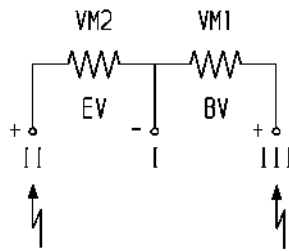
- Both valve magnets VM1 and VM2 are energised.
- The control chamber SD is charged by D-pressure through valve magnet VM1. The pressures are balanced across the D-diaphragm (e); the compression spring (f) pushes the diaphragm onto the valve seat VD. The D-pressure is shut off.
- The control chamber SC is vented through valve magnet VM2. The C-pressure pushes the C-diaphragm (h) to the left. The valve seat VC is open; the C-pressure escapes through VC to O.

b) Re-braking with wheel slide protection (see Figure 4):

- Neither of the two valve magnets VM1 and VM2 is energised.
- The control chamber SD is vented, SC is charged. The D-pressure acts on the D-diaphragm (e). The latter is pushed to the right end position against the compression spring (f) because the control chamber SD is still unloaded. The valve seat VD is open.
- In contrast, the control chamber SC is charged by D-pressure through the open inner valve seat VI of the valve magnet VM2. The D-pressure (relative to the area of the valve seat VC) exerts a closing force on the C-diaphragm (h). The valve seat VC is closed. The passage from D to C is open. The vehicle brakes can be freely applied in this condition.



C 13432/3a



C 13432/3b

- | | | | |
|-----------|------------------------------|------------|--|
| dC | Choke (not in every version) | C | Port - brake cylinder |
| dD | Choke (not in every version) | D | Port - distributor valve or pressure transformer |
| e | D-diaphragm | O | Venting hole |
| f | Compression spring | SC | Control chamber |
| h | C-diaphragm | SD | Control chamber |
| | | VC | Valve seat |
| | | VD | Valve seat |
| | | VM1 | Valve magnet |
| | | VM2 | Valve magnet |

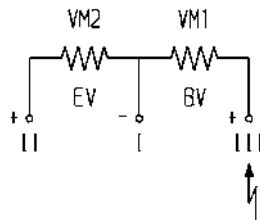
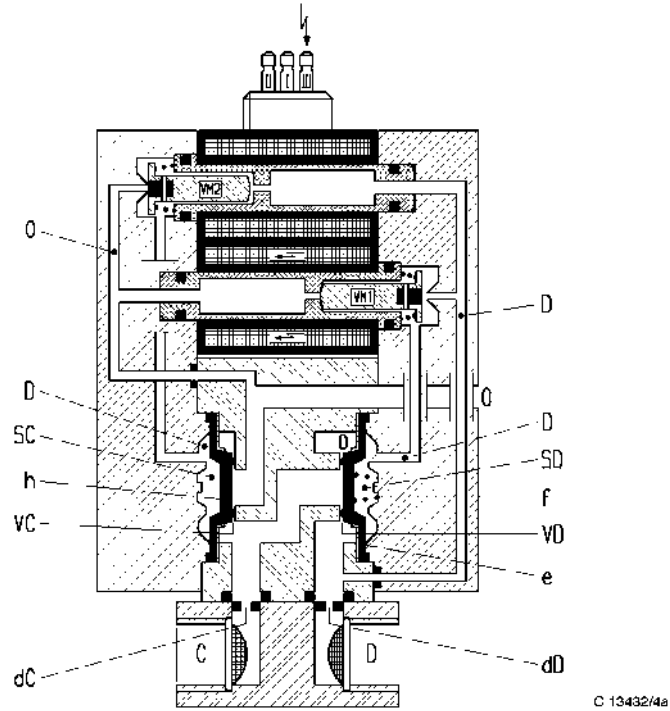
Figure 5 Anti-skid valve GV12-3 (schematic, brake release with wheel slide protection, valve magnets VM1 and VM2 energised)



Holding pressure at a constant level with wheel slide protection:

see Figure 6

- Valve magnet VM2 not energised, valve magnet VM1 energised.
- Both control chambers (SD, SC) are charged by D-pressure.
- The diaphragms close the valve seats VD and VC.
- The C-pressure is isolated from D and O.
- The valve magnets VM1 and VM2 can be suitably driven to generate steps of steady pressure during both the venting phase and the charging phase.
- Building up and discharging pressure can therefore be made to respond quickly (without pressure steps) or slowly (step by step) according to the needs of the wheel slide control logic.
- The pressure gradient for charging and venting (without pressure steps) is ruled by the chokes dD and dC. Their orifices depend on the C-volume that needs controlling (not every version contains the chokes).



- dC** Choke (not in every version)
- dD** Choke (not in every version)
- e** D-diaphragm
- f** Compression spring
- h** C-diaphragm

- C** Port - brake cylinder
- D** Port - distributor valve or pressure transformer
- O** Venting hole
- SC** Control chamber
- SD** Control chamber
- VC** Valve seat
- VD** Valve seat
- VM1** Valve magnet
- VM2** Valve magnet

Figure 6 Anti-skid valve GV12-3 (schematic, holding pressure with wheel slide protection, valve magnet VM1 energised)



NOTE

The documents listed in Section 2.1 deal with the working principle of the component assemblies used in the unit.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Only allowed to be installed are units that

- have been stored in compliance with the details given in the GD15904 regulation and

- whose date of manufacture has not exceeded the limit value specified in the GD15904 regulation.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricants are needed; they can be purchased from KNORR-BREMSE by their order numbers:

- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)
- RENOLIT L20 grease (order number: ID No. 506043)
- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail. Provide for a free flow through the ports.



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To remove and install the valve bracket (g), hold it securely with a suitable tool, such as an open-end wrench.



NOTE

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.



Installing the valve bracket (g) of the anti-skid valve:

- Release the hex-head bolts attaching the anti-skid valve to valve bracket (g), and remove the hex-head bolts together with the washers.
- Take the anti-skid valve off valve bracket (g).



NOTE

Versions with chokes (dC and dD) are identified by C and D letters embossed on the valve bracket (g). The installation drawing shows where the chokes belong.

- Take the covers off the ports of valve bracket (g) and off the onboard compressed air pipes.
- Thoroughly clean the ports.
- Lubricate the thread of the on-board air pipes with a **thin** film of STABURAGS NBU 30 PTM.



CAUTION

Beware of installing the valve bracket incorrectly!
The unit will be damaged and/or its functionality impaired.
The tightening torque may only be applied axially.

- Screw the onboard compressed air pipes into the mating ports of valve bracket (g).

Mounting the anti-skid valve on valve bracket (g):

- Thoroughly clean the joining surfaces of the valve bracket (g) and the unit.
- Lubricate the O-rings with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings in the grooves provided on the unit.
- Locate the unit on valve bracket (g), and fasten it in the correct mounting position using hex-head bolts and washers. Tighten the hex-head bolts alternately.
Tightening torque: see installation drawing.
- Unscrew the grounding screw from the unit and remove together with the spring washers.
- Lubricate the threads of the grounding screw with a **thin** film of RENOLIT L20 grease.
- Attach the on-board ground cable.
Tightening torque for the grounding screw: see installation drawing.



- Connect the unit's twin valve magnet electrically by plugging in and securing the connector.
- Only valid for units with item number I164108/0060024S:
 - Plug the on-board connecting cable into the pressure sensor (i) and secure it with the union nut.
- Connect the supply of compressed air to the unit.
- Connect the power supply.

5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint and pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leakage testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



WARNING

Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.



CAUTION

Beware of installing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove and install the valve bracket (g), hold it securely with a suitable tool such as an open-end wrench.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.
- Disconnect the twin valve magnet electrically by releasing the fastener and unplugging the connector.



- Only valid for units with item number I164108/0060024S:
 - Remove the union nut from the pressure sensor (i) and unplug the on-board connecting cable from the pressure sensor (i).
- Unscrew the grounding screw from the unit and remove it and the on-board ground cable.
- Screw the grounding screw with the spring washers back into the unit.

Detaching the anti-skid valve from valve bracket (g):

- Release the hex-head bolts attaching the unit to valve bracket (g), and remove the hex-head bolts and washers.
- Take the unit off valve bracket (g).
- Cover up the joining surface of the unit.

Removing the valve bracket (g):



NOTE

Leave valve bracket (g) on board the vehicle. Remove the valve bracket (g) only if it is damaged.



CAUTION

Beware of installing the valve bracket incorrectly!
The unit will be damaged and/or its functionality impaired.
The tightening torque may only be applied axially.

- Unscrew the on-board compressed air pipes from the valve bracket of the anti-skid valve, and remove the valve bracket.
- Cover up the ports and joining surfaces of the valve bracket.
- Cover up the on-board ports and secure the electric connecting cable and ground cable unless a replacement unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

**NOTE**

The documents listed in Section 2.1 contain further information about inspecting the component assemblies.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions



6.2 Servicing

**NOTE**

As regards servicing the component assemblies please refer to the applicable documents (see Section 2.1).

6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

**NOTE**

As regards repairing the component assemblies please refer to the applicable documents (see Section 2.1).

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

**NOTE**

As regards overhauling the component assemblies please refer to the applicable documents (see Section 2.1).

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

**NOTE**

As regards debugging the component assemblies please refer to the applicable documents (see Section 2.1).

7.1 Special tools

Not required

7.2 Procedure

**NOTE**

If the problem can be traced to specific component assemblies with the help of the pneumatic diagram, then the Descriptions relating to those component assemblies (see Section 2.1) will be required as support for debugging.

Problem	Cause	Remedy	See
Unit inoperative	Unit not being activated pneumatically	Test the unit for correct pneumatic control.	
	Unit not being activated electrically	Check the connector.	
		Test the unit for correct electric control.	
	Unit defective	Remove the unit and submit for repair.	Section 5.2
Invalid or no signal from pressure sensor (i)	Unit not being activated pneumatically	Test the unit for correct pneumatic control.	
	Unit not being activated electrically	Check the connector.	
		Test the unit for correct electric control.	
	Unit defective	Remove the unit and submit for repair.	See related document (Section 2.1)
Air discharging constantly from the ports on the unit	Connections leaking	Tighten the connections (apply the specified tightening torque!) and test for leakage.	Section 5.1.3



Problem	Cause	Remedy	See
Air discharging constantly from the flange joint (between unit and valve bracket)	Fasteners loose	Tighten the fasteners (observe the tightening torque!) and test for leakage.	Section 5.1.3
	O-rings damaged or missing	Remove the unit, add or exchange O-rings, install the unit and test for leakage.	Section 5.2, and 5.1
Air discharging constantly from exhaust bore O while valve magnets are deenergised	Unit defective	Remove the unit and submit for repair.	Section 5.2
Air discharging constantly from exhaust bore O while valve magnets are energised			



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - G Q 1 0 . 2 1

Rev. 03 (05/ 2008) -en
.....

.....
Description

Air filter

LF7-T; LF7-TF; LF7-TFF



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright 2008© Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	10
4.2	Construction	10
4.3	Working principle	11
5	Removal and installation	13
5.1	Installation	13
5.1.1	Requirements	13
5.1.2	Procedure	14
5.1.3	Leakage testing	15
5.1.4	Function testing	15
5.2	Removal	15
5.2.1	Requirements	15
5.2.2	Procedure	15



6	Maintenance	16
6.1	Inspection	16
6.1.1	Interval	16
6.1.2	Special tools	16
6.1.3	Procedure	16
6.2	Servicing	17
6.2.1	Interval	17
6.2.2	Special tools	17
6.2.3	Procedure	17
6.3	Repair	17
6.4	Overhaul	18
6.4.1	Interval	18
7	Troubleshooting	19
7.1	Special tools	19
7.2	Procedure	19
8	Disposal	20



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS trained service technicians who

- have the skill, experience, safety awareness and professional ability:
 - to remove and install the unit,
 - to inspect, maintain and debug the unit,
- have read and understood this document from start to finish, and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are included only for the sake of completeness.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity

**WARNING**

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

I88747

II61476

I88747K

STK8645

**NOTE**

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KB SfS parts or KB approved spares or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Technical description

Air filters are used in pneumatic systems to keep dirt out of the equipment installed there.

4.1 Technical features

The unit is distinguished by the following features:

- Designed for panel mounting
- Available with filter elements of various mesh sizes
- Two ways of connecting the ports
- Quick and easy to exchange

The installation drawing contains the technical particulars of the unit.

The letter "K" at the end of the item number denotes units with enhanced resistance to low temperatures.

4.2 Construction

See Figure 1

The air filter consists essentially of the following components:

- Housing (a)
- Filter element (b)
- Compression spring (c)
- O-rings (e)

The anodized aluminium housing (a) contains the filter element (b) which is held there by the force of the compression spring (c).

The plastic filter element (b) can move lengthwise and open or close the valve seat V as it does so. If the filter element gets very dirty, filtered or unfiltered compressed air can flow through the unit depending on whether A1 or A3 is chosen as the air inlet.

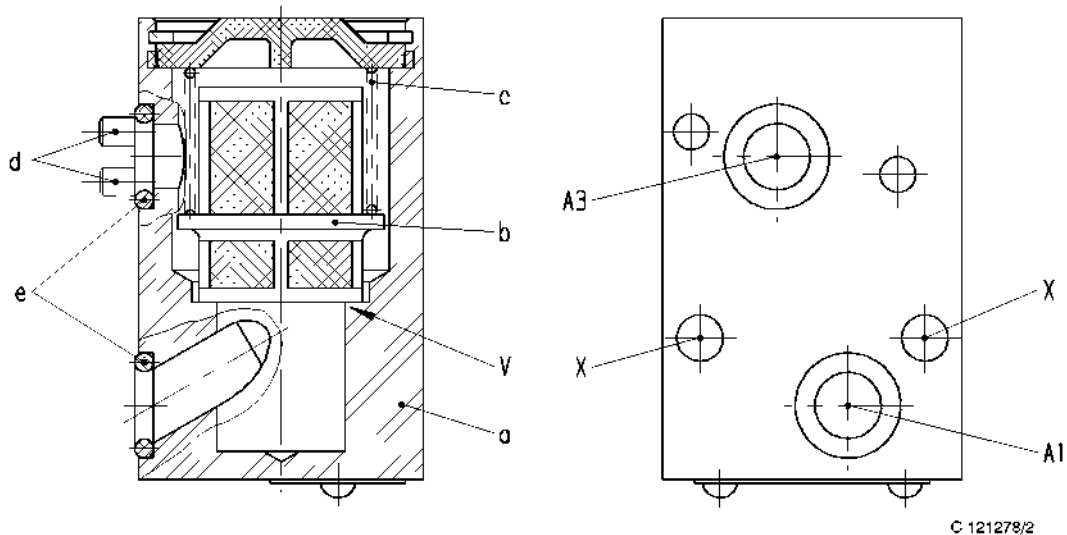
The mesh width of the filter element (b) varies according to the version of the air filter: it is 160µm for versions with item numbers I88747 and I88747K, 15µm for item number STK8645, and 5µm for item number II61476.

The housing (a) has two ports A1 and A3. O-rings (e) are used as seals at the ports mating with the mounting bracket.

The air filter is designed for mounting on a manifold panel, or for installation in pipeline systems on a mating pipe bracket.



The plug-in dowel pin (d) positions the air filter correctly on a manifold panel or bracket, and prevents the unit from being mistaken for any other. The unit is fastened through the two mounting holes X.



- | | | | |
|----------|--------------------|-----------|---------------|
| a | Housing | A1 | Port |
| b | Filter element | A2 | Port |
| c | Compression spring | V | Valve seat |
| d | Plug-in dowel pin | X | Mounting hole |
| e | O-ring | | |

Figure 1 Air filter LF7-T...

4.3 Working principle

See Figure 2

Air inlet at port A1:

Filter with a bypass for unfiltered air.

If the filter element (b) is extremely dirty, the pressure at A1 will lift it off the valve seat V against the thrust of the compression spring (c). The compressed air is then admitted without being filtered. The filter is bypassed by the compressed air.

Given this type of connection, the supply of compressed air to the downstream equipment has priority over protection from contamination.

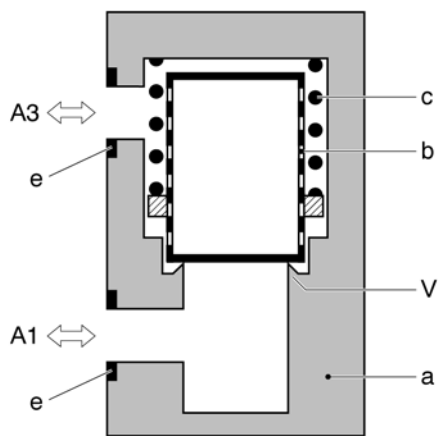


Air inlet at port A3:

Filter with a barrier against unfiltered air.

The filter element (b) is pressed hard against the valve seat V. It cannot be lifted off the valve seat V. Consequently, the air emerging from the port A1 is always filtered.

Given this type of connection, the filter is not bypassed by the compressed air. The protection of downstream assemblies from contamination has priority over supplying them with compressed air.



C 121278/1

- | | | | |
|----------|--------------------|-----------|------------|
| a | Housing | A1 | Port |
| b | Filter element | A2 | Port |
| c | Compression spring | V | Valve seat |
| e | O-ring | | |

Figure 2 Air filter LF7-T... (schematic)



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the maker's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.

5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.



The vehicle builder's documents on installation - especially the data on fastening screws and tightening torques - must also be observed.

The following lubricant is needed; it can be purchased from KB SfS by its order number:

- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - RENOLIT KBS1 (order number: ID No. 505887)
- For all other units:
 - RENOLIT HLT2-KB (order number: ID No. 502647)

5.1.2 Procedure



NOTE

New O-rings must always be used between the flange joints for the ports. Do not install new elastomers that are older than one year. Check the date of manufacture prior to use.

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.

- Take the covers off the ports of the unit and off the onboard mounting bracket.
- Thoroughly clean the ports.
- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - Lubricate O-rings (e) with a **thin** film of RENOLIT KBS1 grease.
- For all other units:
 - Lubricate O-rings (e) with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings (e) in their seats on the unit.
- Locate the unit on the joining surface of the mounting bracket so as to fit the plug-in dowel pins (d), and attach the unit by its fasteners.
- Connect the supply of compressed air.



5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports and connections.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Release the two screws from the mounting holes X, and remove the unit from the mounting bracket.
- Cover up the ports of the unit.
- Cover up the onboard ports unless an exchange unit is going to be fitted immediately after removal.



6 Maintenance

In general, maintenance at KB SfS is subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental conditions in the area where the vehicles are operated. An interval stated generally for all projects will therefore be of only limited validity.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find together with the customer the optimal maintenance intervals for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions





6.2 Servicing

Clean the air filter at regular intervals as the need arises or as instructed by the railway administration in charge of working.

6.2.1 Interval

Activity	Interval
Cleaning the filter element (b)	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	

6.2.2 Special tools

Not required

6.2.3 Procedure

See vehicle operator's instructions

6.3 Repair

Please contact a KB SfS Service Center if the unit develops a malfunction that cannot be corrected by the measures described in Section 7.2.



6.4 Overhaul

KB SfS gives top priority to safety and quality.

To help fulfil this claim, KB SfS provides an overhauling service for its own units. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

The KB SfS Service Centers have the experience and technical equipment needed for performing professional overhauls.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air discharging constantly from the flange joint	Fasteners loose	Tighten the fasteners (observe the tightening torque!) and test for leakage.	Section 5.1.3
	O-rings (e) damaged or missing	Remove the unit, exchange the O-rings, install the unit and test for leakage.	Section 5.2, 5.1 and 5.1.3
Little or no air throughput	Filter element (b) very dirty or frozen	Clean or defrost the filter element.	
Other problems	Unit defective	Remove the unit and submit for repair.	Section 5.2



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KB Sfs units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - T D 2 0 . 2 8

Rev. 02 - 27.01.2011 - en
.....

.....
Description

**Overflow valve without reflux
DR07-T**



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	10
4.2	Construction	10
4.3	Working principle	13
5	Removal and installation	14
5.1	Installation	14
5.1.1	Requirements	15
5.1.2	Procedure	15
5.1.3	Leakage testing	16
5.1.4	Function testing	16
5.2	Removal	17
5.2.1	Requirements	17
5.2.2	Procedure	17



6	Maintenance	18
6.1	Inspection	18
6.1.1	Interval	18
6.1.2	Special tools	18
6.1.3	Procedure	18
6.2	Servicing	18
6.3	Repair	19
6.4	Overhaul	19
6.4.1	Interval	19
7	Troubleshooting	20
7.1	Special tools	20
7.2	Procedure	20
8	Disposal	21



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS trained service technicians who

- have the skill, experience, safety awareness and professional ability:
 - to remove and install the unit,
 - to inspect, maintain and debug the unit,
- have read and understood this document from start to finish, and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are included only for the sake of completeness.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

C128350	Installation drawing of overflow valve DR07-T
WB420332A	Table of specified tightening torques



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

II63947/0...

II63947/0...K



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KB SfS parts or KB approved spares or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Technical description

The overflow valve is used in air suspension systems on rail vehicles and is designed to link two separate pressure chambers when the pressure difference exceeds a certain level.

4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction
- Version without reflux

The installation drawing contains the technical particulars of the unit.

The letter "K" at the end of the item number denotes units with enhanced resistance to low temperatures.

4.2 Construction

See Figure 1 and Figure 2

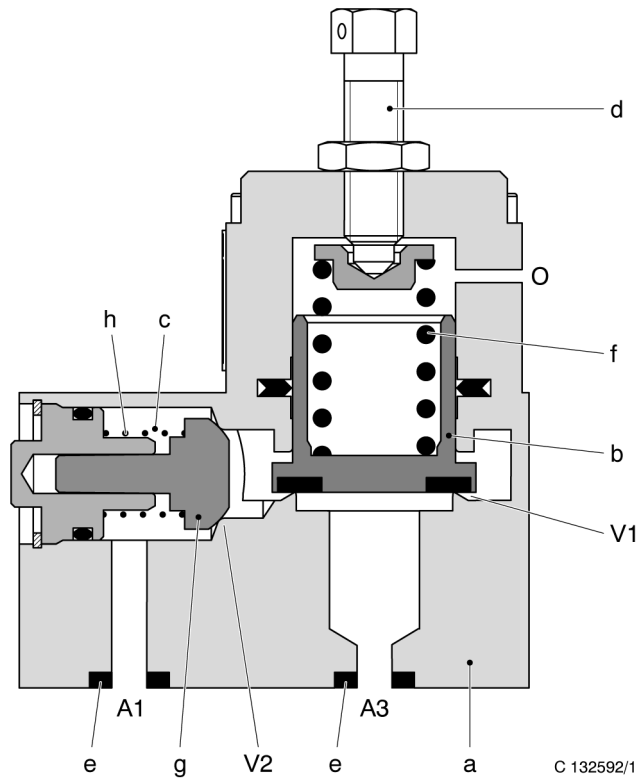
The unit consists essentially of the following:

- Housing (a)
- Spring-loaded valve head (b)
- Check valve (c)
- Adjustment screw (d)

The housing (a) contains all the functional components and is engineered for flange-mounting. Its joining surface contains the ports. The O-rings (e) are used as seals.

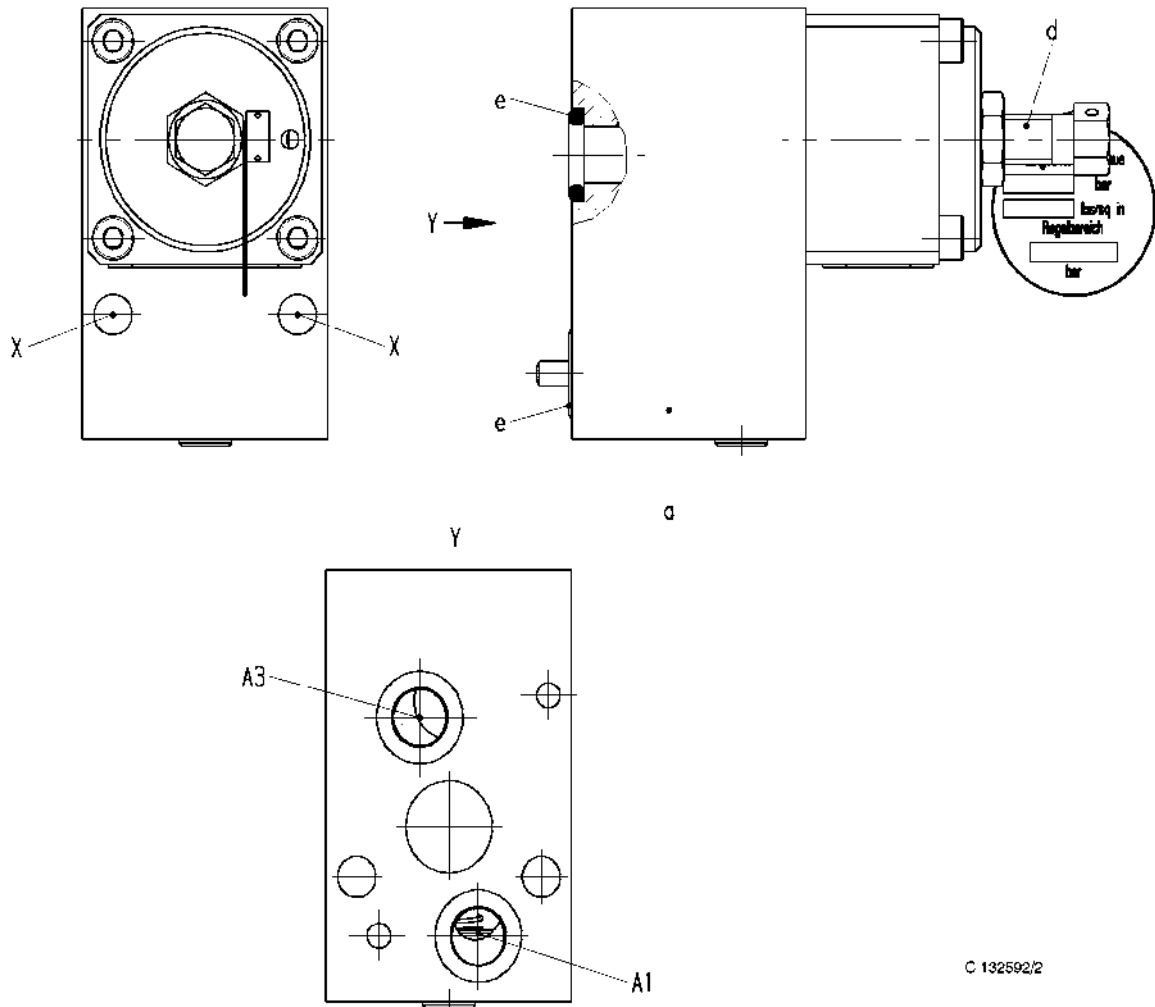
The pretensioning force of the compression spring (f) on the valve head (b) can be altered at the adjustment screw (d). The pretensioning force of the compression spring (f) rules the magnitude of the opening pressure setting.

The check valve (c) stops compressed air reflux from the consumer port A1 when the pressure at the supply port A3 falls.



- | | | | |
|----------|--------------------|-------------|--------------------|
| a | Housing | g | Valve cone |
| b | Valve head | h | Compression spring |
| c | Check valve | A1 | Consumer port |
| d | Adjustment screw | A3 | Supply port |
| e | O-ring | O | Breather hole |
| f | Compression spring | V... | Valve seat |

Figure 1 Overflow valve DR07-T (schematic)



C 132592/2

- | | | | |
|----------|------------------|-----------|----------------|
| a | Housing | X | Mounting holes |
| d | Adjustment screw | A1 | Consumer port |
| e | O-ring | A3 | Supply port |

Figure 2 Overflow valve DR07-T



4.3 Working principle

See Figure 1 and Figure 2

The valve head (b) is pressed onto the valve seat V1 by the compression spring (f) and keeps the seat closed. The compressed air admitted at the supply port A3 flows beneath the valve head (b). The valve seat V1 stays closed as long as the pressure beneath the valve head (b) fails to reach the chosen opening pressure.

The valve head (b) lifts against the force of the compression spring (f) when the chosen opening pressure is reached. The valve seat V1 opens. The compressed air passes through the valve seat V1 to the valve seat V2 of the check valve (c) and opens the valve seat V2. The compressed air now flows from the supply port A3 to the consumer port A1. The valve remains open as long as the supply pressure A3 is higher than the closing pressure.

The valve is closed when the closing pressure is reached. The valve seat (b) is pressed onto, and closes, the valve seat V1. If air flows from the consumer port A1 to the supply port A3 when the valve seat V1 is open, the compression spring (h) will press the valve cone (g) of the check valve (c) onto the valve seat V2. The latter is closed now and stops any further compressed air reflux to the supply port A3.

The opening pressure can be altered at the adjustment screw (d). Screwing in the adjustment screw (d) magnifies the pretensioning force of the compression spring (f) and hence increases the opening pressure.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.

Provide for a free flow of air through the ports.

- Take the covers off the ports of the unit's flange and off the mating ports of the bracket to which the unit is going to be joined.
- Thoroughly clean the connections.



NOTE

New O-rings must always be used between the flange joints for the ports. Do not install new elastomers that are older than one year. Check the date of manufacture prior to use.

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.



- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the type designation):
 - Lubricate O-rings (e) with a **thin** film of RENOLIT KBS1 grease.
- For all other units:
 - Lubricate O-rings (e) with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings in their seats on the unit.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The unit is positioned precisely for installation by one or more dowel pins fitted in the joining surface of the housing.

- Locate the dowel pins in their holes on the joining surface.
- Locate the unit in its mounting position on the bracket and attach by fasteners through the through-holes in the unit.
- Connect the supply of compressed air.

5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, release the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports and connections.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Release the fasteners, and remove the unit plus O-rings (e) from the bracket.
- Cover up the ports of the unit.
- Cover up the mating ports of the bracket to which the unit was joined, unless an exchange unit is going to be fitted immediately after removal.



6 Maintenance

In general, maintenance at KB SfS is subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental conditions in the area where the vehicles are operated. An interval stated generally for all projects will therefore be of only limited validity.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find together with the customer the optimal maintenance intervals for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

If the unit develops a malfunction that cannot be corrected by the measures described in Section 7.2 please contact a KB SfS Service Center.

6.4 Overhaul

KB SfS gives top priority to safety and quality.

To help fulfil this claim, KB SfS provides an overhauling service for its own units. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

Both the experience and the technical equipment necessary for performing professional overhauls are present in KB SfS Service Centers.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air discharging constantly between unit and bracket	Fasteners loose	Tighten the fasteners (observe the tightening torque!) and test for leakage.	Section 5.1.3
	O-rings damaged or missing	Remove the unit, exchange the O-rings, install the unit and test for leakage.	Section 5.2, 5.1 and 5.1.3
Overflow valve not opening	Supply pressure too low	Provide for enough compressed air.	
	Unit defective	Remove the unit and submit for repair.	Section 5.2
Air discharging constantly from the breather hole			
Compressed air reflux to supply port A3			



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KB SfS units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - G D 7 1 . 2 3

Rev. 04 (07/ 2008) -en
.....

.....
Description

Piston valve
WKV1-T



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright 2008© Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Technical description	10
4.1	Technical features	10
4.2	Construction	10
4.3	Working principle	12
5	Removal and installation	13
5.1	Installation	13
5.1.1	Requirements	13
5.1.2	Procedure	14
5.1.3	Leakage testing	15
5.1.4	Function testing	15
5.2	Removal	15
5.2.1	Requirements	15
5.2.2	Procedure	15



6	Maintenance	16
6.1	Inspection	16
6.1.1	Interval	16
6.1.2	Special tools	16
6.1.3	Procedure	16
6.2	Servicing	16
6.3	Repair	17
6.4	Overhaul	17
6.4.1	Interval	17
7	Troubleshooting	18
7.1	Special tools	18
7.2	Procedure	18
8	Disposal	19



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS trained service technicians who

- have the skill, experience, safety awareness and professional ability:
 - to remove and install the unit,
 - to inspect, maintain and debug the unit,
- have read and understood this document from start to finish, and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger

Consequence of the danger

Remedial measures

Notes do not contain any messages relevant to safety and are included only for the sake of completeness.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

Related installation drawings specific to a given item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

I89525

I89525K



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KB SfS parts or KB approved spares or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Technical description

The piston valve is used for charging and venting small volumes in pneumatic system on rail vehicles.

4.1 Technical features

The unit is distinguished by the following features:

- Flange construction
- Quick and easy to exchange
- Straightforward construction

The installation drawing contains the technical particulars of the unit.

The letter "K" at the end of the item number denotes units with enhanced resistance to low temperatures.

4.2 Construction

See Figure 1

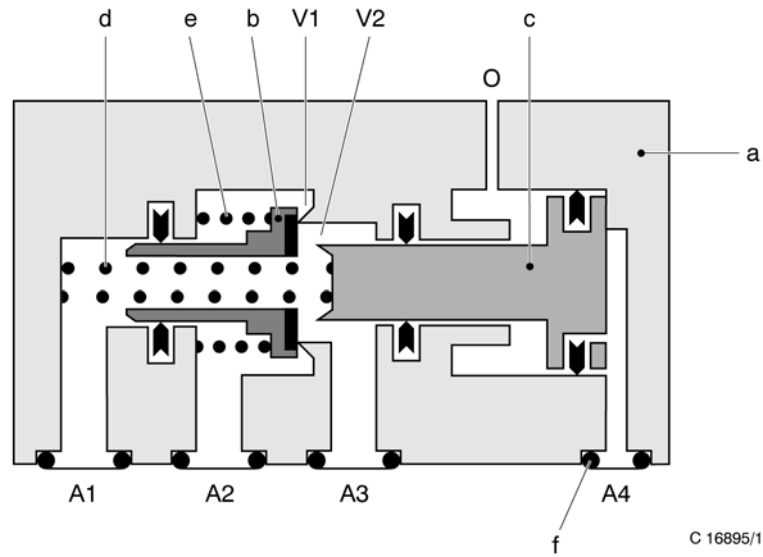
The model WKV1-T piston valve is a pneumatically controlled 3/2-way unit with a separate control air port. The valve can be used alternatively as a 2/2-way unit when the port A1 is plugged. The installation drawing contains the pneumatic diagrams.

The unit consists essentially of the following:

- Housing (a)
- Valve head (b)
- Control piston (c)
- Compression springs (d and e)

The thrust of the compression springs (d and e) holds valve head (b) and control piston (c) at the position shown here.

The unit is designed for flange mounting. All the ports are located in that flange surface of the housing (a) by which the unit is joined to a base plate or manifold panel. The ports are sealed by O-rings (f).



- | | | | |
|----------|--------------------|-------------|---------------|
| a | Housing | V... | Valve seat |
| b | Valve head | A1 | Port |
| c | Control piston | A2 | Port |
| d | Compression spring | A3 | Consumer port |
| e | Compression spring | A4 | Control port |
| f | O-ring | O | Bore |

Figure 1 Piston valve WKV1-T (schematic)



4.3 Working principle

See Figure 1

Control pressure not applied

There is no control pressure applied to control port A4. Valve seat V1 is closed and valve seat V2 is open.

The path from port A1 to the consumer port A3 is open in the unit. The path from port A2 to the consumer port A3 is closed.

Control pressure applied

Control pressure is applied to the control port A4. The control piston (c) describes a certain movement and, on reaching the valve head (b), closes the valve seat V2 and subsequently opens the valve seat V1.

The path from port A2 to the consumer port A3 is open in the unit. The path from port A1 to the consumer port A3 is closed.

When the control pressure applied to the control port A4 is vented, the control piston (c) and the valve head (b) are returned to their home position by the force of the compression springs (d and e).



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.

5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.



The notes contained in the installation drawing relating to mounting position and necessary clearances must be observed.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricants are needed; they can be purchased from KB SfS by their order numbers:

- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - RENOLIT KBS1 (order number: ID No. 505887)
- For all other units:
 - RENOLIT HLT2-KB (order number: ID No. 502647)

5.1.2 Procedure



NOTE

New O-rings must always be used between the flange joints for the ports. Do not install new elastomers that are older than one year. Check the date of manufacture prior to use.

To avoid grease ingress in the air passages, lubricate the O-rings with just a **thin** film of grease.



NOTE

Make sure that the thinly greased seals rest and rest/stick correctly in their seats with no dust or dirt present.

- Take the covers off the ports of the unit and onboard manifold panel.
- Thoroughly clean the ports.
- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - Lubricate O-rings (f) with a **thin** film of RENOLIT KBS1 grease.
- For all other units:
 - Lubricate O-rings (f) with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings (f) in their seats on the unit.
- Locate the unit on the joining surface of the manifold panel and attach by its fasteners.
- Connect the supply of compressed air to the unit.



5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the flange joint for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function testing

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.

5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, release the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports and connections.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Release the fasteners and remove the unit from the manifold panel.
- Cover up the ports of the unit.
- Cover up the onboard ports unless an exchange unit is going to be fitted immediately after removal.



6 Maintenance

In general, maintenance at KB SfS is subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental conditions in the area where the vehicles are operated. An interval stated generally for all projects will therefore be of only limited validity.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find together with the customer the optimal maintenance intervals for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	

6.1.2 Special tools

Not required

6.1.3 Procedure

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

If the unit develops a malfunction that cannot be corrected by the measures described in Section 7.2 please contact a KB SfS Service Center.

6.4 Overhaul

KB SfS gives top priority to safety and quality.

To help fulfil this claim, KB SfS provides an overhauling service for its own units. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

Both the experience and the technical equipment necessary for performing professional overhauls are present in KB SfS Service Centers.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to the vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KB SfS.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Procedure

Problem	Cause	Remedy	See
Air discharging constantly between unit and bracket or from the flange surface	Fasteners loose	Tighten the fasteners (observe the tightening torque!) and test for leakage.	Section 5.1.3
	O-rings damaged or missing	Remove the unit, exchange the O-rings, install the unit and test for leakage.	Section 5.2 5.1 and/or 5.1.3
Unit not toggling	No control pressure at port A4	Check the unit for correct precontrol.	
Air discharging constantly from bore O	Unit defective	Remove the unit and ship to a KB SfS Service Center for repair.	Section 5.2
Air discharging constantly from exhaust port A1 or A2 (provided the unit is functioning properly, air may escape just briefly to vent pipe A3)			



8 Disposal



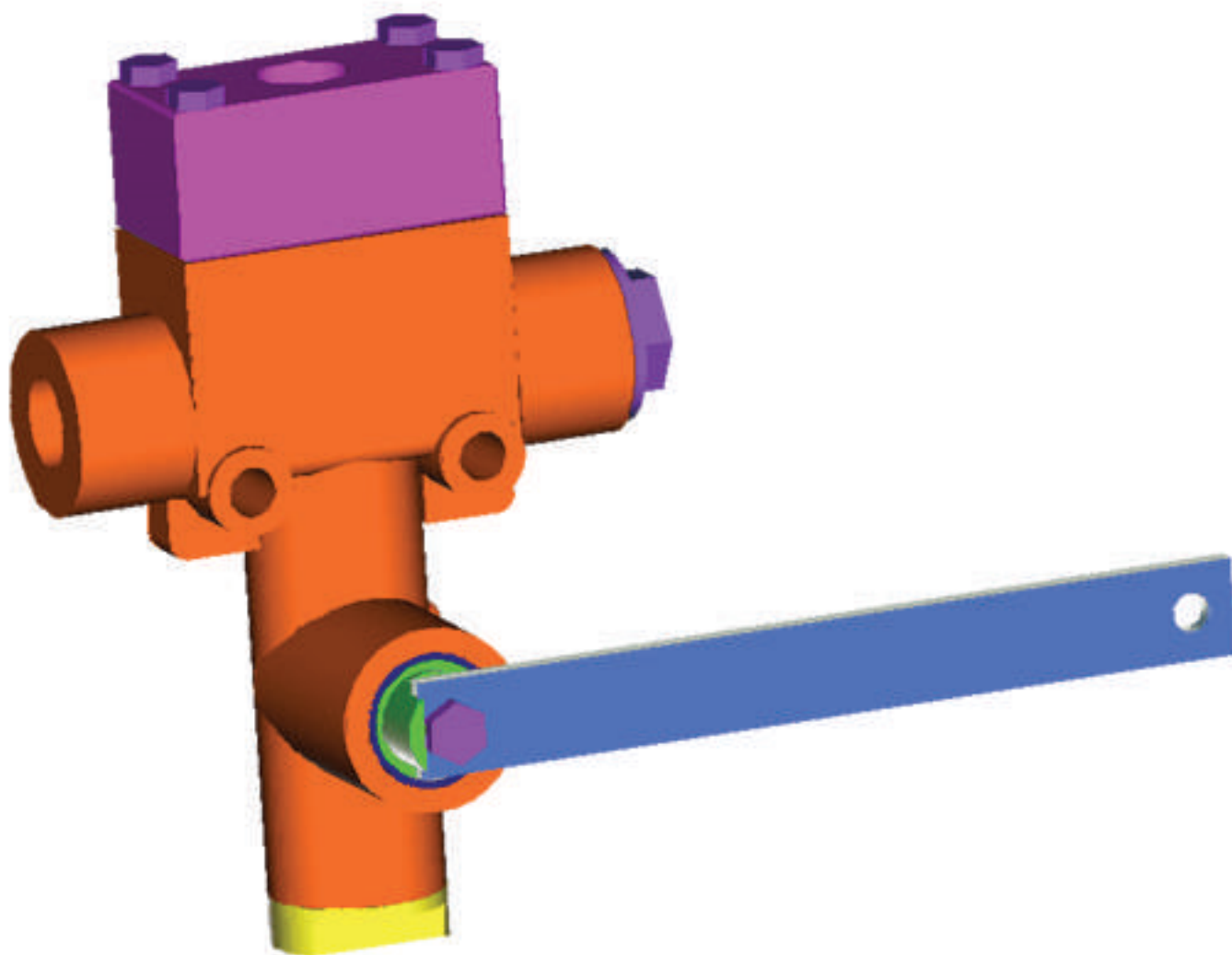
CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KB Sfs units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

Air Suspension Levelling Valves for Rail Vehicles

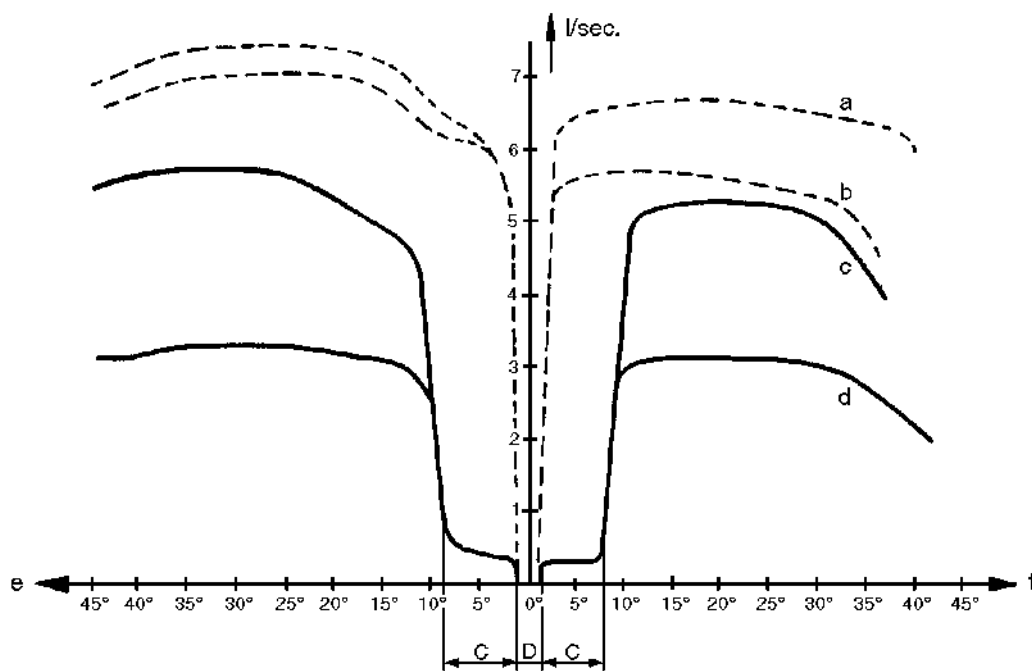


© 13431

The air suspension levelling valve is fitted to rail vehicles to regulate the car body level, irrespective of the load condition of the vehicle, by charging or venting the air spring bellows.

Design

In the closed-loop air suspension control system, the air suspension levelling valve performs the function of the actuator. The valve has been designed as a double seat valve with throttling action (a version without restriction is available as an option). A check valve is incorporated to safeguard bellows pressure. Located at the top of the valve is the port "V" for the auxiliary air reservoir, and the right and left sides each feature a port "L" for connection to the air spring bellows. Opposite the port "V" is the exhaust port "E". The characteristic rates of flow of a throttled and an unthrottled valve are shown in the diagram below. A modification of the flow rates (up to a maximum of 11 l/sec at a supply pressure of 4 bar) and also of the throttling action can be obtained within limits by simple design measures. Also available is an air suspension levelling valve with a locking lap position.



- a 2 Ports unthrottled
- b 1 Ports unthrottled
- c 2 Ports throttled

- d 1 Ports throttled
- e Venting
- f Changing

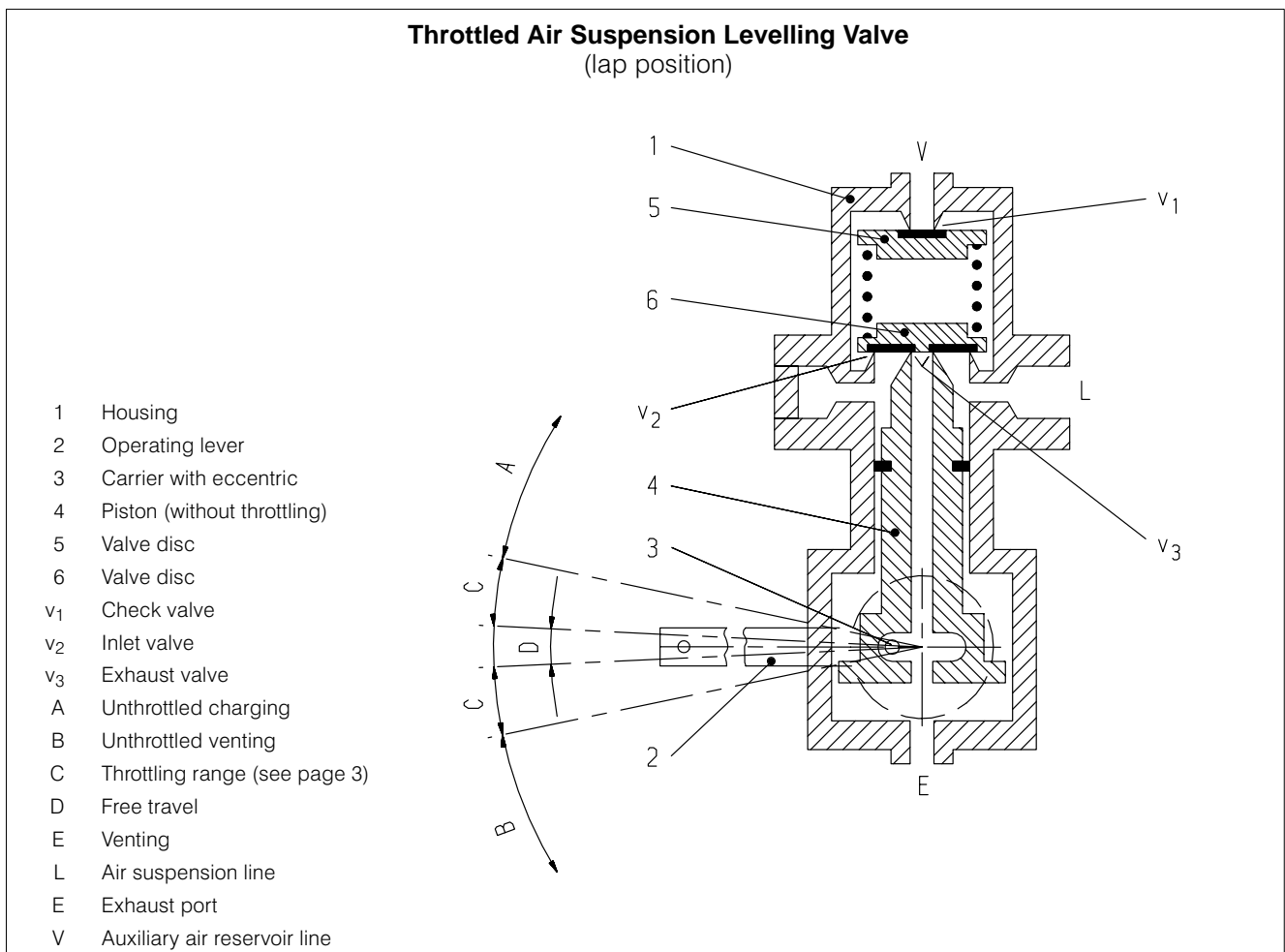
- C Throttling range
- D Free travel

Rate of Flow of Atmospheric Air with Throttled and Unthrottled Air Suspension Levelling Valves, Measured at 4 bar Supply Pressure and Venting to Atmosphere.

C 13435/1

Operation

The relative vertical motion between running gear and car body as caused by loading or unloading of the vehicle is communicated via the actuating linkage to the operating lever (2) and is transmitted to the carrier with eccentric (3) supported in the housing (1) of the air suspension levelling valve. The eccentric engages in an oblong hole of the piston (4) and upon rotation of the carrier causes upward and downward movement of the piston. The valve disc (5) acts as a check valve v_1 , stopping air reflux from L (air spring bellows) to V when the pressure V falls. With the rail vehicle in the level position, the air suspension levelling valve and thus also the air spring is in the so-called lap position where compressed air is neither admitted (charging) nor discharged (venting). In this position, both the inlet valve v_2 and the exhaust valve v_3 are seated.



C 13435/2

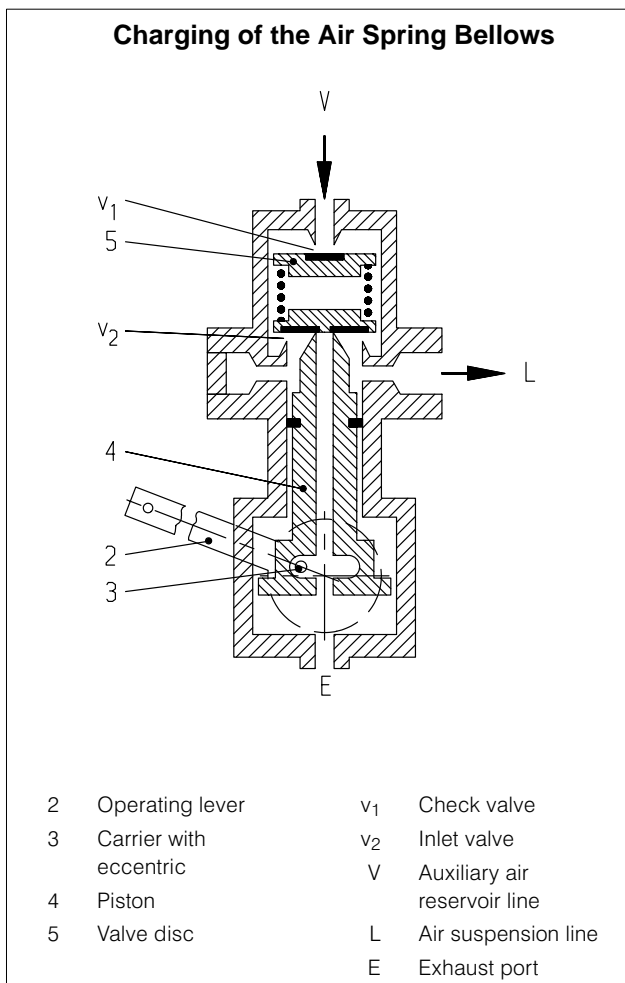
Loading - Charging of the Air Spring Bellows

Upon loading of the vehicle, the car body will first lower due to the air spring bellows being compressed as a result of the higher load applied. The compression causes the carrier (3) to be rotated, via the actuating mechanism, in such a manner that the eccentric moves the piston (4) upwards, thus unseating the inlet valve v_2 . The compressed air "V" supplied from the auxiliary air reservoir is applied to the upper valve disc (5) and causes the check valve v_1 to open. In the case of the throttled air suspension levelling valve, compressed air "V" passes first through the narrow fit between piston neck and housing bore in a throttled manner to "L" and to the air spring bellows.

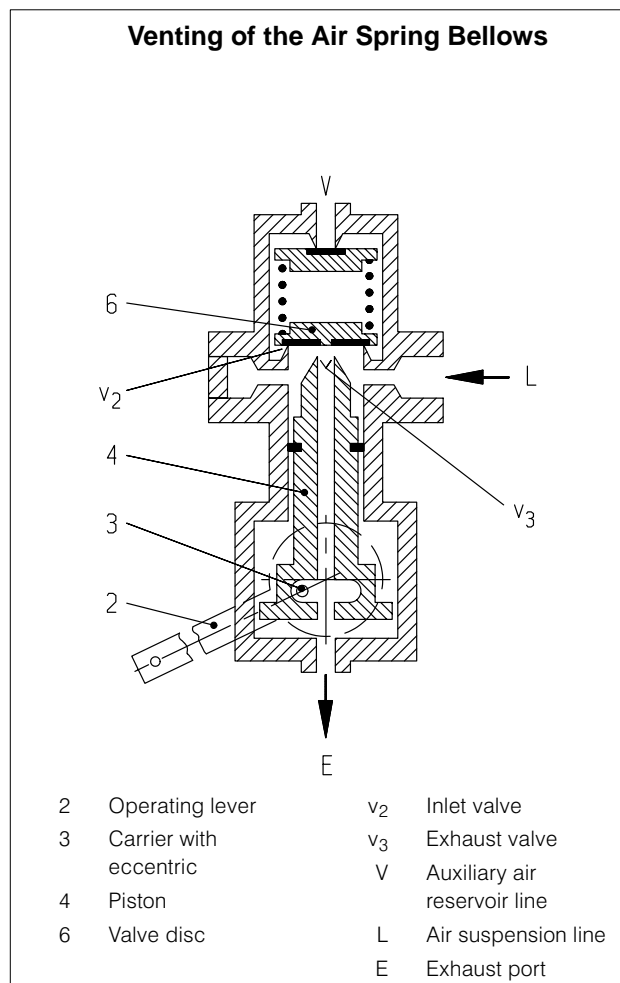
As the deflection of the operating lever (2) increases, the piston (4) is shifted further upwards and - being appropriately shaped - serves to clear an increasing cross-section of the housing bore. In the case of the unthrottled air suspension levelling valve, the full charging cross-section is cleared immediately once free travel has been covered. The car body is raised. Once the level as originally set has been reached, the operating lever is in its lap position again, and the inlet valve v_2 is closed.

Unloading - Venting of the Air Spring Bellows

Upon unloading of the vehicle, the car body will first rise due to the air spring bellows extending as a result of the decreasing load. The decompression causes the carrier (3) to be rotated, via the actuating mechanism, in such a manner that the eccentric moves the piston (4) downwards so that the exhaust valve v_3 is unseated. The inlet valve v_2 is kept closed by the force of the compression spring and the pressure "V" from the auxiliary air reservoir acting on the valve disc (6). Communication from the auxiliary air reservoir to the air spring bellows is thus cut off. In the case of the throttled air suspension levelling valve, compressed air "L" is now able to travel from the air spring bellows by way of the narrow fit between piston neck and housing bore in a throttled manner through the exhaust bore of the piston (4) to the exhaust port "E". When the piston (4) is moved further down, it serves to clear an increasing cross-section of the housing bore. In the case of the unthrottled air suspension levelling valve, the full venting cross-section is cleared immediately once free travel has been covered. In this way, the car body is lowered until the original level has been reached, the operating lever is restored to its lap position, and the exhaust valve v_3 is closed.



C 13435/3



C 13435/4

Installation

The air suspension levelling valve is preferably mounted to the car body with the port "V" located at the top. The lap position of the operating lever is horizontal subject to precision of fitting. Rotation of the operating lever by a half turn results in a mirror-inverted version, with the original function maintained.

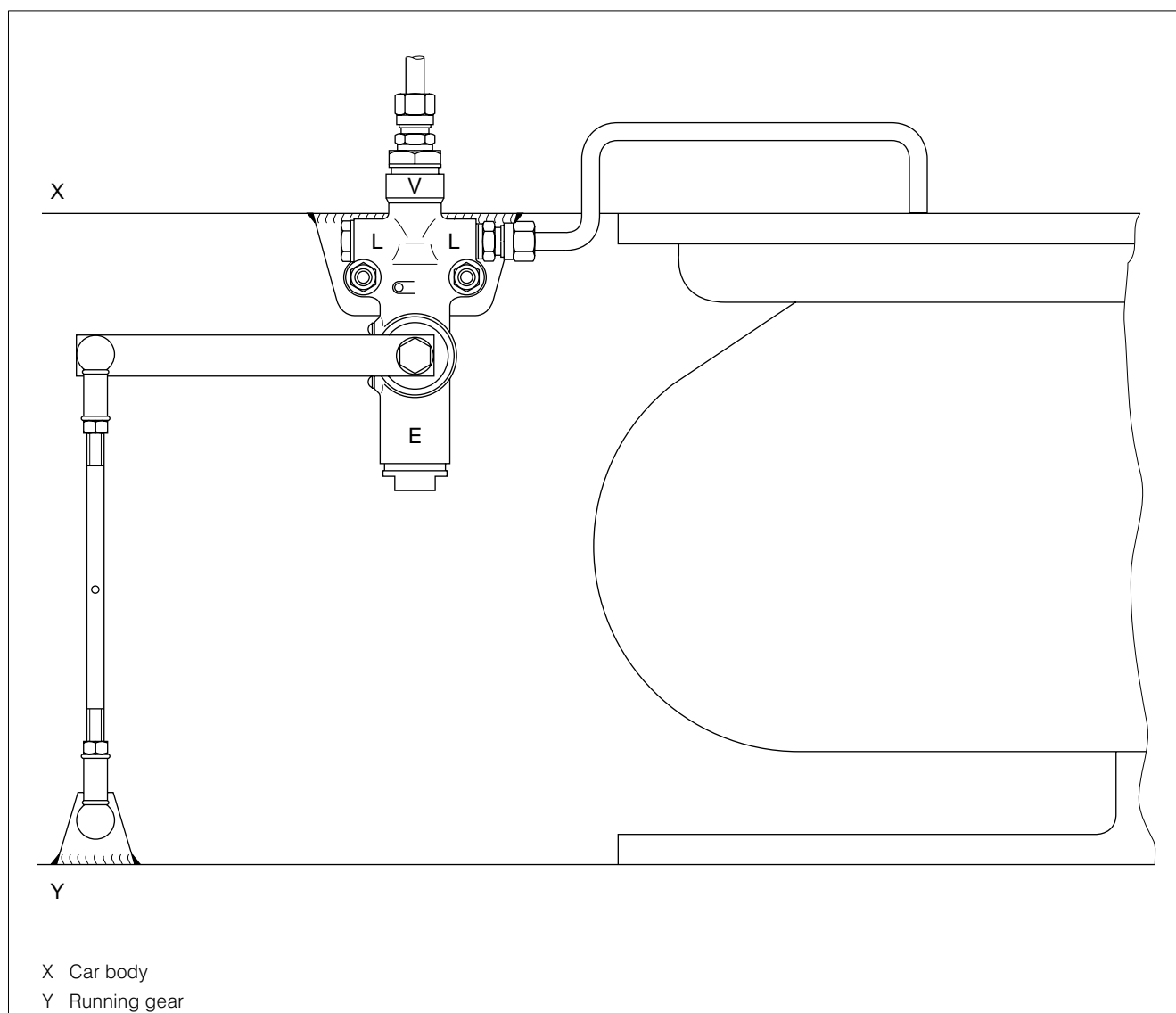
To connect the valve operating lever to the running gear, use should be made of an adjustable actuating linkage with two ball-and-socket joints. Care must be taken to ensure that the two joints are located vertically above each other, that they are mounted in a stress-free manner, and that the actuating mechanism is precluded from taking an extended position at maximum spring deflection.

In-Service Maintenance

The air suspension levelling valve does not require any routine maintenance. It is sufficient for the valve to be checked in the course of the specified general inspection.

General Inspection

General inspection intervals are specified by the individual railway administrations so that trouble-free service is safely ensured. Checking must be carried out in a technically qualified workshop and in accordance with the test instructions.



C 13435/5

D

KNORR-BREMSE
 Systeme für Schienenfahrzeuge GmbH
 Moosacher Straße 80
 D-80809 München
 Tel.: +49 89 3547-0
 Fax: +49 89 3547-2767

KNORR-BREMSE Berlin
 Zweigniederlassung der KNORR-BREMSE
 Systeme für Schienenfahrzeuge GmbH
 Landsberger Allee 399
 D-12681 Berlin
 Tel.: +49 30 9392-0
 Fax: +49 30 9392-2409

A

KNORR-BREMSE Ges.m.b.H.
 Steinfeldergasse12
 A-2340 Mödling
 Austria
 Tel.: +43 2236 409-0
 Fax: +43 2236 409-412

CH

OERLIKON-KNORR
EISENBAHNTECHNIK AG
 Mandachstrasse 50
 CH-8155 Niederhasli
 Switzerland
 Tel.: +41 1 8523111
 Fax: +41 1 8523131

E

SOCIEDAD ESPANOLA DE FRENOS
CALEFACCION Y SENALES S.A.
 Calle Nicolás Fúster, 2
 E-28320 Pinto (Madrid)
 Spain
 Tel.: +34 1 6910054
 Fax: +34 1 6910100

F

FREINRAIL S.A.
 47, 49 Rue Gosset
 F-51100 Reims
 France
 Tel.: +33 326 797211
 Fax: +33 326 797201

I

FRENISTEMI S.R.L.
 Via della Cupola 112
 I-50145 Firenze
 Italy
 Tel.: +390 55 3020-1
 Fax: +390 55 3020-333

CDN

KNORR-BRAKE LIMITED
 675, Development Drive
 CDN-Kingston Ontario K7M4W6
 Canada
 Tel.: +1 613 389-4660
 Fax: +1 613 389-8703

AUS

KNORR-BRAKE AUSTRALIA PTY. LTD.
 2/45 Salisbury Road
 AUS-Hornsby, N.S.W. 2077
 Australia
 Tel.: +61 2 4765266
 Fax: +61 2 4821949

USA

NEW YORK AIR BRAKE CORPORATION
 748, Starbuck Avenue
 USA-Watertown, NY 13601
 USA
 Tel.: +1 315 786-5200
 Fax: +1 315 786-5676

KNORR BRAKE CORPORATION
 P.O. Box 9300
 USA-Westminster, MD 211 58
 USA
 Tel.: +1 410 875-0900
 Fax: +1 410 875-0830

BR

FREIOS KNORR SISTEMAS
FERROVIÁRIAS LTDA.
 Av. Eugo Eusebio Stevaux, 873
 BR-São Paulo
 Brazil
 Tel.: +55 11 5246099
 Fax: +55 11 2468954

IND

KNORR-BREMSE RAIL SYSTEMS
INDIA PVT. LTD.
 14/6, Mathura Road
 IND-Faridabad - 121003
 India
 Tel.: +91 129 276409
 Fax: +91 129 275935

J

KOSHIN-KNORR LTD.
 Kamimura No. 2 Bldg., 4th Floor
 45-9, Higashi-ikebukuro 2-chome
 Toshima-ku
 J-Tokyo 170
 Japan
 Tel.: +81 3 5391-1013
 Fax: +81 3 5391-1022

RSA

KNORR-BREMSE (S.A.) PTY. LTD.
 3, Derrick Road
 RSA-Kempton Park 1620
 South Africa
 Tel.: +27 11 3943120
 Fax: +27 11 9751513

HK

KNORR-BREMSE FAR EAST LTD.
 1301 Evergo House
 HK-38 Gloucester Road, Wanchai
 Hongkong
 Tel.: +852 2861-2669
 Fax: +852 2520-6259

ROK

KNORR-BREMSE RAIL SYSTEMS KOREA LTD.
 Room 501, Im-Sung Bldg.
 788-2 Yeok Sam-Dong, Kang-Nam Ku,
 ROK-Seoul
 Republic of Korea
 Tel.: +82 2 5388727
 Fax: +82 2 5388729



KNORR-BREMSE
Systeme für Schienenfahrzeuge GmbH

Moosacher Str. 80 D-80809 München Tel.: (089) 3547-0 Fax (089) 3547-2767

Subject to modifications.

For application studies and use of our products please
 contact us, requesting specific documentation.

Reproduction, as a whole or in part, is not permitted.

Printed in Germany

.....
.....
B - V E 2 0 . 2 3

Rev. 06 - 12.06.2018 - en
.....

.....
Description

Tyfon
MKT...



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
04	29.01.2014	Revision history started		x				
		1, 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3, 4, 4.2, 4.3, 6, 6.1.1, 8		x				
		2.1, 4.1, 5.1.1, 5.1.2, 5.1.3, 5.2.2, 6.3, 7.2					x	
		5.1, 5.1.2, 5.2, 5.2.2						x
05	07.11.2014	4.1, 4.2, 4.3, 5.1.1, 5.1.3					x	
		5.1.2, 5.2.2					x	x
06	12.06.2018	1, 3.1, 3.2, 4.1, 4.2, 5.1, 5.1.4, 6.1.3, 7.2		x				



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group of this documentation	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	13
4.3	Working principle	17
5	Removal and installation	18
5.1	Installation	18
5.1.1	Requirements	19
5.1.2	Procedure	19
5.1.3	Leakage testing	21
5.1.4	Function test	21
5.2	Removal	22
5.2.1	Requirements	22
5.2.2	Procedure	22



6	Maintenance	25
6.1	Inspection	25
6.1.1	Interval	25
6.1.2	Special tools	25
6.1.3	Implementation	26
6.2	Servicing	26
6.3	Repair	26
6.4	Overhaul	26
6.4.1	Interval	26
7	Troubleshooting	27
7.1	Special tools	27
7.2	Implementation	27
8	Disposal	30



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group of this documentation

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Specification "Packaging, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate or is engraved on the unit. The item number and type designation must match the validity note stated in this document.

This document is valid for units with type designation:

MKT...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The units are air-powered sound emitters that are used in pneumatic systems on rail vehicles.

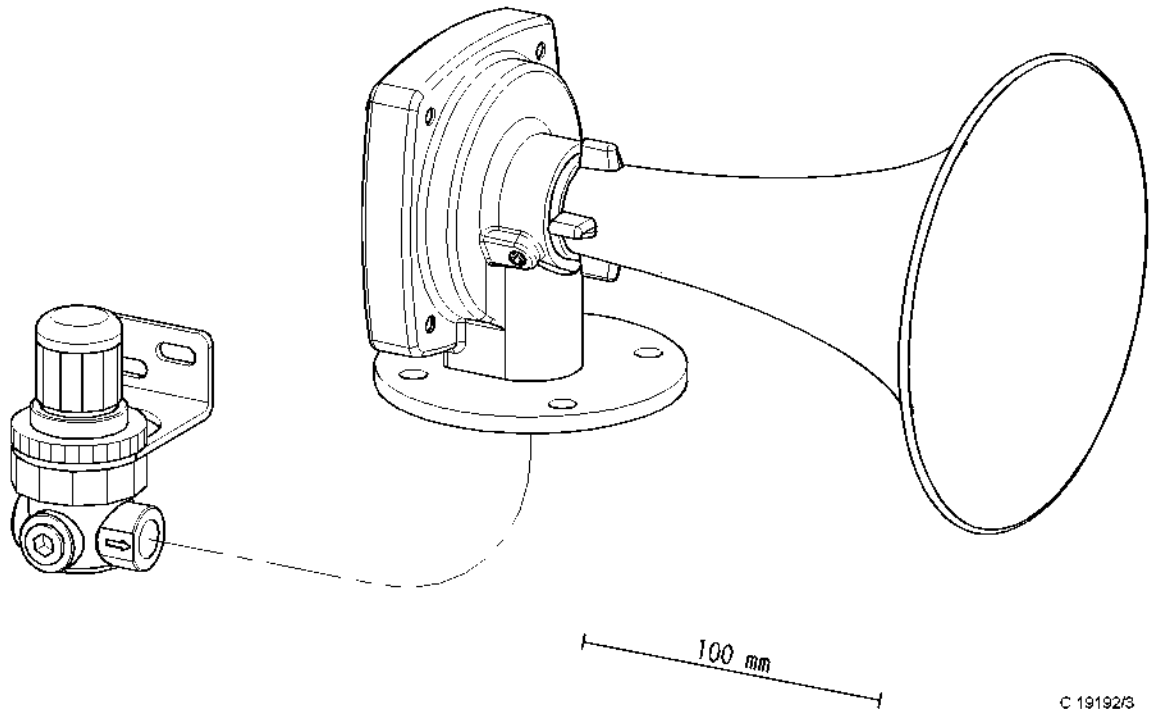


Figure 1 Typhone MTK75/660Hz with pressure regulator
(the unit with item number II75020-N is shown here by way of example)



4.1 Technical features

The following information is encoded in the type designation (e.g. MKT75/660Hz UIC).

- The number after MKT denotes the diameter of the typhone diaphragm.
- The number after the slash denotes the typhone's audio frequency.
- The designation UIC indicates that this typhone meets UIC requirements and conforms to Deutsche Bahn railway standards. (Only the installation drawing contains this information.)

Accordingly, the typhone with type designation MKT75/660 UIC has:

- a diaphragm diameter of 75mm,
- an audio frequency of 660Hz,
- it conforms to UIC-644

Accordingly, the typhone with type designation MKT75/370HZ TSI has:

- a diaphragm diameter of 75mm,
- an audio frequency of 370 Hz
- it conforms to TSI (technical specifications for the interoperability)

The typhones with type code MKTH... are fitted with an integrated heating system.

The sound pressure level can be reduced with an upstream pressure regulator (see Figure 1). The pressure regulator is part of the scope of delivery of some typhones (see the included installation).

The installation drawing that goes with the unit contains the technical particulars of the unit.



4.2 Construction

See Figure 2, Figure 3 and Figure 4

The typhone consists of a housing (a) to which a horn (b) is attached.

The typhone comes with or without a flange (c) serving as a joint with the vehicle. It is connected pneumatically through a pipe fitting (d) at the underside of the flange.

The variants of the typhone MKT differ mainly in their:

- Type
- Rating
- Audio frequency
- Sound pressure level
- Features

Twin typhones share a common base and simultaneously generate two different tones.

Certain typhones have an electrical connection for an integrated heating system. The length of the electric lead can be deduced from the item number. The number after the slash denotes the cable length in cm.

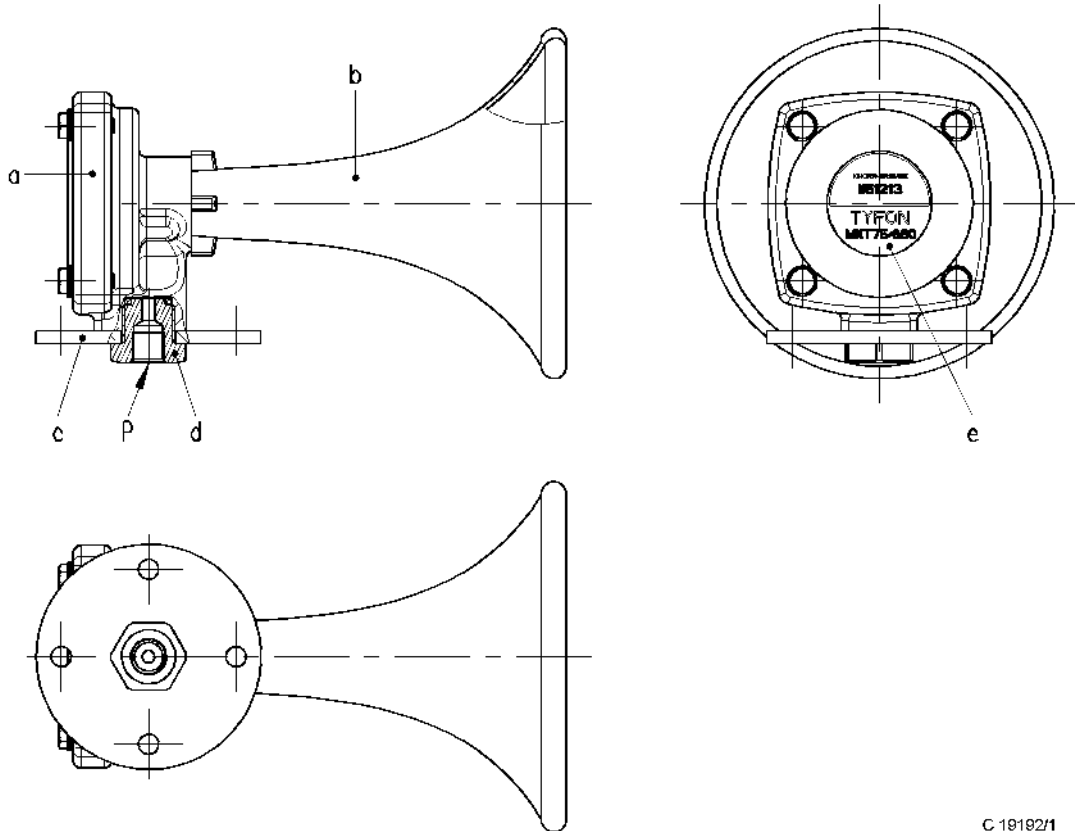
Example: A typhone with item number I187052/0600 has a cable length of 600 cm.

The typhone requires an operating valve to control its supply of compressed air. It is advisable to install an air filter just upstream of the operating valve.

Sound is generated by a metal plate (diaphragm) that is clamped inside the typhone housing (a).

A typhone emits a loud sound at a low rate of air consumption. Different frequencies can be generated by different horns. A twin typhone produces a twin tone.

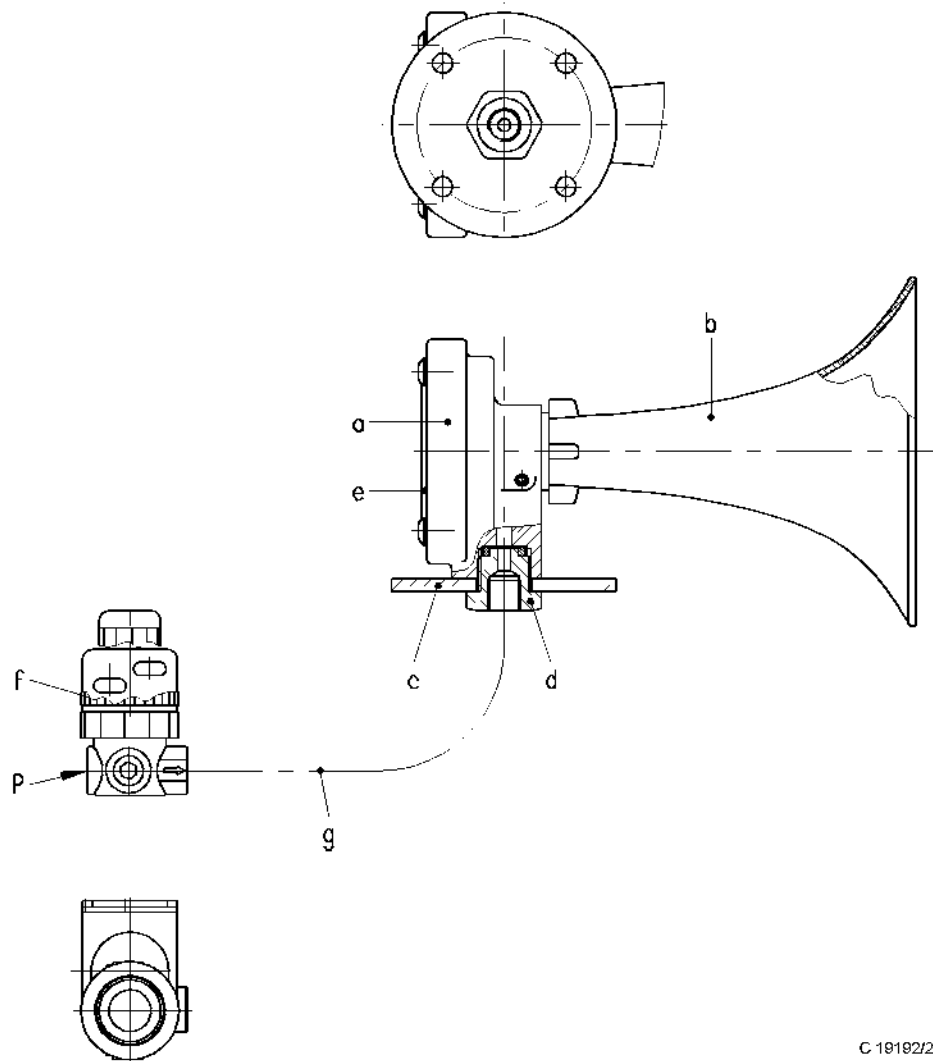
The pressure regulator (f) may be included with the typhone (see installation drawing). The sound pressure level can be reduced with the pressure regulator (f).



C 19192/1

- | | | | |
|----------|-------------------------------|----------|--------------|
| a | Housing | d | Pipe fitting |
| b | Horn | e | Name plate |
| c | Flange (depending on version) | P | Port |

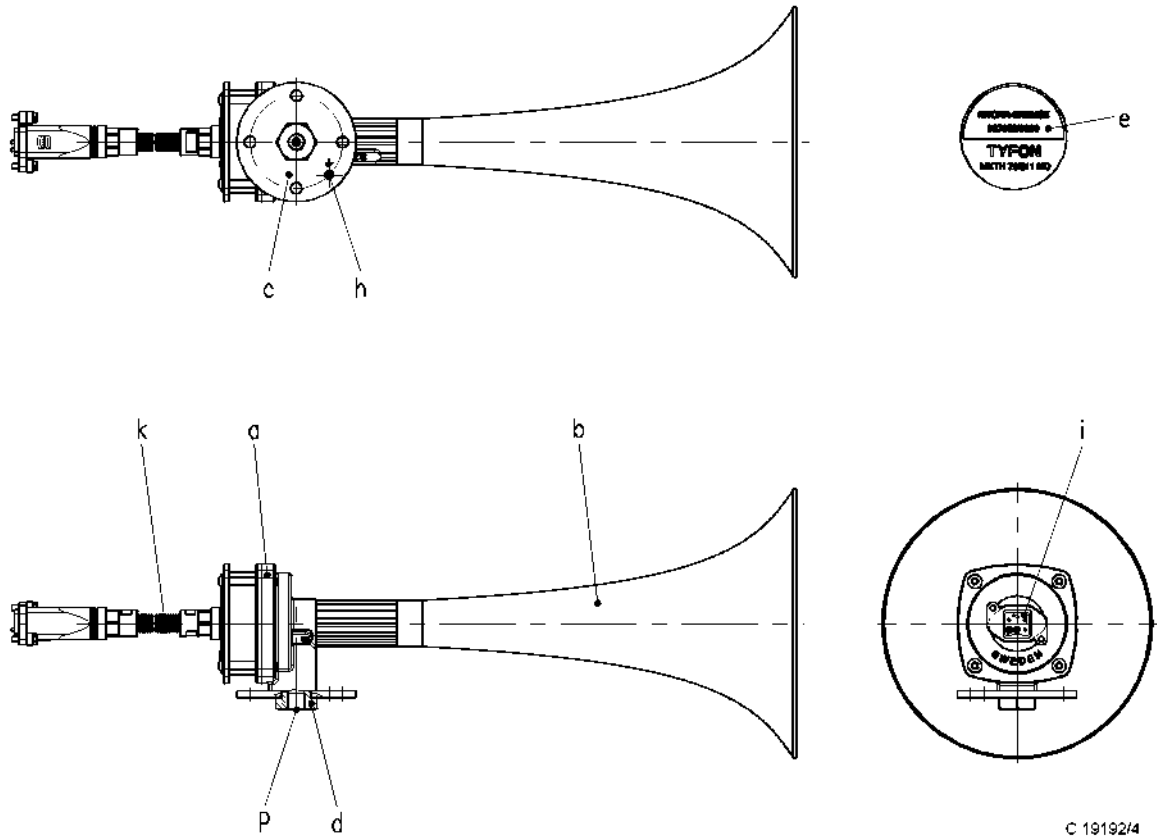
Figure 2 Typical view of a type MKT... typhone
(The type MKT75/660Hz UIC variant is shown here)



C 18182/2

- | | | | |
|---|-------------------------------|---|---|
| a | Housing | e | Name plate |
| b | Horn | f | Pressure regulator |
| c | Flange (depending on version) | g | Air delivery pipe (not included in the scope of the delivery) |
| d | Pipe fitting | P | Port |

Figure 3 Typical view of a type MKT typhone with pressure regulator (the typhone with item number II75020-N is shown here)



C 19192/4

- | | | | |
|---|--|---|---------------------|
| a | Housing | h | Ground terminal |
| b | Horn | i | Power connector |
| c | Flange | k | Cable conduit |
| d | Pipe fitting | P | Compressed air port |
| e | Name plate
(attached to the sound baffle (b)) | | |

Figure 4 Typical view of a type MKTH... typhone
(The type MKTH75/370 ND variant is shown here)



4.3 Working principle

See Figure 2, Figure 3 and Figure 4

The unit needs a supply of compressed air in order to generate signals. This supply is controlled by an upstream valve in the rail vehicle's pneumatic system.

The compressed air entering the housing (a) through the pipe fitting (d) causes the diaphragm to vibrate. The sound signal produced by these vibrations is amplified by the (exponential) horn (b) and given off to the environment.

For variants with a pressure regulator (f) compressed air is supplied via an upstream valve to the pressure regulator (f). The pressure can also be influenced here. The regulated pressure then enters the pipe fitting (d) via the on-board air delivery pipe (g).

Individual units are heated electrically in order to ensure that the unit can still generate signal properly when the ambient temperature is cold and in icy or snowy conditions.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Only allowed to be installed are units that

- have been stored in compliance with the details given in the GD15904 regulation and
- whose date of manufacture has not exceeded the limit value specified in the GD15904 regulation.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle. The place of installation must be defined accordingly when the vehicle is being engineered.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

- RENOLIT L20 grease (order number: ID No. 506043)

5.1.2 Procedure



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.

Variant without pressure regulator (f)

See Figure 2

- Take the covers off the ports of the typhone and the on-board air pipe.
- Thoroughly clean the ports.
- Locate the typhone on the on-board mounting bracket and attach by its fasteners.
- Screw the on-board air pipes into the pipe fitting (d).
- Connect the supply of compressed air to the typhone.



Variant without pressure regulator (f)

See Figure 3

- Take the covers off the ports of the pressure regulator (f), and the on-board air pipe (g).
- Thoroughly clean the ports.
- Locate the pressure regulator (f) on the on-board mounting bracket and attach by its fasteners.
- Screw the on-board air pipes into the pressure regulator (f).
- Screw the on-board air pipes (g) into the pressure regulator (f).
- Close the open end of the air pipe (g) pressure-tight.
- Run the leakage test described in Section 5.1.3.
- Take the covers off the ports of the typhone and the on-board air pipe (g).
- Thoroughly clean the ports.
- Locate the typhone on the on-board mounting bracket and attach by its fasteners.
- Screw the on-board air pipes (g) into the pipe fitting (d).
- Connect the supply of compressed air to the typhone.

Model with heating

See Figure 4

- Take the covers off the ports of the typhone and the on-board air pipe.
- Thoroughly clean the ports.
- Locate the typhone on the on-board mounting bracket and attach by its fasteners.
- Lubricate the threads of the onboard grounding screw with a **thin** film of RENOLIT L20 grease.
- Attach the onboard ground cable to ground terminal (h) on the unit by the grounding screw.
- Insert the connector (i) into the socket of the respective thermostat and secure.
- Screw the on-board air pipe into the pipe fitting (d).
- Connect the supply of compressed air to the typhone.
- Connect the typhone to a power supply.



5.1.3 Leakage testing

Model without pressure regulator (f) or with heating

Not required

Variant without pressure regulator (f)

See Figure 3

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test



WARNING

Loud noise is caused by function testing!

Your hearing may be harmed. Do not perform any function test in a closed room.

Do not allow anybody to stand close to the typhone or microphone during the function test.

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



WARNING

Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.



Variant without pressure regulator (f)

See Figure 2

- Unscrew the on-board compressed air pipes from the typhone.
- Release the fasteners, and take the typhone off the mounting bracket.
- Cover up the typhone's port.
- Cover up the onboard port unless a replacement unit is going to be fitted immediately after removal.

Variant without pressure regulator (f)

See Figure 3

- Unscrew the onboard compressed air pipes (g) from the typhone.
- Release the fasteners, and take the typhone off the mounting bracket.
- Cover up the typhone's port.
- Unscrew the on-board air pipes (g) from the pressure regulator (f).
- Unscrew the on-board air pipes from the pressure regulator (f).
- Release the fasteners, and take the pressure regulator (f) off the mounting bracket.
- Cover up the ports of pressure regulator (f).
- Cover up the onboard ports unless a replacement unit is going to be fitted immediately after removal.



Model with heating

See Figure 4

- Release the fastener on the connector (i) and remove the connector (i) from the socket of the respective thermostat.
- Unscrew the onboard grounding screw from the ground terminal (h) of the unit and remove along with the onboard ground cable.
- Unscrew the on-board compressed air pipe from the typhone.
- Release the fasteners, and take the typhone off the mounting bracket.
- Cover up the port of the typhone and protect the connector (i) from damage.
- Cover up the onboard port unless a replacement unit is going to be fitted immediately after removal.
- Protect the onboard ground cable and the socket of the respective thermostat from damage.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required



6.1.3 Implementation



WARNING

Loud noise is caused by function testing!

Your hearing may be harmed. Do not perform any function test in a closed room.

Do not allow anybody to stand close to the typhone or microphone during the function test.

See vehicle operator's instructions

6.2 Servicing

Not required

6.3 Repair

Exchange the unit if it happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Implementation



WARNING

Loud noise is caused by function testing!

Your hearing may be harmed. Do not perform any function test in a closed room.

Do not allow anybody to stand close to the typhone or macrophone during the function test.

Variant without pressure regulator (f)

See Figure 2

Problem	Cause	Remedy	See
No sound	Typhone not being activated pneumatically	Test the typhone for correct pneumatic control.	
		Actuator/operating valve defective, check whether lines are broken.	
	Dirt or foreign particles in the typhone	Remove dirt or foreign particles	
	Typhone defective	Remove the unit and submit for repair.	Section 5.2, 5.1
Frequency / loudness of the sound is not good	Connection leaking	Tighten the connection (apply the specified tightening torque!) and test for leakage.	
	Dirt or foreign particles in the typhone	Remove dirt or foreign particles	
	Typhone defective	Remove the unit and submit for repair.	Section 5.2, 5.1



Variant without pressure regulator (f)

See Figure 3

Problem	Cause	Remedy	See
No sound	Typhone not being activated pneumatically	Test the typhone for correct pneumatic control.	
		Actuator/operating valve defective, check whether lines are broken.	
	Pressure regulator set incorrectly (f)	Remove the pressure regulator (f), adjust and reinstall.	Section 5.2, 5.1
	Ports on the pressure regulator (f) are leaking	Tighten the connection (apply the specified tightening torque!) and carry out a function test.	
	Pressure regulator (f) defective	Remove pressure switch (f), arrange for its disposal and exchange for an operative unit.	Section 5.2, 5.1
	Dirt or foreign particles in the typhone	Remove dirt or foreign particles	
Frequency / loudness of the sound is not good	Typhone defective	Remove the unit and submit for repair.	Section 5.2, 5.1
	Connections leaking	Tighten the connection (apply the specified tightening torque!) and carry out a function test.	
	Pressure regulator (f) set incorrectly	Remove the pressure regulator (f), adjust and reinstall.	Section 5.2, 5.1
	Pressure regulator (f) defective	Remove pressure switch (f), arrange for its disposal and exchange for an operative unit.	Section 5.2, 5.1
	Dirt or foreign particles in the typhone	Remove dirt or foreign particles	
Typhone defective	Remove the unit and submit for repair.	Section 5.2, 5.1	



Model with heating

See Figure 4

Error	Cause	Remedy	See
No sound	Typhone not being activated pneumatically	Test the typhone for correct pneumatic control.	
		Actuator/operating valve defective, check whether lines are broken.	
	Typhone iced up or frozen	Check the connector.	
		Test the heating system for correct electrical control.	
Dirt or foreign particles in the typhone	Remove dirt or foreign particles		
Typhone defective	Remove the unit and submit for repair.	Section 5.2, 5.1	
Frequency / loudness of the sound is not good	Connection leaking	Tighten the connection (apply the specified tightening torque!) and carry out a function test.	
	Typhone iced up or frozen	Check the connector.	
		Test the heating system for correct electrical control.	
	Dirt or foreign particles in the typhone	Remove dirt or foreign particles	
Typhone defective	Remove the unit and submit for repair.	Section 5.2, 5.1	



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
U - O F 1 1 . 2 1

Rev. 05 - 03.06.2009 - en
.....

.....
Overhaul Instructions

Check valves with damping

G3/4"

G1"

G1 1/2"



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	4
1.1	Technical changes	4
1.2	Target group for this document	4
1.3	Notes and warning messages	5
2	Introduction	6
2.1	Related documents	6
3	Basic safety information	7
3.1	Validity	7
3.2	Authorized use of the product	7
3.3	Operator's / maintainer's commitment to due care	7
3.3.1	Assignment of personnel	7
3.3.2	Availability of the document	7
3.3.3	Amendments to the document	8
3.3.4	Spares and wearing parts	8
4	Maintenance	9
4.1	Requirements	9
4.1.1	Auxiliary products and working materials	9
4.1.2	Special tools	10
4.1.3	Disassembly	11
4.1.3.1	Check valves 8.000.0.769.002.7 and I47617	11
4.1.3.2	Check valves 8.000.0.769.003.7, 8.000.0.769.700.6 and 8.000.0.769.700.7	12
4.2	Disposal	14
4.3	Cleaning	14
4.4	Inspection	15
4.5	Assembly	16
4.5.1	Check valves 8.000.0.769.002.7 and I47617	17
4.5.2	Check valves 8.000.0.769.003.7, 8.000.0.769.700.6 and 8.000.0.769.700.7	17
4.6	Testing	19



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS-trained service technicians who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish,
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-OF11.21 Description of check valves with damping

See Section 4.6 See Table 2 for the Test Instructions valid for the unit

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

8.000.0.769.002.7

I47617

8.000.0.769.003.7

8.000.0.769.700.6

8.000.0.769.700.7



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possess the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KB SfS or KB SfS approved parts or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Maintenance

KB Sfs gives top priority to safety and quality.

To help fulfil this claim, KB Sfs provides an overhauling service for its own units. KB Sfs performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

The KB Sfs Service Centers have the experience and technical equipment needed for performing professional overhauls.

KB Sfs has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact a KB Sfs Service Center if the unit develops a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KB Sfs by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- RENOLIT HLT2-KB grease (order number: ID No. 502647)



NOTE

The following LOCTITE products will be needed if a reducing nipple (h) has to be exchanged because of damage.

- LOCTITE 7471 activator (order number: ID No. 461990)
- LOCTITE 640 joining compound (order number: ID No. 501902)



4.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tool according to Figure 1

The special tools can be purchased from KB SfS by their order numbers.

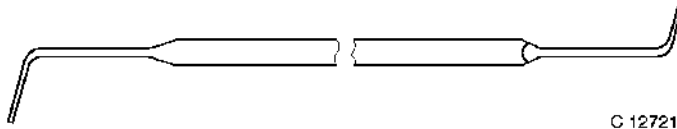


Figure 1 Special hook (order number B64617)



NOTE

A new reducing nipple (h) will have to be screwed into housing (a) if its internal thread is damaged. A well cleaned ISO228/1-G1" internal thread is required in the housing for this purpose. This is best obtained by recutting the thread with a suitable tap.

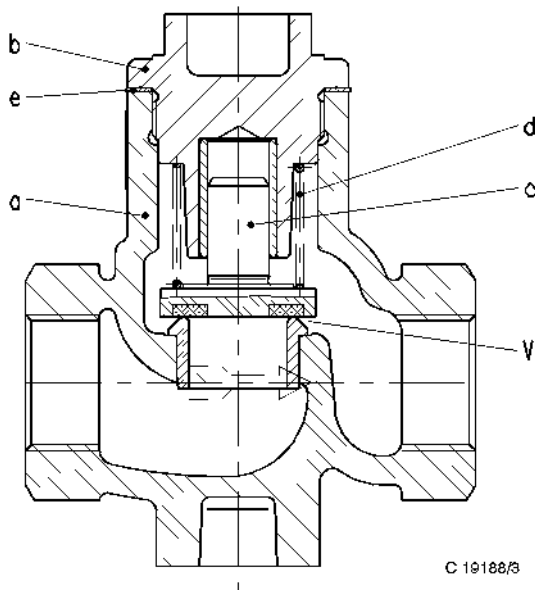


4.1.3 Disassembly

4.1.3.1 Check valves 8.000.0.769.002.7 and I47617

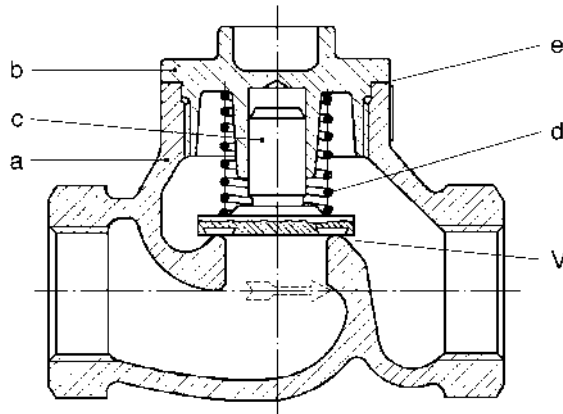
See Figure 2 and Figure 3

- Unscrew the screw plug (b) from housing (a), and remove sealing ring (e).
- Take compression spring (d) and valve cone (c) out of the housing.



- | | | | |
|----------|------------|----------|--------------------|
| a | Housing | d | Compression spring |
| b | Screw plug | e | Sealing ring |
| c | Valve cone | V | Valve seat |

Figure 2 Check valve I47617



C 19188/2

- | | | | |
|----------|------------|----------|--------------------|
| a | Housing | d | Compression spring |
| b | Screw plug | e | Sealing ring |
| c | Valve cone | V | Valve seat |

Figure 3 Check valve 8.000.0.769.002.7

4.1.3.2 Check valves 8.000.0.769.003.7, 8.000.0.769.700.6 and 8.000.0.769.700.7

See Figure 4

- Perform these steps only for units with item number 8.000.0.769.700.7.
 - Release all hose clamps (k), and take the two-part insulator (i) off housing (a).
 - Strip the seals (l) off reducing nipples (h).
- Perform these steps only for units with item numbers 8.000.0.769.700.6 and 8.000.0.769.700.7 if one of the reducing nipples (h) is damaged.
 - Unscrew the damaged reducing nipple (h) from housing (a).
- Unscrew the screw plug (b) from housing (a).



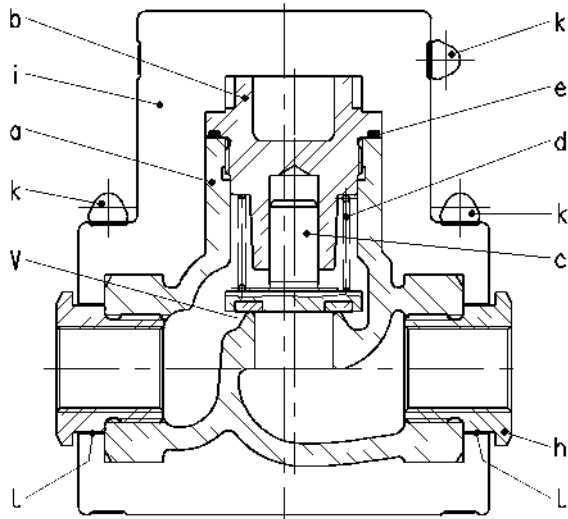
CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

- Using the special hook, draw O-ring (e) out of the groove in screw plug (b).
- Take compression spring (d) and valve cone (c) out of the housing.



C 19188/4

- | | | | |
|----------|--|----------|--|
| a | Housing | i | Insulator (only on 8.000.0.769.700.7) |
| b | Screw plug | k | Hose clamp (only on 8.000.0.769.700.7) |
| c | Valve cone | l | Seal (self-adhesive strip) |
| d | Compression spring | v | Valve seat |
| e | O-ring | | |
| h | Reducing nipple (not on 8.000.0.769.003.7) | | |

Figure 4 Check valves 8.000.0.769.003.7, 8.000.0.769.700.6 and 8.000.0.769.700.7



4.2 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

The following parts must be exchanged for new ones whenever they are removed (e.g. if they need to be removed for repair or overhaul):

- Sealing ring (e) on units with item numbers 8.000.0.769.002.7 and I47617
- O-ring (e) on units with item numbers 8.000.0.769.003.7, 8.000.0.769.700.6 and 8.000.0.769.700.7
- Reducing nipple (h) if the thread is damaged

The following parts must additionally be exchanged for new ones upon overhaul:

- Valve cone (c)
- Compression spring (d)

4.3 Cleaning

Clean all parts that do not have to be exchanged (also read the notes in Section 4.2).



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



- Take the following steps if a reducing nipple (h) had to be removed because of damage.
 - The ISO228/1-G1" internal thread that serves to hold the reducing nipple must be recut in housing (a) to clear out all traces of LOCTITE thread sealant.
 - All the debris caused by cutting must be blown out of the housing with compressed air.



NOTE

The cleaning substance must be compatible with plastics.

- Soak the cleaning cloth in a cold cleaning substance. Clean the insulator (i) with the cloth and blow dry with compressed air immediately afterwards.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.4 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- Inspect the sliding surface of the bore in screw plug (b). Exchange the screw plug in case of visible scoring or scratching.
- Ascertain the difference between the diameter of the bore in screw plug (b) and the diameter of the shank of valve cone (c). Exchange the screw plug as well if the difference exceeds the value stated below for the individual versions of the check valve.
 - Not more than 0.08mm for check valves 8.000.0.769.003.7, 8.000.0.769.700.6, 8.000.0.769.700.7 and I47617
 - Not more than 0.10mm for check valve 8.000.0.769.002.7
- Inspect the valve seat (V) in the housing for damage. Exchange the housing in case of visible scoring or scratching.



4.5 Assembly



CAUTION

Beware of contaminating and damaging the unit!

Functionality will be impaired or the unit might even fail.

Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Do not install new elastomers (seals) that are older than one year. Verify the date of manufacture prior to use.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate certain parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.

Item number of the check valve	Wrench size	Tightening torque
8.000.0.769.002.7	41mm	250 Nm.
8.000.0.769.003.7	36mm	120 Nm.
8.000.0.769.700.6		
8.000.0.769.700.7		
I47617		

Table 1 Wrench sizes and tightening torques for screw plug (b)



4.5.1 Check valves 8.000.0.769.002.7 and I47617

See Figure 2 and Figure 3



NOTE

Make sure that the thinly greased seals rest and rest/stick correctly in their seats with no dust or dirt present.

- Lubricate sealing ring (e) and the shank of valve cone (c) with a **thin** film of RENOLIT HLT2-KB grease.
- Put compression spring (d) and valve cone (c) in the housing.
- Add sealing ring (e) to screw plug (b), and screw the screw plug into housing (a).
- Tighten the screw plug to the torque value stated in Table 1.
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.

4.5.2 Check valves 8.000.0.769.003.7, 8.000.0.769.700.6 and 8.000.0.769.700.7

See Figure 4



NOTE

Make sure that the thinly greased seals rest and rest/stick correctly in their seats with no dust or dirt present.

- Lubricate O-ring (e) and the shank of valve cone (c) with a **thin** film of RENOLIT HLT2-KB grease.
- Put compression spring (d) and valve cone (c) in the housing.
- Add O-ring (e) to screw plug (b), and screw the screw plug into housing (a).
- Tighten the screw plug to the torque value stated in Table 1.



WARNING

Beware of using auxiliary products and working materials incorrectly!

The skin or respiratory tracts may be harmed or inflamed.

It is vital to observe the manufacturer's safety codes and directions for use.

- Perform these steps only for units with item numbers 8.000.0.769.700.6 and 8.000.0.769.700.7 if one of the reducing nipples (h) had to be unscrewed.
 - Coat the threads of the new reducing nipple with LOCTITE 640 and LOCTITE 7471 as instructed by the LOCTITE manufacturer.
 - Screw the reducing nipple into housing (a) and tighten immediately (before the LOCTITE sealant sets!) to a torque value of 50 Nm (using a 41mm wrench).
- Perform these steps only for units with item number 8.000.0.769.700.7.
 - Stick the seals (l) (self-adhesive strips) around the two reducing nipples (h).
 - Attach the two-part insulator (i) to housing (a) and fasten by the three hose clamps (k).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.6 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.

Item number of the unit	Document number of the Test Instructions
8.000.0.769.002.7 8.000.0.769.003.7 I47617	PRF1069
8.000.0.769.700.6 8.000.0.769.700.7	8.000.4.005.4004

Table 2 Test Instructions



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Flange surfaces (if any) must be protected from damage.

.....
.....
U - T B 1 0 . 2 1

Rev. 02 - 21.11.2014 - en
.....

.....
Overhaul Instructions

Silencer
NW6, NW12



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
02	21.11.2014	Revision history started		x				
		all			x		x	x



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	8
3.3	Operator's / maintainer's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working materials	10
4.1.2	Special tools	10
4.2	Disassembly	11
4.3	Disposal	13
4.4	Cleaning	14
4.5	Inspection	14
4.6	Assembly	15
4.7	Testing	17



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to modify the unit or this document at any time without making any specific announcements.

1.2 Target group for this document

The target group of this documentation are people who, due to training from KNORR-BREMSE,

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

The related Test Instructions specific to each item number must be consulted.

B-TB10.21 Description of silencers NW6, NW12

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I83602

I84285

I88533

I89666

I89666/A

I93076

II15905



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.

3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics
- RENOLIT HLT2-KB grease (order number: ID No. 502647)
- LOCTITE 222 sealant (order number: ID No. 506348)
- LOCTITE 290 sealant (order number: ID No. 506351)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools.



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

See Figure 1 and Figure 2



NOTE

Perform the working steps according to the version of the unit (see Table 1).



NOTE

The nipple (4) remains on the housing (1). This is only unscrewed if damaged (see Table 1 for version).



NOTE

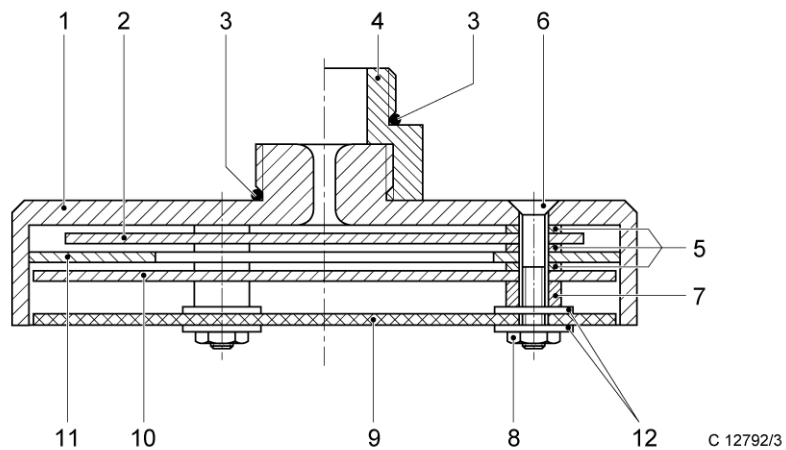
The ring (4) is cemented to the housing (1) and is not to be detached (see Table 1 for version).

- If necessary, unscrew the nipple (4) from the compressed air connection of the silencer (see Table 1 for version).
- If present, remove the O-ring (3) from the seat in the nipple (4) (see Table 1 for version).
- Remove the O-ring (3) from its seat in the housing (1) (see Table 1 for version).
- If present, unscrew machine screw (14) and remove cover (16) plus strainer (13) and toothed washer (15) from the silencer (see Table 1 for version).
- Unscrew hexagon nuts (8) and remove together with washers (12) and countersunk screws (6).
- Remove the disc (9), washers (7 and 12), including the disc (10), ring (11), disc (2) and washers (5) from the housing (1).



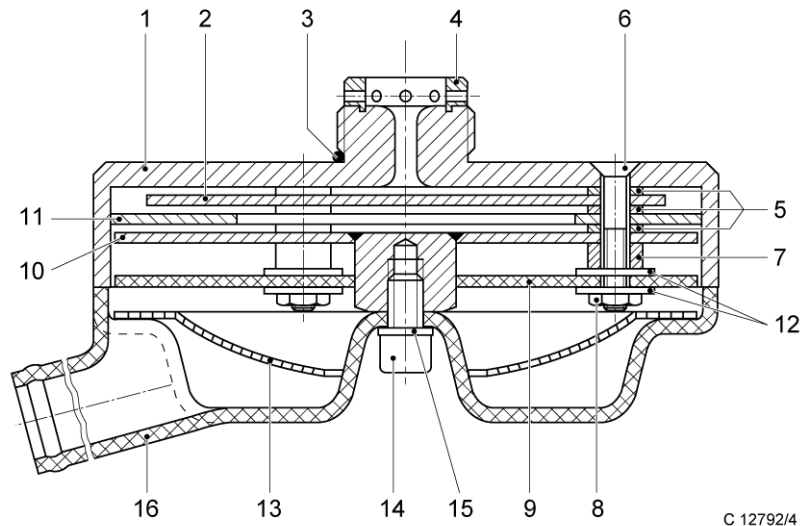
Item number	Silencer NW6		Silencer NW12	
	Without nipple (4)	With nipple (4)	Without cover (16)	With cover (16)
I83602	x			
I84285	x			
I88533		x		
I89666			x	
I89666/A			x	
I93076				x
II15905				x

Table 1 Overview of silencer versions



- | | | | |
|---|---------------|----|-------------|
| 1 | Housing | 7 | Washer |
| 2 | Washer | 8 | Hexagon nut |
| 3 | O-ring | 9 | Washer |
| 4 | Nipple | 10 | Washer |
| 5 | Washer | 11 | Ring |
| 6 | Hex-head bolt | 12 | Washer |

Figure 1 Silencers NW6 and NW12



C 12792/4

- | | | | |
|---|---------------|----|----------------|
| 1 | Housing | 9 | Washer |
| 2 | Washer | 10 | Washer |
| 3 | O-ring | 11 | Ring |
| 4 | Ring | 12 | Washer |
| 5 | Washer | 13 | Strainer |
| 6 | Hex-head bolt | 14 | Machine screw |
| 7 | Washer | 15 | Toothed washer |
| 8 | Hexagon nut | 16 | Cover |

Figure 2 Silencer NW12 with a cover

4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)



4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.



NOTE

Prior to cleaning the bonded metal-to-plastic components (Pos. 9 and 6), check the plastic part for compatibility with the chemical cleaning spirit. The bonded component will have to be handled and cleaned entirely like a non-metallic part if the plastic is suspected of attack by the chemical cleaning spirit.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.
- When unscrewed, thoroughly remove all traces of sealants from the countersunk screw (6), the hexagon nut (8), the nipple (4) and the housing (1).



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Unless stated otherwise in the following text, all adhesive bonds are subject, as a maximum, to bonding class A3 of DIN6701 "Manufacture of Adhesive Bonds on Rail Vehicles and Parts of Rail Vehicles".
The customer is responsible for ensuring that adhesive bonds will be manufactured in accordance with the quality demands and standardization requirements of the latest version of DIN6701. The requirements set out in this Standard must be observed, met and translated correspondingly into practice.
Furthermore, it is vital to observe the maker's safety codes and directions for the use of adhesives.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.

See Figure 1 and Figure 2



NOTE

Perform the working steps according to the version of the unit (see Table 1).

- Grease the O-ring (3) with a **thin** film of RENOLIT HLT2-KB.
- Insert the O-ring (3) in its seat on housing (1).
- Coat the external threads of the housing (1) and the internal thread of the nipple (4) with LOCTITE 290 (see Table 1 for version).
- Coat the threads of countersunk screws (6) and hexagon nuts (8) with LOCTITE 222.
- Insert the countersunk screws (6) in their holes in the housing (1).



NOTE

Assemble the unit so that an even annular gap S exists around the full circumference between the wall of the housing and the discs (9) and (10).

The width of the gap must not vary by more than 0.3mm at any two diagonally opposite points.

- Successively locate the washers (5), disc (2), washers (5), ring (11), washers (5), disc (10), washers (7), washers (12) and disc (9) on countersunk screws (6) in the housing (1).
- Screw the inserted individual parts tightly in their correct mounting positions using hex-head bolts (8) and washers (12).
- If present, position the strainer (13) in the cover (16) and fasten the cover (16) to the housing (1) in the correct mounting position, using the machine screw (14) and toothed washer (15).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.



CAUTION

Beware of failure to protect parts during storage and shipment!
The unit might be damaged, e.g. connector contacts deformed.
Put a protective cap on the unit's electric connector.

.....
.....
U - O G 2 0 . 3 1

Rev. 02 - 04.03.2015 - en
.....

.....
Overhaul Instructions

Magnet valve
WMV-01/1NZG



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
02	02.03.2015	Revision history started		x				
		all			x		x	x



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working substances	10
4.1.2	Special tools	10
4.2	Disassembly	11
4.3	Disposal	13
4.4	Cleaning	14
4.5	Inspection	14
4.6	Assembly	16
4.7	Testing	18



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to modify the unit or this document at any time without making any specific announcements.

1.2 Target group for this document

The target group of this documentation are people who, due to training from KNORR-BREMSE,

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-OG20.31 Description of magnet valve WMV-01/1NZG

B-OG51.21 Description of valve magnets Z-01N-G; ...

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I82553/...

I85094/...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools.



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

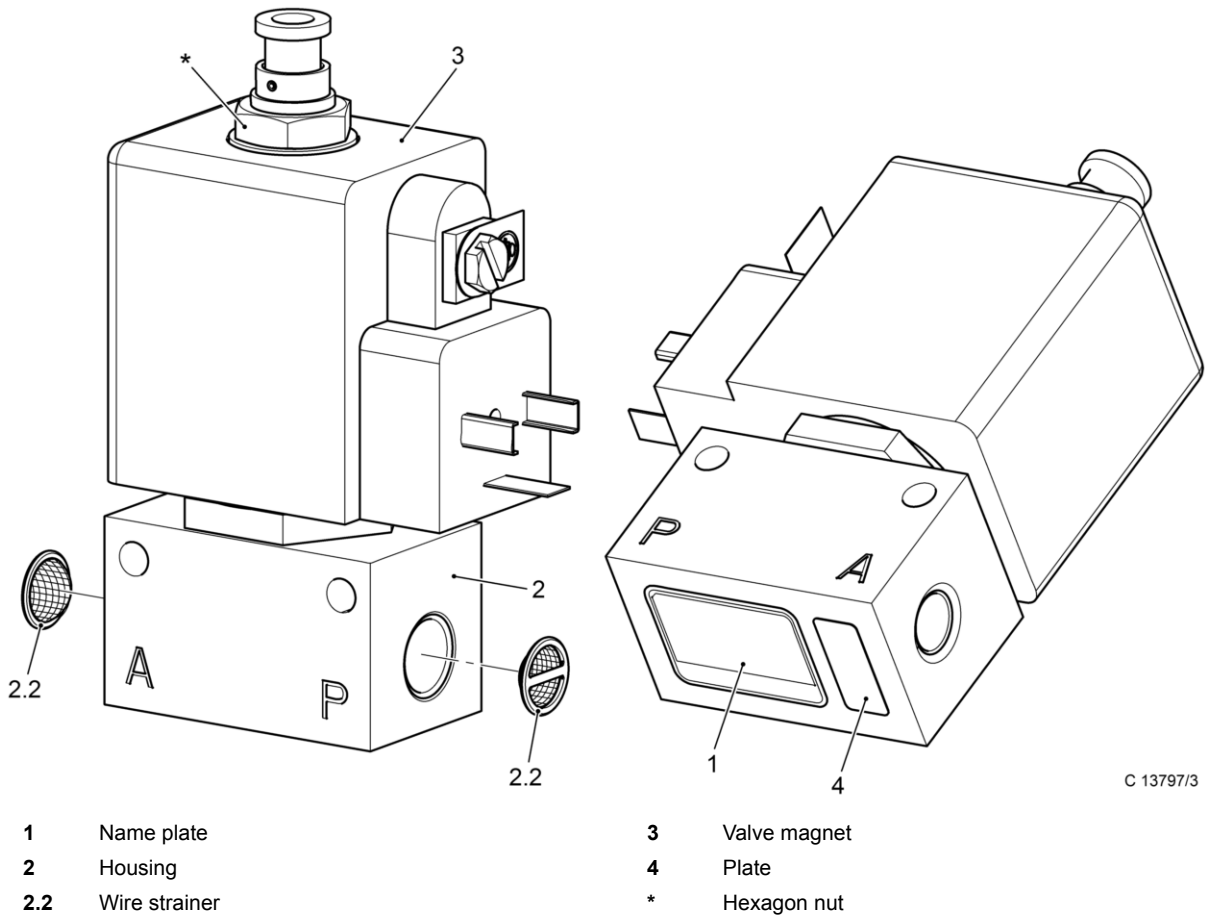
See Figure 1

- Unscrew the valve magnet (3) from the housing (2) as directed in the related documents (see Section 2.1).
- Unscrew the wire strainers (2.2) out of the housing (2).



NOTE

Treat the valve magnet (3) as directed in the related Description (see Section 2.1).



C 13797/3

- 1 Name plate
- 2 Housing
- 2.2 Wire strainer

- 3 Valve magnet
- 4 Plate
- * Hexagon nut

Figure 1 Magnet valve WMV-01/1NZG



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous! This would mean unnecessary and legally punishable harm to the environment. Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)



NOTE

Arrange for the disposal of the component assemblies as directed in the relevant documents (see Section 2.1).



4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.



NOTE

Clean the component assemblies as directed in the relevant documents (see Section 2.1).

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.
- Any missing or barely legible signs or name plates must be replaced or added.



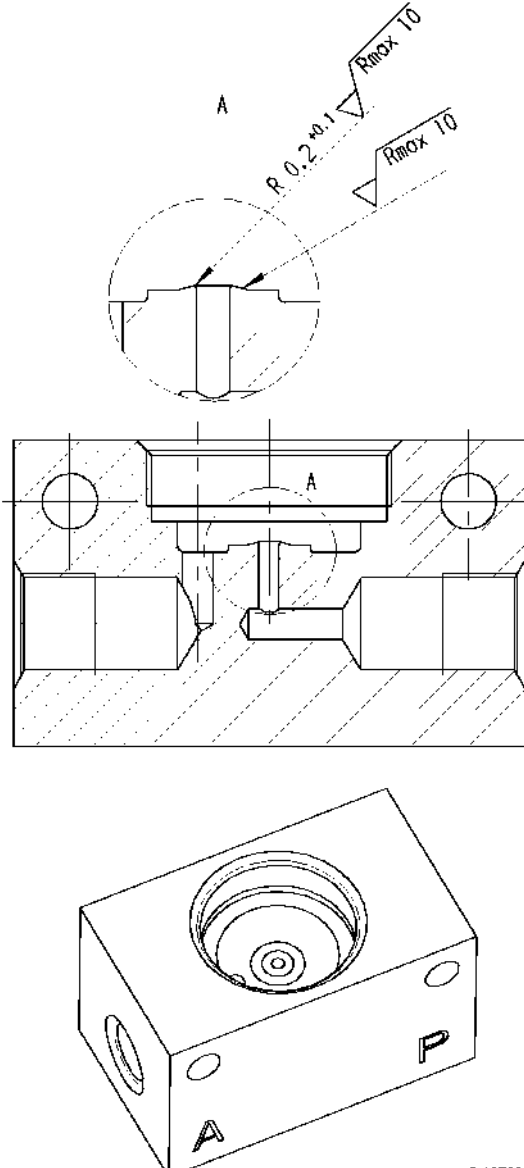
Item	Designation	Notes
2	Housing	 <p>The dimensions and surface finishes must be to specification. Exchange any part out of specification.</p>

Table 1 Separate inspection of special components



NOTE

Inspect the component assemblies as directed in the relevant documents (see Section 2.1).



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



See Figure 1

- Screw the wire strainers (2.2) into the housing (2).
- Screw the valve magnet (3) into the housing (2) according to the instructions in the associated documentation (see Section 2.1).
Tightening torque: 75 Nm \pm 10%
- Tighten the hexagon nut (*) on the knob of the hand control of the valve magnet (3).
Tightening torque: 7.3 Nm \pm 10%
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.



CAUTION

Beware of failure to protect parts during storage and shipment!
The unit might be damaged, e.g. connector contacts deformed.
Put a protective cap on the unit's electric connector.

.....
.....
U - G F 1 0 . 2 8

Rev. 03 - 08.02.2018 - en
.....

.....
Overhaul instructions

Check valve
RV19-T
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
02	23.07.2013	Revision history started		x				
		4.1, 4.2, 4.6		x				
		4.3					x	
		4.5					x	x
03	08.02.2018	4.5, 4.6		x				



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group of this documentation	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working substances	10
4.1.2	Special tools	10
4.2	Disassembly	11
4.3	Disposal	14
4.4	Cleaning	15
4.5	Inspection	16
4.6	Assembly	18
4.7	Check	20



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group of this documentation

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-GF10.21 Description of check valve RV19-T

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I88744

I88744/A

II67897

STK8939

STK8939K



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools.



4.2 Disassembly

See Figure 1 and Figure 2



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.



NOTE

Leave grooved dowel pin (7) in housing (1). Only remove in case of damage.

- If included, remove O-rings (6) from housing (1).



CAUTION

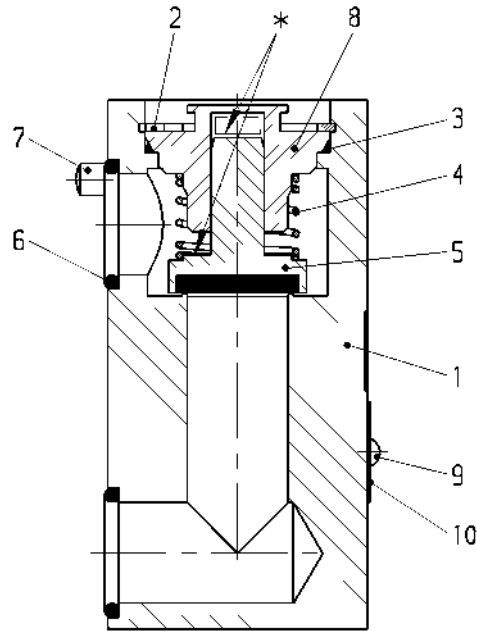
Pretensioned compression spring (4)!

The valve guide (8) is pre-tensioned by compression spring (4).

The pretensioned compression spring (4) may jump out of the housing (1) and cause eye injuries.

Perform all the working steps in the specified sequence.

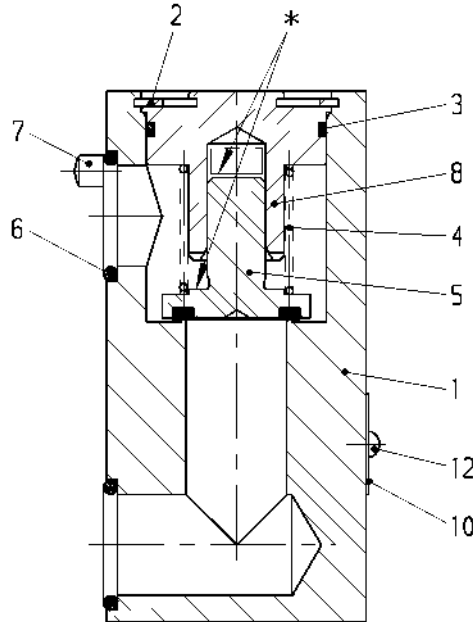
- Secure and hold down the valve guide (8) while cautiously releasing the retaining ring (2) from housing (1).
- Decrease the pressure on valve guide (8) while relaxing the compression spring (4).
- Take valve guide (8), compression spring (4) and valve head (5) out of housing (1).
- Release O-ring (3) from its seat on valve guide (8) and from housing (1), respectively.



C 19582/5

- | | | | |
|---|--------------------|----|------------------------|
| 1 | Housing | 7 | Plug-in dowel pin |
| 2 | Retaining ring | 8 | Valve guide |
| 3 | O-ring | 10 | Name plate |
| 4 | Compression spring | 12 | Rivet |
| 5 | Valve head | * | No grease in this area |
| 6 | O-ring | | |

Figure 1 Check valve RV19-T
(the unit with item number I88744 is shown here by way of example)



- | | | | |
|---|--------------------|----|------------------------|
| 1 | Housing | 7 | Plug-in dowel pin |
| 2 | Retaining ring | 8 | Valve guide |
| 3 | O-ring | 9 | Rivet |
| 4 | Compression spring | 10 | Name plate |
| 5 | Valve head | * | No grease in this area |
| 6 | O-ring | | |

Figure 2 Check valve RV19-T
(the unit with item number I167897 is shown here by way of example)

Item number:	Version corresponding to:
I88744	Figure 1
I88744/A	Figure 1
I167897	Figure 2
STK8939	Figure 1
STK8939K	Figure 2

Table 1 Versions of the check valves



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)



4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



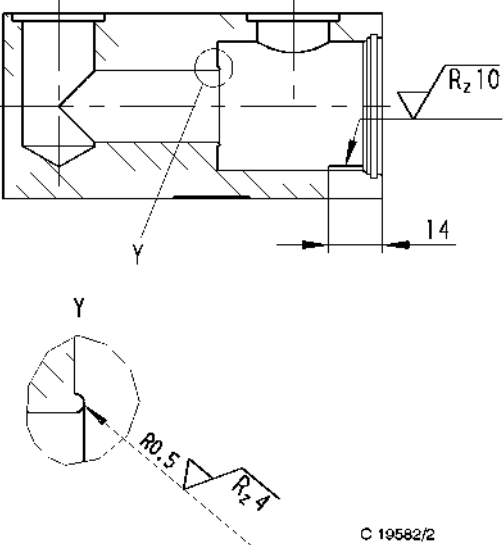
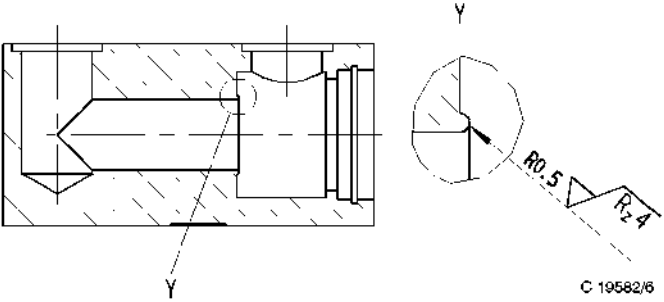
NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.



4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Any part displaying damage such as cracking, distortion, corrosion or thread deformation must be exchanged for a new one.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given as notes and illustrated, where applicable, in a figure.

Item	Designation	Notes
1	Housing only valid for I88744 I88744/A STK8939	 <p>The dimensions and surface finishes must be to specification. Failing this requirement, exchange the part.</p>
1	Housing only valid for II67897 STK8939K	 <p>The dimensions and surface finish must be to specification. Failing this requirement, exchange the part.</p>



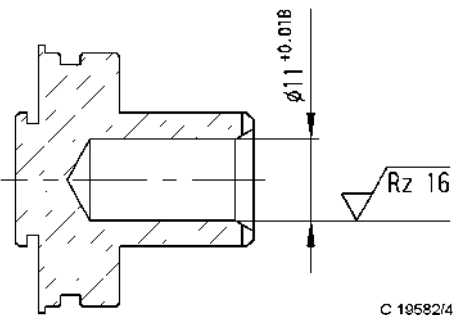
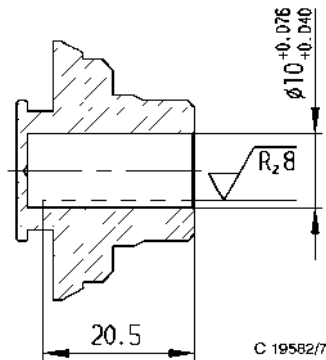
Item	Designation	Notes
8	Valve guide only valid for I88744 I88744/A STK8939	 <p>The size and the surface finish must be to specification. Failing this requirement, exchange the part.</p>
8	Valve guide only valid for I167897 STK8939K	 <p>The dimensions and surface finish must be to specification. Failing this requirement, exchange the part.</p>

Table 2 Separate inspection of special components



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



See Figure 1 and Figure 2



NOTE

The inner sides of the compression spring (4) as well as the areas marked (*) in Figure 1 and Figure 2 must be grease free.

- Only valid for units with item number **STK8939K**:
 - Grease the O-rings (3 and 6) with a **thin** film of RENOLIT KBS 1.
 - Lubricate the end faces of compression spring (7) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate the shank of valve head (5) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate the guiding bore for valve guide (8) in housing (1) with a **thin** film of RENOLIT KBS 1 grease.
- Valid for all other units:
 - Grease the O-rings (3 and 6) with a **thin** film of RENOLIT HLT2-KB.
 - Lubricate the end faces of compression springs (4) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate the shank of valve head (5) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate the guiding bore for valve guide (8) in housing (1) with a **thin** film of RENOLIT HLT2-KB grease.
- Insert the greased O-ring (3) in its seat on valve guide (8) and in housing (1), respectively.
- Put together valve head (5), compression spring (4) and valve guide (8), insert the assembly in housing (1) and secure with retaining ring (2).



NOTE

Make sure that the retaining ring (2) is seated correctly.

- Put the greased O-rings (6) in their seats on housing (1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Check

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.

.....
.....
U - G J 2 0 . 2 3

Rev. 02 - 27.07.2016 - en
.....

.....
Overhaul Instructions

Ballcock with an exhaust and switch
module

SK-T-DN..E-SM

SK-T-DN..E-SM-K



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
01	05.06.2015	4.1.1, 4.2, 4.3, 4.6					x	
		4.4, 4.7		x				
02	27.07.2016	3.1	x					
		4.2		x				



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	9
3.3	Operator's / maintainer's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spare parts and wearing parts	10
4	Maintenance	11
4.1	Requirements	11
4.1.1	Auxiliary products and working substances	11
4.1.2	Special tools	11
4.2	Disassembly	13
4.3	Disposal	18
4.4	Cleaning	18
4.5	Inspection	19
4.6	Assembly	20
4.7	Testing	24



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to modify the unit or this document at any time without making any specific announcements.

1.2 Target group for this document

The target group of this documentation are people who, due to training from KNORR-BREMSE,

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-OJ45.21 Description of the switch module

The related Description specific to each item number must be consulted.

The associated Test Instructions for the ballcock specific to each item number must be adhered to.

The associated Test Instructions for the ballcock with switch module specific to each item number must be adhered to.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

II57474/.....	II74556/.....
II57615/.....	II74561/.....
II57616/.....	II74562/.....
II58177/.....	II74563/.....
II58178/.....	II74564/.....
II58179/.....	II74565/.....
II67348/.....	II74566/.....
II67349/.....	II74567/.....
II67357/.....	II74568/.....
II67358/.....	II74569/.....
II67359/.....	II74571/.....
II72497/.....	II74572/.....
II72498/.....	II74573/.....
II72765/.....	II74574/.....
II73455/.....	II74575/.....
II73456/.....	II74576/.....
II73457/.....	II74881/.....
II73496/.....	II74882/.....
II73497/.....	II74883/.....
II73547/.....	II74884/.....
II73548/.....	II74885/.....
II73549/.....	II74886/.....
II74551/.....	II74887/.....
II74552/.....	II74888/.....
II74553/.....	II74889/.....
II74554/.....	II74901/.....
II74555/.....	II74902/.....



II74903/.....
II74904/.....
II74905/.....
II74906/.....
II74911/.....
II74912/.....
II74913/.....
II74914/.....
II74915/.....
II74916/.....
II79751/.....
II79752/.....
II79753/.....
II79754/.....
II79755/.....
II79756/.....

II79791/.....
II79792/.....
II79793/.....
II79794/.....
II79795/.....
II79796/.....
II79797/.....
II79798/.....
II79799/.....
II80461/.....
II80462/.....
II80463/.....
II80464/.....
II80465/.....
II80466/.....



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics
- LOCTITE 262 sealant (order number: ID.no. 506350)

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tools:

- Assembly drift - dependent on the nominal bore (see Table 1)
(needed for installing the inner retaining ring (16))
- Test gauge - dependent on the nominal bore (see Table 2)
(needed for checking the inner retaining ring (16) for correct installation)
- Press
(needed for installing the inner retaining ring (16))



Order number	for type designation
C162984_DN7	SK-T-DN7E...
C162984_DN19	SK-T-DN19E...
C162984_DN25	SK-T-DN25E...

Table 1 Order numbers of the assembly drift

Order number	for type designation
C162985_DN7	SK-T-DN7E...
C162985_DN19	SK-T-DN19E...
C162985_DN25	SK-T-DN25E...

Table 2 Order numbers of the test gauge



NOTE

Special tools with an order number can be purchased from KNORR-BREMSE.

Special tools with a tool drawing number must be made to the specifications of the tool drawings supplied by KNORR-BREMSE.

Special tools without an order number or tool drawing number must be made to the specifications in the figures. The dimensions specified in the figures are mandatory values. Unspecified dimensions are left to the toolmaker's discretion.



4.2 Disassembly



NOTE

The part numbers and designations used in these Overhaul Instructions may differ from those of the unit you are actually dealing with.



NOTE

To ensure that the ballcock is correctly assembled, it is necessary to write up a verifiable record during disassembly, showing how the component parts are arranged and aligned.

Detach the actuator (8):

See Figure 1

- Turn the cock to the "closed" position.
- Unscrew the countersunk screw (20).
- Record the alignment of the marking disc (11) and the actuator (8) relative to the switch module (33).
- Remove the marking disc (11) and the actuator (8).
- Record the marking on the end face of the switch module shaft.
- Only for units without a handle lock:
 - Record the alignment of the stop disc (35) relative to the switch module (33).
 - Remove the stop disc (35).

Remove the switch module (33):

See Figure 1

- Record the alignment of the switch module control shaft relative to the switch module (33).
- Unscrew the machine screws (34).
- Only for units with a handle lock:
 - Record the alignment of the stop plate (36) relative to the switch module (33).
 - Remove the stop plate (36).
- Remove the switch module (33).
- Mark stop disc (6) to avoid mistaking it for stop disc (35).
- Record the alignment of the stop disc/lever (6) relative to the housing (1).



- Remove the stop disc/lever (6).
- Unscrew the countersunk screws (31).
- Record the alignment of the adapter plate (30) relative to the housing (1).
- Remove the adapter plate (30).
- Remove the spacer (21) from the adapter plate (30).

Dismantling the ballcock:

See Figure 1



CAUTION

Beware of incorrect handling!

Malfunions and/or leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.



NOTE

Depending on the version, the ports contain three O-rings (18) or two O-rings (17) and one O-ring (18).

- Remove O-rings (17 and 18) or O-rings (18) from the housing (1).



CAUTION

Pretensioned compression spring (15)!

Pretensioned compression springs may jump out of the housing and cause eye injuries.

Perform all the working steps in the specified sequence.

- Press down the stopper (4) while counter-holding the housing (1) until the retaining ring (16) is free of pressure.
- Remove the retaining ring (16) and decrease the pressure on the stopper (4) while relaxing the compression spring (15).
- Remove the stopper (4) and compression spring (15) from the housing (1).
- Remove the O-ring (13) from the stopper (4).
- Remove the retaining ring (16).
- Remove the supporting ring (14), seal (2) and ball (3) from the housing (1).
- Remove the O-ring (12) from the supporting ring (14).

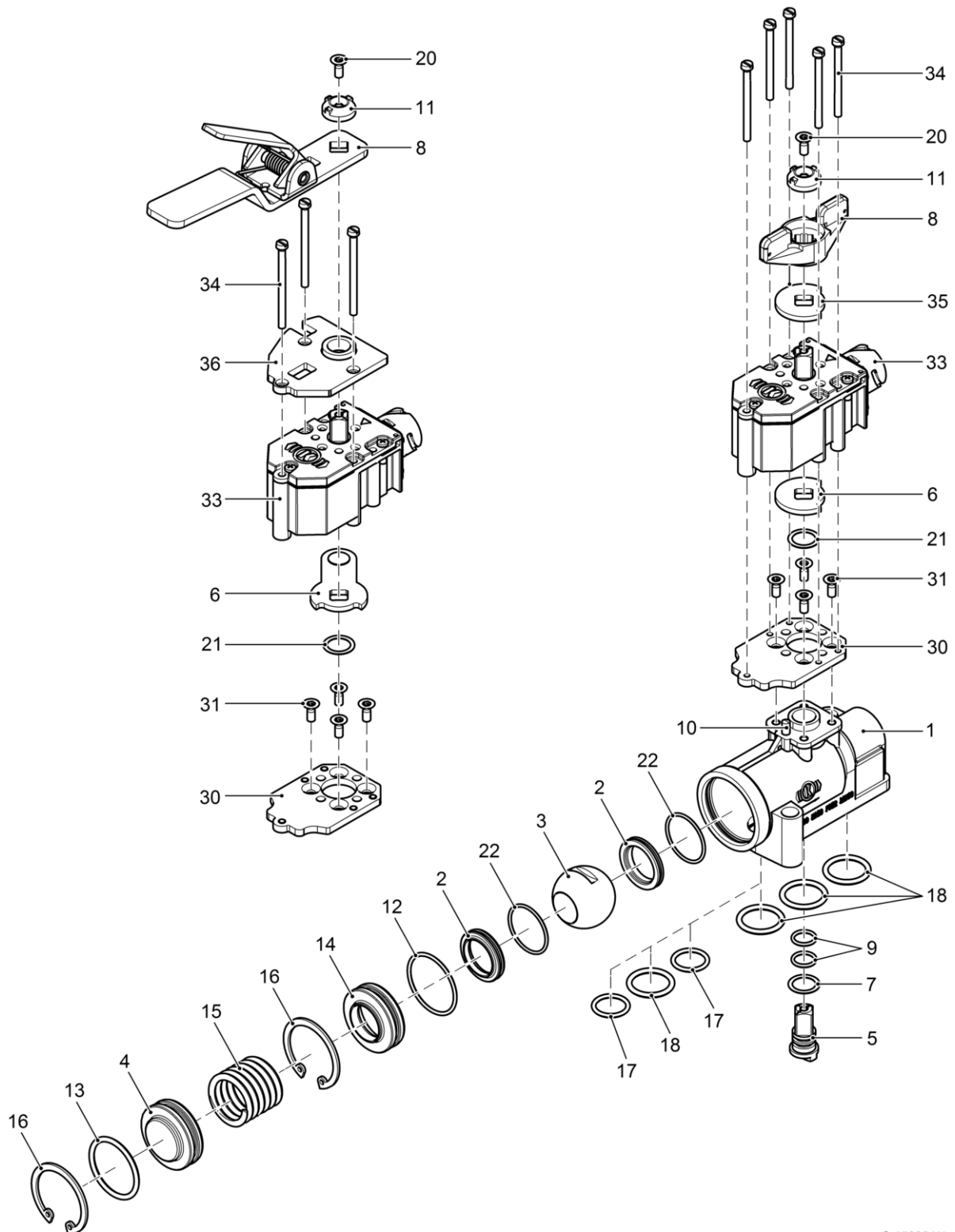


- Record the alignment of the control shaft (5) relative to the housing (1).
- Remove the control shaft (5) and thrust ring (7).
- Remove the O-rings (9) from the control shaft (5).
- Remove the seal (2) from the housing (1).
- Not for DN7 ballcocks:
 - Remove the O-rings (22) from the seals (2).



NOTE

The dowel pin (10) remains in the housing (1) and is only exchanged if damaged.



C 158901/1





1	Housing	16	Retaining ring
2	Seal	17	O-ring
3	Ball	18	O-ring
4	Plug	19	Name plate (not shown)
5	Control shaft	20	Countersunk screw
6	Stop disc/lever	21	Spacer
7	Thrust ring	22	O-ring*
8	Actuator **	30	Adapter plate
9	O-ring	31	Countersunk screw
10	Dowel pin	33	Switch module
11	Marking disc	34	Machine screw
12	O-ring	35	Stop disc
13	O-ring	36	Stop plate
14	Supporting ring	*	Not for ...DN7... units
15	Compression spring	**	e.g.: T-handle, handle, handle with locking function

Figure 1 Ballcock with a switch module
Illustration of: Cock open (typical view)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous! This would mean unnecessary and legally punishable harm to the environment. Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)

4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly! The skin or respiratory tracts may be harmed or inflamed. It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling! Malfunctions and leakage due to damaged sealing surfaces. Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.
- Thoroughly strip all traces of sealants from the threads of the countersunk screw (20), countersunk screws (31) and machine screws (34) and also from the mating threads.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.

Item	Designation	Notes
3	Ball	The sealing surfaces must not be scratched in any way or reveal deep wear. Exchange any part that is out of specification.

Table 3 Separate inspection of special components



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



NOTE

Unless indicated specially in the following text, tighten all bolted joints **evenly** to the specifications in document WB420332A - doing so crosswise if there are four or more mounting points.



NOTE

The part numbers and designations used in these Overhaul Instructions may differ from those of the unit you are actually dealing with.

The O-rings (22) are only included in DN19 and DN25 units.

Assembling the ballcock:

See Figure 1



CAUTION

Beware of incorrect handling!

Malfunctions and/or leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the type designation):
 - Grease the O-rings (9, 12, 13, 17, 18, 22) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate the seal (2) with a **thin** film of RENOLIT KBS 1 grease.
- Only for all other units:
 - Grease the O-rings (9, 12, 13, 17, 18, 22) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate the seal (2) with a **thin** film of RENOLIT HLT2-KB grease.
- Not for DN7 ballcocks:
 - Fit the seal (2) into the housing (1).
- Place the greased O-rings (22) on the seals (2).
- Fit the thrust ring (7) on the control shaft (5).
- Insert the greased O-rings (9) in their seats on the control shaft (5).
- Insert the control shaft (5) in the correct position in housing (1) (consult your previously recorded alignment information).
- Fit the seal (2) into the housing (1).



NOTE

The mark indicating the exhaust on the end face of the square head, and the exhaust bore must be positioned equilaterally.

- Insert the ball (3) in the correct position in the housing (1) (exhaust bore pointing towards the vented side), while taking care to locate the control shaft (5) in the groove on the ball (3).
- Insert the O-ring (12) in its seat on the supporting ring (14).
- Fit the seal (2) and supporting ring (14) in the housing (1).
- Position the assembly drift on the supporting ring (14), then carefully apply pressure in a press and secure with the retaining ring (16).
- Unload the press and remove the assembly drift.
- Check the retaining ring (16) for correct seating using the test gauge.
- Insert the O-ring (13) into its seat on the stopper (4).
- Insert compression spring (15) and stopper (4) in housing (1), and apply pressure to thrust member (4) while holding the housing (1) tight for support.
- Secure the stopper (4) with the retaining ring (16) and unload the pressure on the stopper (4).
- Insert the O-rings (17 and 18) or O-rings (18) in the seats on the housing (1).

Attaching the switch module (33):

See Figure 1



NOTE

Before installing the switch module (33), check its item number for agreement with that named in the reference information about the ballcock.

- Place the adapter plate (30) in the correct position on the housing (1) (consult your previously recorded alignment information).
- Coat the threads of the countersunk screws (31) with LOCTITE 262.
- Attach the adapter plate (30) to the housing (1) using the countersunk screws (31).
- Insert the spacer (21) into the adapter plate (30).
- Place the stop disc/lever (6) in the correct position on the shank of the control shaft (5) (consult your previously recorded alignment information).
- Test the ballcock without the switch module, proceeding in accordance with the relevant test Instructions (see section 2.1).



NOTE

Take care to position the switch module shaft correctly (marking on the end face of this shaft) (consult your record).

- Only for units with a handle lock:
 - Place the stop plate (36) in the correct position on the switch module (consult your previously recorded alignment information).
- Coat the threads of machine screws (34) with LOCTITE 262.
- Attach the switch module (33), and the stop plate (36) if present, to the adapter plate (30) using the machine screws (34).

Attaching the actuator (8):

See Figure 1

- Only for units without a handle lock:
 - Mount the stop disc (35) in the correct position on the shank of the shaft of switch module (33) (consult your previously recorded alignment information).
- Mount the actuator (8) and marking disc (11) in the correct position on the shank of the shaft of the switch module (33) (consult your previously recorded alignment information).
- Coat the threads of the countersunk screw (20) with LOCTITE 262.
- Fasten the actuator (8) using the marking disc (11) and countersunk screw (20).



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.



CAUTION

Beware of failure to protect parts during storage and shipment!
The unit might be damaged, e.g. connector contacts deformed.
Put a protective cap on the unit's electric connector.

.....
.....
U - G D 8 0 . 2 4

Rev. 00 - 13.11.2009 - en
.....

.....
Overhaul Instructions

Impulse valve
WIMHV5-NT



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	4
1.1	Technical changes	4
1.2	Target group for this document	4
1.3	Notes and warning messages	5
2	Introduction	6
2.1	Related documents	6
3	Basic safety information	7
3.1	Validity	7
3.2	Authorized use of the product	7
3.3	Operator's / maintainer's commitment to due care	7
3.3.1	Assignment of personnel	7
3.3.2	Availability of the document	7
3.3.3	Amendments to the document	8
3.3.4	Spares and wearing parts	8
4	Maintenance	9
4.1	Requirements	9
4.1.1	Auxiliary products and working materials	9
4.1.2	Special tools	9
4.2	Disassembly	11
4.3	Disposal	13
4.4	Cleaning	14
4.5	Inspection	15
4.6	Assembly	16
4.7	Testing	19



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS-trained service technicians who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-GD80.24	Description of impulse valve WIMHV5-NT
B-OG51.27	Description of valve magnet N-S2
PRF6095	Test Instructions
WB420332A	Table of specified tightening torques

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item number

II68655/...



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possess the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KB SfS or KB SfS approved parts or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Maintenance

KB SfS gives top priority to safety and quality.

To help fulfil this claim, KB SfS provides an overhauling service for its own units. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

The KB SfS Service Centers have the experience and technical equipment needed for performing professional overhauls.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact a KB SfS Service Center if the unit develops a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KB SfS by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics
- RENOLIT HLT2-KB grease (order number: ID No. 502647)
- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tool according to Figure 1

The special tool can be purchased from KB SfS by its order number.

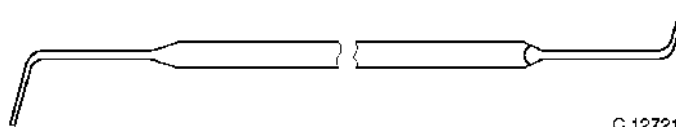


Figure 1 Special hook (order number B64617)



Figure 2

Removing KNORR K-rings (outer ring)

Draw the ring out of its groove by the special hook, and pull it entirely off by hand.

Or:

Draw the ring taut between thumb and index finger. The ring emerges from its groove at the opposite side. Pull off the ring by hand.



Figure 3

Installing KNORR K-rings (outer ring)

Draw the thinly greased KNORR K-ring over the piston. Stretch the ring to one side and slip by hand into the groove with the sealing lips first. Repeat the procedure around the full circumference until the entire ring is seated in its groove.

Run the special hook round between the KNORR K-ring and the groove wall.



4.2 Disassembly

See Figure 4



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

- Take O-rings (8) off housing (12).
- Detach valve magnets (1) from covers (6) as directed in the relevant documents and their annexes (see Section 2.1).



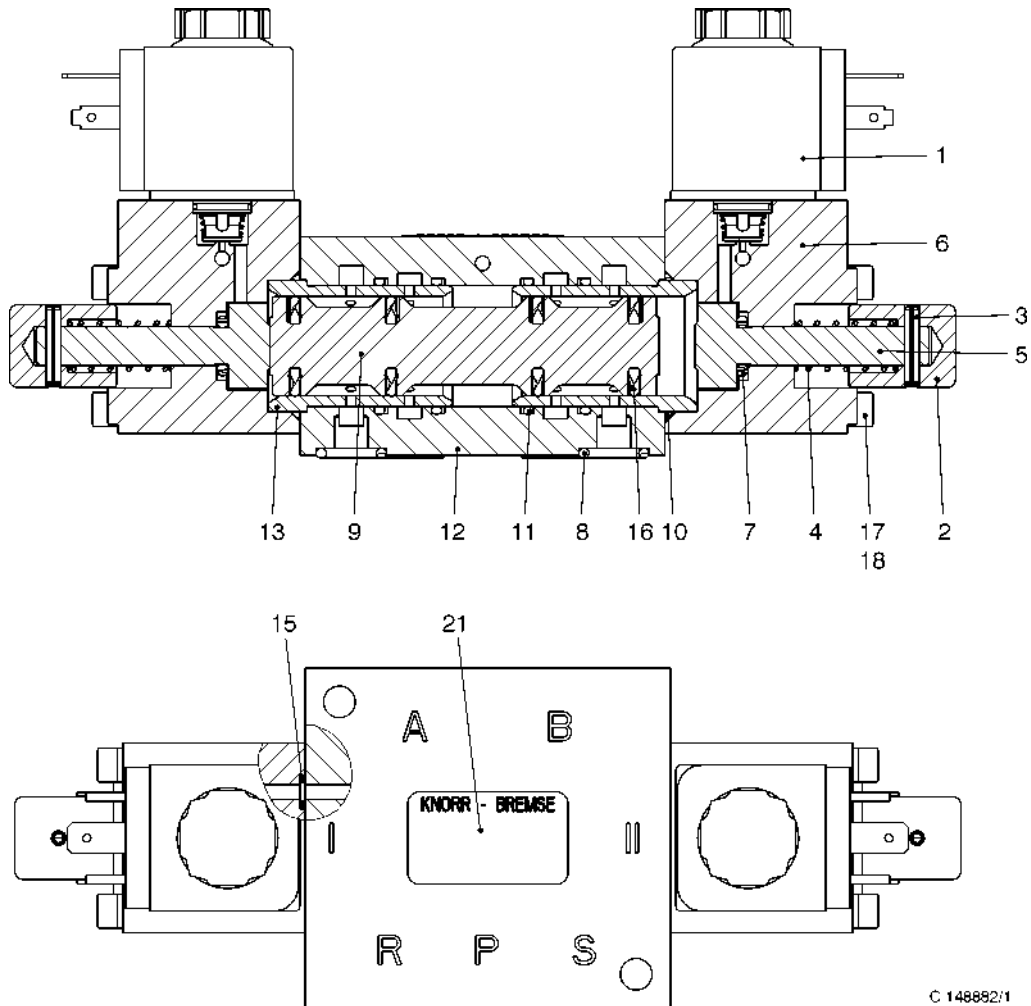
WARNING

Pretensioned compression springs (4)!

The spring and the parts loaded by spring tension may cause severe injuries (e.g. to the eyes) if they are dismantled incorrectly.

It is vital to perform all the working steps in the specified sequence.

- Remove the **pretensioned** compression springs (4) in the following steps.
Drive out dowel pins (3) one by one at either side, cautiously pull cap (2) off pin (5) and remove the thus expanded compression spring (4).
- Unscrew the machine screws (17) one by one at either side and remove them together with locking rings (18). Take off covers (6).
- Remove O-rings (15) and pins (5) from covers (6).
- Take O-rings (7) off pins (5).
- Remove O-ring (10) at either side.
- Push piston (9) out of housing (12).
- Release KNORR K-rings (16) from piston (9), using the special hook (Figure 1) as shown in Figure 2.
- Remove bushes (13) from housing (12).
- Remove O-rings (11) from housing (12).



C 148882/1

- | | | | |
|---|--------------------|----|---------------|
| 1 | Valve magnet | 10 | O-ring |
| 2 | Cap | 11 | O-ring |
| 3 | Dowel pin | 12 | Housing |
| 4 | Compression spring | 13 | Bush |
| 5 | Pin | 15 | O-ring |
| 6 | Cover | 16 | KNORR K-ring |
| 7 | O-ring | 17 | Machine screw |
| 8 | O-ring | 18 | Locking ring |
| 9 | Piston | 21 | Name plate |

Figure 4 Impulse valve WIMHV5-NT



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

The following parts must be exchanged for new ones whenever they are removed (e.g. if they need to be removed for repair or overhaul):

- Dowel pins (3)
- O-rings (8)

The following parts must additionally be exchanged for new ones upon overhaul:

- Compression springs (4)
- O-rings (7, 10, 11, 15)
- KNORR K-rings (16)
- Locking rings (18)



NOTE

The valve magnets cannot be overhauled. If necessary, exchange the valve magnets for new ones as directed in the relevant documents and their annexes (see Section 2.1).



4.4 Cleaning

Clean all parts that do not have to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



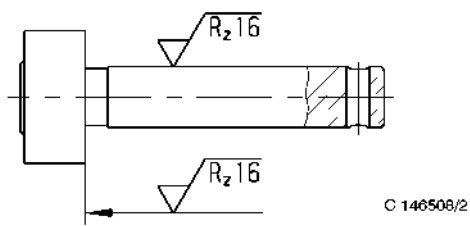
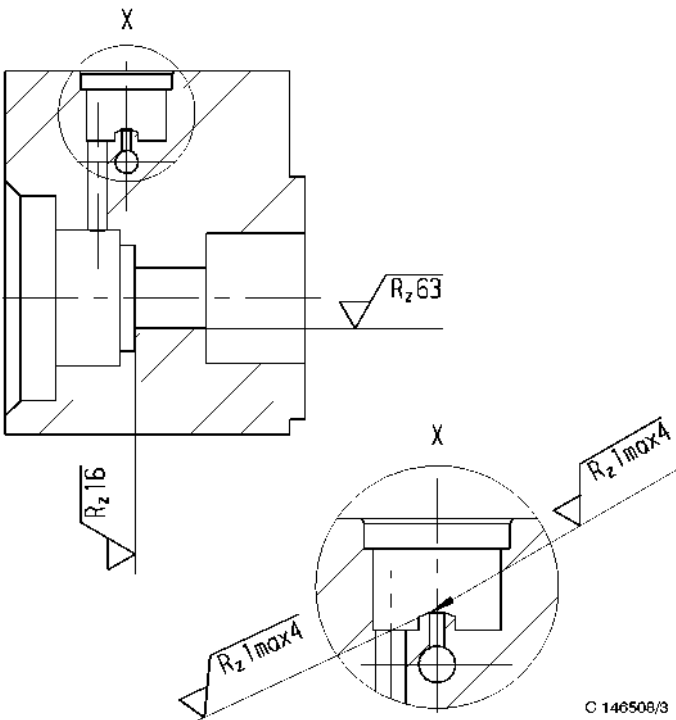
NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.



4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.

Part No.	Name	Notes
5	Pin	 <p>The surface finish must be to specification. Exchange any part out of specification.</p>
6	Cover	 <p>The surface finishes must be to specification. Exchange any part out of specification.</p>



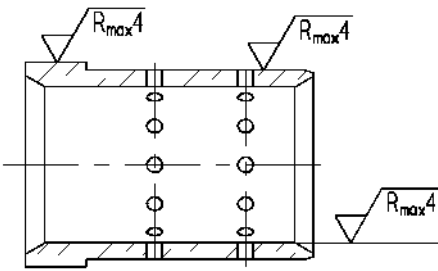
Part No.	Name	Notes
13	Bush	 © 148882/2 The surface finishes must be to specification. Exchange any part out of specification. Check the bores for obstructions.

Table 1 Separate inspection of special components

4.6 Assembly



CAUTION

Beware of contaminating and damaging the unit!

Functionality will be impaired or the unit might even fail.

Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of assembling the unit.



WARNING

Beware of using auxiliary products and working materials incorrectly!

The skin or respiratory tracts may be harmed or inflamed.

It is vital to observe the manufacturer's safety codes and directions for use.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than one year. Verify the date of manufacture prior to use.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate certain parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



NOTE

Unless indicated specially in the following text, tighten all bolted joints **evenly** to the specifications in document WB420332A - doing so crosswise if there are four or more mounting points.

See Figure 4

- Lubricate the threads of machine screws (17) with a **thin** film of STABURAGS NBU 30 PTM grease.
- Lubricate O-rings (7, 8, 10, 11 and 15) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate KNORR K-rings (16) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the sliding and guiding surfaces of pins (5), covers (6), piston (9), housing (12) and bushes (13) with a **thin** film of RENOLIT HLT2-KB grease.
- Put O-rings (11) in their seats on housing (12).
- Insert bushes (13) in housing (12).
- Install KNORR K-rings (16) in their seats on piston (9), using the special hook (Figure 1) as shown in Figure 3.
- Introduce piston (9) into bushes (13).
- Mount O-rings (10) on the projecting part of bushes (13).



- Put O-rings (7) in their seats on pins (5).
- Insert pins (5) in covers (6).
- Slip compression springs (4) onto the pins (5) located in covers (6).
- Slip caps (2) onto pins (5) while positioning in such a way that the holes for dowel pin (3) are aligned in both parts. To make adjustment easier, push pins (5) slightly out of covers (6). Then insert dowel pin (3) and fit flush.
- Put O-rings (15) in their seats on covers (6).
- Locate one of covers (6) on either side of housing (12) and fasten tight by locking rings (18) and machine screws (17).
- Attach valve magnets (1) to covers (6) as directed in the relevant documents (see Section 2.1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.



CAUTION

Beware of failure to protect parts during storage and shipment!
The unit might be damaged, e.g. connector contacts deformed.
Put a protective cap on the unit's electric connector.

.....
.....
U - G F 2 0 . 2 7

Rev. 02 - 14.10.2010 - en
.....

.....
Overhaul Instructions

Double check valve
(changeover valve)
DRV7-T
.....



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	4
1.1	Technical changes	4
1.2	Target group for this document	4
1.3	Notes and warning messages	5
2	Introduction	6
2.1	Related documents	6
3	Basic safety information	7
3.1	Validity	7
3.2	Authorized use of the product	7
3.3	Operator's / maintainer's commitment to due care	7
3.3.1	Assignment of personnel	7
3.3.2	Availability of the document	7
3.3.3	Amendments to the document	8
3.3.4	Spares and wearing parts	8
4	Maintenance	9
4.1	Requirements	9
4.1.1	Auxiliary products and working materials	9
4.1.2	Special tools	9
4.2	Disassembly	10
4.3	Disposal	12
4.4	Cleaning	12
4.5	Inspection	13
4.6	Assembly	14
4.7	Testing	16



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS-trained service technicians who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-GF20.27	Description of the double check valve (changeover valve)
PRF11749	Test Instructions for the double check valve (changeover valve)
WB420332A	Table of specified tightening torques



NOTE

The reference to the Spare parts catalogue denotes the unit containing the assembly described here.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

II40529



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possess the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KB SfS or KB SfS approved parts or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Maintenance

KB SfS gives top priority to safety and quality.

To help fulfil this claim, KB SfS provides an overhauling service for its own units. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

The KB SfS Service Centers have the experience and technical equipment needed for performing professional overhauls.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact a KB SfS Service Center if the unit develops a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KB SfS by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- RENOLIT HLT2-KB grease (order number: ID No. 502647)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tools according to Figure 1

The special tool can be purchased from KB SfS by its order number.

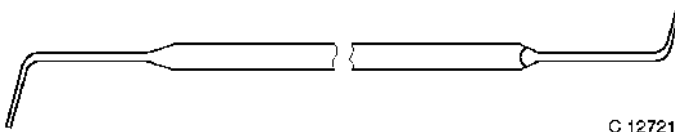


Figure 1 Special hook (order number B64617)



4.2 Disassembly

See Figure 2



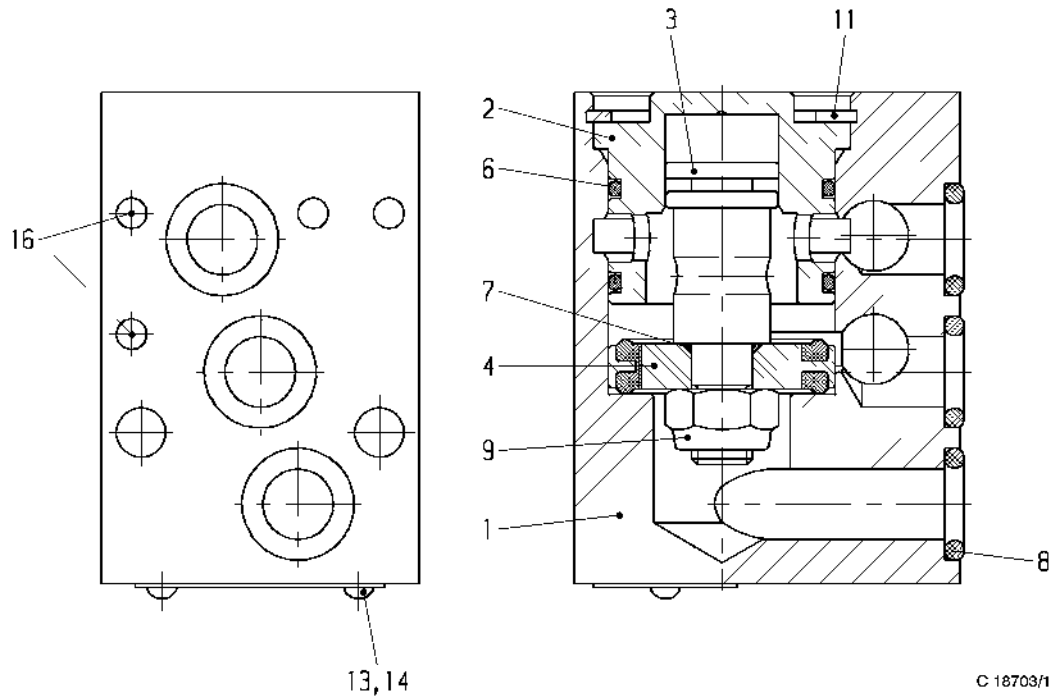
CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

- Take O-rings (8) off housing (1).
- Remove retaining ring (11).
- Take insert (2) and piston rod (3) plus piston (4) out of housing (1).
- Release hexagon nut (9).
- Separate the piston (4) from piston rod (3).
- Draw O-ring (7) off piston rod (3).
- Release and remove O-rings (6) from their seats on insert (2) using the special hook (see Figure 1).



- | | | | |
|---|------------|----|-------------------|
| 1 | Housing | 8 | O-ring |
| 2 | Insert | 9 | Hexagon nut |
| 3 | Piston rod | 11 | Retaining ring |
| 4 | Piston | 13 | Name plate |
| 6 | O-ring | 14 | Rivet |
| 7 | O-ring | 16 | Plug-in dowel pin |

Figure 2 Double check valve (changeover valve)

4.3 Disposal

**CAUTION**

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

The following parts must be exchanged for new ones whenever they are removed (e.g. if they need to be removed for repair or overhaul):

- Retaining ring (11)
- Rivet (14)
- Plug-in dowel pins (16)

The following parts must additionally be exchanged for new ones upon overhaul:

- Piston (4)
- Hexagon nut (9)
- O-rings (6), (7), (8)

4.4 Cleaning

Clean all parts that do not have to be exchanged.

**WARNING**

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.

**CAUTION**

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.

**NOTE**

Once cleaned, the component parts must be kept in a dry place away from dust and damage.



4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.

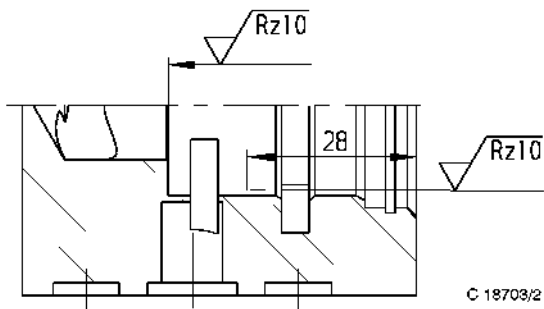
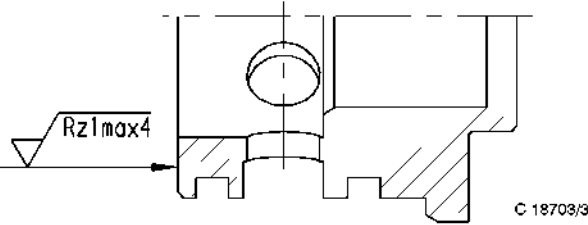
Part No.	Name	Notes
1	Housing	 <p>The surface finish must be to specification. Exchange any part out of specification.</p>
2	Insert	 <p>The surface finish must be to specification. Exchange any part out of specification.</p>

Table 1 Separate inspection of special components



4.6 Assembly

See Figure 2



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than one year. Verify the date of manufacture prior to use.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate certain parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



NOTE

Unless indicated specially in the following text, tighten all bolted joints **evenly** to the specifications in document WB420332A - doing so crosswise if there are four or more mounting points.



- Lubricate O-rings (6), (7) and (8) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the sliding and guiding surfaces in housing (1) and in insert (2) with a **thin** film of RENOLIT HLT2-KB grease.
- Put the thinly greased O-rings (6) in their seats on insert (2).
- Locate the greased O-ring (7) in the specified position on piston rod (3).
- Push piston (4) onto piston rod (3) and fasten tight by hexagon nut (9).
- Lubricate the sliding and guiding surfaces on piston rod (3) and on piston (4) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the seal on piston (4) with a **thin** film of RENOLIT HLT2-KB grease.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.

- Without tilting the piston rod (3), introduce it cautiously into insert (2) and locate this assembly (consisting of piston rod, piston and insert) in housing (1).
- Fit retaining ring (11) in its seat on housing (1) and check for correct seating there.
- Put the O-rings (8) in their seats on housing (1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.

.....
.....
U - G Q 1 0 . 2 2

Rev. 02 - 21.07.2014 - en
.....

.....
Overhaul Instructions

Air filter
FIL100



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
01	06.06.2012	Revision history started		x				
		all					x	x
02	21.07.2014	2.1, 4.1.1, 4.2, 4.6		x				
		3.1	x					
		4.3					x	
		4.5						x



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working materials	10
4.1.2	Special tools	10
4.2	Disassembly	11
4.3	Disposal	13
4.4	Cleaning	13
4.5	Inspection	14
4.6	Assembly	15
4.7	Testing	17



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-GQ10.22 Description of air filter FIL100

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

WBFIL100AA001

WBFIL100AA002

WBFIL100AA003

WBFIL100AA004

WBFIL100AA005

I162044K



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possess the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools.



4.2 Disassembly

See Figure 1



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.



NOTE

The positioning of the components in this documents may deviate from the respective positioning in the relevant spare parts catalogue.



NOTE

The dowel pin (10) (available or not depending on the variant) is used for coding. It is left in housing (1).

- If still present, remove O-rings (11) from the ports.



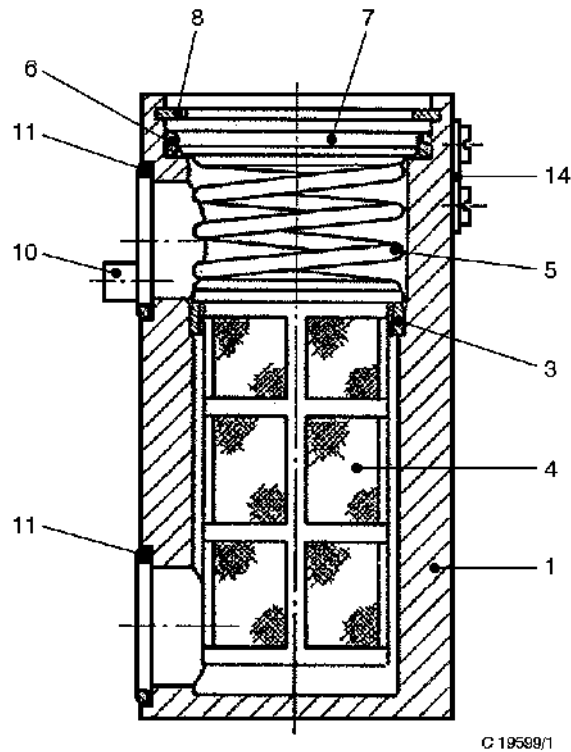
CAUTION

Pretensioned compression spring (5)!

The cover (7) is pretensioned by the compression spring (5). Pretensioned parts and compression springs may jump out of the housing and cause eye injuries.

While removing the retaining ring (8), hold the cover (7) securely with your hand or a press.

- Hold down the cover (7).
- Remove the retaining ring (8).
- Cautiously decrease the pressure on cover (7) while relaxing the compression spring (5).
- Remove cover (7), compression spring (5) and O-ring (6) from housing (1).
- Remove filter (4) and ring (3) from housing (1).



- | | | | |
|---|--------------------|----|--------------------------------------|
| 1 | Housing | 8 | Retaining ring |
| 3 | Ring | 10 | Dowel pin (not in every item number) |
| 4 | Filter | 11 | O-ring |
| 5 | Compression spring | 14 | Plate |
| 6 | O-ring | | |
| 7 | Cover | | |

Figure 1 Air filter FIL100



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced can be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)

4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.



WARNING

Compression springs under tension!

Compression spring jumping out of the measuring fixture.

Put the compression spring in the measuring fixture provided for this purpose, check for correct seating and use a suitable cage for protection.

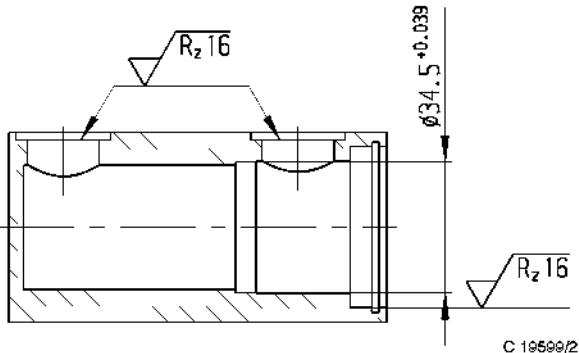
Item	Name	Notes
1	Housing	 <p>The size and surface finishes must be to specification. Exchange any part out of specification.</p>
5	Compression spring	The spring force must be at least 18.2 N at a clamped length of 34 mm. Exchange any part out of specification.

Table 1 Separate inspection of special components



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



See Figure 1

- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - Lubricate O-rings (6 and 11) with a **thin** film of RENOLIT KBS 1 grease.
- For all other units:
 - Lubricate the O-rings (6 and 11) with a **thin** film of RENOLIT HLT2-KB grease.
- Insert ring (3) in housing (1).
- Slip filter (4) into ring (3).
- Insert compression spring (5).
- Place O-ring (6) on cover (7).
- Hold down cover (7), and insert retaining ring (8).
- Put O-rings (11) in the ports on housing (1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.

.....
.....
U - G E 5 0 . 2 5

Rev. 02 - 01.06.2009 - en
.....

.....
Overhaul Instructions

Pressure reducing valve
DMV15/T...



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	4
1.1	Technical changes	4
1.2	Target group for this document	4
1.3	Notes and warning messages	5
2	Introduction	6
2.1	Related documents	6
3	Basic safety information	7
3.1	Validity	7
3.2	Authorized use of the product	7
3.3	Operator's / maintainer's commitment to due care	7
3.3.1	Assignment of personnel	7
3.3.2	Availability of the document	7
3.3.3	Amendments to the document	8
3.3.4	Spares and wearing parts	8
4	Maintenance	9
4.1	Requirements	9
4.1.1	Auxiliary products and working materials	9
4.1.2	Special tools	9
4.2	Disassembly	10
4.3	Disposal	13
4.4	Cleaning	14
4.5	Inspection	15
4.6	Assembly	17
4.7	Testing	20



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS-trained service technicians who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish,
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-GE50.25	Description of pressure reducing valve DMV15/T...
PRF7322	Test Instructions

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

I71472/...A

II36508/...

II36216/...A



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possess the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KB SfS or KB SfS approved parts or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Maintenance

KB SfS gives top priority to safety and quality.

To help fulfil this claim, KB SfS provides an overhauling service for its own units. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

The KB SfS Service Centers have the experience and technical equipment needed for performing professional overhauls.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact a KB SfS Service Center if the unit develops a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KB SfS by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- RENOLIT HLT2-KB grease (order number: ID No. 502647)
- LOCTITE 586 sealant (order number: ID No. 460011)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tool according to Figure 1

The special tool can be purchased from KB SfS by its order number.

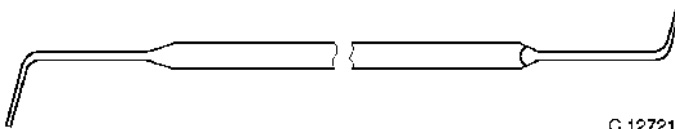


Figure 1 Special hook (order number B64617)



4.2 Disassembly

See Figure 4



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.



Figure 2

Removing KNORR K-rings (outer ring)

Draw the ring out of its groove by the special hook, and pull it entirely off by hand.

Or:

Draw the ring taut between thumb and index finger. The ring emerges from its groove at the opposite side. Pull off the ring by hand.

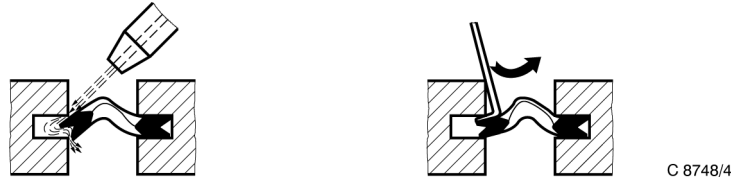


Figure 3

Removing KNORR K-rings (inner ring)

Blow a jet of compressed air slantingly into the groove. The KNORR K-ring is blown up behind its sealing lips and jumps out of the groove.

Or:

Slip the special hook into the groove above the KNORR K-ring. Push out the KNORR K-ring by applying light pressure downwards.



CAUTION

Pretensioned spring!

Pretensioned springs may jump out of the housing and cause eye injuries.

Perform all the working steps in the specified sequence.

- Remove retaining ring (20), and cautiously take out bush (5) while relaxing the compression spring (9).



NOTE

A special hook (see Figure 1) is required for removing the KNORR K-rings. Removal is described in Figure 3.

- Release KNORR K-ring (12) from bush (5) as shown in Figure 3.
- Remove compression spring (9) and ring (29) from valve head (3).
- Take valve head (3) out of housing (1).
- Draw basket filter (10) out of housing (1).
- Remove O-ring (13) from housing (1).
- Remove twin-hole lead seal (27).
- Release hexagon nut (16), and unscrew hex-head bolt (15).



CAUTION

Pretensioned spring!

Pretensioned springs may jump out of the housing and cause eye injuries. Perform all the working steps in the specified sequence.

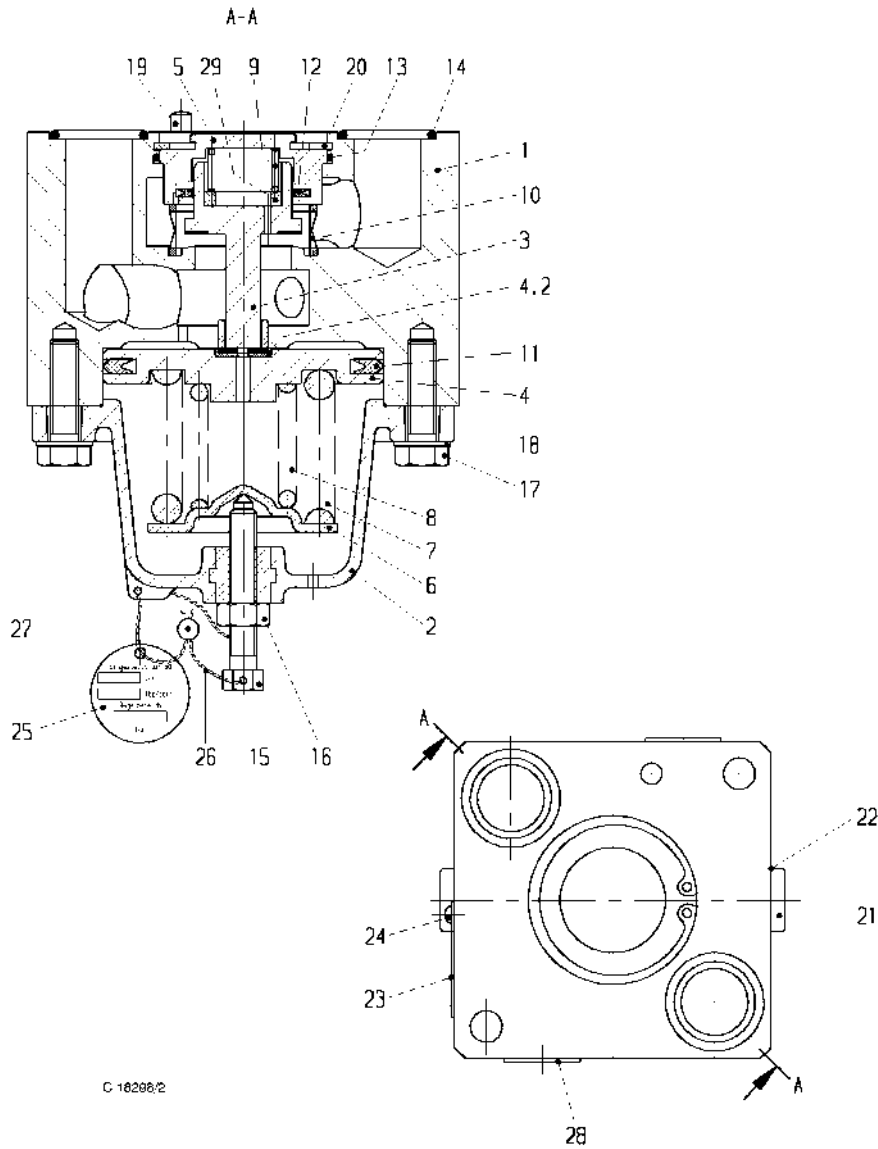
- Release the two hex-head bolts (17) slowly and alternately while relaxing the compression springs (7 and 8).
- Entirely unscrew hex-head bolts (17), remove locking ring (18), and take off spring casing (2).
- Take spring retainer (6) plus compression springs (7 and 8) out of housing (1).
- Remove piston (4) plus valve plate (4.2) from housing (1).
- Unscrew the screw plugs (21) from housing (1).



NOTE

A special hook (see Figure 1) is required for removing the KNORR K-rings. Removal is described in Figure 2.

- Release KNORR K-ring (11) from piston (4) as shown in Figure 2.





1	Housing	15	Hex-head bolt
2	Spring casing	16	Hexagon nut
3	Valve head	17	Hex-head bolt
4	Piston	18	Locking ring
4.2	Valve plate	19	Plug-in dowel pin
5	Bush	20	Retaining ring
6	Spring retainer	21	Screw plug
7	Compression spring	22	Thread seal
8	Compression spring	23	Name plate
9	Compression spring	24	Rivet
10	Basket filter	25	Labelling tag
11	KNORR K-ring	26	Wire
12	KNORR K-ring	27	Twin-hole lead seal
13	O-ring	28	Screw plug (cemented)
14	O-ring	29	Ring

Figure 4 Pressure reducing valve

4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

See Figure 4

The following parts must be exchanged for new ones whenever they are removed (e.g. if they need to be removed for repair or overhaul):

- Rivets (24)
- Plug-in dowel pin (19)
- Thread seal (22)
- Twin-hole lead seal (27)
- Wire (26)



The following parts must additionally be exchanged for new ones upon overhaul:

- O-rings (13 and 14)
- KNORR K-rings (11 and 12)
- Locking ring (18)
- Retaining ring (20)
- Basket filter (10)

4.4 Cleaning

Clean all parts that do not have to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.



NOTE

Prior to putting the components in a bath for cleaning, check them for compatibility with the chemical cleaning spirit. Any component suspected of attack by the chemical cleaning spirit must be handled and cleaned like a non-metallic part.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



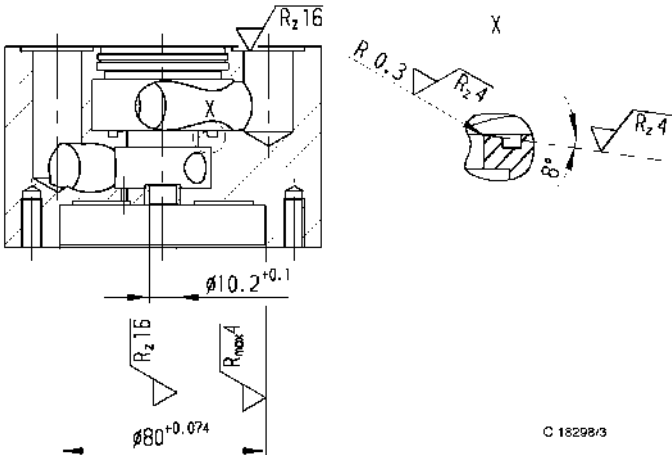
NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.



4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.
- Exchange the name plate if it has become difficult to read. Use new rivets to attach the new plate.

Part No.	Name	Notes
1	Housing	 <p>The dimensions and surface finishes must be to specification. Exchange any part out of specification.</p> <p>C 18298/3</p>



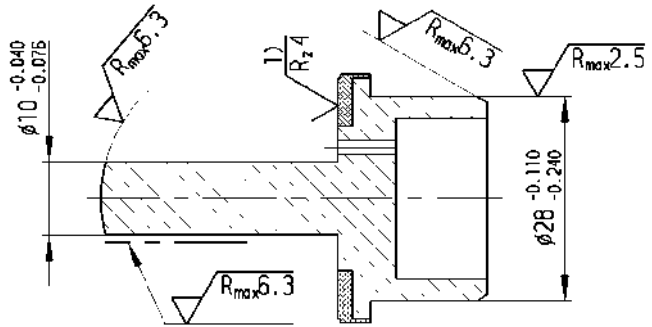
Part No.	Name	Notes
3	Valve head	 <p>1) Stamped smooth</p> <p>Examine the rubber valve seating for damage. Exchange the valve head if the rubber is indented by more than 0.4mm.</p> <p>The dimensions and surface finishes must be to specification. Exchange any part out of specification.</p>
4	Piston	Check the valve plate (4.2) for airtight seating. Exchange any part out of specification.
7	Compression spring	The spring force must be at least 2,376 N at a clamped length of 35mm. Exchange any part out of specification.
8	Compression spring	The spring force must be at least 1,050 N at a clamped length of 26mm. Exchange any part out of specification.
9	Compression spring	The spring force must be at least 46.3 N at a clamped length of 20 mm. Exchange any part out of specification.

Table 1 Separate inspection of special components



4.6 Assembly



CAUTION

Beware of contaminating and damaging the unit!

Functionality will be impaired or the unit might even fail.

Before starting work, clean your place of work and tools and keep them clean throughout assembly.

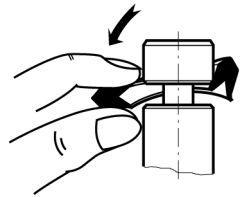


CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of assembling the unit.



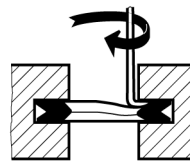
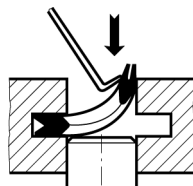
C 8748/3

Figure 5

Installing KNORR K-rings (outer ring)

Draw the thinly greased KNORR K-ring over the piston. Stretch the ring to one side and slip by hand into the groove with the sealing lips first. Repeat the procedure around the full circumference until the entire ring is seated in its groove.

Run the special hook round between the KNORR K-ring and the groove wall.



C 8748/5

Figure 6

Installing KNORR K-rings (inner ring)

Squeeze the thinly greased KNORR K-ring into an oval and slip slantingly into the hole. Using the special hook, press the ring flat at the front and push into its groove.

Push the remainder downwards and into the groove. Run the special hook round between the KNORR K-ring and the groove wall.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.

- If the screw plugs (28) have been unscrewed from housing (1), coat their cleaned and grease-free threads with sealant as stated in Section 4.1.1, screw the plugs tight into housing (1), and allow 24 hours to set.



NOTE

Do not install new elastomers (seals) that are older than one year. Verify the date of manufacture prior to use.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate certain parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.

- Lubricate O-ring (13) with grease as stated in Section 4.1.1.
- Lubricate KNORR K-rings (11 and 12) with grease as stated in Section 4.1.1.
- Lubricate the sliding and guiding surfaces of piston (4), of valve head (3), of spring retainer (6), of bush (5) and in housing (1) with grease as stated in Section 4.1.1.



NOTE

Make sure that the thinly greased seals rest and rest/stick correctly in their seats with no dust or dirt present.

- Put the greased O-ring (13) in its seat on housing (1).



NOTE

A special hook (see Figure 1) is required for installing the KNORR K-rings. Installation is described in Figure 5 and Figure 6.

- Install KNORR K-ring (11) in piston (4) as shown in Figure 5.
- Install KNORR K-ring (12) in bush (5) as shown in Figure 6.



- Locate piston (4) plus valve plate (4.2) in housing (1).
- Locate spring retainer (6) plus compression springs (7 and 8) on piston (4) in housing (1).
- Mount spring casing (2) on the complete spring retainer (6), locate on housing (1), and attach by hex-head bolts (17) and locking rings (18); tighten the hex-head bolts (17) alternately as you proceed.



NOTE

Screw in hex-head bolt (15) and tighten just slightly, because it needs to be adjusted later when the valve is tested, adjusted and subsequently sealed.

- Screw in hex-head bolt (15) with its hexagon nut (16).
- Insert basket filter (10) in housing (1).
- Put ring (29) and compression spring (9) in valve head (3).
- Locate valve head (3) in housing (1) and on piston (4).
- Locate bush (5) on the complete valve head (3), and fit retaining ring (20).
- Screw the screw plugs (21) tight into housing (1) with their thread seal (22).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



NOTE

Having completed assembly and testing, fix the pressure setting by attaching the twin-hole lead seal (27) to stop unauthorized tampering.

- Thread the sealing wire (27) through hex-head bolt (15), spring casing (2), labelling tag (25) and twin-hole lead seal (27) and secure correctly.



4.7 Testing

Once assembled, the unit must be adjusted and tested for correct operation on a test bench in accordance with Test Instructions PRF7322.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Flange surfaces (if any) must be protected from damage.

.....
.....
U - E C 9 0 . 2 2

Rev. 00 - 29.02.2012 - en
.....

.....
Overhaul Instructions

Distributor valve
STV200-...



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working materials	10
4.1.2	Special tools	10
4.2	Disassembly	12
4.3	Disposal	15
4.4	Cleaning	16
4.5	Inspection	16
4.6	Assembly	19
4.7	Testing	23



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-EC90.22	Description of distributor valve STV200-...
WB420332A	Table of specified tightening torques

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with type designation:

STV200-...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics
- RENOLIT HLT2-KB grease (order number: ID No. 502647)
- LOCTITE 516 sealant (order number: ID No. 506354)

4.1.2 Special tools

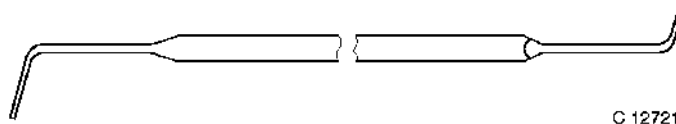
The unit can be dismantled and assembled with standard tools and the following special tools:

- Special tools according to Figure 1 and Figure 2
- Screw or toggle press, or quick-action clamp



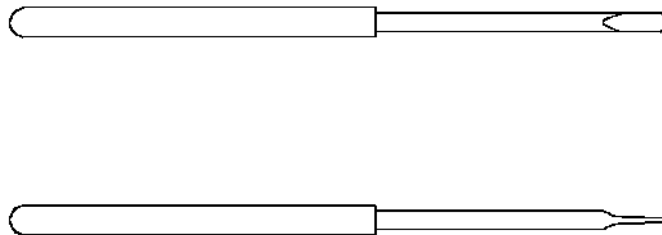
NOTE

Special tools with an order number can be purchased from KNORR-BREMSE. Special tools with a tool drawing number must be made to the specifications of the tool drawings supplied by KNORR-BREMSE. Special tools without an order number or tool drawing number must be made to the specifications in the figures. The dimensions specified in the figures are mandatory values. Unspecified dimensions are left to the toolmaker's discretion.



C 12721

Figure 1 Special hook (order number B64617)



C 11212/3

Figure 2 Diaphragm extractor (order number A54802)

Directions for the use of the special hook



C 8748/4

Figure 3 Removing KNORR K-rings (inner ring)
Blow a jet of compressed air slantingly into the groove. The KNORR K-ring is blown up behind its sealing lips and jumps out of the groove.
Or:
Slip the special hook into the groove above the KNORR K-ring. Push out the KNORR K-ring by applying light pressure downwards.



C 8748/5

Figure 4 Installing KNORR K-rings (inner ring)
Squeeze the thinly greased KNORR K-ring into an oval and slip slantingly into the hole. Using the special hook, press the ring flat at the front and push into its groove. Push the remainder downwards and into the groove. Run the special hook round between the KNORR K-ring and the groove wall.



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.



NOTE

Not every distributor valve contains the throttle screws (38 and 50).

Not every distributor valve contains the ring (65).

See Figure 5

- Remove O-rings (52) from the ports.
- Remove nylon filter (51) from the port.
- If included, unscrew the throttle screw (50).
- Cut apart the sealing wire (59) and remove together with twin-hole lead seal (60).
- Release hexagon nut (7), unscrew the bolt (5) and remove together with locking ring (6) while discharging the tension from spring (11).
- Unscrew the hex-head bolts (47) alternately step by step (only at the side belonging to housing (1)).
- Take housing (1) off intermediate member (31).
- Remove washer (43), support (44) and ball (45).
- If included, remove ring (65).



CAUTION

Pretensioned spring (11)!

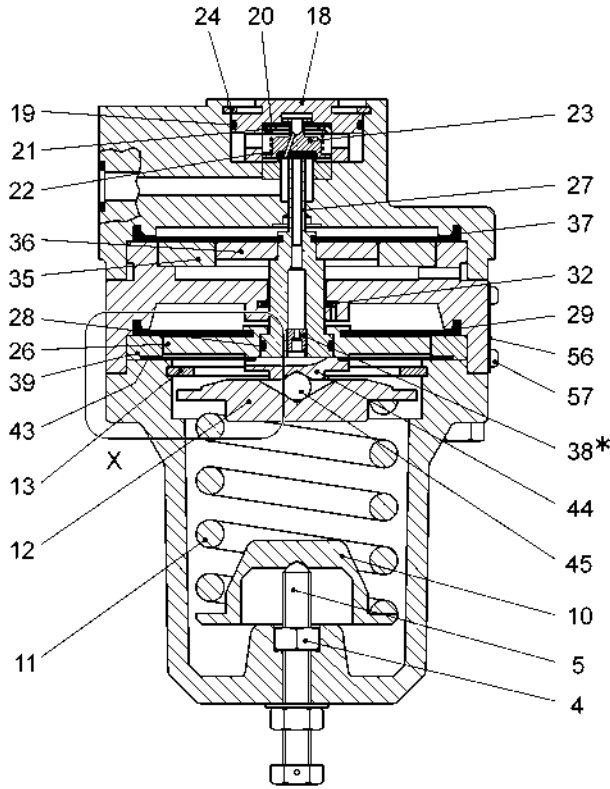
Pretensioned springs may jump out of the housing and cause eye injuries.

Perform all the working steps in the specified sequence.

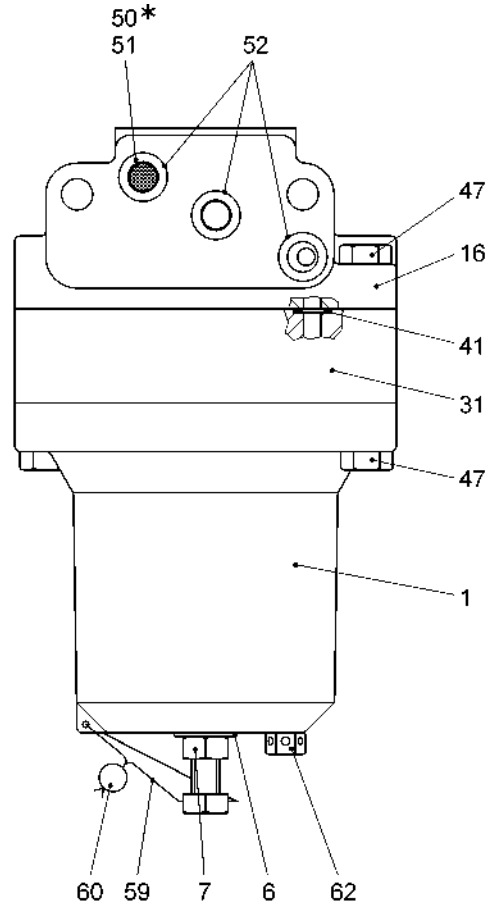
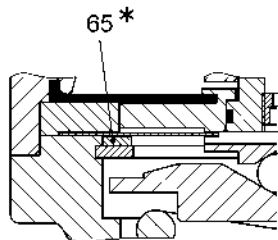
- Locate housing (1) in a hand press, and compress spring (11) by way of spring retainer (12).
- Remove retaining ring (13).



- Cautiously reduce the pressure on spring retainer (12) while entirely relaxing the spring (11).
- Remove spring retainer (12), compression spring (11), spring retainer (10) and hexagon nut (4) from housing (1).
- Unscrew the throttle screw (62) from housing (1).
- Remove ring (39) from intermediate member (31).
- Remove retaining ring (24).
- Withdraw ring (18) from cover (16).
- Remove valve tappet (23) from ring (18).
- Take flat diaphragm (20) off valve tappet (23), and remove spring retainer (21) and compression spring (22).
- Unscrew the hex-head bolts (47) at the side belonging to cover (16).
- Take cover (16) off intermediate member (31), and remove O-ring (41).
- Remove diaphragm (37), thrust plate (36) and ring (35).
- Push tappet (27) out of intermediate member (31).
- Take off diaphragm (29).
- Push thrust plate (26) out of tappet (27).
- Remove ring (39).
- Release O-ring (28) from tappet (27).
- Remove KNORR K-ring (32) from intermediate member (31), using the special hook (see Figure 1) as shown in Figure 3.
- If included, unscrew the screwed choke (38) from tappet (27).



X



C 175012/1



1	Housing	31	Intermediate member
4	Hexagon nut	32	KNORR K-ring
5	Bolt	35	Ring
6	Locking ring	36	Thrust plate
7	Hexagon nut	37	Diaphragm
10	Spring retainer	38*	Throttle screw
11	Spring	39	Ring
12	Spring retainer	41	O-ring
13	Retaining ring	43	Washer
16	Cover	44	Support
18	Ring	45	Ball
19	O-ring	47	Hex-head bolt
20	Flat diaphragm	50*	Throttle screw
21	Spring retainer	51	Nylon filter
22	Compression spring	52	O-ring
23	Valve tappet	56	Name plate
24	Retaining ring	57	Rivet
26	Thrust plate	59	Wire
27	Tappet	60	Twin-hole lead seal
28	O-ring	62	Throttle screw
29	Diaphragm	65*	Ring
		*	Not in every distributor valve

Figure 5 Distributor valve STV200-...

4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous! This would mean unnecessary and legally punishable harm to the environment. Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced can be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)

4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.
- Strip all traces of sealants off the threads of throttle screws (38, 50 and 62) and off the mating threads in tappet (27), in housing (1) and in cover (16).



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



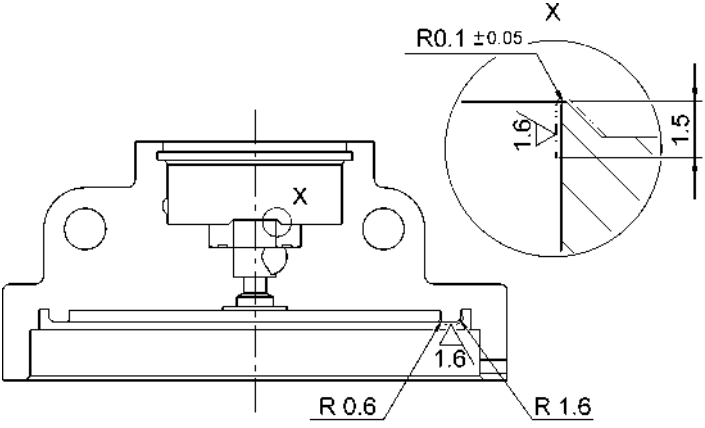
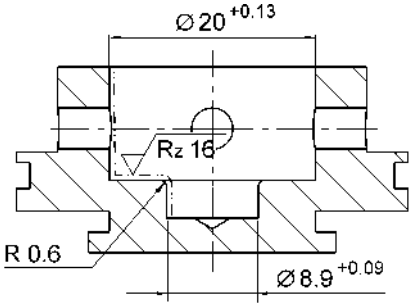
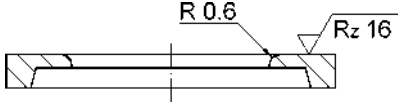
NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.



Part No.	Name	Notes
16	Cover	 <p>C 175012/2</p> <p>The dimensions and surface finishes must be to specification. Failing this requirement, exchange the part.</p>
18	Ring	 <p>C 175012/3</p> <p>The dimensions and surface finishes must be to specification. Failing this requirement, exchange the part.</p>
21	Spring retainer	 <p>C 175012/4</p> <p>The size and the surface finish must be to specification. Failing this requirement, exchange the part.</p>



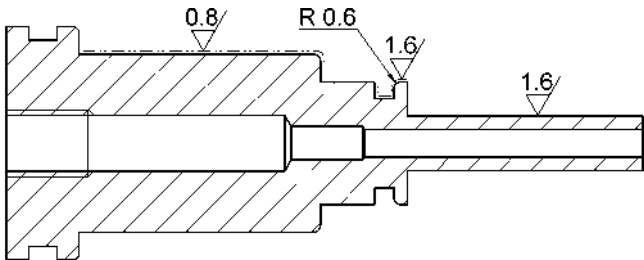
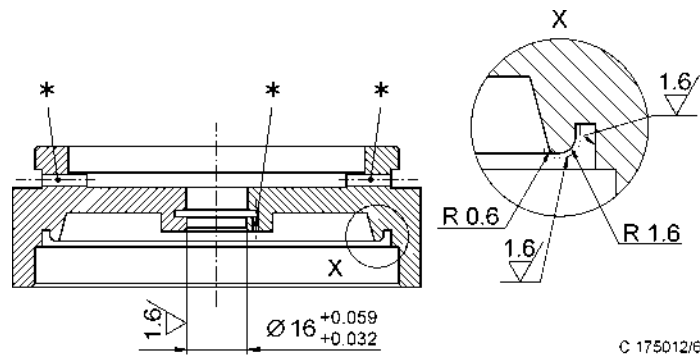
Part No.	Name	Notes
27	Tappet	 <p>C 175012/5</p> <p>The surface finishes must be to specification. Failing this requirement, exchange the part. * Smooth polished finish</p>
31	Intermediate member	 <p>C 175012/6</p> <p>The dimensions and surface finishes must be to specification. Failing this requirement, exchange the part. * Make sure that the bore is quite clear.</p>

Table 1 Separate inspection of special components



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



NOTE

Unless indicated specially in the following text, tighten all bolted joints **evenly** to the specifications in document WB420332A - doing so crosswise if there are four or more mounting points.

See Figure 5

- If included, coat the threads of throttle screw (38) with LOCTITE 516.
- Screw the throttle screw (38) into tappet (27).
- Lubricate KNORR K-ring (32) and O-ring (28) with a **thin** film of RENOLIT HLT2-KB grease.
- Insert O-ring (28) in the seat on tappet (27).
- Install KNORR K-ring (32) in its seat on intermediate member (31), using the special hook (see Figure 1) as shown in Figure 4.
- Lubricate the sliding and guiding surfaces of thrust plate (26), tappet (27), intermediate member (31) and ring (39) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate diaphragms (29 and 37) with a **thin** film of RENOLIT HLT2-KB grease.
- Insert diaphragm (29) in thrust plate (26).
- Pass tappet (27) through the hole in thrust plate (26).
- Insert tappet (27) plus mounting parts in intermediate member (31).
- Insert ring (39).
- Lubricate the sliding and guiding surfaces of thrust plate (36) and ring (35) with a **thin** film of RENOLIT HLT2-KB grease.
- Insert thrust plate (36) and ring (35).
- Insert diaphragm (29) in tappet (27).
- Lubricate O-ring (41) with a **thin** film of RENOLIT HLT2-KB grease.
- Put O-ring (41) in its seat on intermediate member (31).
- Cautiously mount cover (16) on intermediate member (31), taking care not to damage the diaphragm (37).
- Screw together the cover (16) and intermediate member (31) using hex-head bolts (47).
- Lubricate the sliding and guiding surfaces of valve tappet (23) and ring (18) with a **thin** film of RENOLIT HLT2-KB grease.



- Lubricate O-ring (19) and flat diaphragm (20) with a **thin** film of RENOLIT HLT2-KB grease.
- Mount compression spring (22) and spring retainer (21) on valve tappet (23).
- Place flat diaphragm (20) on valve tappet (23).
- Insert O-ring (19) in ring (18).
- Insert valve tappet (23) in ring (18).
- Slip ring (18) into cover (16) and secure with retaining ring (24).
- Insert hexagon nut (4) in the recess in housing (1).
- Screw the hexagon nut (7) onto bolt (5).
- Place locking ring (6) on bolt (5).
- Insert bolt (5) in housing (1) and screw it into hexagon nut (4).
- Insert spring retainer (10), spring (11) and spring retainer (12) in housing (1).



CAUTION

Pretensioned spring (11)!

Pretensioned springs may jump out of the housing and cause eye injuries.

Perform all the working steps in the specified sequence.

- Locate housing (1) in a hand press, compress spring (11) by way of spring retainer (12) and secure it with retaining ring (13).
- Place the assembly on cover (16).
- Working from above, place washer (43), support (44) and ball (45) on the assemblies in intermediate member (31).
- If included, put on ring (65).
- Slip the preassembled housing (19) onto intermediate member (31).
- Screw the two assemblies together by hex-head bolts (47).
- If included, coat the threads of throttle screw (50) with LOCTITE 516.
- Screw the throttle screw (50) into cover (16).
- Insert nylon filter (51) in cover (16).



- Lubricate O-rings (52) with a **thin** film of RENOLIT HLT2-KB grease.
- Put O-rings (52) in the ports.
- Coat the threads of throttle screw (62) with LOCTITE 516.
- Screw the throttle screw (62) into housing (1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested and adjusted on a test bench in accordance with the applicable Test Instructions.

After completing testing and adjustment, plumb the distributor valve with wire (59) and twin-hole lead seal (60).



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.

.....
.....
U - G D 7 0 . 2 3

Rev. 03 - 14.01.2015 - en
.....

.....
Overhaul Instructions

Piston valve
WKV1-T
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
03	14/01/2015	Revision history started		x				
		all	x		x		x	x



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working substances	10
4.1.2	Special tools	11
4.2	Disassembly	13
4.3	Disposal	18
4.4	Cleaning	19
4.5	Inspection	19
4.6	Assembly	24
4.7	Testing	27



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to modify the unit or this document at any time without making any specific announcements.

1.2 Target group for this document

The target group of this documentation are people who, due to training from KNORR-BREMSE,

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-GD71.23 Description of piston valve WKV1-T

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I89525

I89525K



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)



4.1.2 Special tools

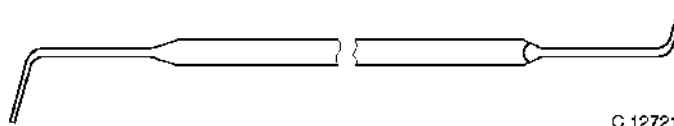
The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tool according to Figure 1



NOTE

Special tools with an order number can be purchased from KNORR-BREMSE. Special tools with a tool drawing number must be made to the specifications of the tool drawings supplied by KNORR-BREMSE. Special tools without an order number or tool drawing number must be made to the specifications in the figures. The dimensions specified in the figures are mandatory values. Unspecified dimensions are left to the toolmaker's discretion.



C 12721

Figure 1 Special hook (order number B64617)

Directions for the use of the special hook



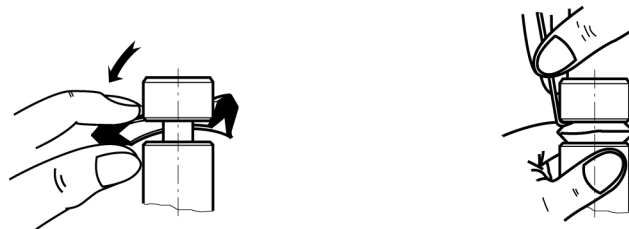
C 8748/2

Figure 2 Removing KNORR K-rings (outer ring)

Draw the ring out of its groove by the special hook, and pull it entirely off by hand.

Or:

Draw the ring taut between thumb and index finger. The ring emerges from its groove at the opposite side. Pull off the ring by hand.

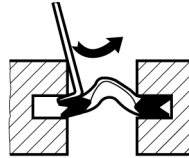
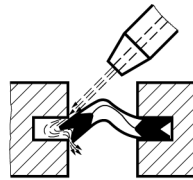


C 8748/3

Figure 3 Installing KNORR K-rings (outer ring)

Draw the thinly greased KNORR K-ring over the piston. Stretch the ring to one side and slip by hand into the groove with the sealing lips first. Repeat the procedure around the full circumference until the entire ring is seated in its groove.

Run the special hook round between the KNORR K-ring and the groove wall.



C 8748/4

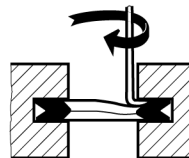
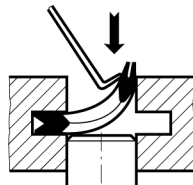
Figure 4

Removing KNORR K-rings (inner ring)

Blow a jet of compressed air slantingly into the groove. The KNORR K-ring is blown up behind its sealing lips and jumps out of the groove.

Or:

Slip the special hook into the groove above the KNORR K-ring. Push out the KNORR K-ring by applying light pressure downwards.



C 8748/5

Figure 5

Installing KNORR K-rings (inner ring)

Squeeze the thinly greased KNORR K-ring into an oval and slip slantingly into the hole. Using the special hook, press the ring flat at the front and push into its groove.

Push the remainder downwards and into the groove. Run the special hook round between the KNORR K-ring and the groove wall.



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.



NOTE

The grooved dowel pins (32) are pressed fully home into the housing (1) and must **not** be withdrawn from the housing!

See Figure 6 and Figure 7

- If still fitted, remove the O-rings (12 and 13) from the grooves on the ports of the housing (1).



CAUTION

Pre-tensioned compression spring (16)!

The covers (8 and 33) are pre-tensioned.

The pre-tensioned compression spring (16) may jump out of housing (1) and cause eye injuries.

Perform all the working steps in the specified sequence.

- Hold down the cover (8).
- Cautiously remove the retaining ring (19) from the housing (1).
- Slowly decrease the pressure on the cover (8) while relaxing the compression spring (16).
- Take off the cover (8).
- Withdraw piston (4) from housing (1), and remove compression spring (16) from housing (1).
- Remove the KNORR K-ring (23) from the piston (4) using the special hook (see Figure 1) as specified in Figure 2.
- Remove the O-ring (9) from its seat on housing (1).



NOTE

On device variants with item numbers I89525K, items 7 and 30 are replaced by item 7.



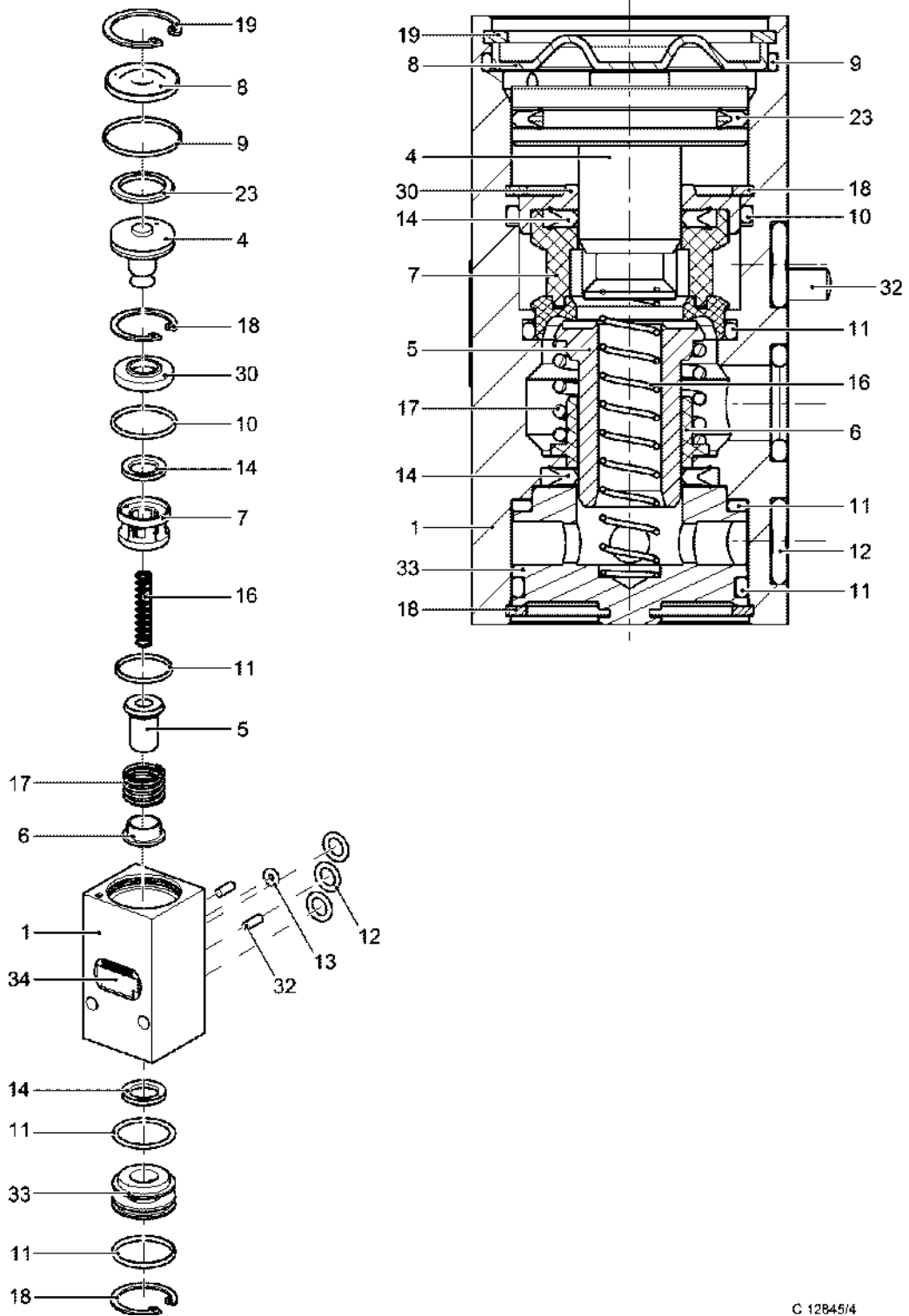
CAUTION

Pre-loaded compression spring (17)!

Pretensioned springs may jump out of the housing and cause eye injuries.

Perform all the working steps in the specified sequence.

- Hold down the valve bushing (7) and the washer (30).
- Cautiously remove the retaining ring (18).
- Slowly reduce the pressure on the valve bushing (7) and the washer (30), thereby reducing the tension on the compression spring (17). Take the washer (30) and the valve seat bushing (7) or the valve bushing (7) out of the housing (1).
- Applicable only to units with item number I89525:
 - Lift the disc (30) off the valve seat bushing (7) and remove the KNORR K-ring (14).
- Applicable only to units with item number I89525K:
 - Remove the KNORR K-ring (14) from the valve bushing (7), using the special hook (see Figure 1) as specified in Figure 4.
- Remove the valve head (5), compression spring (17) and guide bushing (6) from the housing (1).
- Remove the O-rings (10 and 11) from the housing (1).
- Remove the retaining ring (18) from the housing (1).
- Take cover (33) out of housing (1).
- Remove the O-rings (11) from their seats on the cover (33).
- Take the KNORR K-ring (14) out of the housing (1).

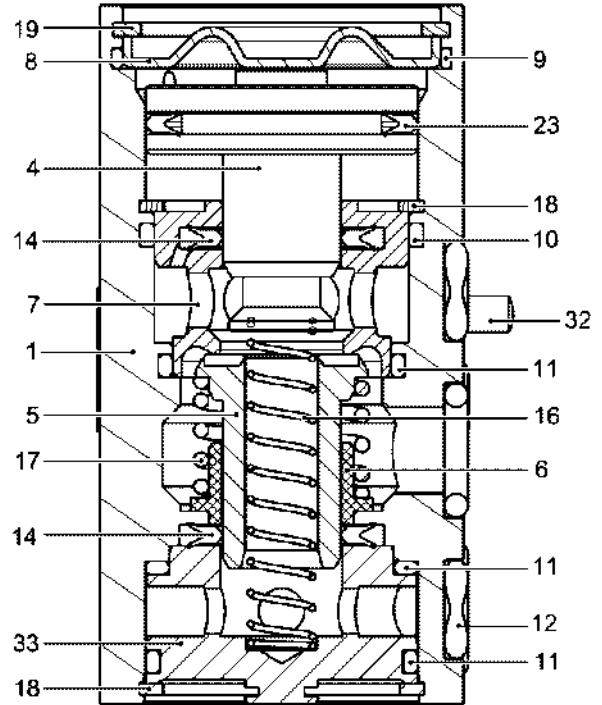
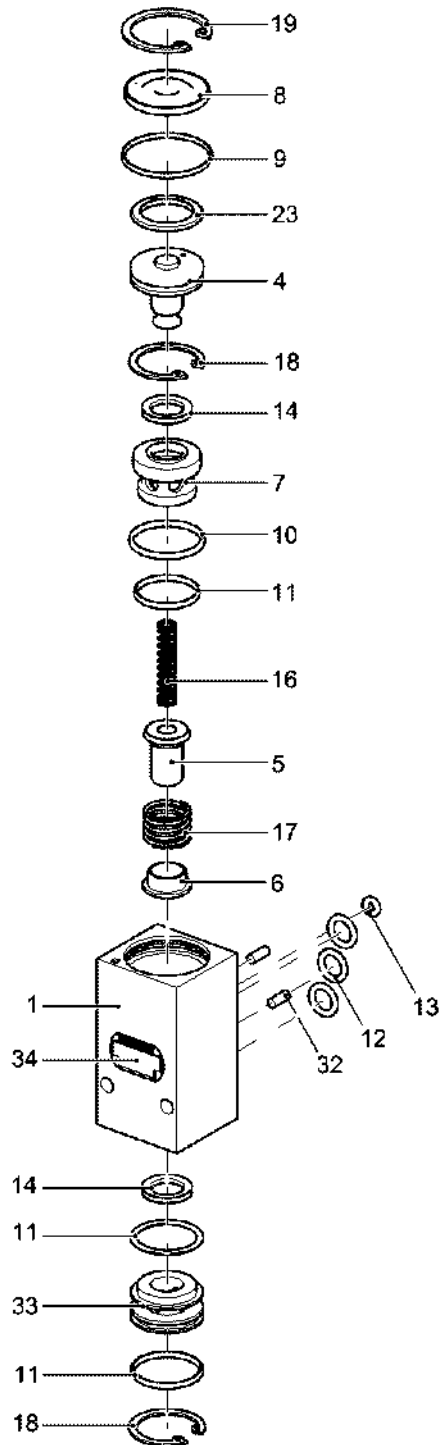


C 12B45/4



1	Housing	14	KNORR K-ring
4	Piston	16	Compression spring
5	Valve head	17	Compression spring
6	Guide bush	18	Retaining ring
7	Valve seat bushing	19	Retaining ring
8	Cover	23	KNORR K-ring
9	O-ring	30	Washer
10	O-ring	32	Plug-in dowel pin
11	O-ring	33	Cover
12	O-ring	34	Name plate
13	O-ring		

Figure 6 Piston valve WKV1-T
(unit with the item number I89525)



C 12845/5



1	Housing	13	O-ring
4	Piston	14	KNORR K-ring
5	Valve head	16	Compression spring
6	Guide bush	17	Compression spring
7	Valve bush	18	Retaining ring
8	Cover	19	Retaining ring
9	O-ring	23	KNORR K-ring
10	O-ring	32	Plug-in dowel pin
11	O-ring	33	Cover
12	O-ring	34	Name plate

Figure 7 Piston valve WKV1-T
(unit with the item number I89525K)

4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)



4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

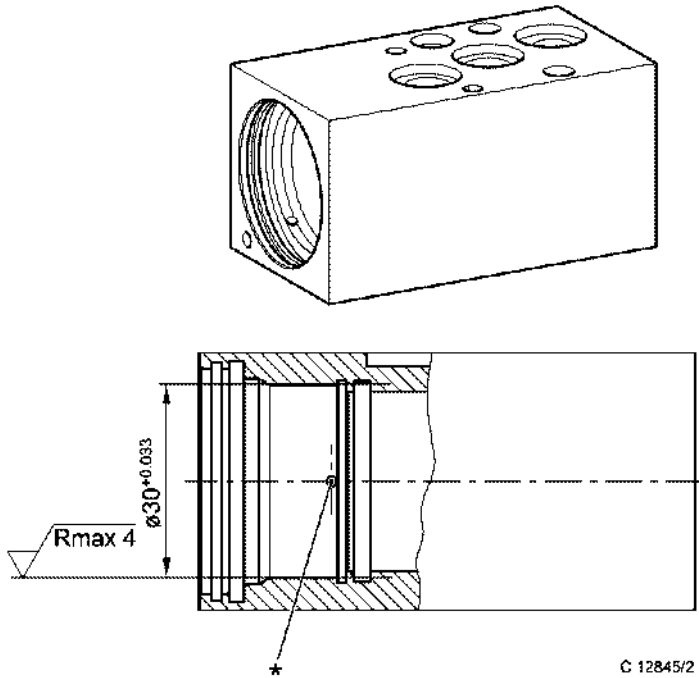
- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.
- Any missing or barely legible signs or name plates must be replaced or added.



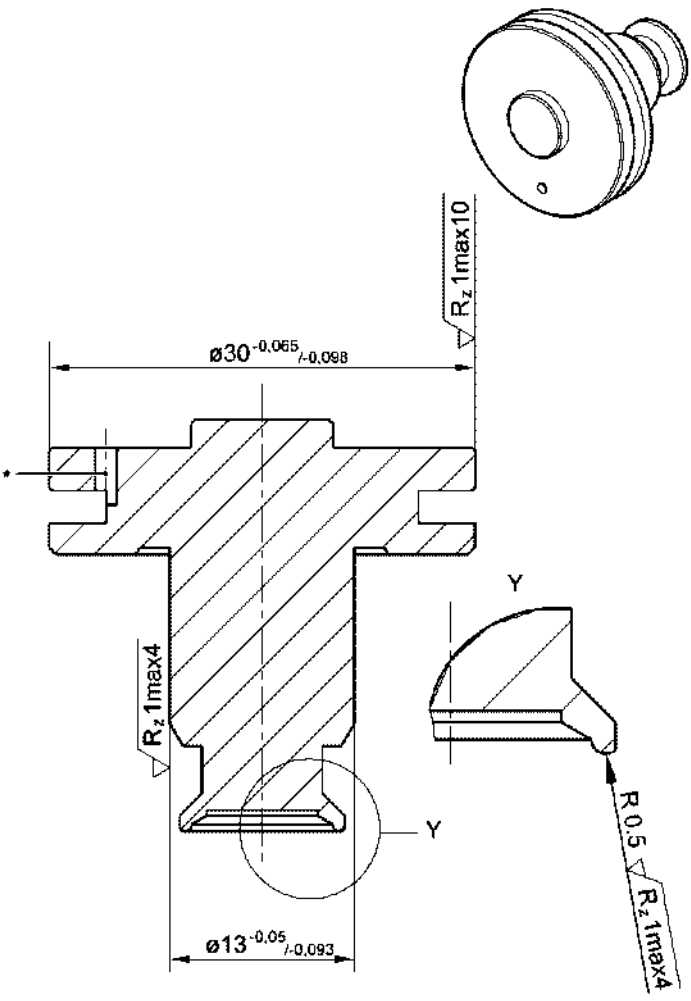
WARNING

Compression springs under tension!
Compression spring jumping out of the measuring fixture.
Put the compression spring in the measuring fixture provided for this purpose, check for correct seating and use a suitable cage for protection.

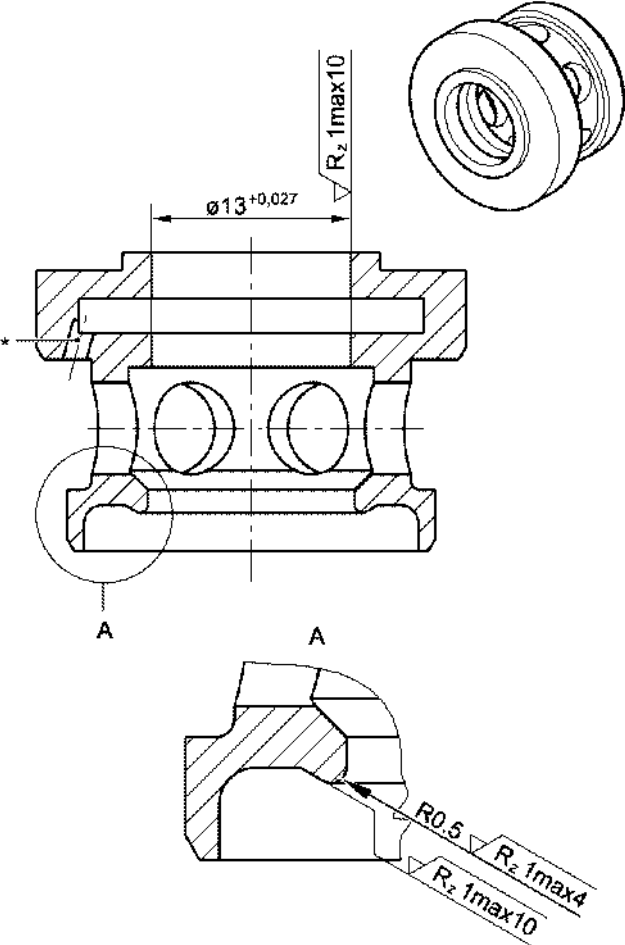


Item	Designation	Notes
1	Housing	 <p>The size and the surface finish must be to specification. Exchange any part that is out of specification. * Make sure that the bore is quite clear.</p>



Item	Designation	Notes
4	Piston	 <p>C 12845/8</p> <p>The dimensions and surface finishes must be to specification. Exchange any part that is out of specification.</p> <p>* Make sure that the bore is quite clear.</p>



Item	Designation	Notes
7	Valve bush (only item number I89525K)	 <p>C 12845/6</p> <p>The dimensions and surface finishes must be to specification. Exchange any part that is out of specification. * Make sure that the bore is quite clear.</p>
16	Compression spring	The spring force must be 7.8 ± 1 N at a clamped length of 32.5 mm. Exchange any part that is out of specification.
17	Compression spring	The spring force must be $66 +6/-2$ N at a clamped length of 13.2 mm. Failing this requirement, exchange the part.



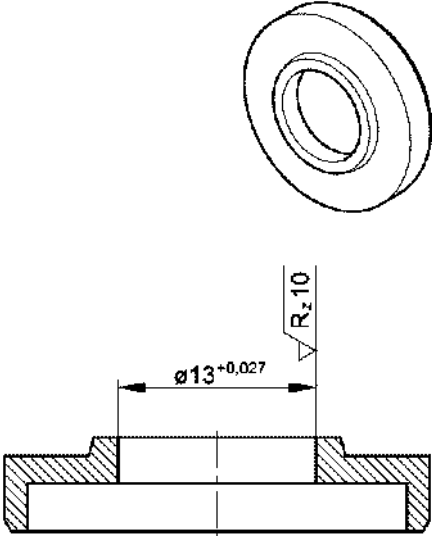
Item	Designation	Notes
30	Washer (only item number 189525)	 <p>C 12845/7</p> <p>The size and the surface finish must be to specification. Exchange any part that is out of specification.</p>

Table 1 Separate inspection of special components



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



See Figure 6 and Figure 7

- Only valid for item numbers with the letter "K" at the end of the item number:
 - Grease the KNORR K-rings (14 and 23) with a **thin** film of RENOLIT KBS 1.
 - Grease the O-rings (9, 10, 11, 12 and 13) with a **thin** film of RENOLIT KBS 1.
 - Grease the sliding and guiding surfaces of the housing (1), piston (4), valve head (5), guide bushing (6), valve bushing (7) and cover (33) with a **thin** film of RENOLIT KBS 1.
 - Grease the whole circumference and the spring ends of compression spring (16) with a **thin** film of RENOLIT KBS 1.
 - Grease the spring ends of the compression spring (17) with a **thin** film of RENOLIT KBS 1.
- Only valid for item numbers without the letter "K" at the end of the item number:
 - Grease the KNORR K-rings (14 and 23) with a **thin** film of RENOLIT HLT2-KB.
 - Grease O-rings (9, 10, 11, 12 and 13) with a **thin** film of RENOLIT HLT2-KB.
 - Grease the sliding and guiding surfaces of the housing (1), piston (4), valve head (5), guide bushing (6), valve bushing (7), washer (30) and cover (33) with a **thin** film of RENOLIT KBS 1.
 - Grease the whole circumference and the spring ends of compression spring (16) with a **thin** film of RENOLIT HLT2-KB.
 - Grease the spring ends of compression spring (17) with a **thin** film of RENOLIT HLT2-KB.
- Insert the greased O-rings (9, 10 and 11) in the respective seats in the housing (1).
- Insert guide bush (6) in housing (1).
- Position the compression spring (17) on the guide bushing (6).
- Insert the valve head (5) into the housing (1).



NOTE

On device variants with item numbers I89525K, items 7 and 30 are replaced by item 7.

- Applicable only to units with item number I89525:
 - Insert the greased KNORR K-ring (14) into the valve seat bushing (7) and place the washer (30) on it.
- Applicable only to units with item number I89525K:
 - Insert the greased KNORR K-ring (14) into the valve bushing (7) using the special hook (see Figure 1) as shown in Figure 5.



- Position the valve seat bushing (7) together with the washer (30), or the valve bushing (7) in the housing (1).
- Insert the retaining ring (18) in the correct installation position.
- Insert the greased KNORR K-ring (23) in the piston (4) using a special hook (see Figure 1) as specified in Figure 3.
- Locate piston (4) in housing (1).
- Fit the cover (8) and fix it with the retaining ring (19) in the correct installation position.
- Insert the greased KNORR K-ring (14) into the housing.
- Insert compression spring (16) in valve head (5) on housing (1).
- Insert the greased O-rings (11) in the seats of the cover (33).
- Insert the cover (33) into the housing (1) and secure it with the retaining ring (18).
- Insert the greased O-rings (12 and 13) into the grooves on the housing (1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.

.....
.....
U - K F 2 0 . 2 2

Rev. 04 - 10.07.2012 - en
.....

.....
Overhaul Instructions

**Mean pressure valve
MDV1**
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
04	10.07.2012	Revision service started		x				
		All	x				x	x



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working materials	10
4.1.2	Special tools	11
4.2	Disassembly	12
4.3	Disposal	23
4.4	Cleaning	23
4.5	Inspection	24
4.6	Assembly	25
4.7	Testing	31



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-KF20.22 Description of mean pressure valve MDV1

WB420332A Table of specified tightening torques

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I20871

I20871/K

I20871/X67

I22950

I22950/02

I22950/1

I22950/X

I22950/X122

I22950X143

I61627

ISTL17416



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics
- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)
- LOCTITE 262 sealant (order number: ID No. 502515)
- LOCTITE 7471 activator (order number: ID No.506340)

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)



4.1.2 Special tools

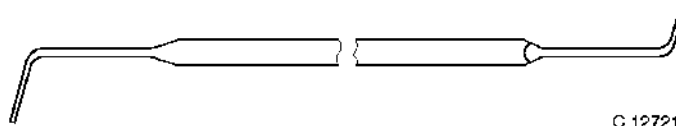
The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tool according to Figure 1



NOTE

Special tools with an order number can be purchased from KNORR-BREMSE. Special tools with a tool drawing number must be made to the specifications of the tool drawings supplied by KNORR-BREMSE. Special tools without an order number or tool drawing number must be made to the specifications in the figures. The dimensions specified in the figures are mandatory values. Unspecified dimensions are left to the toolmaker's discretion.



C 12721

Figure 1 Special hook (order number B64617)

Directions for the use of the special hook



C 8748/2

Figure 2 Removing KNORR K-rings (outer ring)

Draw the ring out of its groove by the special hook, and pull it entirely off by hand.

Or:

Draw the ring taut between thumb and index finger. The ring emerges from its groove at the opposite side. Pull off the ring by hand.



C 8748/3

Figure 3 Installing KNORR K-rings (outer ring)

Draw the thinly greased KNORR K-ring over the piston. Stretch the ring to one side and slip by hand into the groove with the sealing lips first. Repeat the procedure around the full circumference until the entire ring is seated in its groove.

Run the special hook round between the KNORR K-ring and the groove wall.



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.



NOTE

The numbers of the parts may differ from the numbering in the Spare parts catalogue.

The screw plug (1.4) and the studs (1.2) (if included) are screwed in tight with thread sealants and may be unscrewed only in case of damage or leakage.

Item number	Version (old)	Version (new)
I20871 I20871/X67	without a valve bracket	
I20871/K	without a valve bracket, with enhanced resistance to low temperatures	
I22950 I22950/02 I22950/X I22950/X122 I22950X143	with a valve bracket with studs with double nipples	with a valve bracket with studs without double nipples
ISTL17416	with a valve bracket with studs with double nipples	with a valve bracket with studs with unions
I61627	with a valve bracket with studs without double nipples	with a valve bracket with studs without double nipples
I22950/1	with a valve bracket without studs with double nipples	with a valve bracket without studs without double nipples

Table 1 Versions of mean pressure valve MDV1



Detaching valve bracket (1):

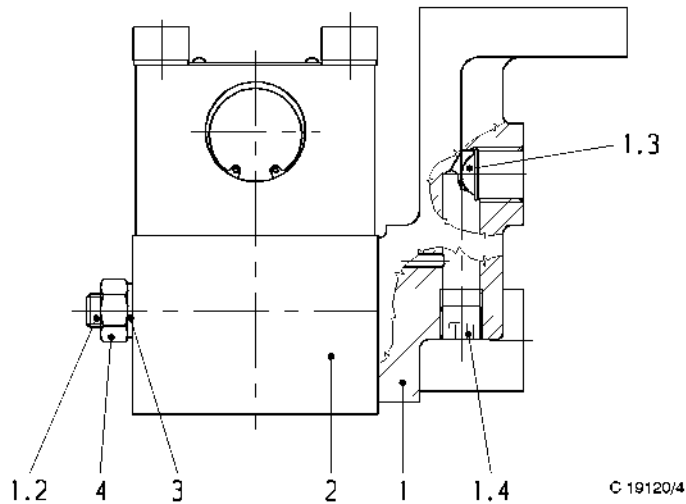
- Valve bracket (1) with studs, without double nipples (see Figure 4)



NOTE

This section applies to the following item number:
I61627 as far as Rev. 07

- Unscrew the hexagon nuts (4) from studs (1.2) and remove together with lock washers (3).
- Remove mean pressure valve (2).
- Unscrew the wire strainers (1.3) from valve bracket (1).



1	Valve bracket	2	Mean pressure valve
1.2	Stud	3	Lock washer
1.3	Wire strainer	4	Hexagon nut
1.4	Screw plug		

Figure 4 Mean pressure valve
with a valve bracket, with studs, without double nipples



- Valve bracket (1) with studs, with double nipples (see Figure 5)



NOTE

This section applies to the following item numbers:

I22950 as far as Rev. 07

I22950/02 as far as Rev. 00

I22950/X as far as Rev. 04

I22950/X122 as far as Rev. 03

I22950X143 as far as Rev. 01

ISTL17416 as far as Rev. 03



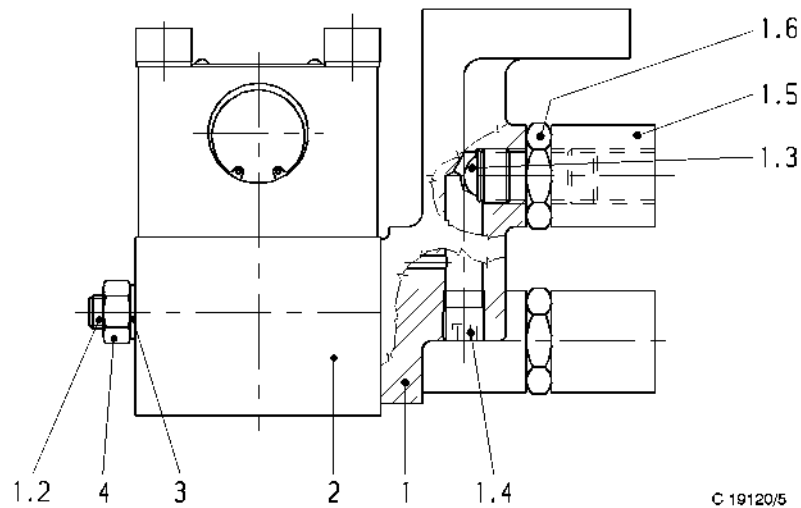
CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To unscrew the sockets (1.5), hold the double nipples (1.6) securely with a suitable tool, such as an open-end wrench.

- Unscrew the hexagon nuts (4) from studs (1.2) and remove together with lock washers (3).
- Remove mean pressure valve (2).
- Unscrew the sockets (1.5) from double nipples (1.6).
- Unscrew the double nipples (1.6) from valve bracket (1).
- Unscrew the wire strainers (1.3) from valve bracket (1).



- | | | | |
|-----|---------------|---|---------------------|
| 1 | Valve bracket | 2 | Mean pressure valve |
| 1.2 | Stud | 3 | Lock washer |
| 1.3 | Wire strainer | 4 | Hexagon nut |
| 1.4 | Screw plug | | |
| 1.5 | Socket | | |
| 1.6 | Double nipple | | |

Figure 5 Mean pressure valve
with a valve bracket, with studs, with double nipples



- Valve bracket (1) without studs, with double nipples (see Figure 6)



NOTE

This section applies to the following item number:
I22950/1 as far as Rev. 03



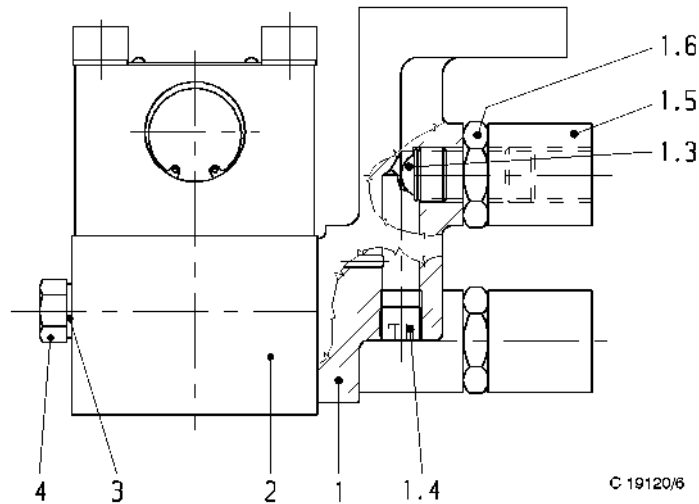
CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To unscrew the sockets (1.5), hold the double nipples (1.6) securely with a suitable tool, such as an open-end wrench.

- Unscrew the hex-head bolts (4) and remove together with locking rings (3).
- Remove mean pressure valve (2).
- Unscrew the sockets (1.5) from double nipples (1.6).
- Unscrew the double nipples (1.6) from valve bracket (1).
- Unscrew the wire strainers (1.3) from valve bracket (1).



- | | | | |
|-----|---------------|---|---------------------|
| 1 | Valve bracket | 2 | Mean pressure valve |
| 1.3 | Wire strainer | 3 | Locking ring |
| 1.4 | Screw plug | 4 | Hex-head bolt |
| 1.5 | Socket | | |
| 1.6 | Double nipple | | |

Figure 6 Mean pressure valve
with a valve bracket, without studs, with double nipples



- Valve bracket (1) with studs, without double nipples (see Figure 7)



NOTE

This section applies to the following item numbers:

I22950 onwards of Rev. 08

I22950/02 onwards of Rev. 01

I22950/X onwards of Rev. 05

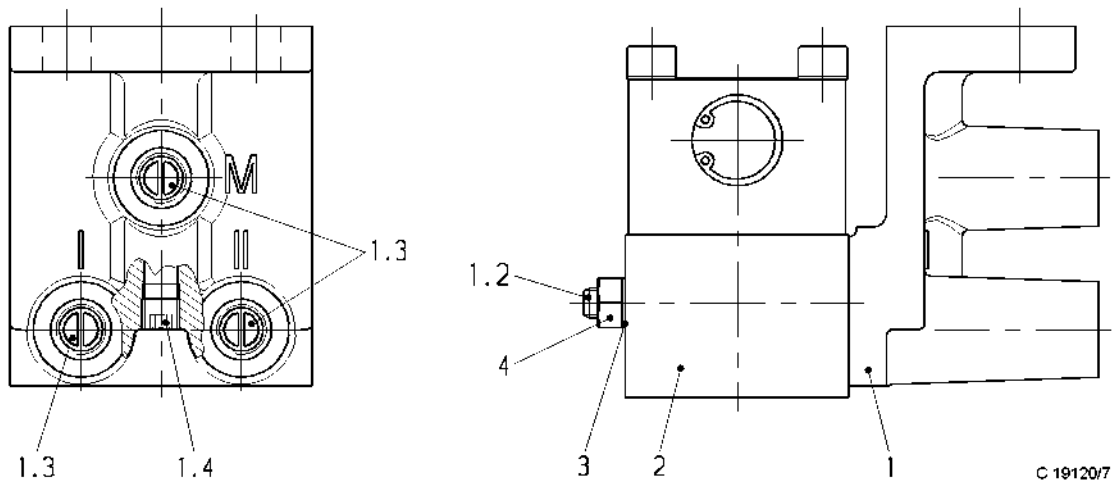
I22950/X122 onwards of Rev. 04

I22950X143 onwards of Rev. 02

I61627 onwards of Rev. 08

The units differ in the design of the ports on valve bracket (1, see Figure 8).

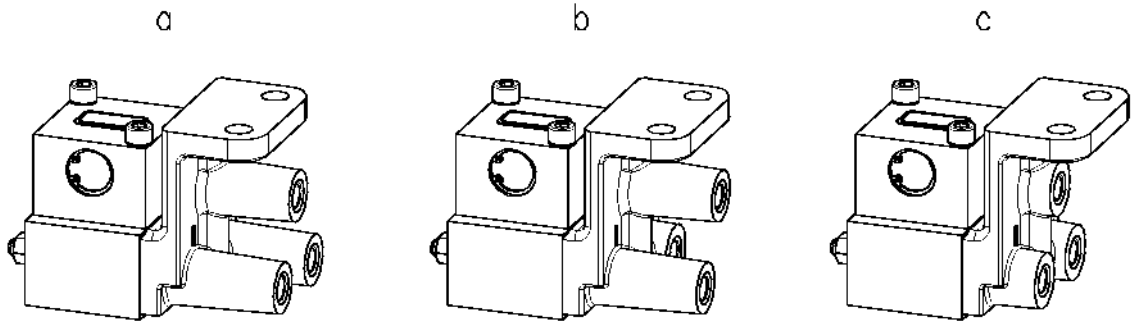
- Unscrew the hexagon nuts (4) from studs (1.2) and remove together with lock washers (3).
- Remove mean pressure valve (2).
- Unscrew the wire strainers (1.3) from valve bracket (1).



- 1 Valve bracket
- 1.2 Stud
- 1.3 Wire strainer
- 1.4 Screw plug

- 2 Mean pressure valve
- 3 Lock washer
- 4 Hexagon nut

Figure 7 Mean pressure valve with a valve bracket, with studs, without double nipples (showing I22950 by way of example)



C 19120/8

a Construction of item numbers I22950, I22950/X,
I22950/X122, I22950X143

b Construction of item number I22950/02

c Construction of item number I61627

Figure 8 Versions of valve bracket (1)



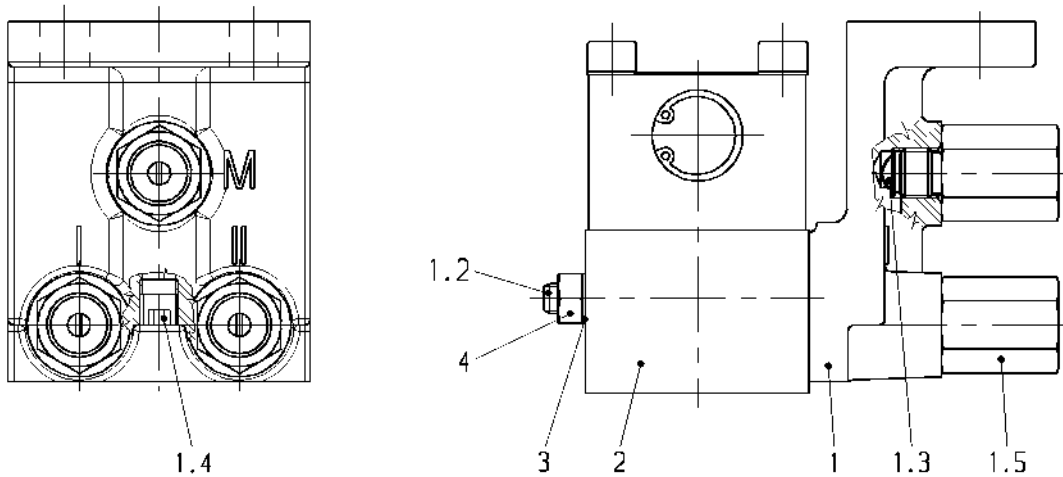
- Valve bracket (1) with studs, with unions (see Figure 9)



NOTE

This section applies to the following item number:
ISTL17416 onwards of Rev. 04

- Unscrew the hexagon nuts (4) from studs (1.2) and remove together with lock washers (3).
- Remove mean pressure valve (2).
- Unscrew the unions (1.5).
- Take wire strainers (1.3) out of valve bracket (1).



C 19120/9

- | | | | |
|-----|---------------|---|---------------------|
| 1 | Valve bracket | 2 | Mean pressure valve |
| 1.2 | Stud | 3 | Lock washer |
| 1.3 | Wire strainer | 4 | Hexagon nut |
| 1.4 | Screw plug | | |
| 1.5 | Pipe union | | |

Figure 9 Mean pressure valve
with a valve bracket, with studs, with unions



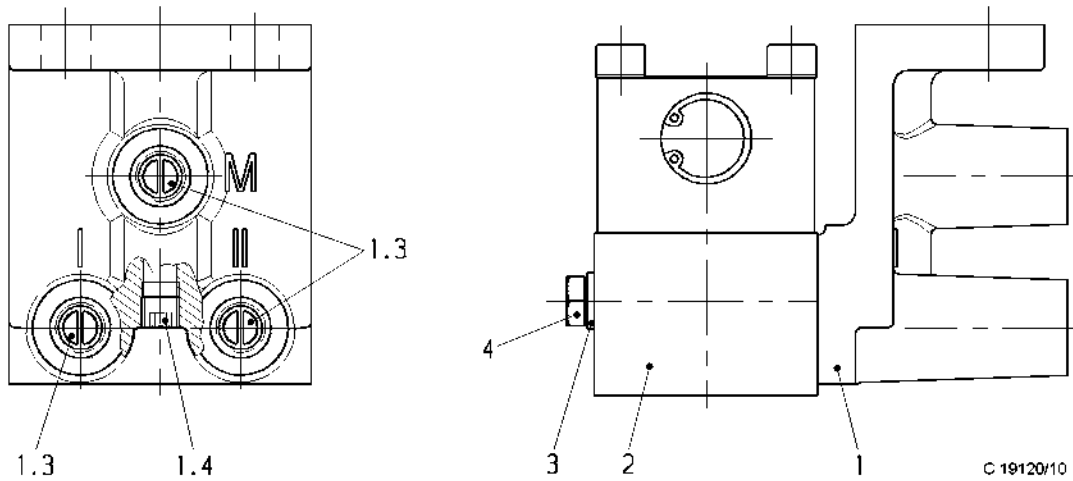
- Valve bracket (1) without studs, without double nipples (see Figure 10)



NOTE

This section applies to the following item number:
I22950/1 as far as Rev. 04

- Unscrew the hex-head bolts (4) and remove together with locking rings (3).
- Remove mean pressure valve (2).
- Unscrew the wire strainers (1.3) from valve bracket (1).



- 1 Valve bracket
- 1.3 Wire strainer
- 1.4 Screw plug

- 2 Mean pressure valve
- 3 Locking ring
- 4 Hex-head bolt

Figure 10 Mean pressure valve
with a valve bracket, without studs, with double nipples



Dismantling the mean pressure valve (2):

See Figure 11

- Remove O-rings (2.21) from the joining surface mating with valve bracket (1).
- Unscrew both machine screws (2.15) and remove together with lock washers (2.16).
- Remove upper housing member (2.13) and all its parts from lower housing member (2.4).
- Take out O-rings (2.20 and 2.21).
- Unscrew the valve screw (2.7).
- Release O-ring (2.12) from valve screw (2.7).



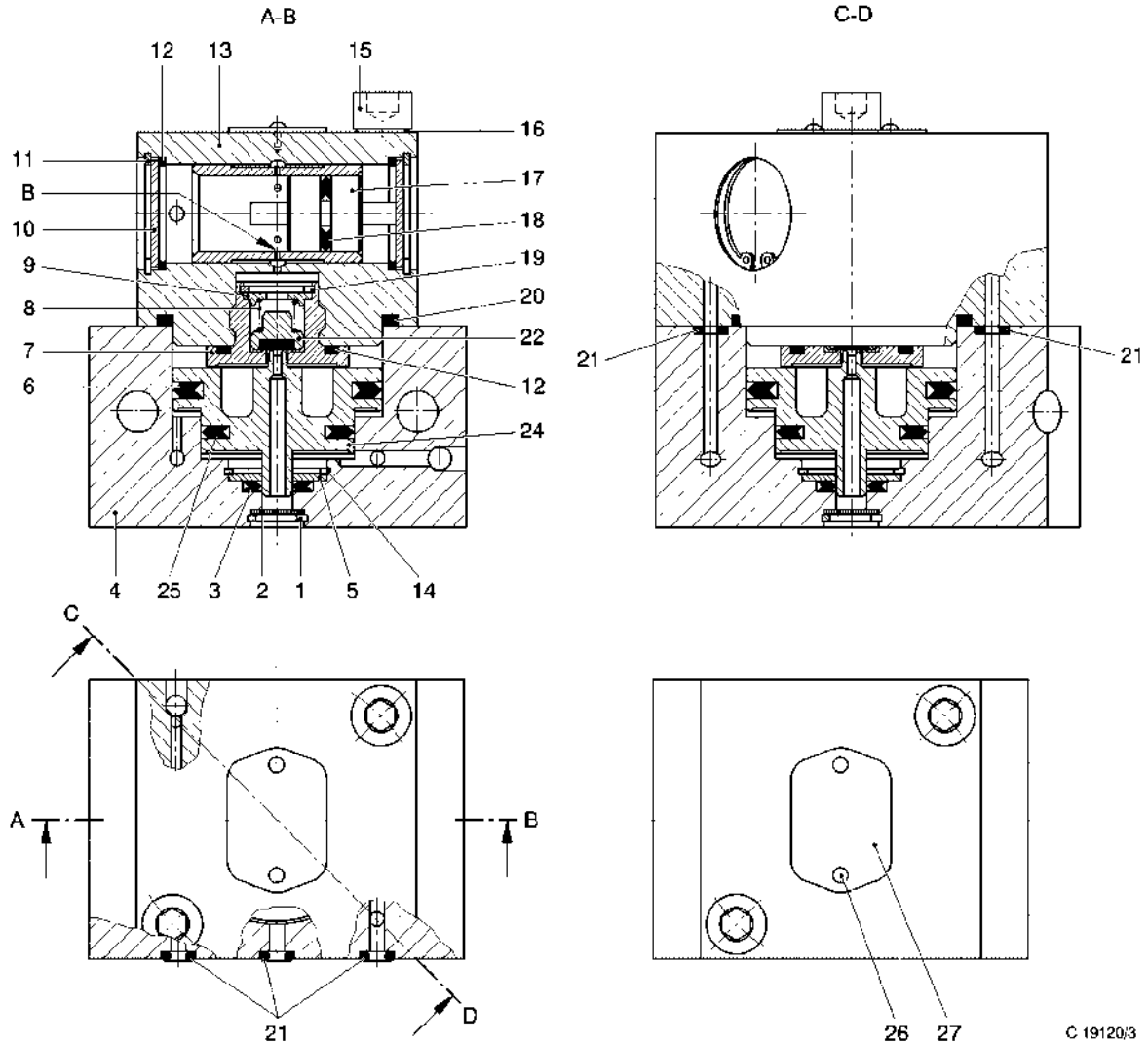
CAUTION

Pretensioned compression spring (2.8)!

The pretensioned compression spring (2.8) may jump out of valve screw (2.7) and cause eye injuries.

Perform all the working steps in the specified sequence.

- Cautiously remove retaining ring (2.19) while holding down the spring retainer (2.9).
- Slowly relax compression spring (2.8).
- Remove spring retainer (2.9), compression spring (2.8) and twin valve head (2.22) successively from valve screw (2.7).
- Remove retaining rings (2.11).
- Take discs (2.10) and O-rings (2.12) out of upper housing member (2.13).
- Withdraw pistons (2.17) together with KNORR K-ring (2.18).
- Remove KNORR K-Ring (2.18), using the special hook (see Figure 1) as shown in Figure 2.
- Withdraw differential piston (2.24) plus KNORR K-rings (2.6 and 2.25) from the lower member.
- Remove KNORR K-Rings (2.6 and 2.25), using the special hook (see Figure 1) as shown in Figure 2.
- Remove retaining ring (2.14).
- Take out washer (2.5) and KNORR K-ring (2.3) one by one.
- Remove retaining ring (2.1) from lower housing member (2.4).
- Take strainer (2.2) out of lower housing member (2.4).



- | | | | |
|--------|----------------------|----|---------------------|
| 2. ... | | 14 | Retaining ring |
| 1 | Retaining ring | 15 | Machine screw |
| 2 | Strainer | 16 | Lock washer |
| 3 | KNORR K-ring | 17 | Piston |
| 4 | Lower housing member | 18 | KNORR K-ring |
| 5 | Washer | 19 | Retaining ring |
| 6 | KNORR K-ring | 20 | O-ring |
| 7 | Valve screw | 21 | O-ring |
| 8 | Compression spring | 22 | Twin valve head |
| 9 | Spring retainer | 24 | Differential piston |
| 10 | Disc | 25 | KNORR K-ring |
| 11 | Retaining ring | 26 | Rivet |
| 12 | O-ring | 27 | Name plate |
| 13 | Upper housing member | B | Bore 0.5mm dia. |

C 19120/3

Figure 11 Mean pressure valve (2)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

After dismantling, separate all individual parts to be replaced and dispose of them in accordance with the instructions in the relevant spare parts catalogue.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and spares. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked (see Section 4.5). Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged.

4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.
- Strip all traces of sealant off the threads of unions (1.5) and off the mating threads in valve bracket (1).



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.



WARNING

Compression springs under tension!

Compression spring jumping out of the measuring fixture.

Put the compression spring in the measuring fixture provided for this purpose, check for correct seating and use a suitable cage for protection.

Part No.	Name	Notes
2.4	Lower housing member	The sealing and sliding surfaces must not be scratched or scored in any way. Failing this requirement, exchange the part.
2.8	Compression spring	The spring force must be 3 ± 0.7 N at a clamped length of 5mm. Failing this requirement, exchange the part.
2.13	Upper housing member	The sealing and sliding surfaces must not be scratched or scored in any way. Make sure that the 0.5mm dia. bores (B) in the center line of the piston liner are clear. Trim off burrs. Failing this requirement, exchange the part.

Table 2 Separate inspection of special components



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



NOTE

Unless indicated specially in the following text, tighten all bolted joints **evenly** to the specifications in document WB420332A - doing so crosswise if there are four or more mounting points.

Assembling the mean pressure valve (2):

See Figure 11

- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the type designation):
 - Lubricate O-rings (2.12, 2.20 and 2.21) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate KNORR K-rings (2.3, 2.6, 2.18 and 2.25) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate the sliding and guiding surfaces of lower housing member (2.4), valve screw (2.7), upper housing member (2.13), piston (2.17), twin valve head (2.22) and differential piston (2.24) with a **thin** film of RENOLIT KBS 1 grease.
- For all other units:
 - Lubricate O-rings (2.12, 2.20 and 2.21) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate KNORR K-rings (2.3, 2.6, 2.18 and 2.25) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate the sliding and guiding surfaces of lower housing member (2.4), valve screw (2.7), upper housing member (2.13), piston (2.17), twin valve head (2.22) and differential piston (2.24) with a **thin** film of RENOLIT HLT2-KB grease.
- Put strainer (2.2) in lower housing member (2.4) and secure with retaining ring (2.1).
- Put KNORR K-ring (2.3) in lower housing member (2.4).
- Put washer (2.5) in place and secure with retaining ring (2.14).
- Install KNORR K-rings (2.6 and 2.25) in differential piston (2.24) as shown in Figure 3.
- Slip differential piston (2.24) into lower housing member (2.4).
- Install KNORR K-ring (2.18) in piston (2.17) as shown in Figure 3.
- Slip piston (2.17) into upper housing member (2.13).
- Put O-rings (2.12) in upper housing member (2.13).
- Place discs (2.10) on O-rings (2.12) and secure with retaining rings (2.11).
- Put twin valve head (2.22) in valve screw (2.7).
- Insert and compress the compression spring (2.8) and spring retainer (2.9), and secure with retaining ring (2.19).



- Put O-ring (2.12) in its seat on valve screw (2.7).
- Screw the valve screw (2.7) into upper housing member (2.13).
Tightening torque: 20±2 Nm
- Put O-ring (2.20) in its seat on upper housing member (2.13).
- Lubricate the threads of machine screws (2.15) with a **thin** film of STABURAGS NBU 30 PTM grease.
- Place O-rings (2.21) in their seats on lower housing member (2.4).
- Introduce upper housing member (2.13) into lower housing member (2.4) and fasten by lock washers (2.16) and machine screws (2.15).
- Place O-rings (2.21) in their seats on the joining surface mating with valve bracket (1) and with the onboard mounting bracket of lower housing member (2.4).

Assembling and attaching the valve bracket (1):



NOTE

If new studs (1.2) need to be installed, coat their threads with LOCTITE 7471 and LOCTITE 262 prior to screwing them into place.

Tightening torque: 23±2 Nm

If the screw plug (1.4) has been removed, put it back with LOCTITE 7471 and LOCTITE 262.

- Valve bracket (1) with studs, without double nipples (see Figure 4)



NOTE

This section applies to the following item number:

I61627 as far as Rev. 07

- Screw the wire strainers (1.3) into valve bracket (1).



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.

- Slide mean pressure valve (2) onto studs (1.2).
- Attach mean pressure valve (2) by hexagon nuts (4) and lock washers (3).
Tightening torque: 20±2 Nm



- Valve bracket (1) with studs, with double nipples (see Figure 5)



NOTE

This section applies to the following item numbers:

I22950 as far as Rev. 07

I22950/02 as far as Rev. 00

I22950/X as far as Rev. 04

I22950/X122 as far as Rev. 03

I22950X143 as far as Rev. 01

ISTL17416 as far as Rev. 03

- Screw the wire strainers (1.3) into valve bracket (1).
- Coat the threads of double nipples (1.6) with LOCTITE 7471 and LOCTITE 262
- Screw the double nipples (1.6) into valve bracket (1).



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To screw on the sockets (1.5), hold the double nipples (1.6) securely with a suitable tool, such as an open-end wrench.

- Coat the threads of sockets (1.5) with LOCTITE 7471 and LOCTITE 262.
- Screw the sockets (1.5) onto double nipples (1.6).
Tightening torque: 18 Nm



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.

- Slide mean pressure valve (2) onto studs (1.2).
- Attach mean pressure valve (2) by hexagon nuts (4) and lock washers (3).
Tightening torque: 20±2 Nm

- Valve bracket (1) without studs, with double nipples (see Figure 6)



NOTE

This section applies to the following item number:

I22950/1 as far as Rev. 03

- Screw the wire strainers (1.3) into valve bracket (1).
- Coat the threads of double nipples (1.6) with LOCTITE 7471 and LOCTITE 262
- Screw the double nipples (1.6) into valve bracket (1).



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To screw on the sockets (1.5), hold the double nipples (1.6) securely with a suitable tool, such as an open-end wrench.

- Coat the threads of sockets (1.5) with LOCTITE 7471 and LOCTITE 262.
- Screw the sockets (1.5) onto double nipples (1.6).
Tightening torque: 18 Nm



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.

- Attach mean pressure valve (2) by hex-head bolts (4) and locking rings (3).
Tightening torque: 20 ± 2 Nm
- Valve bracket (1) with studs, without double nipples (see Figure 7)



NOTE

This section applies to the following item numbers:

I22950 onwards of Rev. 08

I22950/02 onwards of Rev. 01

I22950/X onwards of Rev. 05

I22950/X122 onwards of Rev. 04

I22950X143 onwards of Rev. 02

I61627 onwards of Rev. 08

The units differ in the design of the ports on valve bracket (1, see Figure 8).

- Screw the wire strainers (1.3) into valve bracket (1).



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.

- Attach mean pressure valve (2) by hex-head bolts (4) and locking rings (3).
Tightening torque: 20 ± 2 Nm



- Valve bracket (1) with studs, with unions (see Figure 9)



NOTE

This section applies to the following item number:
ISTL17416 onwards of Rev. 04

- Screw the wire strainers (1.3) into valve bracket (1).
- Coat the threads of unions (1.5) with LOCTITE 7471 and LOCTITE 262.
- Screw the unions (1.5) into valve bracket (1).



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.

- Attach mean pressure valve (2) by hex-head bolts (4) and locking rings (3).
Tightening torque: 20 ± 2 Nm

- Valve bracket (1) without studs, without double nipples (see Figure 10)



NOTE

This section applies to the following item number:
I22950/1 as far as Rev. 04

- Screw the wire strainers (1.3) into valve bracket (1).



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.

- Attach mean pressure valve (2) by hex-head bolts (4) and locking rings (3).
Tightening torque: 20 ± 2 Nm
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.

.....
.....
U - G J 1 0 . 2 2

Rev. 01 - 22.08.2016 - en
.....

.....
Overhaul Instructions

Ballcock with an exhaust
SK-T-DN..E
SK-T-DN..E-K
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
01	22.08.2016	4.1.1, 4.3					x	
		4.2, 4.4, 4.6		x				



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working substances	10
4.1.2	Special tools	10
4.2	Disassembly	11
4.3	Disposal	21
4.4	Cleaning	21
4.5	Inspection	22
4.6	Assembly	22
4.7	Testing	26



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to modify the unit or this document at any time without making any specific announcements.

1.2 Target group for this document

The target group of this documentation are people who, due to training from KNORR-BREMSE,

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

The related Description specific to each item number must be consulted.

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

II57254/.....

II57355/.....

II57356/.....

II65390/.....

II67360/.....

II72764/.....

II74550/.....

II74560/.....

II74570/.....

II74579/.....

II74581/.....

II74676/.....

II74677/.....

II74678/.....

II74721/.....

II74730/.....

II74880/.....

II74896/.....

II74897/.....

II74898/.....

II74996/.....

II74997/.....

II74998/.....

II80469/.....



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics
- LOCTITE 262 sealant (order number: ID.no. 506350)

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tools:

- Assembly drift - dependent on the nominal bore (see Table 1)
(needed for installing the inner retaining ring (16))
- Test gauge - dependent on the nominal bore (see Table 2)
(needed for checking the inner retaining ring (16) for correct installation)
- Press
(needed for installing the inner retaining ring (16))



Order number	for type designation
C162984_DN7	SK-T-DN7E...
C162984_DN19	SK-T-DN19E...
C162984_DN25	SK-T-DN25E...

Table 1 Order numbers of the assembly drift

Order number	for type designation
C162985_DN7	SK-T-DN7E...
C162985_DN19	SK-T-DN19E...
C162985_DN25	SK-T-DN25E...

Table 2 Order numbers of the test gauge



NOTE

Special tools with an order number can be purchased from KNORR-BREMSE. Special tools with a tool drawing number must be made to the specifications of the tool drawings supplied by KNORR-BREMSE. Special tools without an order number or tool drawing number must be made to the specifications in the figures. The dimensions specified in the figures are mandatory values. Unspecified dimensions are left to the toolmaker's discretion.

4.2 Disassembly



NOTE

The part numbers and designations used in these Overhaul Instructions may differ from those of the unit you are actually dealing with.



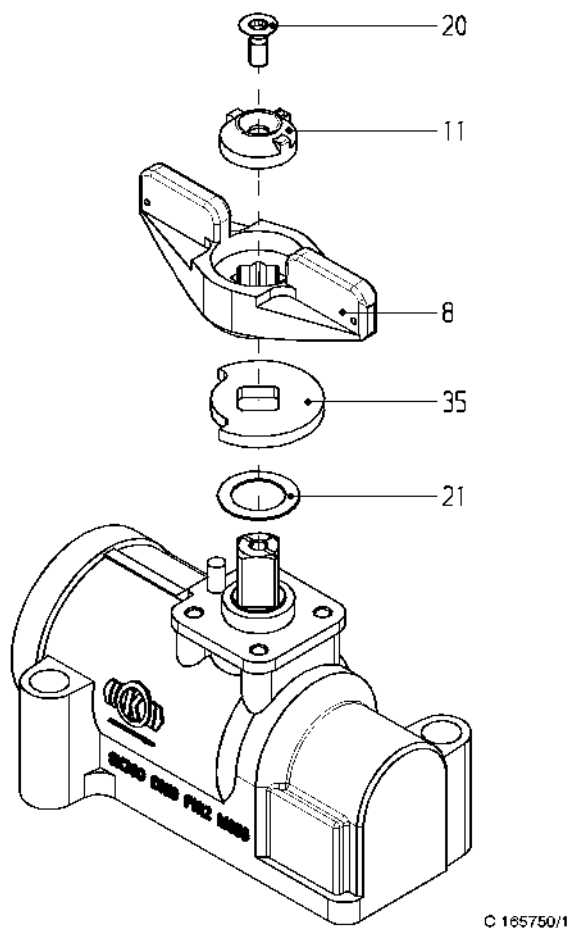
NOTE

To ensure that the ballcock is correctly assembled, it is necessary to write up a verifiable record during disassembly, showing how the component parts are arranged and aligned.



Detach the actuator (8):

- Version with a T-handle (see Figure 1):
 - Turn the cock to the "closed" position.
 - Unscrew the countersunk screw (20).
 - Record how the marking disc (11) and the T-handle (8) are positioned relative to the ballcock.
 - Remove the marking disc (11) and the T-handle (8).
 - Record how the stop disc (35) is positioned relative to the ballcock.
 - Remove the stop disc (35) and the spacer (21).

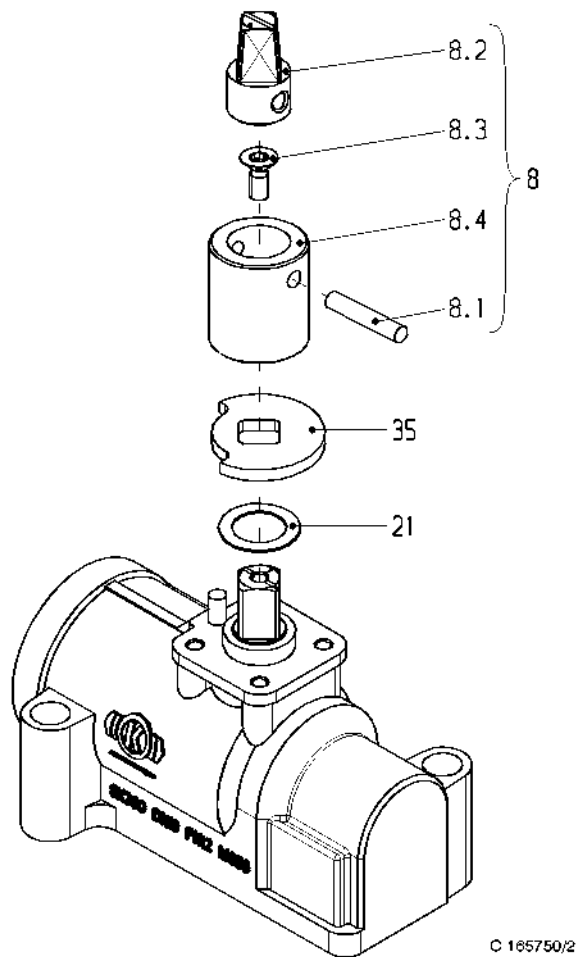


8	T-handle	21	Spacer
11	Marking disc	35	Stop disc
20	Countersunk screw		

Figure 1 Ballcock with a T-handle
(typical view showing the cock open)



- Version with a connection for conductor's carriage key (see Figure 2):
 - Turn the cock to the "closed" position.
 - Drive out the dowel pin (8.1).
 - Remove the square head (8.2).
 - Unscrew the countersunk screw (8.3).
 - Pull off the mounting part for carriage key (8.4).
 - Record how the stop disc (35) is positioned relative to the ballcock.
 - Remove the stop disc (35) and the spacer (21).

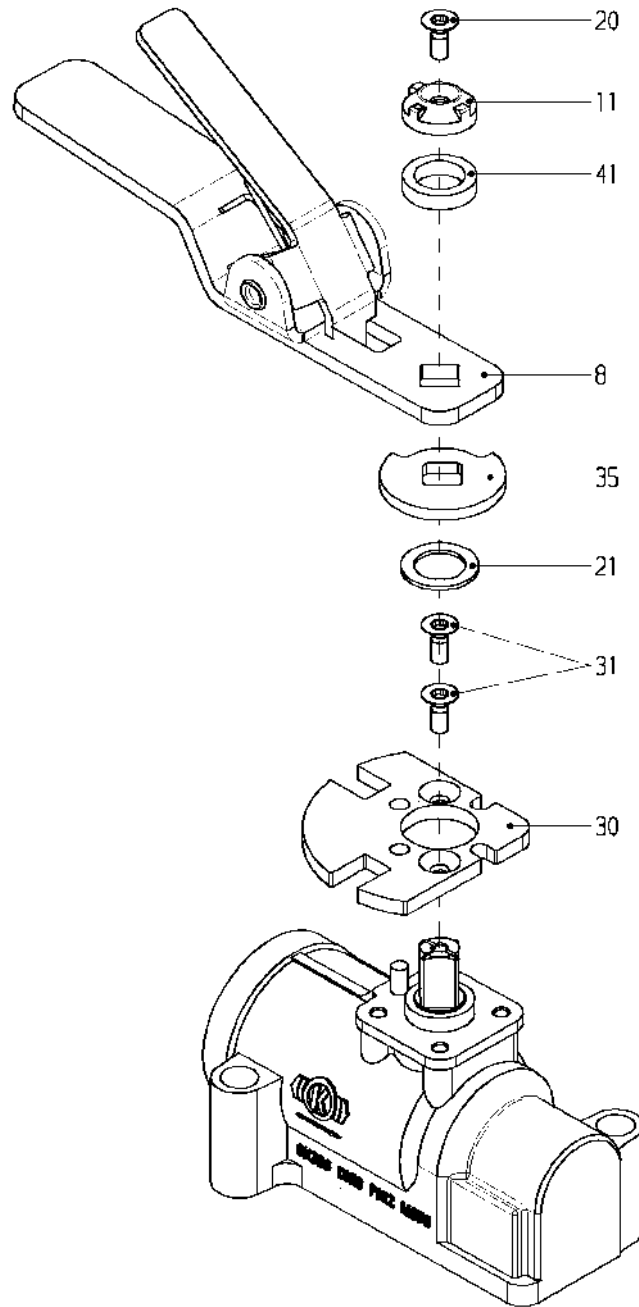


8	Mounting part for carriage key consisting of:	8.3	Countersunk screw
8.1	Dowel pin	8.4	Mounting part for carriage key
8.2	Square head	21	Spacer
		35	Stop disc

Figure 2 Ballcock with a connection for conductor's carriage key (typical view showing the cock open)



- Version with a handle lock (see Figure 3):
 - Turn the cock to the "closed" position.
 - Unscrew the countersunk screw (20).
 - Record how the marking disc (11) and the handle (8) are positioned relative to the ballcock.
 - Take off the marking disc (11), the spacer (41) and the handle (8).
 - Record how the stop disc (35) and the notch plate (30) are positioned relative to the ballcock.
 - Remove the spacer (21) and the stop disc (35).
 - Unscrew the countersunk screws (31), and take off the notch plate (30).

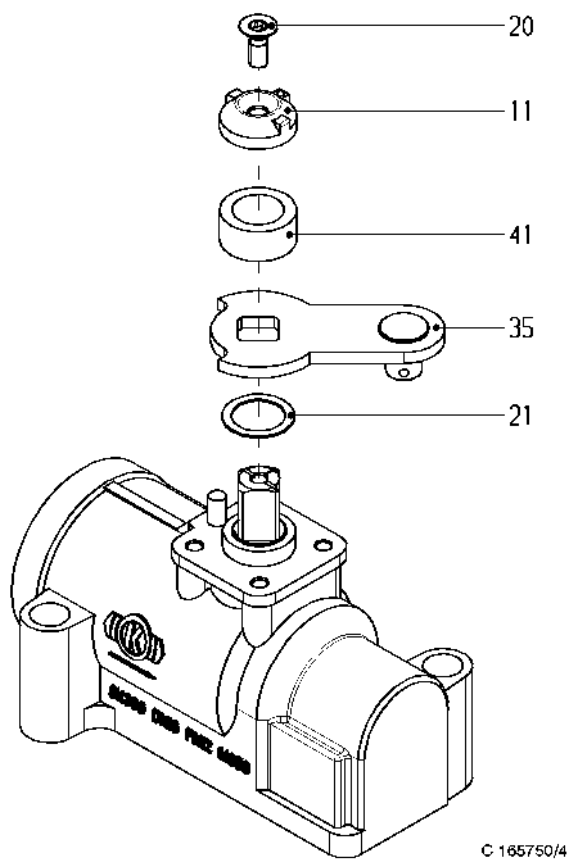


- | | | | |
|----|-------------------|----|-------------------|
| 8 | Handle | 30 | Notch plate |
| 11 | Marking disc | 31 | Countersunk screw |
| 20 | Countersunk screw | 35 | Stop disc |
| 21 | Spacer | 41 | Spacer |

Figure 3 Ballcock with a handle lock
(typical view showing the cock open)



- Version without an actuator with a lever (see Figure 4):
 - Turn the cock to the "closed" position.
 - Unscrew the countersunk screw (20).
 - Record how the marking disc (11) is positioned relative to the ballcock.
 - Remove the marking disc (11) and the spacer (41).
 - Record how the lever (35) is positioned relative to the ballcock.
 - Remove the lever (35) and the spacer (21).



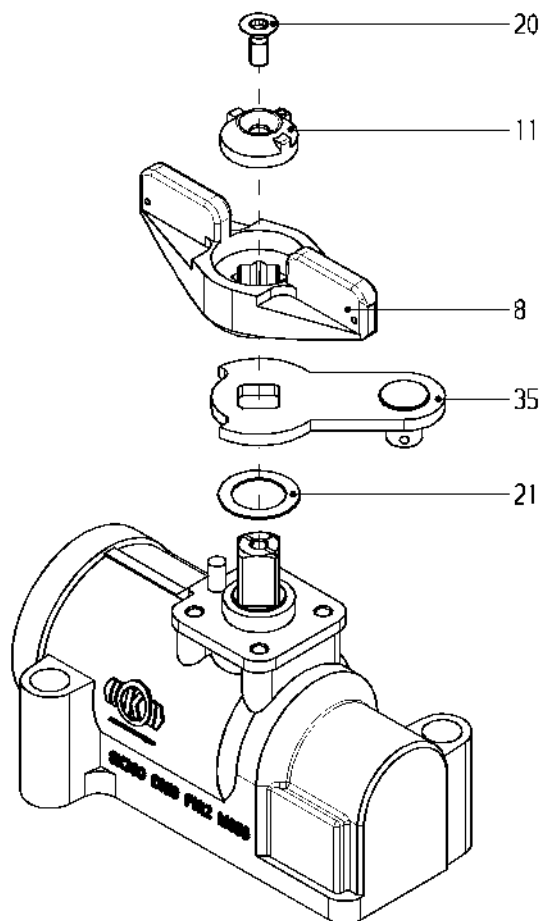
C 165750/4

11	Marking disc	21	Spacer
20	Countersunk screw	35	Lever
		41	Spacer

Figure 4 Version without an actuator with a lever
(typical view showing the cock open)



- Version with a T-handle and lever (see Figure 5):
 - Turn the cock to the "closed" position.
 - Unscrew the countersunk screw (20).
 - Record how the marking disc (11) and the T-handle (8) are positioned relative to the ballcock.
 - Remove the marking disc (11) and the T-handle (8).
 - Record how the lever (35) is positioned relative to the ballcock.
 - Remove the lever (35) and the spacer (21).



C 165750/5

8	T-handle	21	Spacer
11	Marking disc	35	Lever
20	Countersunk screw		

Figure 5 Version with a T-handle and lever
(typical view showing the cock open)



Dismantling the ballcock:

See Figure 6



CAUTION

Beware of incorrect handling!

Malfunctions and/or leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.



NOTE

Depending on the version, the ports contain three O-rings (18) or two O-rings (17) and one O-ring (18).

- Remove the O-rings (17 and 18) or the O-rings (18) from the housing (1).



CAUTION

Pre-tensioned compression spring (15)!

Pretensioned compression springs may jump out of the housing and cause eye injuries.

Perform all the working steps in the specified sequence.

- Hold down the stopper (4) until the retaining ring (16) is relaxed, while holding the housing (1) tight for support.
- Remove the retaining ring (16) and decrease the pressure on the stopper (4) while relaxing the compression spring (15).
- Remove the stopper (4) and compression spring (15) from the housing (1).
- Remove the O-ring (13) from the stopper (4).
- Remove the retaining ring (16).
- Remove the supporting ring (14), seal (2) and ball (3) from the housing (1).
- Remove the O-ring (12) from the supporting ring (14).
- Record the alignment of the control shaft (5) relative to the housing (1).
- Remove the control shaft (5) and thrust ring (7).
- Remove the O-rings (9) from the control shaft (5).



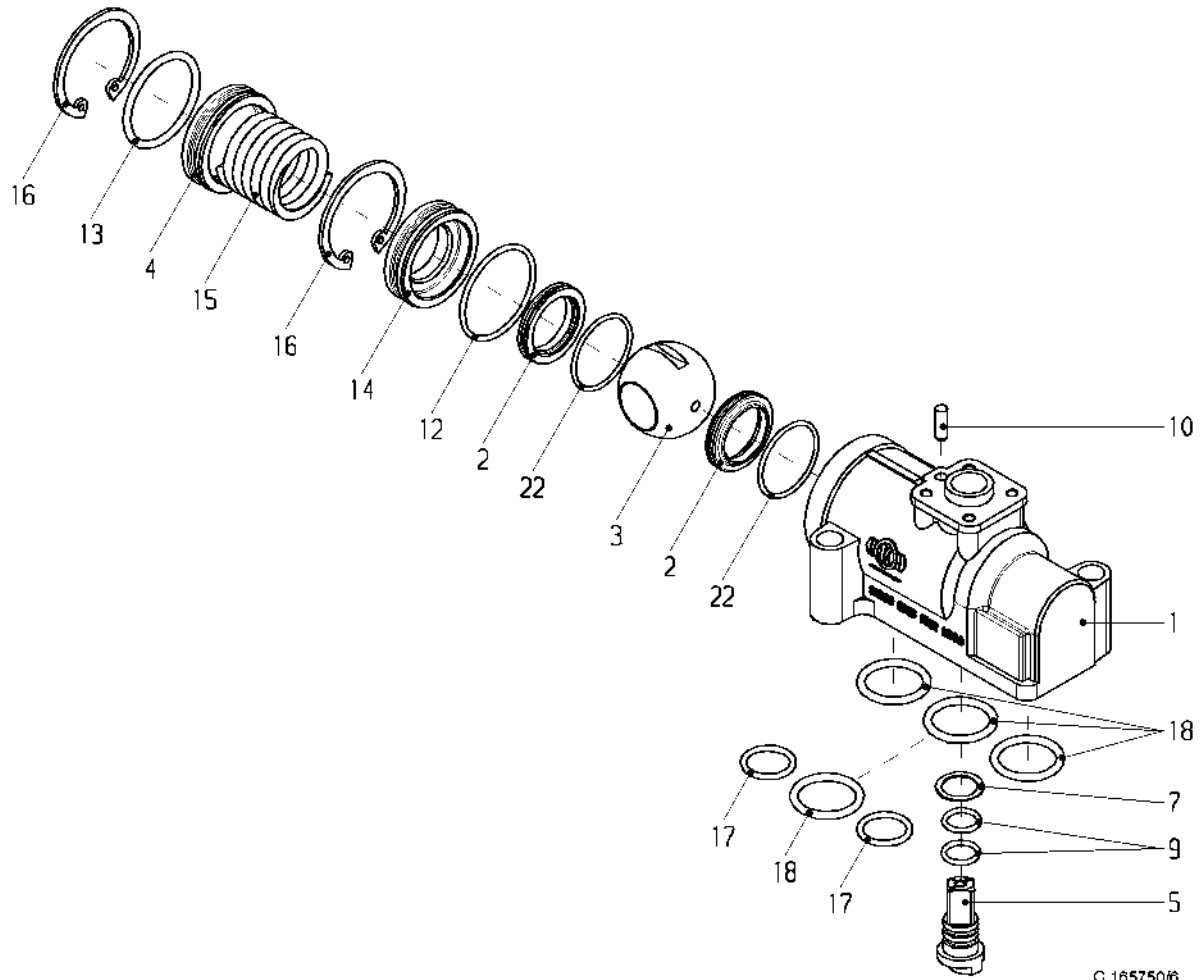
- Remove the seal (2) from the housing (1).
- Not for DN7 ballcocks:

Remove the O-rings (22) from the seals (2).



NOTE

The dowel pin (10) remains in the housing (1) and is only exchanged if damaged.



- | | | | |
|----|---------------|----|-------------------------|
| 1 | Housing | 12 | O-ring |
| 2 | Seal | 13 | O-ring |
| 3 | Ball | 14 | Supporting ring |
| 4 | Plug | 15 | Compression spring |
| 5 | Control shaft | 16 | Retaining ring |
| 7 | Thrust ring | 18 | O-ring |
| 9 | O-ring | 19 | Name plate (not shown) |
| 10 | Dowel pin | 22 | O-ring* |
| 11 | Marking disc | * | Not for ...DN7... units |

Figure 6 Ballcock without an actuator
(typical view showing the cock closed)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)

4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.
- Thoroughly strip all traces of sealants off the threads of countersunk screw (20) and countersunk screws (31) and also off the mating threads.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.

Item	Designation	Notes
3	Ball	The sealing surfaces must not be scratched in any way or reveal deep wear. Failing this requirement, exchange the part.

Table 3 Separate inspection of special components

4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



NOTE

The part numbers and designations used in these Overhaul Instructions may differ from those of the unit you are actually dealing with.

The O-rings (22) are only included in DN19 and DN25 units.



Assembling the ballcock:

See Figure 6



CAUTION

Beware of incorrect handling!

Malfunctions and/or leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the type designation):
 - Lubricate the O-rings (9, 12, 13, 17, 18, 22) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate the seal (2) with a **thin** film of RENOLIT KBS 1 grease.
- Only for all other units:
 - Lubricate the O-rings (9, 12, 13, 17, 18, 22) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate the seal (2) with a **thin** film of RENOLIT HLT2-KB grease.
- Place the greased O-rings (22) on the seals (2).
- Not for DN7 ballcocks:

Fit the seal (2) into the housing (1).
- Fit the thrust ring (7) on the control shaft (5).
- Insert the greased O-rings (9) in their seats on the control shaft (5).
- Insert control shaft (5) in the correct position in housing (1) (consult your record).
- Only for DN7 ballcocks:

Fit the seal (2) into the housing (1).



NOTE

The mark indicating the exhaust on the end face of the square head, and the exhaust bore must be positioned equilaterally.

- Insert the ball (3) in the correct position in the housing (1) (exhaust bore pointing towards the vented side), while taking care to locate the control shaft (5) in the groove on the ball (3).



- Insert the O-ring (12) in its seat on the supporting ring (14).
- Fit the seal (2) and supporting ring (14) in the housing (1).
- Position the assembly drift on the supporting ring (14), then carefully apply pressure in a press and secure with the retaining ring (16).
- Unload the press and remove the assembly drift.
- Check the retaining ring (16) for correct seating using the test gauge.
- Insert the O-ring (13) into its seat on the stopper (4).
- Insert the compression spring (15) and the stopper (4) in housing (1), and apply pressure to the stopper (4) while holding the housing (1) tight for support.
- Secure the stopper (4) with the retaining ring (16) and unload the pressure on the stopper (4).
- Insert the O-rings (17 and 18) or O-rings (18) in the seats on the housing (1).

Attaching the actuator (8):

- Version with a T-handle (see Figure 1):
 - Mount the stop disc (35), the spacer (21), the T-handle (8) and the marking disc (11) in the correct position on the shank of the control shaft (consult your record).
 - Coat the threads of the countersunk screw (20) with LOCTITE 262.
 - Fasten the T-handle (8) by countersunk screw (20).
- Version with a connection for conductor's carriage key (see Figure 2):
 - Mount and insert the stop disc (35), the spacer (21) and the mounting part for the carriage key (8.4) in the correct position on the shank of the control shaft (consult your record).
 - Coat the threads of the countersunk screw (8.3) with LOCTITE 262.
 - Screw in the countersunk screw (8.3).
 - Insert and align the square head (8.2) in the mounting part for the carriage key (8.4).
 - Drive the dowel pin (8.1) into place.



- Version with a handle lock (see Figure 3):
 - Coat the threads of the countersunk screws (31) with LOCTITE 262.
 - Place and insert the notch plate (30) in the correct position on the shank of the control shaft (consult your record).
 - Fasten the notch plate (30) by countersunk screws (31).
 - Mount and insert the spacer (21), the stop disc (35), the handle (8), the spacer (41) and the marking disc (11) in the correct position on the shank of the control shaft (consult your record).
 - Coat the threads of the countersunk screw (20) with LOCTITE 262.
 - Fasten the handle (8) by countersunk screw (20).
- Version without an actuator with a lever (see Figure 4):
 - Mount the lever (35), the spacer (21), the spacer (41) and the marking disc (11) in the correct position on the shank of the control shaft (consult your record).
 - Coat the threads of the countersunk screw (20) with LOCTITE 262.
 - Fasten the marking disc (11) by countersunk screw (20).
- Version with a T-handle and lever (see Figure 5):
 - Mount the lever (35), the spacer (21), the T-handle (8) and the marking disc (11) in the correct position on the shank of the control shaft (consult your record).
 - Coat the threads of the countersunk screw (20) with LOCTITE 262.
 - Fasten the T-handle (8) by countersunk screw (20).

4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.

.....
.....
U - G G 2 1 . 4 1

Rev. 03 - 17.05.2011 - en
.....

.....
Overhaul Instructions

Magnet valves
WMV1-ZEST



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Inhaltsverzeichnis

1	General information	4
1.1	Technical changes	4
1.2	Target group for this document	4
1.3	Notes and warning messages	5
2	Introduction	6
2.1	Related documents	6
3	Basic safety information	7
3.1	Validity	7
3.2	Authorized use of the product	7
3.3	Operator's / maintainer's commitment to due care	8
3.3.1	Assignment of personnel	8
3.3.2	Availability of the document	8
3.3.3	Amendments to the document	8
3.3.4	Spares and wearing parts	8
4	Maintenance	9
4.1	Requirements	9
4.1.1	Auxiliary products and working materials	9
4.1.2	Special tools	9
4.2	Disassembly	11
4.3	Disposal	16
4.4	Cleaning	17
4.5	Inspection	17
4.6	Assembly	21
4.7	Testing	25



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-GG21.41	Description of magnet valves WMV1...
U-OG51.24	Overhaul Instructions for valve magnets ZE-01; ZES-01
PK28	Test Instructions

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

I94900/1024

I94900/1024K

I94900/1024R

I94900/1032

I94900/1036

I94900/1048

I94900/1072

I94900/1096

I94900/1110

I94900/1110E

I94900/1110K



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own units. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tool according to Figure 1



NOTE

Special tools with an order number can be purchased from KNORR-BREMSE. Special tools with a tool drawing number must be made to the specifications of the tool drawings supplied by KNORR-BREMSE. Special tools without an order number or tool drawing number must be made to the specifications in the figures. The dimensions specified in the figures are mandatory values. Unspecified dimensions are left to the toolmaker's discretion.

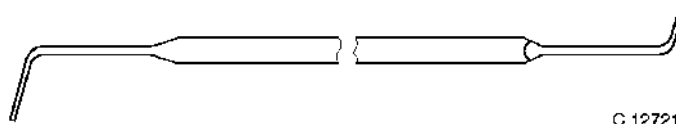


Figure 1 Special hook (order number B64617)

Directions for the use of the special hook



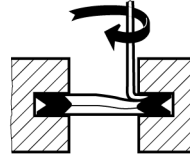
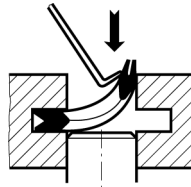
Figure 2 Removing KNORR K-rings (outer ring)
Draw the ring out of its groove by the special hook, and pull it entirely off by hand.
Or:
Draw the ring taut between thumb and index finger. The ring emerges from its groove at the opposite side. Pull off the ring by hand.



Figure 3 Installing KNORR K-rings (outer ring)
Draw the thinly greased KNORR K-ring over the piston. Stretch the ring to one side and slip by hand into the groove with the sealing lips first. Repeat the procedure around the full circumference until the entire ring is seated in its groove.
Run the special hook round between the KNORR K-ring and the groove wall.



Figure 4 Removing KNORR K-rings (inner ring)
Blow a jet of compressed air slantingly into the groove. The KNORR K-ring is blown up behind its sealing lips and jumps out of the groove.
Or:
Slip the special hook into the groove above the KNORR K-ring. Push out the KNORR K-ring by applying light pressure downwards.



C 8748/5

Figure 5 Installing KNORR K-rings (inner ring)
Squeeze the thinly greased KNORR K-ring into an oval and slip slantingly into the hole. Using the special hook, press the ring flat at the front and push into its groove. Push the remainder downwards and into the groove. Run the special hook round between the KNORR K-ring and the groove wall.

4.2 Disassembly

See Figure 6



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

- Release O-rings (12 and 13) from housing (1).
- Unscrew the breather filter / exhaust plug (31) from valve magnet (2).
- Detach and remove valve magnet (2) from housing (1) as directed in the relevant documents (see Section 2.1).



CAUTION

Pretensioned compression spring (16)!

Pretensioned compression springs may jump out of the housing and cause eye injuries.

Perform all the working steps in the specified sequence.

- Hold down cover (8), and cautiously remove retaining ring (19).
- Slowly decrease the pressure on cover (8) while relaxing the compression spring (16).
- Draw cover (8) off housing (1).
- Withdraw piston (4) from housing (1), and remove compression spring (16) from housing (1).
- Release KNORR K-ring (23) from piston (4), using the special hook (see Figure 1) as shown in Figure 2.



- Remove O-ring (9) from its seat on housing (1).



CAUTION

Pretensioned compression spring (17)!

Pretensioned compression springs may jump out of the housing and cause eye injuries.

Perform all the working steps in the specified sequence.

- Only valid for item numbers without the letter "K" at the end:
 - Hold down disc (30), and remove retaining ring (18).
 - Slowly decrease the pressure on disc (30) while relaxing the compression spring (17).
 - Take disc (30), rib (29) and ring (7) out of housing (1).
 - Lift disc (30) off rib (29), and remove KNORR K-ring (14).



NOTE

Units with the letter "K" at the end of the item number have a valve bush (7*) instead of parts (7, 29 and 30).

- Only valid for item numbers with the letter "K" at the end:
 - Hold down valve bush (7*), and remove retaining ring (18).
 - Slowly decrease the pressure on valve bush (7*) while relaxing the compression spring (17).
 - Take valve bush (7*) out of housing (1).
 - Remove KNORR K-ring (14) from valve bush (7*), using the special hook (see Figure 1) as shown in Figure 4.
- Draw valve head (5), compression spring (17) and guide bush (6) out of housing (1).
- Remove O-rings (10 and 11) from housing (1).
- Hold down cover (33), and cautiously remove retaining ring (18).
- Take cover (33) out of housing (1).
- Remove O-rings (11) from their seats on cover (33).
- Take KNORR K-ring (14) out of housing (1).
- Hold down disc (21), and remove retaining ring (20).
- Take disc (21) out of housing (1).
- Remove KNORR K-ring (22) from housing (1), using the special hook (see Figure 1) as shown in Figure 4.



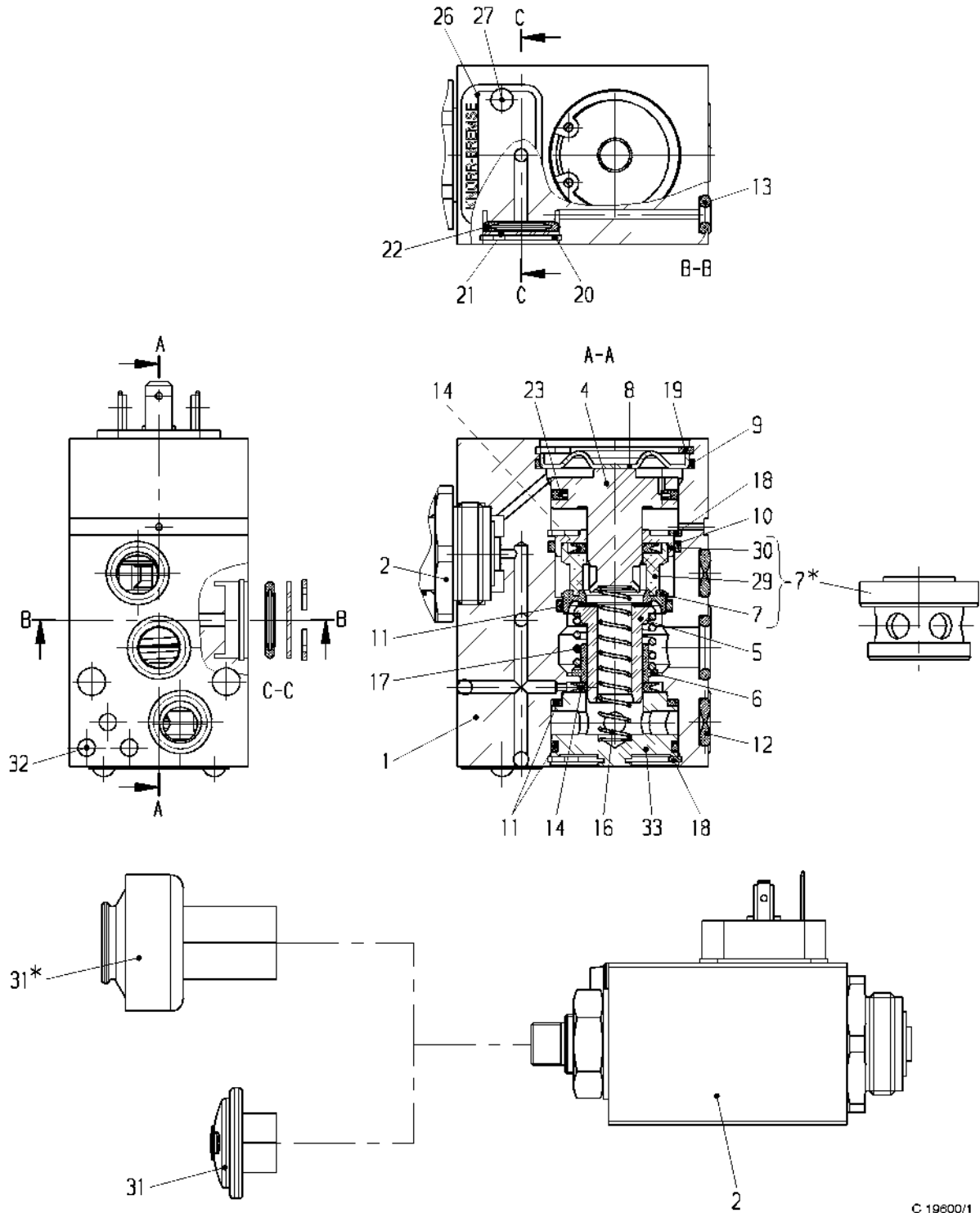
NOTE

The plug-in dowel pins (32) are pressed home hard into housing (1) and must **not** be withdrawn from the housing!



NOTE

Some versions still contain the old type of piston (4) and cover (8). When overhauling the magnet valve, exchange these parts for the current variants. Figure 7 shows both versions of the parts.

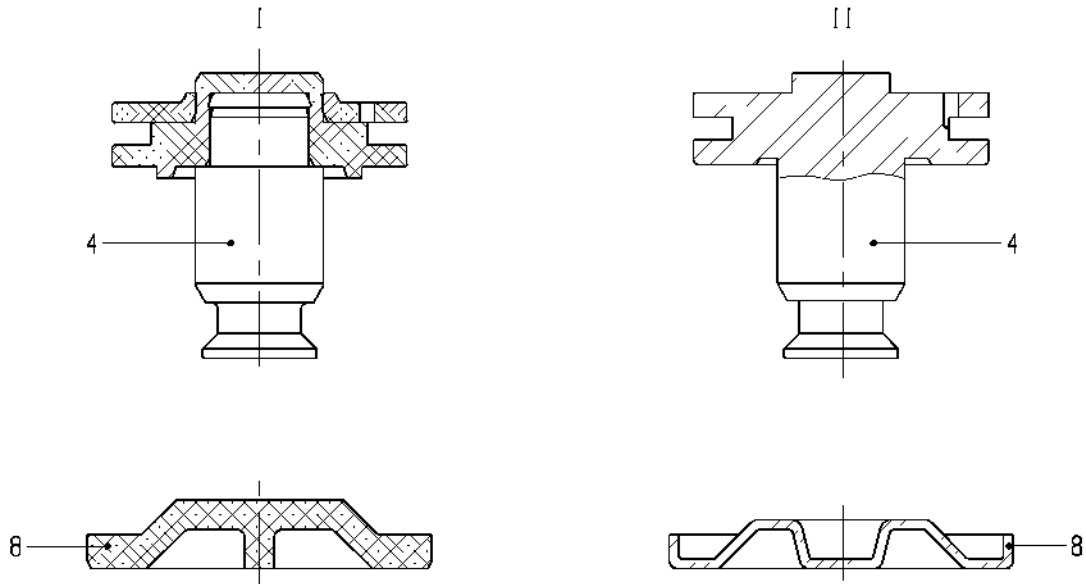


C 19800/1



- | | | | |
|----|---|-----|---|
| 1 | Housing | 17 | Compression spring |
| 2 | Valve magnet | 18 | Retaining ring |
| 4 | Piston | 19 | Retaining ring |
| 5 | Valve head | 20 | Retaining ring |
| 6 | Guide bush | 21 | Disc |
| 7 | Ring | 22 | KNORR K-ring |
| 7* | Valve bush
(only valid for item numbers with the letter
"K" at the end) | 23 | KNORR K-ring |
| 8 | Cover | 26 | Name plate |
| 9 | O-ring | 27 | Rivet |
| 10 | O-ring | 29 | Rib |
| 11 | O-ring | 30 | Disc |
| 12 | O-ring | 31 | Breather filter |
| 13 | O-ring | 31* | Exhaust plug
(only for item number I94900/1110E) |
| 14 | KNORR K-ring | 32 | Plug-in dowel pin |
| 16 | Compression spring | 33 | Cover |

Figure 6 Magnet valve WMV1-ZEST



C 19600/4

- | | | | |
|----|-----------------|---|--------|
| I | Old version | 4 | Piston |
| II | Current version | 8 | Cover |

Figure 7 Variants of piston (4) and cover (8)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

The following parts must be exchanged for new ones whenever they are removed (e.g. if they need to be removed for repair or overhaul):

- Retaining rings (18, 19, 20)
- Rivets (27)
- Plug-in dowel pins (32)

The following parts must additionally be exchanged for new ones upon overhaul:

- Piston (4) - only the outdated version (see Figure 7)
- Valve head (5)
- Guide bush (6)
- Ring (7)
- Cover (8) - only the outdated version (see Figure 7)
- O-rings (9, 10, 11, 12, 13)
- KNORR K-rings (14, 22, 23)
- Compression spring (16)
- Rib (29)



4.4 Cleaning

Clean all parts that do not have to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.
- Clean breather filter (31) with a cold cleaning substance.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

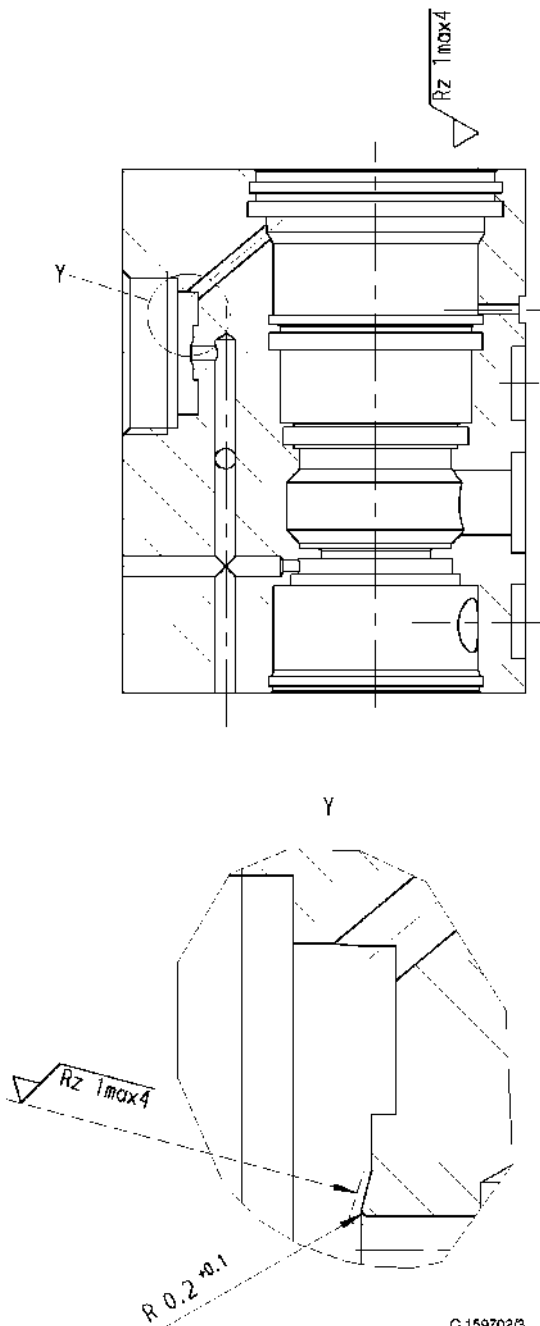
- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.



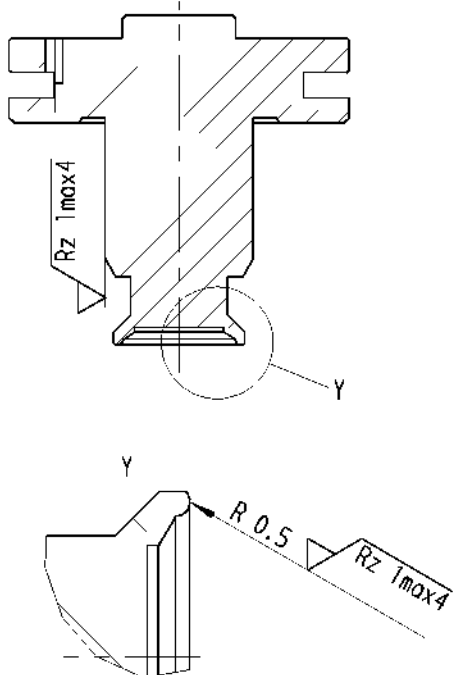
WARNING

Compression springs under tension!
Compression spring jumping out of the measuring fixture.
Put the compression spring in the measuring fixture provided for this purpose, check for correct seating and use a suitable cage for protection.

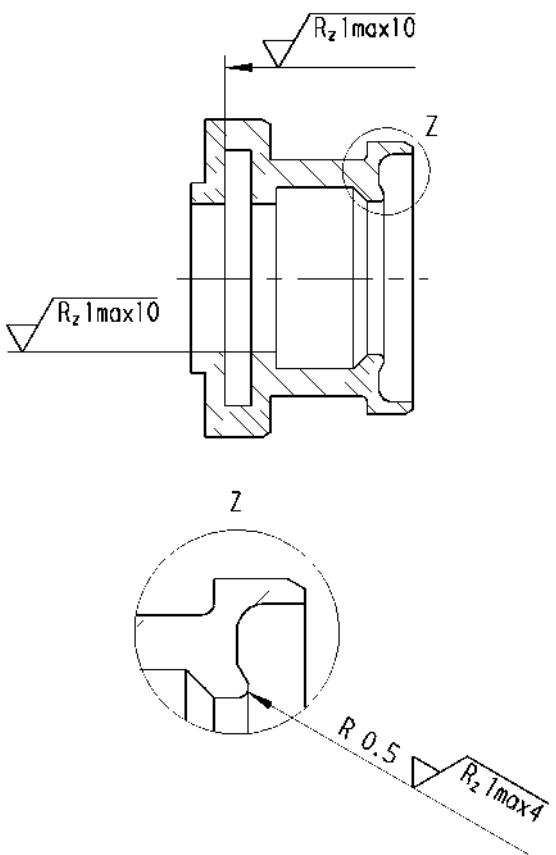


Part No.	Name	Notes
1	Housing	 <p>The size and the surface finishes must be to specification. Exchange any part out of specification.</p> <p>C 159702/3</p>



Part No.	Name	Notes
4	Piston	 <p>C 155955/3</p> <p>The size and the surface finishes must be to specification. Exchange any part out of specification.</p>



Part No.	Name	Notes
7*	Valve bush (only valid for item numbers with the letter "K" at the end)	 <p style="text-align: right;">C 144009/6</p> <p>The dimensions and surface finishes must be to specification. Exchange any part out of specification.</p>
17	Compression spring	The spring force must be 66+6/-2 N at a clamped length of 13.2mm. Exchange any part out of specification.



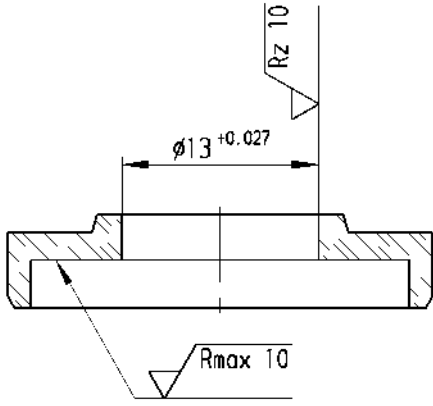
Part No.	Name	Notes
30	Disc (only valid for item numbers without the letter "K" at the end)	 <p style="text-align: right;">C 159702/4</p> <p>The size and the surface finishes must be to specification. Exchange any part out of specification.</p>

Table 1 Separate inspection of special components



NOTE

Inspect the component assemblies as directed in the relevant documents (see Section 2.1).

4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.

If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.

See Figure 6

- Only valid for item numbers with the letter "K" at the end:
 - Lubricate O-rings (9, 10, 11, 12 and 13) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate KNORR K-rings (14, 22 and 23) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate the sliding and guiding surfaces of housing (1), piston (4), valve head (5), guide bush (6) and valve bush (7*) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate the spring ends of compression spring (17) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate the whole circumference and the spring ends of compression spring (16) with a **thin** film of RENOLIT KBS 1 grease.
 - Lubricate the sealing surface of cover (33) with a **thin** film of RENOLIT KBS 1 grease.



- Only valid for item numbers without the letter "K" at the end:
 - Lubricate O-rings (9, 10, 11, 12 and 13) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate KNORR K-rings (14, 22 and 23) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate the sliding and guiding surfaces of housing (1), piston (4), valve head (5), guide bush (6) and disc (30) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate the spring ends of compression spring (17) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate the whole circumference and the spring ends of compression spring (16) with a **thin** film of RENOLIT HLT2-KB grease.
 - Lubricate the sealing surface of cover (33) with a **thin** film of RENOLIT HLT2-KB grease.
- Insert the O-rings (9, 10 and 11) in the seats on housing (1).
- Mount compression spring (17) on guide bush (6) and insert in housing (1).
- Slip valve head (5) into housing (1).
- Only valid for item numbers without the letter "K" at the end:
 - Put together rib (29) and ring (7).
 - Put KNORR K-ring (14) in its seat on rib (29).
 - Slip disc (30) onto rib (29), insert the assembly in housing (1) and fix by retaining ring (18).
- Only valid for item numbers with the letter "K" at the end:
 - Install KNORR K-ring (14) in its seat on valve bush (7*), using the special hook (see Figure 1) as shown in Figure 5.
 - Locate valve bush (7*) in housing (1).
 - Fix valve bush (7*) by retaining ring (18) in the correct mounting position.
- Install KNORR K-ring (23) in piston (4), using a special hook (see Figure 1) as shown in Figure 3.
- Locate piston (4) in housing (1).
- Put on cover (8) and fix by retaining ring (19) in the correct mounting position.
- Insert KNORR K-ring (14) in housing (1).
- Insert compression spring (16) in valve head (5) on housing (1).
- Insert O-rings (11) in the seats on cover (33).
- Insert cover (33) in housing (1) and fix by retaining ring (18).
- Attach valve magnet (2) to housing (1) as directed in the relevant documents (see Section 2.1).



- Attach breather filter (31) / exhaust plug (31*) to valve magnet (2).
Tightening torque: 8 Nm \pm 10%
- Put O-rings (12 and 13) in their seats on housing (1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be adjusted and tested for correct operation on a test bench in accordance with Test Instructions PK28.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.



CAUTION

Beware of failure to protect parts during storage and shipment!
The unit might be damaged, e.g. connector contacts deformed.
Put a protective cap on the unit's electric connector.

Driver's Brake Valve
FB11
FB11-1

0	General information	3
0.1	Copyright	3
0.2	Technical changes	3
0.3	Target group for this document	4
0.4	Notes and warning messages	5
1	Introduction	6
1.1	Related documents	6
2	Basic safety information	7
2.1	Validity	7
2.2	Authorized use of the product	7
2.3	Operator's / maintainer's commitment to due care	7
2.3.1	Assignment of personnel	7
2.3.2	Availability of the document	8
2.3.3	Amendments to the document	8
2.3.4	Spares and wearing parts	8
3	Maintenance	9
3.1	Requirements	9
3.1.1	Auxiliary products and working materials	9
3.1.2	Special tools	9
3.2	Disassembly	11
3.3	Disposal	15
3.4	Cleaning	16
3.5	Inspection	17
3.6	Assembly	18
3.7	Testing	21

0 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

0.1 Copyright

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH

Moosacher Strasse 80, 80809 München, Germany

Department: Technical Documentation (Technische Dokumentation)

Phone: +49 (89) 3547-0

Fax: +49 (89) 3547-2767

All data is protected by copyright. All rights are reserved. The CD containing customer documents from KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH – called “KB SfS” in the following – may be installed and used on a computer and a connected printer. A copy of the CD may be made provided it is used for backup only. Any such copy must bear copyright notes (and trade marks).

A hardcopy of the customer documents may be used in-house provided it is marked “confidential”. No part of the customer documents may be transmitted to others in any form whatever.

Any exception to these rules requires the express, written approval of KB SfS.

0.2 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

0.3 Target group for this document

This document is intended for use by KB Sfs trained service technicians who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish,
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers.

However, it does not claim to provide complete information for such target groups.

0.4 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the ecology.

Safety notes have a specific structure which is explained here for DANGER:



DANGER (= word of alert)

Source of the danger

Consequence of the danger

Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.

1 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance – repair and overhaul – of the unit.

1.1 Related documents

B-FB22.21	Description of driver's brake valves FB-11, FB11-1
PRF4112	Test Instructions
WB420332A	Table of specified tightening torques

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.

2 Basic safety information

2.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I69434	I69435/B
I69434/A	I69435/C
I69434/B	II39818
I69434/C	II60756
I69435/A	



NOTE

Please contact a KB Sfs Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

2.2 Authorized use of the product

The unit named in Section 2.1 shall be used only in the system that has been designed and engineered by KB Sfs for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB Sfs and transfer the liability to the operator.

KB Sfs must always be consulted before any other application or assignment is implemented.

2.3 Operator's / maintainer's commitment to due care

2.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

2.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

2.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

2.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KB SfS parts or KB SfS-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.

3 Maintenance

KB SfS gives top priority to safety and quality.

To guarantee this claim, KB SfS offers to overhaul its products. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

The experience and technical equipment needed for performing professional overhauls are available in the KB SfS Service Centers.

KB SfS has the capacity to test the state of its products regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact a KB SfS Service Center if the unit develops a malfunction that cannot be corrected.

3.1 Requirements

3.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KB SfS by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- RENOLIT HLT2-KB grease (order number: ID No.502647)

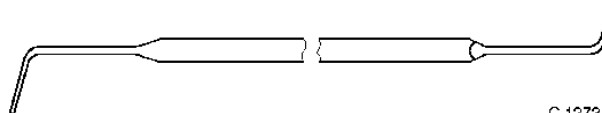
3.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tools.

- Special tool according to Fig. 1

Special tools can be purchased from KB SfS by their order numbers (where stated). Special tools without an order number must be made to the specifications in the figures. The dimensions specified in the figures are mandatory values. Unspecified dimensions are left to the toolmaker's discretion.

Fig. 1 Special hook (order number B64617)



C 12721

Table 1 Driver's brake valve versions

Item number	Type designation	with a valve bracket	without a valve bracket	Handle version
I69434	FB11	•		ball knob
I69434/A	FB11	•		ball knob
I69435/A	FB11		•	ball knob
I69434/B	FB11	•		ball knob
I69435/B	FB11		•	ball knob
I69434/C	FB11	•		ball knob
I69435/C	FB11		•	ball knob
II39818	FB11-1		•	ball handle
II60756	FB11	•		ball knob

3.2 Disassembly

See Fig. 2



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

Removing the handle:

Remove the handle (20) as follows:

- Item numbers: I69434/A, I69434/B, I69435/A, I69435/B
 - The handle (20) can be detached at position III. It can be depressed in this position, turned by 90° and taken off.
- Item numbers: I69434/C, I69435/C, II60756
 - The handle (20) can be detached only in the range between III and V when it is depressed and turned.
- Item numbers: II39818
 - The handle (20) can be detached only at position V when it is depressed and turned.

Detaching valve bracket (1) (only I69434/A, I69434/B, I69434/C, II60756):

- Unscrew machine screws (27) and remove together with washers (28).
- Remove valve bracket (1) from driver's brake valve.
- Remove and dispose of O-rings (17).
- Remove wire strainer (18) from valve bracket (1) and dispose of it.

Disassembling the driver's brake valve:



WARNING

Pretensioned compression springs (12 and 13)!

Pretensioned compression springs may jump out of the valve body and cause eye injuries.

Perform all the working steps in the specified sequence.

- Carefully unscrew screws (15) out of the valve body (2) while relaxing the compression springs (12 and 13). Remove screws (15).
- Using the special hook, release O-rings (14) (see Fig. 1) from the screws (15) and dispose of them.

- Remove the valve heads (10 and 11), compression springs (12 and 13) and the tappet (7) from the valve body (2). Dispose of the valve heads (10 and 11).
- Using the special hook (see Fig. 1), release O-rings (8) from the screws (7) and dispose of them.
- Remove retaining ring (26) and completely remove the control shaft (3).
- Remove the piston guide rings (25) from the control shaft (3) and dispose of them.



WARNING

Pretensioned compression springs (23 and 35)!

Pretensioned compression springs may jump out of the valve body and cause eye injuries.

Perform all the working steps in the specified sequence.

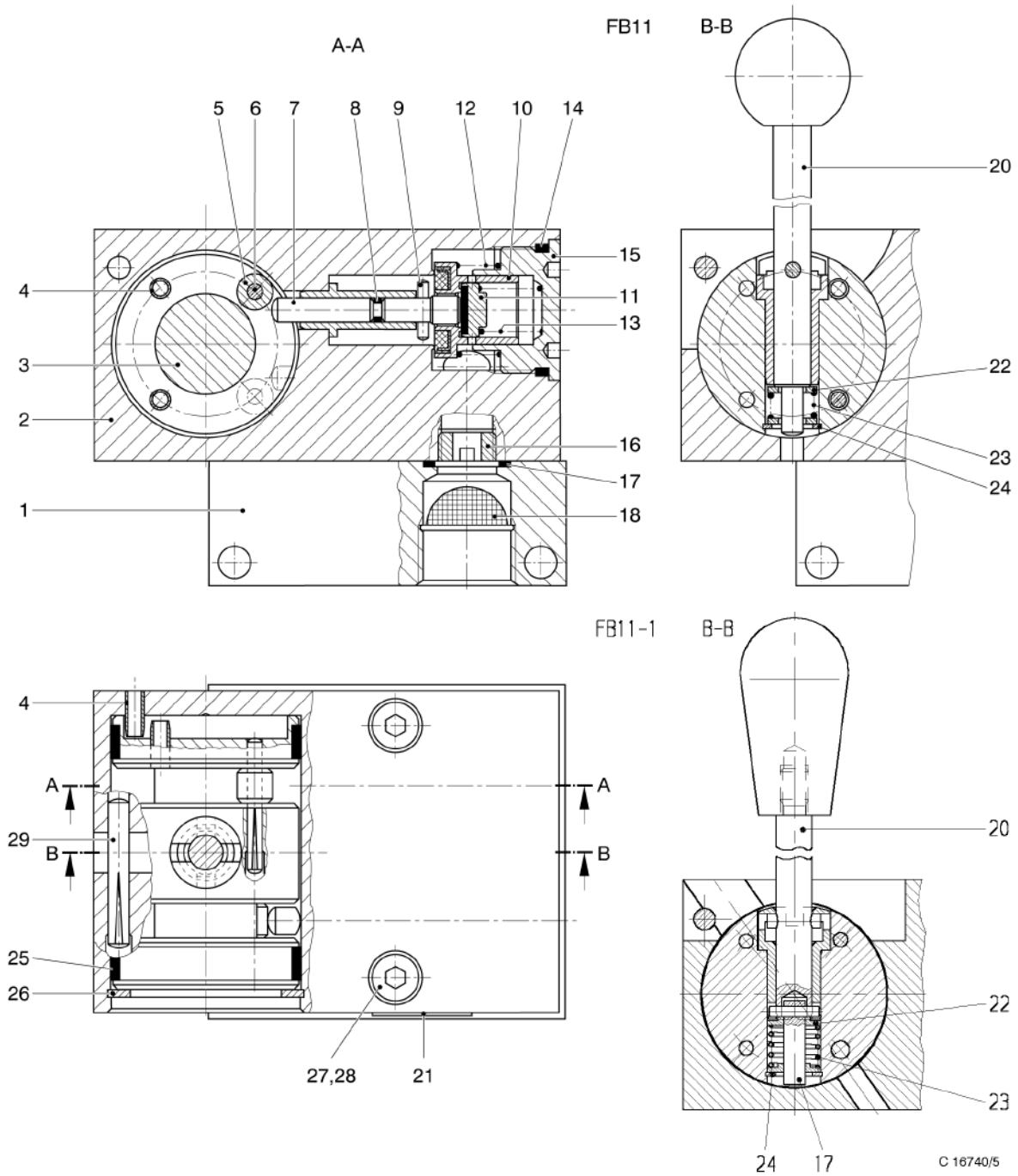
- except I69434/C, I69435/C and II60756:
 - Carefully remove retaining ring (24) from the control shaft (3) while relaxing the compression spring (23).
 - Remove washer (22), compression spring (23) and toggle (17, only II39818) from the control shaft (3).
- only I69434/C, I69435/C and II60756 (see Fig. 3):
 - Carefully remove the retaining ring (24) from the control shaft (3) while relaxing the compression springs (23 and 35).
 - Remove washer (36), compression springs (23 and 35), pin (37) and straight pin from the control shaft (3).
- Unscrew application choke (16) from the valve body (2).
- Remove the fitted dowel pin (6) from the control shaft (3) and detach the rollers. Dispose of the fitted dowel pin (6).



NOTE

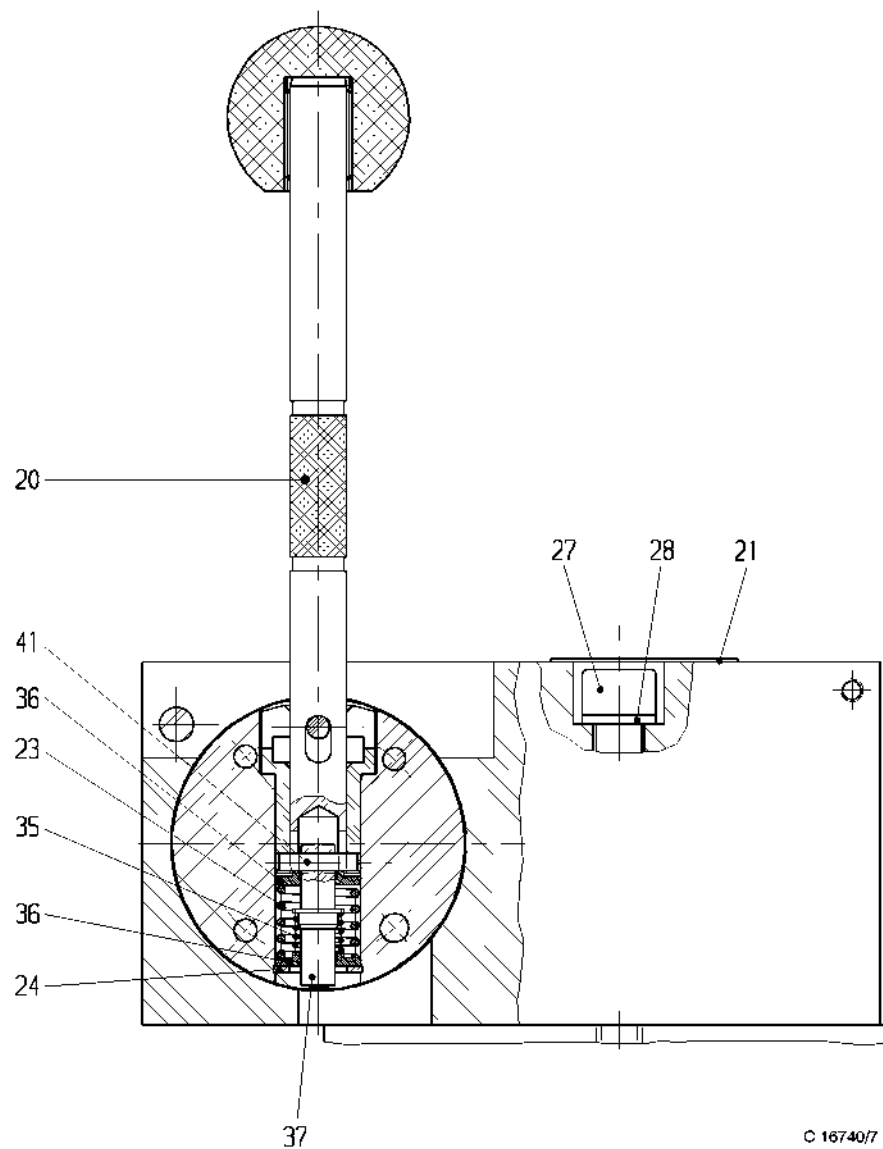
Only replace dowel pins (4) and dowel pin (29) when damaged.

Fig. 2 Driver's brake valve FB11... with a valve bracket



- | | | | | | |
|----|------------------|----|-----------------------|----|--------------------|
| 1 | Valve bracket | 11 | Valve head | 20 | Handle |
| 2 | Valve body | 12 | Compression spring | 21 | Name plate |
| 3 | Control shaft | 13 | Compression spring | 22 | washer |
| 4 | Dowel pin | 14 | O-ring | 23 | Compression spring |
| 5 | Roller | 15 | Screw | 24 | Retaining ring |
| 6 | Fitted dowel pin | 16 | Application choke | 25 | Piston guide ring |
| 7 | Tappet | 17 | O-ring (not II39818) | 26 | Retaining ring |
| 8 | O-ring | 17 | handle (only II39818) | 27 | Machine screw |
| 9 | Dowel pin | 18 | Wire strainer | 28 | washer |
| 10 | Valve head | | | 29 | dowel pins |

Fig. 3 Driver's brake valve FB11... only I69434/C, I69435/C and II60756



- | | | | | | |
|----|--------------------|----|--------------------|----|--------------|
| 20 | Handle | 27 | Machine screw | 36 | washer |
| 21 | Name plate | 28 | washer | 37 | Pin |
| 23 | Compression spring | 35 | Compression spring | 41 | Straight pin |
| 24 | Retaining ring | | | | |

3.3

Disposal



CAUTION

Undue disposal of ecologically harmful substances!

This would mean unnecessary and legally punishable harm to the environment.

Observe the officially applicable waste disposal regulations.

The following parts must be exchanged for new ones whenever they are removed (e.g. if they need to be removed for repair or overhaul):

- Wire strainer (18)
- Dowel pins (9 and 29)
- Fitted dowel pin (6)
- Dowel pins (4)
- Pin (37)
- Straight pin (41)

The following parts must additionally be exchanged for new ones upon overhaul:

- Piston guide rings (25)
- O-rings (8, 14 and 17)
- Retaining rings (24 and 26)
- Valve heads (10 and 11)

3.4 Cleaning

Clean all parts that do not have to be exchanged (also read the notes in Section 3.3).



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the maker's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 3.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Wash handle (20) in lukewarm soapy water. Rinse off with clear water immediately afterwards and blow dry with compressed air.
- Clean all non-metallic parts with a cold cleaning substance and blow dry with compressed air immediately afterwards.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

3.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the **Notes** column and illustrated, where applicable, in a figure.

Table 2 Separate inspection of special components

Part No.	Designation	Notes
2	Valve body	All sealing surfaces and valve seats may not have damages (nicks, scratches) that could cause malfunctions. All threads must be flawless and free-moving. Exchange the part if it is out of specification.
4	Dowel pin	Dowel pin may not have traces of rust. Exchange the part if it is out of specification.
5	Roller	Roller may not have grooves or traces of rust. Exchange the part if it is out of specification.
6	Fitted dowel pin	Fitted dowel pin may not have grooves or traces of rust. Exchange the part if it is out of specification.
12	Compression spring	The spring force must be at least 53.86 N at a clamped length of 14 mm. Exchange the part if it is out of specification.
13	Compression spring	The spring force must be at least 48.07 N at a clamped length of 20 mm. Exchange the part if it is out of specification.
23	Compression spring not for I69434/C I69435/C II60756	The spring force must be at least 46.58 N at a clamped length of 6.8 mm. Exchange the part if it is out of specification.
23	Compression spring only for I69434/C I69435/C II60756	The spring force must be at least 58 N at a clamped length of 10 mm. Exchange the part if it is out of specification.
35	Compression spring	The spring force must be at least 9.81 N at a clamped length of 8.5 mm. Exchange the part if it is out of specification.

3.6 Assembly

See Fig. 2



CAUTION

Beware of contaminating and damaging the unit!

Functionality will be impaired or the unit might even fail.

Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of assembling the unit.



WARNING

Beware of using auxiliary products and working materials incorrectly!

The skin or respiratory tracts may be harmed or inflamed.

It is vital to observe the maker's safety codes and directions for use.



NOTE

Do not use new elastomers (e.g. O-rings, sealing rings) that are older than one year. Verify the date of manufacture prior to use.

The lubricant specified in Section 3.1.1 is the only one allowed for greasing components. Certain parts may be lubricated with just a **thin** film of the grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.

Unless stated specially in the following text, tighten all bolted joints to the specifications in document WB420332A.

Assembling the driver's brake valve:

- Lubricate the running surfaces of the rollers (5) and the fitted dowel pins (6) with a **thin** film of RENOLIT HLT2-KB.
- Lubricate the sliding and guiding surfaces in the valve body (2) with a **thin** film of RENOLIT HLT2-KB.
- Lubricate the sliding and guiding surfaces in the control shaft (3) with a **thin** film of RENOLIT HLT2-KB.
- Lubricate piston guide rings (25) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate compression springs (23 and 35) with a **thin** film of RENOLIT HLT2-KB grease.
- Drive dowel pins (4) – that may have been removed – into the control shaft (3) and in the valve body (2).

- Insert fitted dowel pins (6) with rollers (5) into the control shaft (3).
- except I69434/C, I69435/C and II60756:
 - only for II39818: Insert handle (17) into the control shaft (3).
 - Insert washer (22) into the control shaft (3).
 - Insert compression spring (23) into control shaft (3) and secure with retaining ring (24).
- only I69434/C, I69435/C and II60756 (see Fig. 3):
 - Put washer (36) onto the pin (37) and insert straight pin into the pin (37).
 - Insert pin (37) into the control shaft (3).
 - Insert compression springs (23 and 35) into the control shaft (3).
 - Put on the washer (36) and secure with retaining ring (24).
- Put the piston guide rings (25) onto the sliding surfaces on the control shaft (3).
- Install the control shaft (3) in the housing (2) and secure with the retaining ring (26).
- Lubricate the sliding and guiding surfaces on the tappet (7) with a **thin** film of RENOLIT HLT2-KB.
- Lubricate O-rings (8) with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-rings (8) in their seats on the tappets (7).
- Fit tappets (7) in the valve body (2).
- Lubricate compression springs (12 and 13) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate O-rings (14) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the sliding and guiding surfaces on valve heads (10 and 11) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the sliding and guiding surfaces on the screws (15) with a **thin** film of RENOLIT HLT2-KB grease.
- Fit valve head (10) in the valve body (2).
- Fit compression spring (12).
- Insert valve head (11) and compression spring (13) into the shank of the valve head (10).
- Place O-rings (14) in their seats on the screws (15).
- Carefully screw screws (15) into the valve body (2).
- Lubricate application choke thread (16) with a **thin** film of RENOLIT HLT2-KB grease.
- Screw application choke (16) into valve body (2).

Attaching valve bracket (1) (only I69434/A, I69434/B, I69434/C, II60756):

- Fit wire strainer (18) in valve bracket (1).
- Place O-rings (17) in their seats on valve bracket (1).
- Locate and adjust driver's brake valve on valve bracket (1).
- Fasten the driver's brake valve to the valve bracket, using the machine screws (27) and washers (28).

Insert handle:

Insert the handle (20) as follows:

- Item numbers: I69434/A, I69434/B, I69435/A, I69435B
 - Insert the handle (20) in position III, press down and turn 90°.
- Item numbers: I69434/C, I69435/C, II60756
 - Insert the handle (20) in the range between III and V, press down and turn.
- Item numbers: II39818
 - Insert the handle (20) in position V, press down and turn.
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.

3.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with Test Instructions PRF4112.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Flange surfaces (if any) must be protected from damage.

Notes

Notes

D

**Knorr-Bremse
Systeme für Schienenfahrzeuge GmbH**
Moosacher Str. 80
80809 Munich
Germany
Phone: +49 89 3547-0
Fax: +49 89 3547-2767

A

Knorr-Bremse GmbH
Beethovengasse 43-45
2340 Mödling
Austria
Phone: +43 2236 409-0
Fax: +43 2236 409-412

CH

Oerlikon-Knorr Eisenbahntechnik AG
Mandachstrasse 50
8155 Niederhasli
Switzerland
Phone: +41 1 852 31 11
Fax: +41 1 852 31 31

GB

Knorr-Bremse Rail Systems (UK) Ltd.
Westinghouse Way, Melksham
Wiltshire SN12 6TL
United Kingdom
Phone: +44 1225 898 700
Fax: +44 1225 898 705

H

**Knorr-Bremse Vasúti Jármű
Rendszerek Hungária Kft.**
Helsinki út 86.
1201 Budapest
Hungary
Phone: +36 1 4211 100
Fax: +36 1 4211 192

E

**Sociedad Española de Frenos
Calefacción y Señales, S.A.**
Nicolás Fúster, 2
28320 Pinto (Madrid)
Spain
Phone: +34 91 69 10-054
Fax: +34 91 69 10-100

F

Freinrail Systèmes Ferroviaires S.A.
47-49 rue Gosset
BP 185
51057 Reims Cedex
France
Phone: +33 3 2679-7200
Fax: +33 3 2679-7201

I

Frensisemi S.r.l.
Via della Cupola, 112
50145 Firenze
Italy
Phone: +39 055 3020-1
Fax: +39 055 3020-333

S

Knorr-Bremse Nordic Rail Services AB
Traktorvägen 8
S-226 60 Lund
Sweden
Phone: +46 46 3293-50
Fax: +46 46 1489-71

USA

New York Air Brake Corporation
748 Starbuck Avenue
Watertown, NY 13601
USA
Phone: +1 315 786-52 00
Fax: +1 315 786-56 76

CDN

Knorr Brake Ltd.
675 Development Drive
Kingston, Ontario K7M 4W6
Canada
Phone: +1 613 389-46 60
Fax: +1 613 389-87 03

BR

**Knorr-Bremse
Sistemas para Veículos Ferroviários Ltda.**
Av. Engenheiro Eusébio Stevaux, 1071
Cep: 04696-902, São Paulo - SP
Brazil
Phone: +55 11 5681-1129
Fax: +55 11 5686-8344

RSA

Knorr-Bremse S.A. Pty. Ltd.
3 Derrick Road
1610 Kempton Park
South Africa
Phone: +27 11 961-7800
Fax: +27 11 975-8249

IND

Knorr-Bremse India Private Ltd.
14/6 Mathura Road
Faridabad-121003 Haryana
India
Phone: +91 129 227-64 09
Fax: +91 129 227-59 35

J

Knorr-Bremse Rail Systems Japan Ltd.
Nishiikebukuro TS Bldg., 8F
3-1-15 Nishiikebukuro
Toshima-ku
Tokyo, 171-0021
Japan
Phone: +81 3 5391-1013
Fax: +81 3 5391-1022

HK

**Knorr-Bremse Far East Ltd.
Rail Systems Division**
Suite 2901, 29/FI Central Plaza
18 Harbour Road
Wanchai
Hong Kong SAR, China
Phone: +852 2861-2669
Fax: +852 2520-6000

ROK

Knorr-Bremse Rail Systems Korea Ltd.
6th Floor, Bongwoo Bldg.
31-7, 1 Ka, Changchung-Dong, Choong-Ku
Seoul 100-391
Korea
Phone: +82 2 22 80-55 55
Fax: +82 2 22 80-55 99

AUS

Knorr-Bremse Australia Pty. Ltd.
1/2D Factory Street
Granville NSW 2142
Australia
Phone: +61 2 8863-6500
Fax: +61 2 9897-9980

01/06



KNORR-BREMSE

Systeme für Schienenfahrzeuge GmbH

Moosacher Str. 80 · 80809 Munich · Germany · Phone +49 89 3547-0
Fax +49 89 3547-2767 · Homepage <http://www.knorr-bremse.com>

Printed in Germany.

.....

.....

U - O G 2 1 . 2 4

Rev. 02 - 29.09.2009 - en

.....

.....

Overhaul Instructions

**Magnet valve
WMV-20/2Z...**



Contact address

Knorr-Bremse Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Table of contents

1	General information	4
1.1	Technical changes	4
1.2	Target group for this document	4
1.3	Notes and warning messages	5
2	Introduction	6
2.1	Related documents	6
3	Basic safety information	7
3.1	Validity	7
3.2	Authorized use of the product	7
3.3	Operator's / maintainer's commitment to due care	7
3.3.1	Assignment of personnel	7
3.3.2	Availability of the document	7
3.3.3	Amendments to the document	8
3.3.4	Spares and wearing parts	8
4	Maintenance	9
4.1	Requirements	9
4.1.1	Auxiliary products and working materials	9
4.1.2	Special tools	9
4.2	Disassembly	11
4.3	Disposal	15
4.4	Cleaning	15
4.5	Inspection	16
4.6	Assembly	18
4.7	Testing	21



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KB SfS reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by KB SfS-trained service technicians who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish,
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-OG21.24	Description of magnet valve WMV-20/2Z...
U-OG51.21	Overhaul Instructions for valve magnets ZE-01, ZES-01
U-OG51.24	Overhaul Instructions for valve magnets Z-01-G, Z-01N-G
PRF6129	Test Instructions
WB420332A	Table of specified tightening torques

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers

I83882/...

I86708/...

I83883/...

I87626/...

I83884/...

I116354/...



NOTE

Please contact a KB SfS Service Center if the unit cannot be clearly identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit listed in Section 3.1 shall be used only in the system that has been designed and engineered by KB SfS for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KB SfS and transfer the liability to the operator.

KB SfS must always be consulted before any other application or assignment is implemented.

3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.



3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KB SfS or KB SfS approved parts or wearing parts are used.

The installation of spares other than those approved may impair the safety and reliability of the given unit and overall system and invalidates any warranty on the part of KB SfS.



4 Maintenance

KB SfS gives top priority to safety and quality.

To help fulfil this claim, KB SfS provides an overhauling service for its own units. KB SfS performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

The KB SfS Service Centers have the experience and technical equipment needed for performing professional overhauls.

KB SfS has the capacity to test the state of its units regularly during their lifetime. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact a KB SfS Service Center if the unit develops a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KB SfS by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- RENOLIT HLT2-KB grease (order number: ID No. 502647)
- Cold cleaning substance compatible with plastics

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tool according to Figure 1

The special tool can be purchased from KB SfS by its order number.

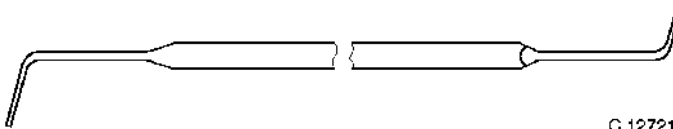


Figure 1 Special hook (order number B64617)



Directions for the use of the special hook



Figure 2

Removing KNORR K-rings (outer ring)

Draw the ring out of its groove by the special hook, and pull it entirely off by hand.

Or:

Draw the ring taut between thumb and index finger. The ring emerges from its groove at the opposite side. Pull off the ring by hand.



Figure 3

Installing KNORR K-rings (outer ring)

Draw the thinly greased KNORR K-ring over the piston. Stretch the ring to one side and slip by hand into the groove with the sealing lips first. Repeat the procedure around the full circumference until the entire ring is seated in its groove.

Run the special hook round between the KNORR K-ring and the groove wall.



4.2 Disassembly

See Figure 4 and Figure 5



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

- Detach breather filter (1).



NOTE

Detach and overhaul valve magnet (2) as directed in the relevant documents.

- Detach valve magnet (2) from basic magnet valve (4) and overhaul as directed in the relevant documents.
- Unscrew the machine screws (4.21) alternately and remove both these and lock washers (4.20).
- Take off cover (4.2).
- Remove O-ring (4.13) and wire strainer (4.12).



CAUTION

Pretensioned compression spring (4.14)!

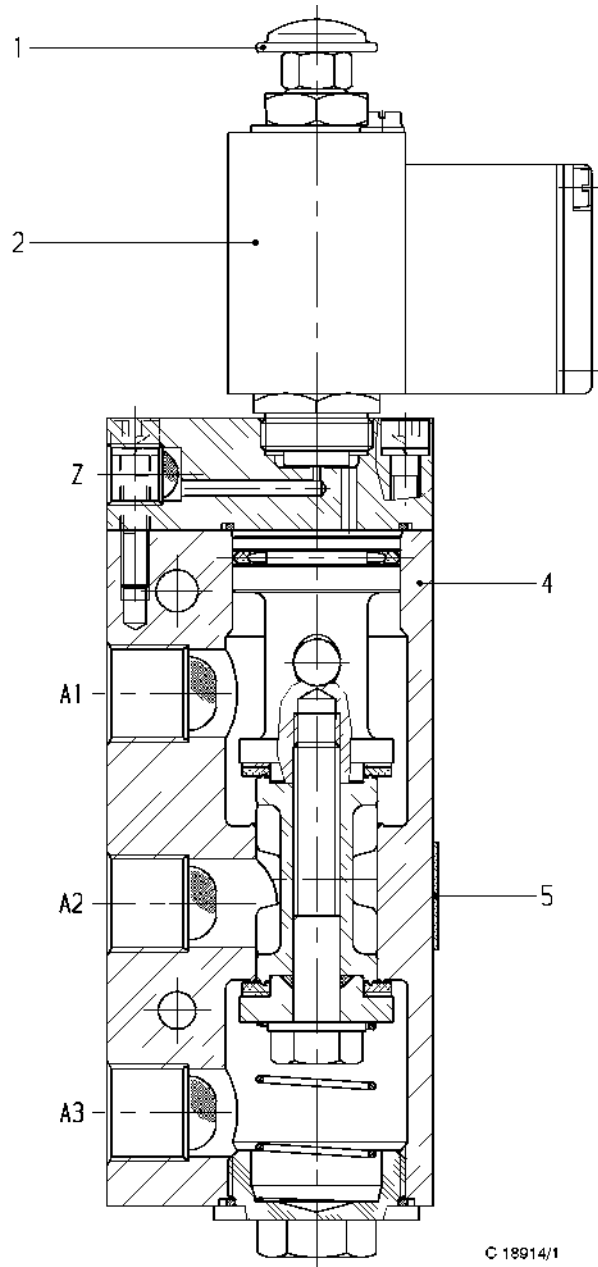
The screw plug (4.11) is pretensioned by compression spring (4.14). Pretensioned parts and the compression spring may jump out of the housing upon removal and cause eye injuries.

Perform all the working steps in the specified sequence.

- Cautiously unscrew the screw plug (4.11) while relaxing the compression spring (4.14).
- Remove screw plug (4.11) and compression spring (4.14).
- Take O-ring (4.13) off screw plug (4.11).
- Unscrew the wire strainers (4.18).
- Put a socket wrench onto hex-head bolt (4.22), and turn piston (4.6) so as to make the bore in the piston shank point towards port A1.
- Slip a drift (9mm dia.) through port A1 and into the bore in the piston shank, hold piston (4.6) tight for support, and unscrew the hex-head bolt (4.22) from the piston.

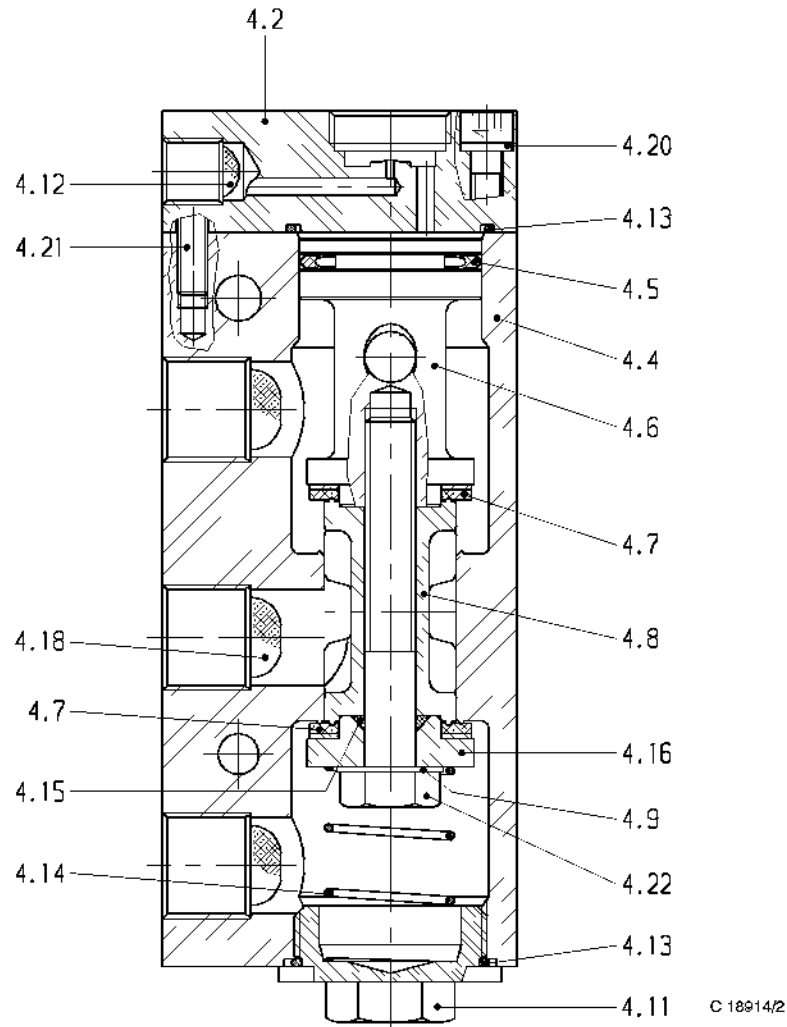


- Remove hex-head bolt (4.22), spring washer (4.9), disc (4.16) plus sealing ring (4.7) and O-ring (4.15) as well as sleeve (4.8) from housing (4.4).
- Take sealing ring (4.7) and O-ring (4.15) off disc (4.16).
- Withdraw piston (4.6) and sealing ring (4.7) from housing (4.4).
- Release KNORR K-ring (4.5) from piston (4.6), using the special hook (see Figure 1) as shown in Figure 2.



- | | | | |
|---|--------------------|----|---------------|
| 1 | Breather filter | A1 | Supply port |
| 2 | Valve magnet | A2 | Consumer port |
| 4 | Basic magnet valve | A3 | Exhaust port |
| 5 | Plate | Z | Control port |

Figure 4 Magnet valve WMV-20/2Z...
(typical view)



- | | |
|---------------------------|--------------------------------|
| 4.2 Cover | 4.13 O-ring |
| 4.4 Housing | 4.14 Compression spring |
| 4.5 KNORR K-ring | 4.15 O-ring |
| 4.6 Piston | 4.16 Disc |
| 4.7 Sealing ring | 4.18 Wire strainer |
| 4.8 Sleeve | 4.20 Lock washer |
| 4.9 Spring washer | 4.21 Machine screw |
| 4.11 Screw plug | 4.22 Hex-head bolt |
| 4.12 Wire strainer | |

Figure 5 Basic magnet valve (4)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

The following parts must be exchanged for new ones whenever they are removed (e.g. if they need to be removed for repair or overhaul):

- Spring washer (4.9)
- Lock washers (4.20)

The following parts must additionally be exchanged for new ones upon overhaul:

- KNORR K-ring (4.5)
- Sealing ring (4.7)
- Wire strainers (4.12 and 4.18)
- O-rings (4.13 and 4.15)

4.4 Cleaning

Clean all parts that do not have to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.



- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

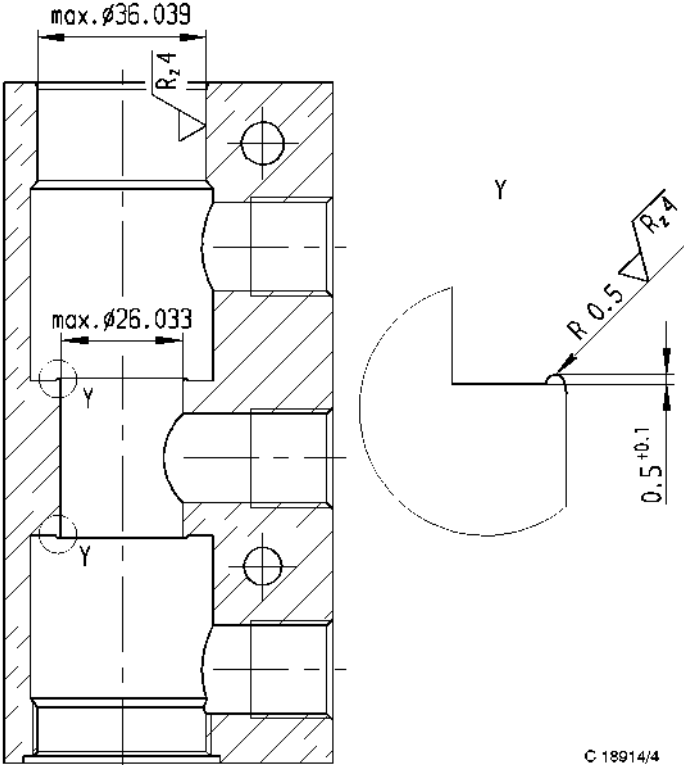
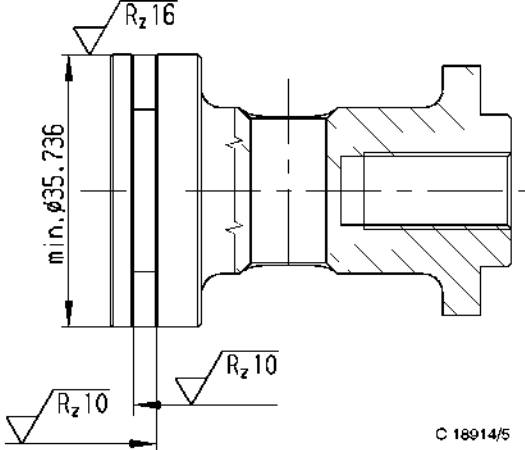
Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.

Part No.	Name	Notes
4.2	Cover	<p>The surface finishes must be to specification. Exchange any part out of specification.</p>



Part No.	Name	Notes
4.4	Housing	 <p>The surface finishes must be to specification. Exchange any part out of specification.</p>
4.6	Piston	 <p>The surface finishes must be to specification. Exchange any part out of specification.</p>



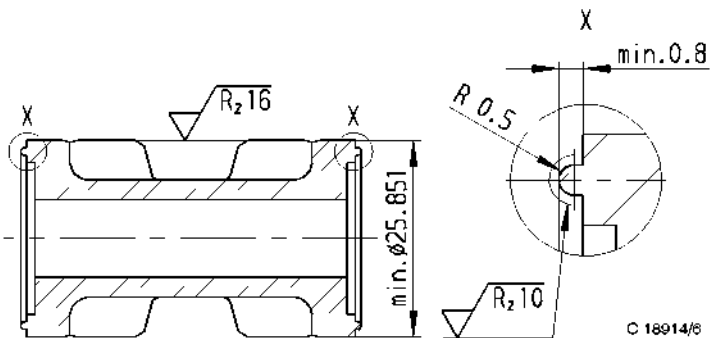
Part No.	Name	Notes
4.8	Sleeve	 <p>The surface finishes must be to specification. Exchange any part out of specification.</p>
4.14	Compression spring	The spring force must be at least 26 N at a clamped length of 38.1 mm. Exchange any part out of specification.

Table 1 Separate inspection of special components

4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
 The skin or respiratory tracts may be harmed or inflamed.
 It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
 Functionality will be impaired or the unit might even fail.
 Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
 Malfunctions and leakage due to damaged sealing surfaces.
 Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than one year. Verify the date of manufacture prior to use.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate certain parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



NOTE

Unless indicated specially in the following text, tighten all bolted joints **evenly** to the specifications in document WB420332A - doing so crosswise if there are four or more mounting points.

See Figure 4 and Figure 5

- Lubricate O-rings (4.13 and 4.15) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate KNORR K-ring (4.5) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the sliding and guiding surfaces of piston (4.6), of sleeve (4.8) and in housing (4.4) with a **thin** film of RENOLIT HLT2-KB grease.
- Put the greased O-ring (4.13) in its seat on cover (4.2).
- Put the greased O-ring (4.13) in its seat on screw plug (4.11).
- Place sealing ring (4.7) on piston (4.6).
- Place sealing ring (4.7) on disc (4.16).



- Install KNORR K-ring (4.5) in piston (4.6), using the special hook (see Figure 1) as shown in Figure 3.
- Position piston (4.6) in housing (4.4) so as to make the bore in the piston shank point towards port A1.
- Add spring washer (4.9), disc (4.16) plus sealing ring (4.7) and O-ring (4.15) as well as sleeve (4.8) to hex-head bolt (4.22).
- Slip a drift (9mm dia.) through port A1 and into the bore in the piston shank, hold piston (4.6) tight for support, and screw the hex-head bolt (4.22) tight on piston (4.6).
- Insert compression spring (4.14), and screw the screw plug (4.11) in tight.
- Install wire strainers (4.18) in housing (4.4).
- Locate cover (4.2) on housing (4.4) and fasten tight by machine screws (4.21) and lock washers (4.20).
- Install wire strainer (4.12) in cover (4.2).



NOTE

Install valve magnet (2) as directed in the relevant documents.

- Attach valve magnet (2) to basic magnet valve (4).
- Install breather filter (1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested for correct operation on a test bench in accordance with the Test Instructions (see Section 2.1).



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.



CAUTION

Beware of failure to protect parts during storage and shipment!
The unit might be damaged, e.g. connector contacts deformed.
Put a protective cap on the unit's electric connector.

.....
.....
B - O J 2 1 . 2 1

Rev. 09 - 14.06.2018 - en
.....

.....
Description

**Ballcocks with or without an exhaust
SK-DN...**



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are null and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
06	03.01.2013	Revision history started		x				
		2.1, 4, 4.1		x				
		5.1						x
		6.4						
07	21.05.2015	5.1						x
		5.1.1					x	
		5.1.2, 5.2.2		x				
08	13.06.2017	3.1	x					
		4.2		x				
09	14.06.2018	5.1.1, 5.1.2		x				



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group of this documentation	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	13
4.3	Working principle	18
5	Removal and installation	19
5.1	Installation	19
5.1.1	Requirements	20
5.1.2	Procedure	21
5.1.3	Leakage testing	21
5.1.4	Function test	21
5.2	Removal	22
5.2.1	Requirements	22
5.2.2	Procedure	22



6	Maintenance	23
6.1	Inspection	23
6.1.1	Interval	23
6.1.2	Special tools	23
6.1.3	Implementation	23
6.2	Servicing	23
6.3	Repair	24
6.4	Overhaul or replacement	24
6.4.1	Interval	24
7	Troubleshooting	25
7.1	Special tools	25
7.2	Implementation	25
8	Disposal	26



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group of this documentation

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

GD15904 Specification "Packaging, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate or is engraved on the unit. The item number and type designation must match the validity note stated in this document.

This document is valid for units with item numbers:

II50172/...

II50176/...

II50173/...

II50177/...

II50174/...

II102345/...

II50175/...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

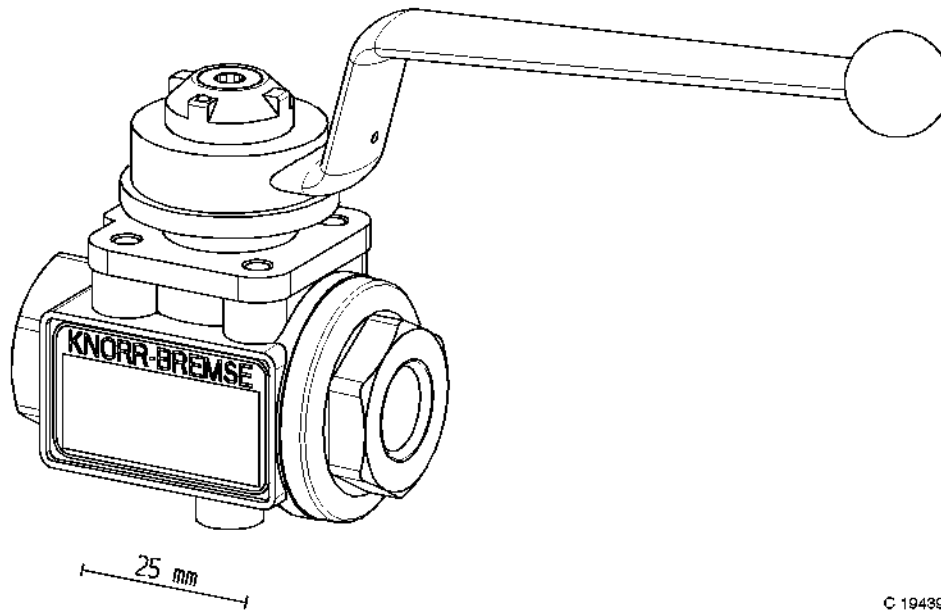
The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

Series SK ballcocks are used as isolating cocks, stopcocks or drain cocks in brake systems and other installations on rail vehicles.



C 19439/5

Figure 1 Ballcock SK-DN8E
(the unit with item number II50172/1A1LE is shown here by way of example)



4.1 Technical features

The units differ in:

- Starting position
- Rotating direction
- Shape of the handle (d)
- Shape of the handle (d)

The ballcocks come with either a long handle or a T-handle.

The long handle can be displaced by $4 \times 90^\circ$. The T-handle can be fitted in two positions. The handle (d) and the stop disc (m) can be mounted so as to adjust the home position of the handle (d) and direction of turning to all mounting scenarios.

Unit types SK-DN25.. with a T-handle are special versions because extremely strong actuating forces may be needed after a lengthy idle period.

The lever can be made to close to the left or right. The handle's range of swivel is defined by the position of the arc-shaped recess in the stop disc (m) relative to the stop pin (n).

The installation drawing shows the possible starting positions of the ballcock, and the directions in which it is closed.

The handle (d) can be fixed in the wanted position by a lead seal and wire drawn through the hole (U).

The handles (d) come in several different colours. The applicable installation drawing shows which colours are available.

The two-part item number on the name plate (t) additionally indicates the features of the relevant ballcock.

For example item number: II50172 / **1A1RE**:

The number "II50172" in front of the stroke is the core item number of series SK-DN8 ballcocks - see Table 1.

The characters after the stroke define the individual features of a particular ballcock in the following sequence:

Place 1	Handle code	1 = long handle
Place 2	Handle colour code	A = fiery red
Place 3	Handle position	1 = horizontal right
Place 4	Direction of closing	R = turning to right
Place 5	with/without exhaust	E = with exhaust

For full details of all the features of the various ballcocks and for the specifications please refer to the applicable installation drawing.



4.2 Construction

See Figure 2 to Figure 6

The ballcock is a one-way unit that is designed and built for installation in pipelines. It has two pipe thread ports: inlet port P1 and outlet port P2. These ports are marked by the numbers 1 and 2 stamped in the housing.

The following additional particulars are stamped in the housing of each ballcock at the opposite side to the name plate:

- Size of the threaded ports, graduated in steps according to the nominal bore of the relevant series (see Table 1)
- Maximum working pressure
- Arrow pointing to the direction of flow from the inlet port (P1) to the outlet port (P2); ballcocks with an exhaust also indicate the vented side of the ballcock

The nominal bore of each of the ballcocks is identified by the type designation: 8, 10, 12, 20, 25 or 32 mm.

The unit consists essentially of:

- Isolating ball (a)
- Housing (b)
- Control shaft (c)
- Handle (d)
- Moulded sealing ring (e1) and counter-support (e2)

The chrome-plated brass isolating ball (a) floats inside the housing (b). It is held and sealed by two plastic rings that are located inside the housing (b). The moulded sealing ring (e1) is at the inlet end, the counter-support (e2) at the outlet end.

The wall of the isolating ball (a) has a slanting through-hole (D) which enables the outlet end P2 of the ballcock to connect to the breather hole O.

The diameter of the breather hole O is either 1.5 mm or 4 mm, depending on the respective item number. (see Table 1)

The housing (b) is inseparable. It is a nickel-plated brass component which therefore does not need to be painted. The housing has identical threaded ports at the inlet end P1 and the outlet end P2.

The threaded ports are sized in steps according to the nominal bore of each series. (see Table 1)

The aluminium handle (d) is joined rigidly to the isolating ball (a) via the control shaft (c). The control shaft is sealed by the O-ring (f) in the housing.



Series	Item number	Pipe thread (ISO228)	Diameter when a breather hole O (mm) is present	Wrench size for fastening (S)
SK-DN8	II50172/...	G1/4	1.5	22
SK-DN10	II50173/...	G3/8	1.5	22
SK-DN12	II50174/...	G1/2	1.5	27
SK-DN20	II50175/... II102345/...	G3/4	1.5 4	32
SK-DN25	II50176/...	G1	1.5	41
SK-DN32	II50177/...	G1 1/4	1.5	50

Table 1 Overview of the versions

The type SK-DN... ballcocks come in several different versions.

Ballcocks without venting have a core stopper to seal their exhaust port O.

Ballcocks with venting do not have a core stopper in their exhaust port O.

The cap of the control shaft bears marking points - protuberances - K and R.

The marking point R indicates the position of the through-hole D. When the marking point R points in the direction of flow, the ballcock is vented, provided it is a version with an exhaust (see Figure 2 and Figure 3). When the ballcock is in its closed position, the location of the marking point R denotes the vented side of the ballcock.

The current working condition of the ballcock (open or closed) can be identified by the position of the two marking points K (parallel or at right angles to the longitudinal axis of the ballcock) on the control shaft cap (see Figure 3 and Figure 4).

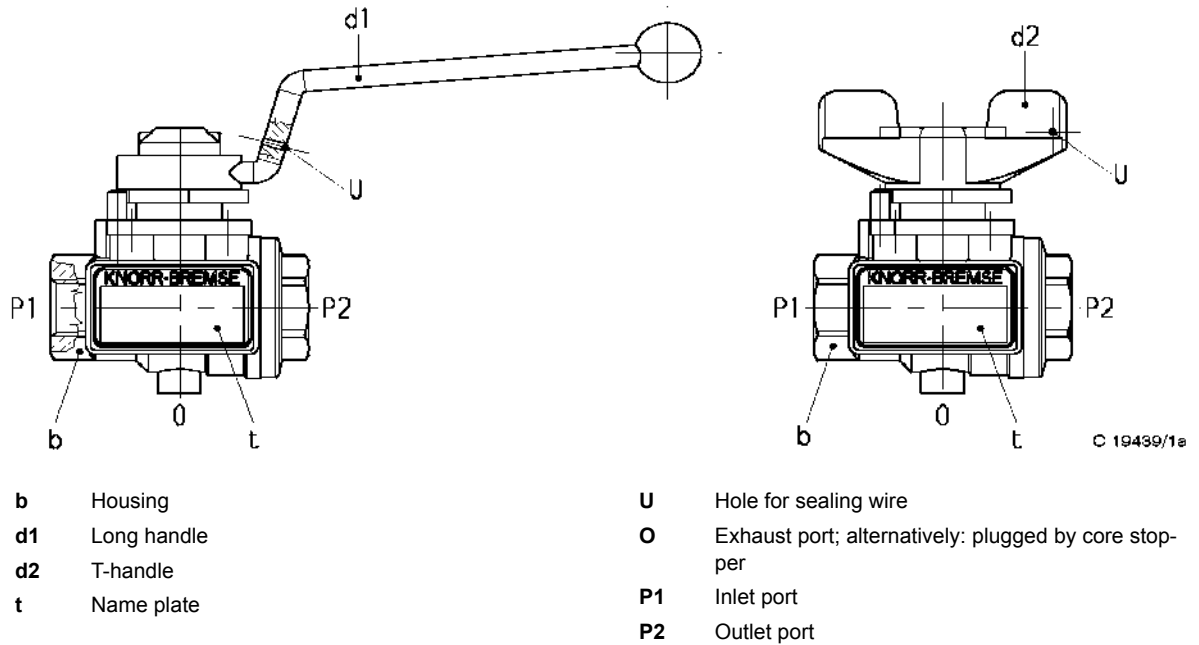


Figure 2 Ballcocks with a long handle or T-handle (showing: ballcock SK-DN12)

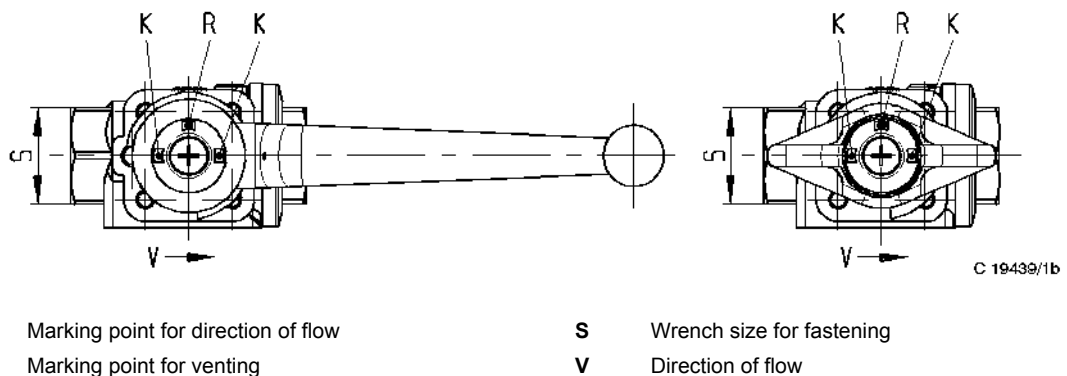
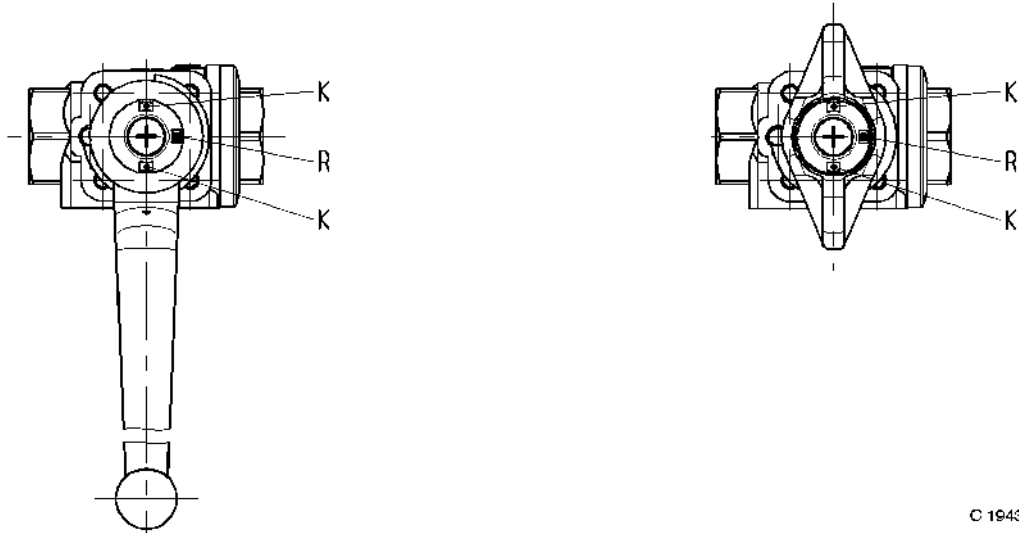


Figure 3 Open position (showing: ballcock SK-DN12)

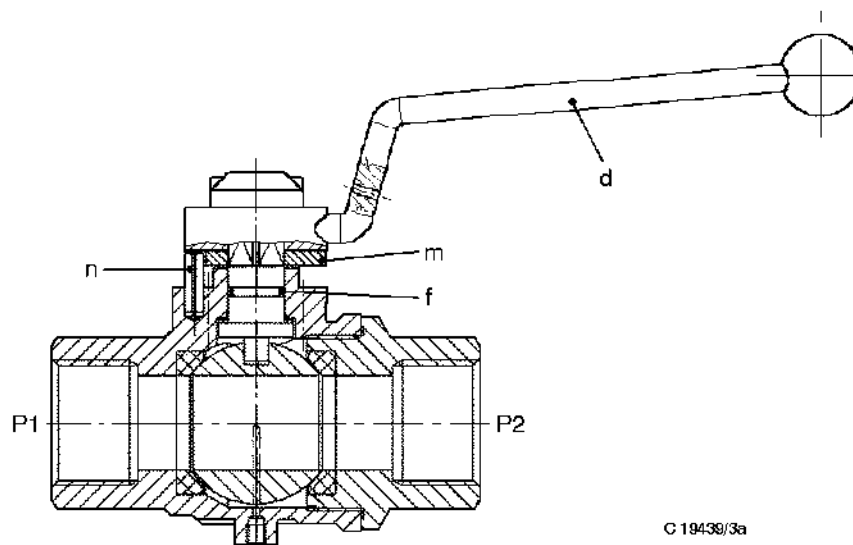


C 19439/1c

K Marking point for direction of flow

R Marking point for venting

Figure 4 Closed position
(showing: ballcock SK-DN12)



C 19438/3a

d Long handle

f O-ring

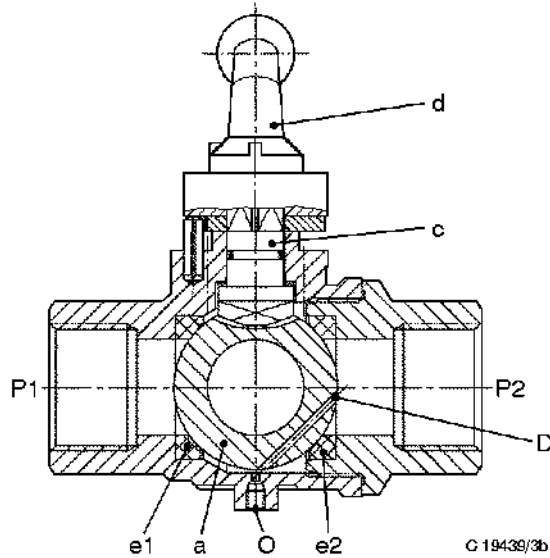
m Stop disc

n Stop pin

P1 Inlet port

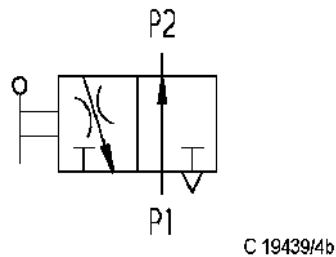
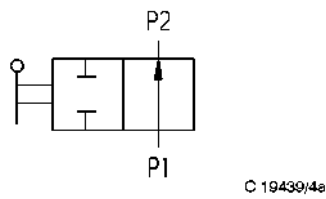
P2 Outlet port

Figure 5 Ballcock - cross-section (open position)
(showing: ballcock SK-DN25 with exhaust)



- | | | | |
|-----------|----------------------|-----------|--------------------------|
| a | Isolating ball | D | Through-hole for exhaust |
| c | Control shaft | O | Exhaust port |
| d | Long handle | P1 | Inlet port |
| e1 | Moulded sealing ring | P2 | Outlet port |
| e2 | Counter-support | | |

Figure 6 Ballcock - cross-section (closed position)
(showing: ballcock SK-DN25 with exhaust)



- | | | | |
|-----------|------------|-----------|-------------|
| P1 | Inlet port | P2 | Outlet port |
|-----------|------------|-----------|-------------|

Figure 7 Functional symbols of the ballcock (with and without an exhaust)



4.3 Working principle



CAUTION

Beware of incorrect operation!

The unit will be damaged and/or its functionality impaired.

The handle (d) must always be swung home to its stop. Intermediate positions will damage the moulded sealing ring (e1) and the counter-support (e2) and may cause the ballcock to leak.

See Figure 5, Figure 6

The two working positions of the ballcock: "Open position" and "cutoff position" are reached by turning the handle (d) by 90°.

Open position

In this position, the isolating ball's through-hole is parallel to the ballcock's longitudinal axis - see cross-section in Figure 5. The marking points K visible on the end of the control shaft cap are similarly parallel to the ballcock's longitudinal axis.

The passage from port P1 to port P2 is open.

Cutoff position

In this position, the isolating ball's through-hole is at a right angle to the ballcock's longitudinal axis - see cross-section in Figure 6. The marking points K visible on the cap of the control shaft are similarly at a right angle to the ballcock's longitudinal axis.

In the closed position, the working principle varies according to whether or not a particular ballcock has an exhaust (see circuit diagram in Figure 7).

Closed position without an exhaust

The exhaust port O is plugged by a core stopper. The supply of compressed air is shut off at the inlet end.

The passage from port P1 to port P2 is closed. The outlet pipe is not vented.

Closed position with an exhaust

The exhaust port O is quite clear, i.e. the port is not blocked by a core stopper. The supply of compressed air is shut off at the inlet end.

The passage from port P1 to port P2 is closed. The outlet pipe is vented through the ball's through-hole D and the exhaust port O. The marking point R on the cap of the control shaft is pointing in the direction of flow and indicates the vented side.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Only allowed to be installed are units that

- have been stored in compliance with the details given in the GD15904 regulation and
- whose date of manufacture has not exceeded the limit value specified in the GD15904 regulation.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements



CAUTION

Beware of an incorrect mounting position!

The unit will be damaged and/or its functionality impaired.

Ballcocks with venting must be mounted with their exhaust port (O) pointing either downwards or sideways.



CAUTION

Beware of an incorrect mounting position!

The unit will not function.

Point the unit in the direction of the arrow on its housing.



NOTE

Suitable sealants must be used to seal the screw joints.

The unit can be installed with standard tools.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricant is needed; it can be purchased from KNORR-BREMSE by its order number:

- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)



5.1.2 Procedure



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.

- Remove the covers from the ports on the unit and the on-board compressed air pipes to be connected.
- Thoroughly clean the ports.
- Lubricate the threads of the on-board compressed air pipes with a **thin** film of STABURAGS NBU 30 PTM grease.
- Screw the on-board compressed air pipes into the unit, taking care to observe the correct direction of flow.
- Connect the supply of compressed air to the unit.

5.1.3 Leakage testing

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test



CAUTION

Beware of incorrect operation!

The unit will be damaged and/or its functionality impaired.

The handle (d) must always be swung home to its stop. Intermediate positions will damage the moulded sealing ring (e1) and the counter-support (e2) and may cause the ballcock to leak.

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Unscrew the on-board compressed air pipes from the unit.
- Cover up the ports on the unit.
- Cover up the on-board compressed air pipes unless a replacement unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Implementation

See vehicle operator's instructions

6.2 Servicing

Not required



6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul or replacement

There is no provision for overhauling the unit. The unit must be exchanged in accordance with the directions in Section 6.4.1.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when replacement is required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation.

Activity	Interval
Replacement	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Implementation

Problem	Cause	Remedy	See
Unit inoperative	Handle not in end position	Move handle to end position.	
Air discharging constantly from threaded port P1 and/or P2	Threaded ports leaking	Tighten the threaded connections (apply the specified tightening torque!) and test for leakage.	Section 5.1 Section 5.1.3
Ballcock with an exhaust is not venting	Exhaust port O clogged	Clean out the exhaust port O.	Section 5
	Through-hole D in isolating ball (a) is clogged	Remove the unit, arrange for its disposal and exchange for an operative unit.	
A ballcock without an exhaust is leaking from the exhaust port in the cutoff position	Core stopper fitted incorrectly		
Compressed air present at outlet port P2 in the cutoff position	Moulded sealing ring (e1) and/or counter-support (e2) defective		
Air discharging constantly from control shaft (c)	O-ring (f) defective		



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - O G 2 1 . 2 4

Rev. 03 - 03.07.2017 - en
.....

.....
Description

Magnet valve
WMV-20/2ZG
WMV-20/2ZE
WMV-20/2ZES



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
02	24.03.2014	Revision history started		x				
		all	x	x			x	x
03	03.07.2017	3.1, 4.2, 4.3	x				x	
		5.1				x		
		7.2		x				



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group of this documentation	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	12
4.2	Construction	12
4.3	Working principle	14
5	Removal and installation	16
5.1	Installation	16
5.1.1	Requirements	17
5.1.2	Procedure	17
5.1.3	Leakage testing	19
5.1.4	Function test	19
5.2	Removal	20
5.2.1	Requirements	20
5.2.2	Procedure	20



6	Maintenance	22
6.1	Inspection	22
6.1.1	Interval	22
6.1.2	Special tools	22
6.1.3	Implementation	22
6.2	Servicing	23
6.3	Repair	23
6.4	Overhaul	23
6.4.1	Interval	23
7	Troubleshooting	24
7.1	Special tools	24
7.2	Implementation	24
8	Disposal	26



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group of this documentation

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

B-OG51.21 Description of the valve magnets...

GD15904 Specification "Packing, handling, transport and storage"

The "Installation drawing" that goes with the unit, as well as the "Technical Information" or the "Data sheet for the installation drawing" must be consulted for technical particulars.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I83883/xxx

I83884/xxx

I86708/xxx

I86708/1xxx

I87626/xxx

I87626/1xxx

II16354/1xxx



NOTE

The "xxx" at the end of the item number represents the operating voltage of the unit.



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

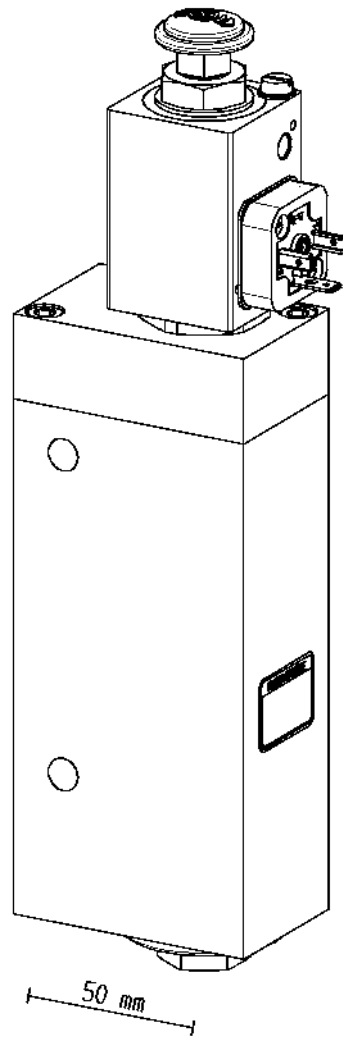
The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The magnet valve serves to charge and vent downstream pneumatic equipment by electric control.



C 13913/4

Figure 1 Magnet valve WMV-20/2ZES
(the unit with item number I87626/1xxx is shown here by way of example)



4.1 Technical features

The unit is distinguished by the following features:

- Straightforward construction
- Designed as a pipeline unit

When the magnet valve WMV-20/2Z.. is deenergized, its through-passage is open; this feature makes it particularly suitable for safety facilities.

The installation drawing that goes with the unit contains the technical particulars of the unit.

4.2 Construction

See Figure 2

The unit consists essentially of:

- the pneumatic basic magnet valve (a)
- the electric valve magnet (b)

The basic magnet valve (a) in each of the various types differs only the size of the connecting threads A1, A2 and A3 for the ports. The sizes of the connecting threads can be found in the corresponding installation drawing for the unit.

The control air to actuate the valve is delivered to the control port Z.

The basic magnet valve (a) combines with valve magnets (b) of different performance ratings, electric connections and circuit arrangements.

The magnet valves are controlled indirectly by energising and de-energising their valve magnets (b).

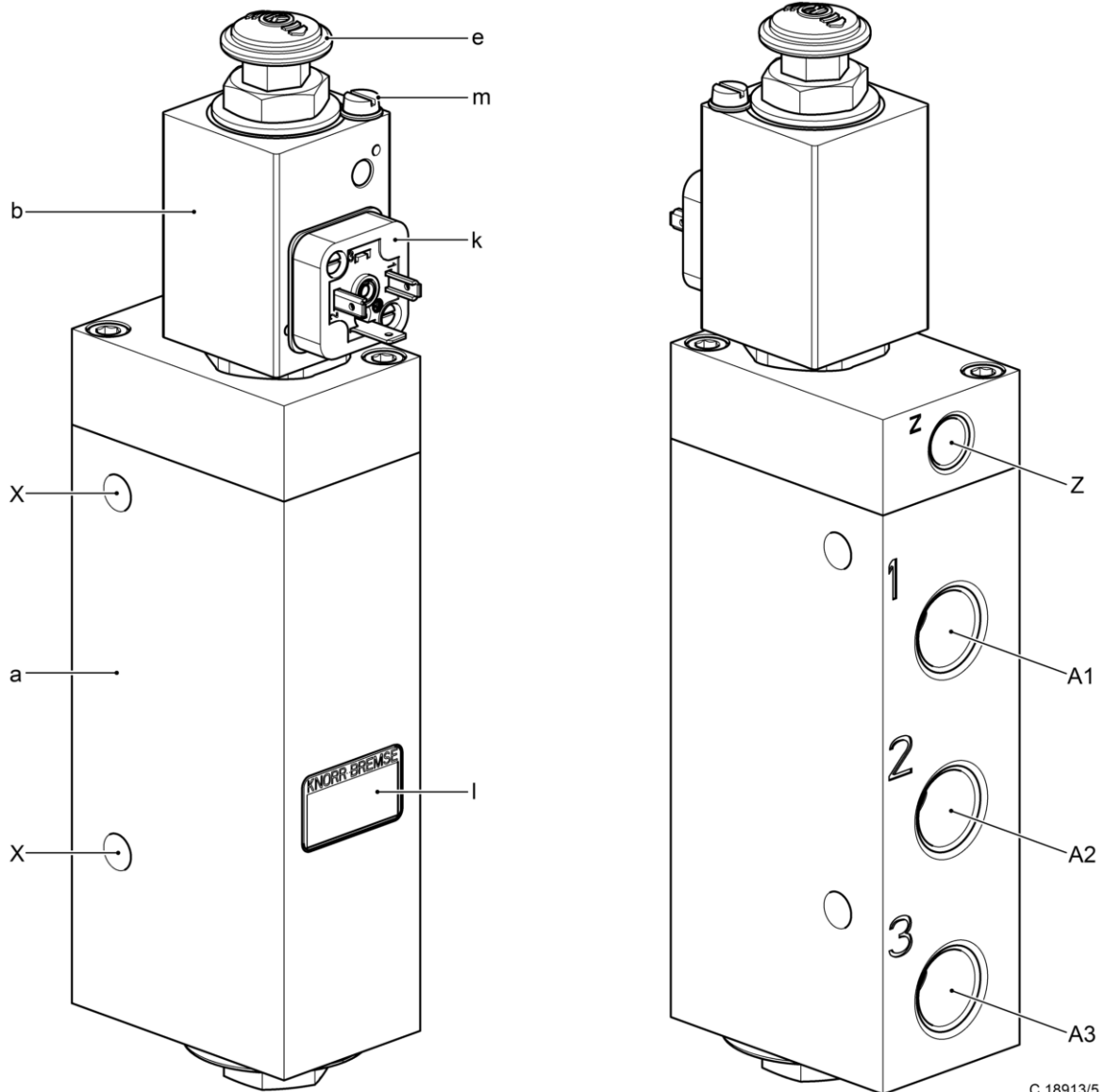
Item number	Type designation
I83883/xxx	WMV-20/2ZG
I83884/xxx	WMV-20/2ZG
I86708/xxx	WMV-20/2ZE
I86708/1xxx	WMV-20/2ZES
I87626/xxx	WMV-20/2ZE
I87626/1xxx	WMV-20/2ZES
II16354/1xxx	WMV-20/2ZES

Table 1 Overview of the versions



NOTE

The documents listed in Section 2.1 deal with the construction of the component assemblies used in the unit.



C 18913/5

- a** Basic magnet valve
- b** Valve magnet
- e** Breather filter
- k** Electric terminal
- m** Ground terminal
- I** Name plate
- X** Mounting hole

Ports:

- A1** Supply port
- A2** Consumer port
- A3** Exhaust
- Z** Control port

Figure 2 Magnet valve WMV-20/2ZES
(the unit with item number I86708/1xxx is shown here by way of example)



4.3 Working principle

See Figure 3

Neutral position (valve magnet (b) not energised)

The magnet valve is at neutral I as long as the valve magnet (b) is deenergized.

The armature of the valve magnet (b) is pressed onto the valve seat V21 by the internal spring force. The supply of control air from control air port A4 is disrupted. The valve seat V2 at which the magnet coil is vented is open.

The piston (c) is held in the upper end position by the force of the compression spring (d). The valve seat V3 is open in this state, and the valve seat V4 closed. The path from supply port A1 to consumer port A2 is open. The air passage from consumer port A2 to exhaust A3 is shut off.

Working position (valve magnet (b) energised)

The magnet valve (a) goes to its working position II. when the basic valve magnet (b) is energised.

The magnet armature of the valve magnet (b) is attracted against the internal spring force. The valve seat V1 is opened and V2 closed.

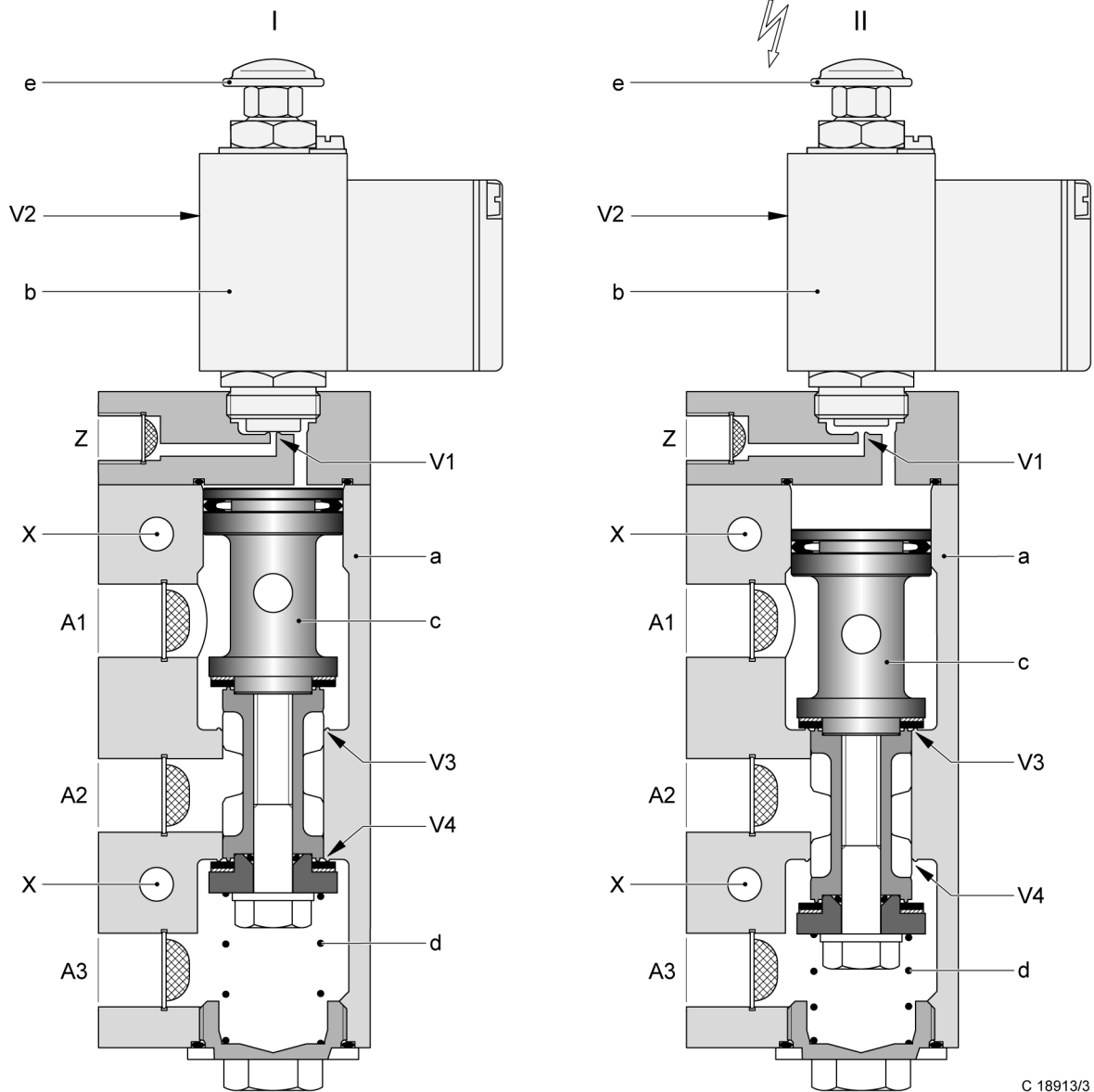
The piston (c) is charged by control air from control air port Z and moved to the lower end position against the thrust of the compression spring (d). The valve seat V3 is closed in this state, and the valve seat V4 opened. The compressed air flows from consumer port A2 to exhaust A3; the supply port A1 is shut off.

The magnet valve returns to the neutral position I when the valve magnet (b) is de-energised.



NOTE

The documents listed in Section 2.1 deal with the working principle of the component assemblies used in the unit.



C 18913/3

- a Basic magnet valve
- b Valve magnet
- c Piston
- d Compression spring
- e Breather filter
- V... Valve seat
- X Mounting hole

- Ports:
- A1 Supply port
 - A2 Consumer port
 - A3 Exhaust
 - Z Control port
 - I Neutral position
 - II Working position

Figure 3 Magnet valve WMV-20/2ZES
(the unit with item number I86708/1xxx is shown here by way of example)



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Only allowed to be installed are units that

- have been stored in compliance with the details given in the GD15904 regulation and
- whose date of manufacture has not exceeded the limit value specified in the GD15904 regulation.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

The vehicle builder's documents on installation – especially the data on fastening screws and tightening torques – must also be observed.

The following lubricants are needed; they can be purchased from KNORR-BREMSE by their order numbers:

- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)
- RENOLIT L20 grease (order number: ID No. 506043)

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.
Provide for a free flow through the ports.



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.

Do not plug in or unplug any connector under power.



WARNING

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the onboard power supply and prevent it from being restored without due authorization.

The work of connecting and disconnecting cables in the electrical system must always be left to specially trained and authorized personnel.



CAUTION

Beware of installing the unit incorrectly!

The unit will be damaged and/or its functionality impaired.

To install the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.



NOTE

Depending on the device type, the electrical connection of the unit to the on-board electrical system is implemented using either an interfacing connector or by connecting the on-board connecting cable to a terminal box.

- Take the covers off the ports on the unit and off the pipes to be connected.
- Thoroughly clean the ports.
- Clean the joining surface of the unit and onboard mounting bracket.
- Lubricate the threads of the fasteners with a **thin** film of STABURAGS NBU 30 PTM grease.
- Locate and align the unit on the on-board mounting bracket.
- Attach the unit to the on-board mounting bracket in the correct mounting position, using the fasteners in the mounting holes X.
- Lubricate the threads of the on-board compressed air pipes with a **thin** film of STABURAGS NBU 30 PTM grease.
- Screw the onboard compressed air pipes into the ports on the unit as shown in the related pneumatic diagram.
- Unscrew the grounding screw from the ground terminal (m) on the unit.
- Lubricate the thread of the grounding screw with a **thin** film of RENOLIT L20 grease.
- Attach the on-board ground cable to the ground terminal (m) by the grounding screw.



NOTE

Depending on the device type, the valve magnets of the valve magnet are equipped with a connector or a terminal box.

- For units with a control port on the valve magnet (b) only:
 - Plug the on-board power socket into the electric terminal (k) on the valve magnet (b) and secure by the fastener.



- For units with a terminal box on the valve magnet (b) only:
 - Open the terminal box at the unit's electric connector.
 - Connect the on-board connecting cable to the valve magnet (b) terminal box as shown in the electric circuit diagram.
 - Close the terminal box at the unit's electric connector.
- Connect the supply of compressed air.
- Connect the power supply.

5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements

The unit can be removed with standard tools.

5.2.2 Procedure



WARNING

Beware of electric shock!
Danger of physical injuries that may have fatal consequences.
Before starting work, switch off the power supply to the electric connection and prevent it from being restored without due authorization.
Do not plug in or unplug any connector under power.



WARNING

Beware of electric shock!
Danger of physical injury.
Before starting work, switch off the onboard power supply and prevent it from being restored without due authorization.
The work of connecting and disconnecting cables in the electrical system must always be left to specially trained and authorized personnel.



CAUTION

Beware of removing the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
To remove the unit, hold the joining part securely with a suitable tool, such as an open-end wrench.



NOTE

How the unit is connected electrically to the onboard electrical system depends on the type of unit, and consists in using either an interfacing connector or a terminal box.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.
- For units with a control port on the valve magnet (b) only:
 - Release the fastener holding the on-board power socket and unplug the power socket from the valve magnet (b).
- For units with a terminal box on the valve magnet (b) only:
 - Open the terminal box at the unit's electric connector.
 - Connect the on-board connecting cable to the valve magnet (b) terminal box and remove from the terminal box.
 - Close the terminal box at the unit's electric connector.
- Unscrew the grounding screw at the ground terminal (m) of the unit and remove the on-board ground cable.
- Screw the grounding screw on the ground terminal (m) back into the unit.
- Unscrew the on-board compressed air pipes from the compressed air ports of the unit.
- Cover up the ports on the unit.
- Remove the fasteners from mounting holes X.
- Remove the unit from the onboard mounting bracket and put it down securely.
- Cover up the on-board compressed air pipes unless a replacement unit is going to be fitted immediately after removal.
- Protect the on-board electrical connecting cable, the power socket and the on-board ground cable from damage.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.



NOTE

The documents listed in Section 2.1 contain further information about inspecting the component assemblies.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Implementation

See vehicle operator's instructions



6.2 Servicing



NOTE

As regards servicing the component assemblies please refer to the related documents (see Section 2.1)

6.3 Repair

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.



NOTE

As regards repairing the component assemblies please refer to the applicable documents (see Section 2.1).

6.4 Overhaul

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.



NOTE

As regards overhauling the component assemblies please refer to the applicable documents (see Section 2.1).

6.4.1 Interval

To judge when overhauls are required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation, and dismantle them to check for wear.

Activity	Interval
Overhaul	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.



NOTE

As regards debugging the component assemblies please refer to the applicable documents (see Section 2.1).

7.1 Special tools

Not required

7.2 Implementation



NOTE

If the problem can be traced to specific component assemblies with the help of the pneumatic diagram, then the Descriptions relating to those component assemblies (see Section 2.1) will be required as support for debugging.

Problem	Cause	Remedy	See
Incorrect or no output pressure	Unit not being activated pneumatically	Test the unit for correct pneumatic control.	
	Unit not being activated electrically	Check the connector or terminal connection.	
		Test the unit for correct electric control.	
	Unit defective	Remove the unit and submit for repair.	Section 5.2
Air discharging constantly between basic magnet valve (a) and valve magnet (b).	Metal sealing surface between basic magnet valve (a) and valve magnet (b) is dirty or damaged	Remove the unit and submit for repair.	Section 5.2
Magnet valve not toggling when valve magnet (b) is energised	Control pressure Z insufficient	Test the unit for correct pneumatic control.	
	Unit not being activated electrically	Check the connector or terminal connection.	
		Test the unit for correct electric control.	
	Unit defective	Remove the unit and submit for repair.	Section 5.2



Problem	Cause	Remedy	See
Compressed air discharging from the ports	Connections leaking	Tighten the air pipe connections (observe the specified tightening torque!) and test for leakage.	Section 5.1.3
Compressed air discharging constantly from the exhaust port of the valve magnet	Unit defective	Remove the unit and submit for repair.	Section 5.2



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
B - VA 10.22

Rev. 07 - 11.05.2017 - en
.....

.....
Description

Display pressure gauge
PG-80D



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
05	18.03.2015	Revision history started		x				
		1, 1.1, 1.2, 1.3, 3.1,3.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4, 4.1, 4.2, 5.1.2, 5.2.2, 6, 6.1.1, 6.3, 6.4.1, 8		x				
		2.1, 5.1.1, 6.4					x	
		5.1						x
06	15.02.2017	4.2		x				
07	11.05.2017	4.2, 5.1		x				



Table of contents

1	General information	6
1.1	Technical changes	6
1.2	Target group for this document	6
1.3	Notes and warning messages	7
2	Introduction	8
2.1	Related documents	8
3	Basic safety information	9
3.1	Validity	9
3.2	Proper usage of the product	9
3.3	Operator's commitment to due care	10
3.3.1	Assignment of personnel	10
3.3.2	Availability of the document	10
3.3.3	Amendments to the document	10
3.3.4	Spares and wearing parts	10
4	Technical description	11
4.1	Technical features	11
4.2	Construction	11
4.3	Working principle	14
5	Removal and installation	15
5.1	Installation	15
5.1.1	Requirements	16
5.1.2	Procedure	16
5.1.3	Leakage testing	17
5.1.4	Function test	17
5.2	Removal	18
5.2.1	Requirements	18
5.2.2	Procedure	18



6	Maintenance	20
6.1	Inspection	20
6.1.1	Interval	20
6.1.2	Special tools	20
6.1.3	Implementation	20
6.2	Servicing	21
6.3	Repair	21
6.4	Overhaul or replacement	21
6.4.1	Interval	21
7	Troubleshooting	22
7.1	Special tools	22
7.2	Implementation	22
8	Disposal	23



1 General information



DANGER

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability
 - to remove and install the unit,
 - to inspect, service and debug the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of this Description draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

This Description contains particulars specific to the unit and discusses operation, installation, removal, function testing and maintenance of the unit when installed on-board.

2.1 Related documents

C109363/... Supplementary drawing of the dial referenced to item numbers

GD15904 Regulation "Packing, handling, transport and storage"

The related installation drawing specific to each item number must be consulted.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item number:

II55802/...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's commitment to due care

3.3.1 Assignment of personnel

The operator shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Technical description

The display pressure gauge serves to measure two air pressures simultaneously.

4.1 Technical features

The unit is distinguished by the following features:

- Two measuring instruments in one housing
- Lighting and light slits
- Direct lighting by a bulb or LED is possible
- Designed for mounting on a wall panel
- Connection to two 10x1.5mm dia. pipes
- Two pointers of different colours
- Stainless steel housing

4.2 Construction

See Figure 1 and Figure 2

The two measuring instruments are enclosed by a bowl-shaped housing (a).

The Bourdon tube measuring system (r) acts on the pointer mechanism (z). The pointer mechanism (z) is protected from the environment by a pane of low-reflection safety glass.

Located at the back of the housing (a) are two pipe unions (A) and (B), each of which has a bite ring (b) and a union nut (c). The gauge can be connected directly to 10x1.5mm dia. piping by these parts.

The pressure gauge can be mounted on a wall panel by its rear steel bar (d) and the hexagon nuts (e). The wall panel must be between 2 and 4mm thick.

The dial of the pressure gauge can be lit directly by a built-in lamp (f) (bulb or LED). The four light slits (L) in the housing (a) provide additional illumination from the side.

Pressure gauges with lighting for supply voltages up to and including 50V are connected electrically via screw contacts at the back. Units for supply voltages from above 50V to 110V inclusive have tab connectors on the back.

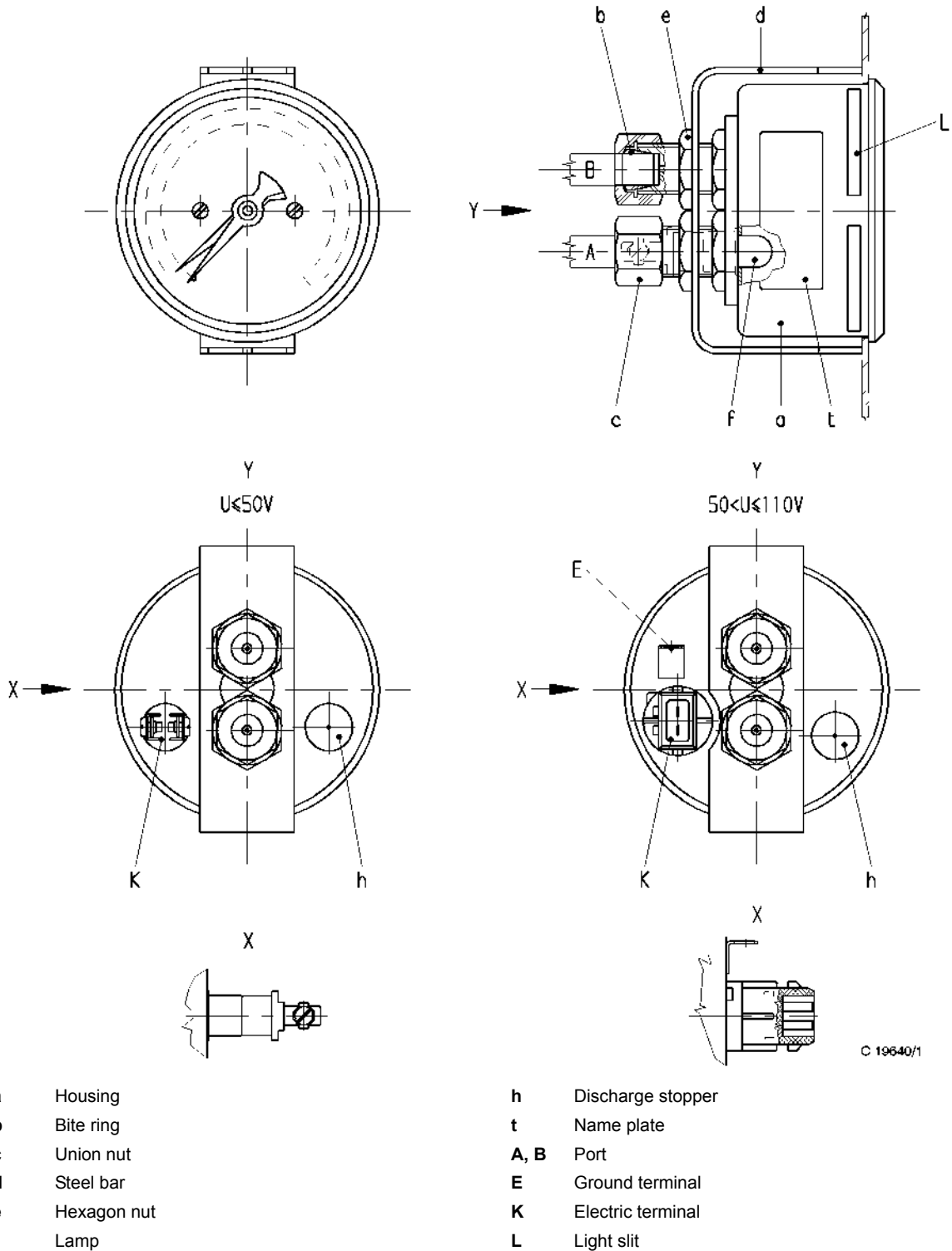
The compressed air at the pipe union (A) acts on the front pointer, that at the pipe union (B) on the rear pointer.

Seated in the back of the housing (a) is a discharge stopper (h) which can be removed to blow off undesired gauge pressure from the housing.



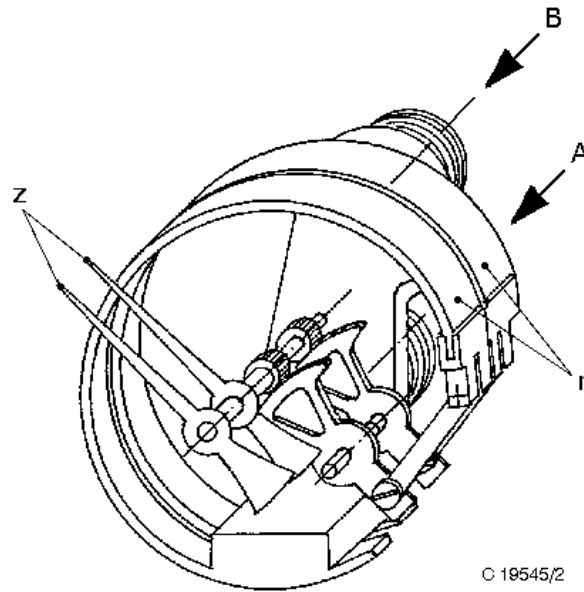
The various display pressure gauges of the PG-80D series differ according to the following criteria:

- Display range (see the associated supplementary drawing for the instrument dial)
- Coloured marking of the two pointers
- Customized dial labelling (optional)
- Additional marking points on the scale
- Supply voltage to power the lamp



C 19640/1

Figure 1 Display pressure gauge PG-80D



© 19545/2

r Bourdon tube

A, B Port

z Pointer

Figure 2 Measuring instruments

4.3 Working principle

See Figure 2

The pressure of the medium being measured acts on one of two separate Bourdon tubes (r) of the same shape. The cross-section at the free end of the Bourdon tube responds to pressure, changes its curvature and causes a lever mechanism to act on the connected pointer.

The pointer turns with growing pressure. The dial of the display pressure gauge indicates the pressure representing the angular position of the pointer.



5 Removal and installation



DANGER

Beware of a moving vehicle!

A vehicle allowed to move inadvertently will cause personal injury.

It is vital to observe the working rules for arresting a vehicle.

5.1 Installation



CAUTION

Beware of contaminating the pneumatic system!

Device and/or system functions will fail.

Keep out dirt during installation. If necessary, blow out the pipes of the pneumatic system.



CAUTION

Beware of disregarding the installation instructions!

Safety will be diminished and functions restricted.

Installation instructions and installation drawings must be taken into account.



CAUTION

Beware of installing untested units!

Safety will be diminished and functions restricted.

Make sure that units are always tested before they are installed.

The system must have been tested and found to be in order before the vehicle is cleared for service.



NOTE

Only allowed to be installed are units that

- have been stored in compliance with the details given in the GD15904 regulation and
- whose date of manufacture has not exceeded the limit value specified in the GD15904 regulation.



NOTE

It is vital to observe the manufacturer's safety instructions and directions for the use of cleaning substances, sealants, adhesives, auxiliary products, working substances, etc.



5.1.1 Requirements

The unit can be installed with standard tools.

The unit is designed for installation anywhere in the sprung part of a vehicle, provided it is protected from wet and dirt. The place of installation must be defined accordingly during engineering design of the vehicle.

All the installation notes in the installation drawing of the unit, especially any and all data stated there regarding bolted joints, must be observed and translated suitably into practice. The working standards named there are obligatory and serve to meet the demand for high quality assembly.

5.1.2 Procedure



DANGER

Ports plugged or clogged!

Failure of device and/or system functions that might cause the brake system to fail.
Provide for a free flow through the ports.



CAUTION

Beware of electric shock!

Danger of physical injury.

Before starting work, switch off the onboard power supply and prevent it from being restored without authorization.

The work of connecting and disconnecting cables in the electrical system must always be left to specially trained and authorised personnel.



NOTE

Please refer to the vehicle builder's data for the tightening torque of hexagon nut (e).



- Take the covers off the ports of the display pressure gauge and the on-board compressed air pipes.
- Thoroughly clean the ports.
- Unscrew the hexagon nuts (e) and remove the steel bar (d) from the display pressure gauge.
- Fit the display pressure gauge in the opening provided in the wall panel, and fasten using the steel bar (d) and the hexagon nuts (e).
- Connect the Ø10x1.5 mm on-board compressed air pipes accordingly to pipe unions (A) and (B) using bite rings (b) and union nuts (c).
- Connect the on-board electric connecting cable to electric terminal (K).
- Only for versions with supply voltages from above 50V to 110V inclusive:
Connect the on-board ground cable to ground terminal (E).
- Connect the supply of compressed air.
- Connect the power supply.

5.1.3 Leakage testing



WARNING

Beware of electric shock!

Danger of physical injuries that may have fatal consequences.

The work of testing a unit equipped with electric components must always be assigned to specially trained and authorized personnel.

Never allow a leakage testing substance to come into contact with electrically live components.

Carry out the leakage test by applying a leakage testing substance. The test may be performed alternatively with a soap solution if no such special products are available.

- Test the pipe connections for leakage at the maximum acceptable working pressure. Air bubbling is unacceptable.
- Leak testing substances and all traces of soap must be removed immediately after the test.

5.1.4 Function test

The unit is an integral part of a system and must be tested for correct interaction with this system in the manner instructed by the railway administration / vehicle builder.



5.2 Removal



WARNING

Pneumatic system is under high pressure!
Particles flung outwards will, for instance, cause severe eye injuries.
Observe the safety regulations for pneumatic systems.
Prior to removal, unload the pressure from the (sub)system.



CAUTION

Beware of contaminating the pneumatic system!
Device and/or system functions will fail.
Keep out dirt after removal, such as by masking the ports.

5.2.1 Requirements



CAUTION

Beware of removing the pressure gauge incorrectly
The unit will be damaged and/or its functionality impaired.
Turn off the electric power prior to removing the pressure gauge.

The unit can be removed with standard tools.

5.2.2 Procedure



CAUTION

Beware of electric shock!
Danger of physical injury.
Before starting work, switch off the onboard power supply and prevent it from being restored without authorization.
The work of connecting and disconnecting cables in the electrical system must always be left to specially trained and authorised personnel.

- Turn off the supply of compressed air and vent all the reservoirs and air pipes connected to the unit. Do not allow any more compressed air to reach the unit.
- Switch off the power supply and prevent it from being restored. Do not allow electric power to reach the unit any longer.



- Disconnect the on-board compressed air pipes from the pipe unions (A) and (B) by unscrewing the union nuts (c).
- Only for versions with supply voltages from above 50V to 110V inclusive:
Detach the on-board ground cable from ground terminal (E).
- Disconnect the on-board electric connecting cable from electric terminal (K).
- Unscrew the hexagon nuts (e) and remove the steel bar (d) from the display pressure gauge.
- Take the display pressure gauge out of the opening in the wall panel.
- Reattach the steel bar (d) to the display pressure gauge using the hexagon nuts (e).
- Cover up the ports on the display pressure gauge.
- Cover up the onboard ports and insulate the electric connecting cable unless a replacement unit is going to be fitted immediately after removal.



6 Maintenance

Maintenance at KNORR-BREMSE is basically subdivided into:

- Inspection
- Servicing
- Repair
- Overhaul

The maintenance intervals required for the activities described below must be timed according to the statutory operating requirements, the service conditions under which the unit is used, and the environmental influences in the area where the vehicles are run. An interval stated generally for all projects will therefore be of only limited validity.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project. The interval applicable to a specific project can be derived from the targets named in the table. The first target is always more significant than the successively lesser targets.

6.1 Inspection

The unit must be checked for good external condition and correct operation at regular intervals as specified by the vehicle operator.

6.1.1 Interval

Activity	Interval
Inspection	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	

6.1.2 Special tools

Not required

6.1.3 Implementation

See vehicle operator's instructions



6.2 Servicing



WARNING

Beware of removing the lamp incorrectly!

The unit will be damaged and/or its functionality impaired.

Turn off the electric power prior to removing the lamp.

The bulb or LED may fail on rare occasions.

Bulb / LED defective:

- Units with supply voltages up to and including 50V:
In this case, pull out the lamp socket at the back of housing (a) and withdraw it together with the bulb/LED from the housing.
- Units with supply voltages from above 50V to 110V inclusive:
Turn the lamp socket to the left (by about 45°), and then withdraw it from the housing together with the bulb/LED.

Turn the bulb/LED to the left (by about 30°), withdraw it from the lamp socket and exchange for a new bulb/LED.

No other servicing is needed.

6.3 Repair

Exchange the unit if it happens to develop a malfunction that cannot be corrected by the measures described in Section 7.2.

6.4 Overhaul or replacement

There is no provision for overhauling the unit. The unit must be exchanged in accordance with the directions in Section 6.4.1.

Parts and assemblies must be shipped in packing that meets the requirements of Specification GD15904.

6.4.1 Interval

To judge when replacement is required under the actual service conditions, you are urged to inspect a few randomly selected units for functionality and condition after a sufficient period of operation.

Activity	Interval
Replacement	1. According to vehicle operator's project-specific experience
	2. In accordance with project-specific maintenance schedule, if any*
* If a project-specific maintenance schedule is drawn up, it must be worked out jointly by the customer and KNORR-BREMSE.	



7 Troubleshooting

If the unit starts to malfunction, trace possible problems on board. Causes of problems can be corrected with the help of the directions proposed for debugging.

7.1 Special tools

Not required

7.2 Implementation

Error	Cause	Remedy	See
No direct lighting	Unit not being activated electrically	Check the terminal connection. Test the unit for correct electrical control.	
	Lamp (f) defective	Exchange lamp (f).	Section 6.2
No indirect lighting	Light slits (L) covered up	Clear the light slits (L).	
Air discharging constantly from the ports of the pressure gauge	Connections leaking	Tighten the connections (apply the specified tightening torque!) and test for leakage.	Section 5.1.2 and 5.1.3
Invalid or no pressure reading	Unit not being activated pneumatically	Test for correct pneumatic control.	
	Unit defective	Remove the unit, arrange for its disposal and exchange for an operative unit.	Section 5.2



8 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

KNORR-BREMSE units consist essentially of metal, rubber and plastic parts. Electronic components, auxiliary products and working substances are used as well.

All materials must be separated as best possible from one another for the purposes of proper disposal. The national regulations on disposal must be observed.

.....
.....
U - H E 1 0 . 4 0

Rev. 02 - 01.09.2014 - en
.....

.....
Overhaul Instructions

Wheel-slide valve
GV12-3
GV12-3S
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
01	2013-10-11	Revision history started		x				
		all					x	x
02	2014-09-08	2.1, 4.1.1, 4.2, 4.3, 4.4, 4.5, 4.6					x	
		3.1	x					



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working substances	10
4.1.2	Special tools	10
4.2	Disassembly	12
4.3	Disposal	21
4.4	Cleaning	22
4.5	Inspection	23
4.6	Assembly	25
4.7	Testing	29



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to modify the unit or this document at any time without making any specific announcements.

1.2 Target group for this document

The target group of this documentation are people who, due to training from KNORR-BREMSE,

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-HE10.40	Description of anti-skid valve GV12-3
B-IS30.24	Description of pressure sensor DG10
U-HE20.21	Overhaul instructions for valve magnet G-31

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

II62473/...

II64108/...S

II64108/...

II89437/...



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics
- STABURAGS NBU 30 PTM grease (order number: ID No. 503318)
- RENOLIT HLT2-KB grease (order number: ID No. 502647)
- RENOLIT L20 grease (order number: ID No. 506043)

4.1.2 Special tools

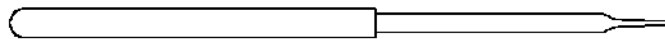
The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tool according to Figure 1



NOTE

Special tools with an order number can be purchased from KNORR-BREMSE. Special tools with a tool drawing number must be made to the specifications of the tool drawings supplied by KNORR-BREMSE. Special tools without an order number or tool drawing number must be made to the specifications in the figures. The dimensions specified in the figures are mandatory values. Unspecified dimensions are left to the toolmaker's discretion.



© 11212/3

Figure 1 Diaphragm extractor (order number A54802)



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.



NOTE

Leave valve bracket (19) on board the vehicle when the unit is overhauled. Only remove in case of damage.

Removed anti-skid valve without valve bracket (19):



NOTE

The valve bracket (19) is on board the vehicle. The anti-skid valve and, if present, the plate (26) are ready for overhauling separately.

- If present, remove the chokes (23 and 24) from the housing (1).

Removed anti-skid valve with valve bracket (19):

- Unscrew the screw plug (20) from the valve bracket (19).
- Remove the O-ring (21) from the screw plug (20).
- Unscrew the hex-head bolts (22) and remove them together with the washers (25).
- Remove the valve bracket (19) and, if present, the plate (26).
- If present, unscrew the pressure sensor (27) from the plate (26) as directed in the relevant documents (see section 2.1).
- If present, remove the chokes (23 and 24) from the plate (26), from the valve bracket (19) or from the housing (1).
- If present, remove strainers (17) from the valve bracket (19).



Dismantling the anti-skid valve:

See Figure 2 and Figure 3

- Unscrew the O-rings (18) from the grooves of the housing (1) and, if present, from the grooves of the plate (26).
- Remove the strainer (17) or, if present, remove the chokes (23 and 24) from the housing (1).
- Unscrew and remove the venting valve (12).
- Unscrew hex-head bolt (15), and remove spring washer (16).
- Position the housing (1) on your bench in such a way that the bore for venting valve (12) is on the right and the two ports for the valve bracket (19) are at the side facing yourself.
- Unscrew the hex-head bolts (8) and remove together with washers (9).
- Remove the plate (6) from the housing (1).
- Release the O-ring (7) from its seat on the plate (6).
- Remove diaphragm (4) from the plate (6) using the diaphragm extractor (see Figure 1).
- Remove the supporting plate (3) from the housing (1).
- Remove the valve magnet (10) and armature systems from the plate (6).
- Remove O-rings (11) from valve magnet (10).
- Position the housing (1) on your bench in such a way that the bore for venting valve (12) is on the left side and the two ports for the valve bracket (19) are at the side facing yourself.



CAUTION

Pretensioned compression spring (5)!

The plate (6) is pretensioned by the compression spring (5). When the plate (6) is removed, the compression spring (5) may jump out and cause eye injuries.

Perform all the working steps in the specified sequence.

- Unscrew the hex-head bolts (8) in an alternate sequence and remove together with washers (9).
- Carefully take the plate (6) off housing (1).
- Using the diaphragm extractor (see Figure 1), release the diaphragm (4) from the groove in the plate (6), while relieving the tension in the compression spring (5).

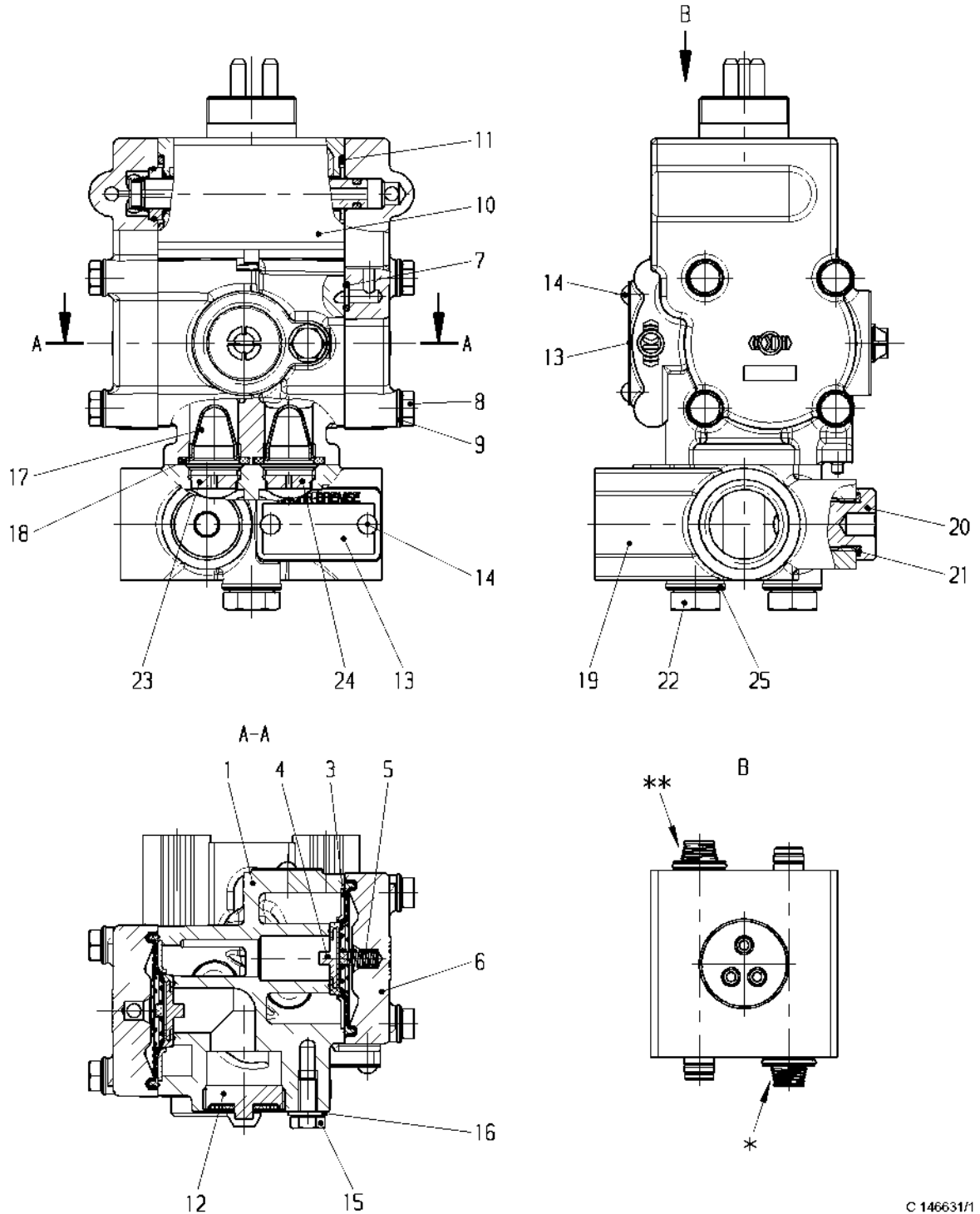


- Remove the compression spring (5) from the plate (6).
- Remove the supporting plate (3) from the housing (1).
- Release the O-ring (7) from its seat on the plate (6).



NOTE

Overhaul the component assemblies as directed in the related Overhaul Instructions (see Section 2.1) and handle them in accordance with the related manuals. These component assemblies and their parts are therefore not dealt with again in the following.

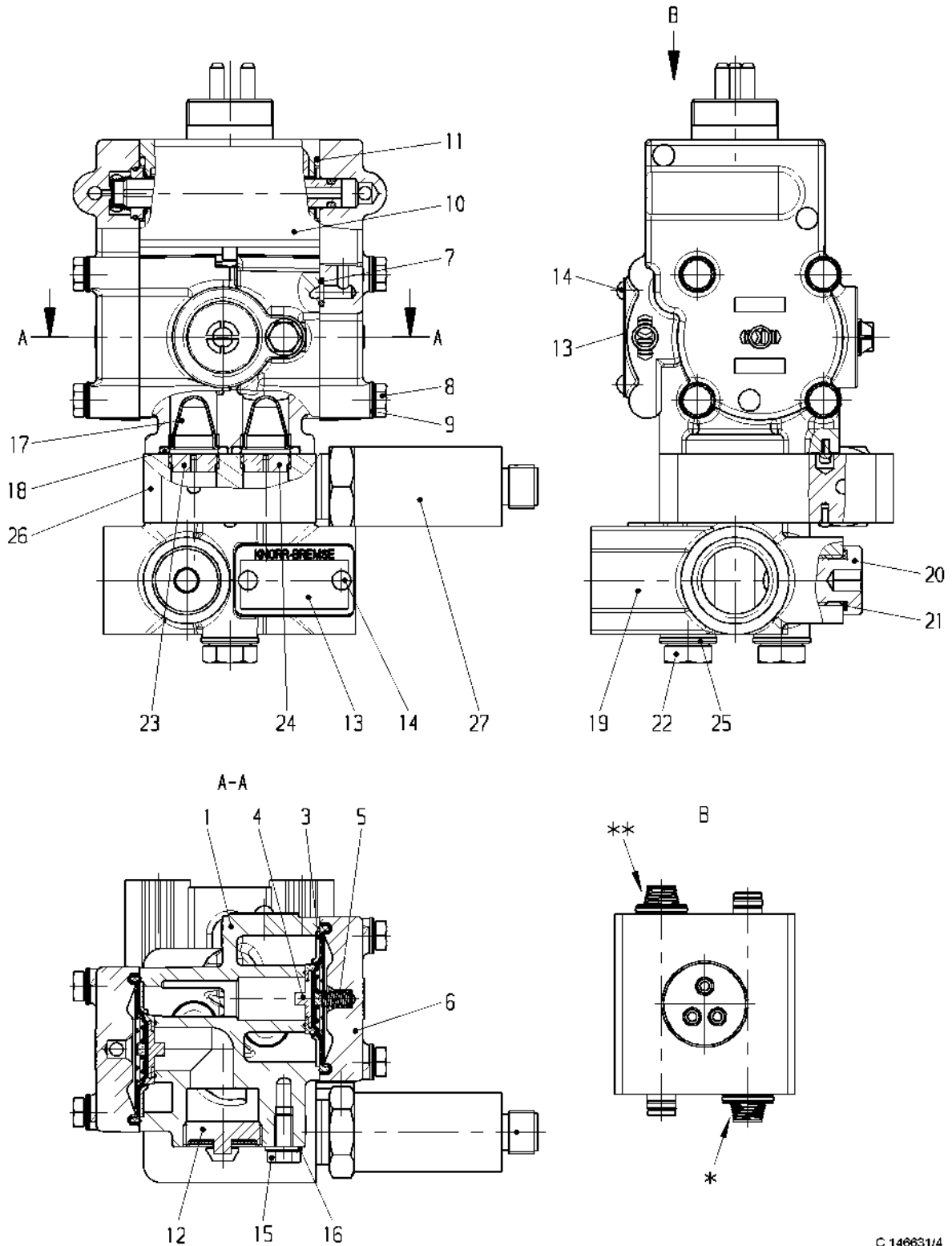


C 146631/1



1	Housing	15	Hex-head bolt
3	Supporting plate	16	Spring washer
4	Diaphragm	17	Strainer
5	Compression spring	18	O-ring
6	Plate	19	Valve bracket
7	O-ring	20	Screw plug
8	Hex-head bolt	21	O-ring
9	Washer	22	Hex-head bolt
10	Valve magnet	23	Choke
11	O-ring	24	Choke
12	Venting valve	25	Washer
13	Name plate	*	Weak armature spring
14	Rivet	**	Strong armature spring

Figure 2 Anti-skid valve GV12-3
(the unit with item number II64108/... is shown here by way of example)



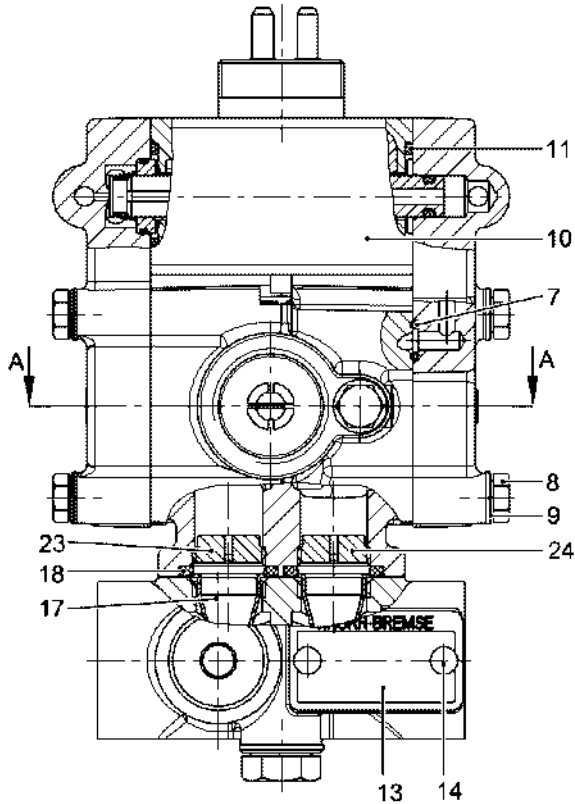
C 146631/4



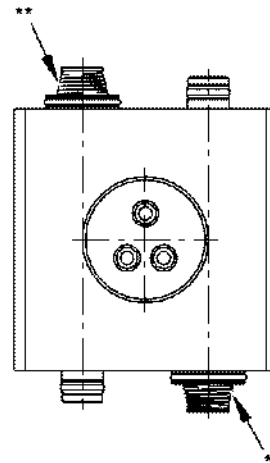
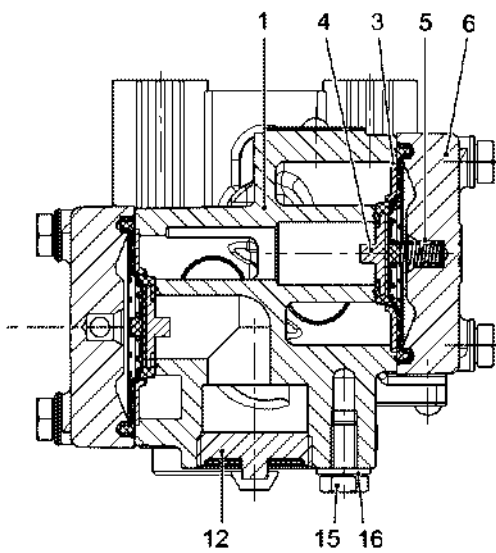
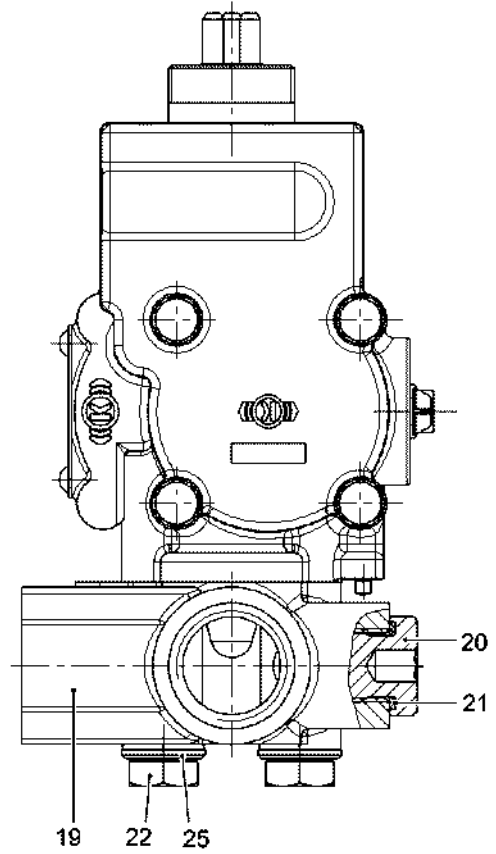


1	Housing	16	Spring washer
3	Supporting plate	17	Strainer
4	Diaphragm	18	O-ring
5	Compression spring	19	Valve bracket
6	Plate	20	Screw plug
7	O-ring	21	O-ring
8	Hex-head bolt	22	Hex-head bolt
9	Disc	23	Choke
10	Valve magnet	24	Choke
11	O-ring	25	Disc
12	Venting valve	26	Plate
13	Name plate	27	Pressure sensor
14	Rivet	*	Weak armature spring
15	Hex-head bolt	**	Strong armature spring

Figure 3 Anti-skid valve GV12-3S
(the unit with item number II64108/...S is shown here by way of example)



A - A



C 146631/5



1	Housing	15	Hex-head bolt
3	Supporting plate	16	Spring washer
4	Diaphragm	17	Strainer
5	Compression spring	18	O-ring
6	Plate	19	Valve bracket
7	O-ring	20	Screw plug
8	Hex-head bolt	21	O-ring
9	Disc	22	Hex-head bolt
10	Valve magnet	23	Choke
11	O-ring	24	Choke
12	Venting valve	25	Disc
13	Name plate	*	Weak armature spring
14	Rivet	**	Strong armature spring

Figure 4 Anti-skid valve GV12-3
(the unit with item number I189437/... is shown here by way of example)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous! This would mean unnecessary and legally punishable harm to the environment. Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)



NOTE

Arrange for the disposal of the component assemblies as directed in the related manuals (Section 2.1).



4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.
- Rub off the plate (26) with a soaked cloth. Do not allow any cleaning substance to get inside the open passages. Then blow out the channels with compressed air to remove dirt and cleaning agent residue.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.



NOTE

Clean the component assemblies as directed in the related manuals (Section 2.1).



4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.
- The sealing surfaces of plate (6) must not be scratched in any way.
- Any missing or barely legible signs or name plates must be replaced or added.

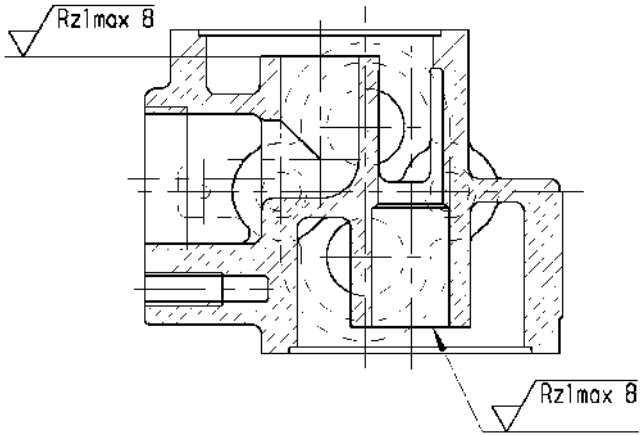


WARNING

Compression springs under tension!

Compression spring jumping out of the measuring fixture.

Put the compression spring in the measuring fixture provided for this purpose, check for correct seating and use a suitable cage for protection.

Item	Designation	Notes
1	Housing	 <p>C 131063/2</p> <p>The surface finishes must be to specification. Failing this requirement, exchange the part.</p>
5	Compression spring	The spring force must be at least 7.5 ± 1 N when the spring is compressed to a length of 10 mm. Failing this requirement, exchange the part.



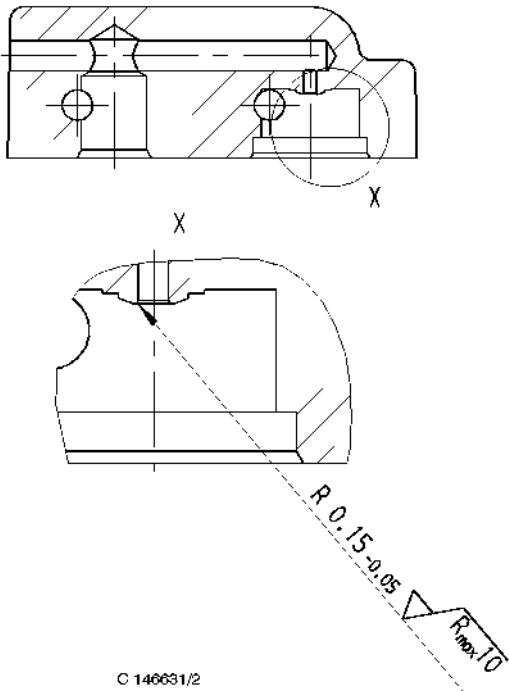
Item	Designation	Notes
6	Plate	 <p>The size and the surface finish must be to specification. The sealing surfaces must not be scratched in any way. Failing this requirement, exchange the part.</p>

Table 1 Separate inspection of special components



NOTE

Inspect the component assemblies as directed in the related manuals (Section 2.1).



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



Assemble anti-skid valve:

See Figure 2 and Figure 3



NOTE

Install the valve magnet (10) in the correct position. Note how the contact pins are positioned, see Figure 2.

Position the housing (1) on your bench in such a way that the bore for venting valve (12) is on the left side and the two ports for the valve bracket (19) are at the side facing yourself.

- Lubricate O-ring (7) with a **thin** film of RENOLIT HLT2KB grease and put in its groove on the plate (6).
- Place supporting plate (3) on housing (1).
- Lubricate the clamping bead of diaphragm (4) with a **thin** film of RENOLIT HLT2-KB grease.
- Put the diaphragm (4) on the supporting plate (3).
- Lubricate compression spring (5) with a **thin** film of RENOLIT HLT2-KB grease.
- Fit the compression spring (5) on the diaphragm (4) so that the guide is in the middle of the compression spring (5).
- Position the plate (6) on the body (1) and align it. In doing so, ensure that the compression spring (5) is inserted into the central bore of the plate (6) during assembly and the bead of the diaphragm (4) is not damaged.
- Attach plate (6) in the correct position on housing (1) using hex-head bolts (8) and washers (9). Tighten the hex-head bolts (8) alternately step by step.
Tightening torque: 5.4 Nm
- Position the housing (1) on your work station in such a way that the bore for the venting valve (12) is on the right and the two ports are at the side facing you.
- Lubricate the O-rings (11) with a **thin** film of RENOLIT HLT2-KB grease and insert them into the grooves on the coil casing.
- Place the valve magnets (10) on plate (6).
- Place supporting plate (3) on housing (1).
- Lubricate the clamping bead of diaphragm (4) with a **thin** film of RENOLIT HLT2-KB grease.
- Put the diaphragm (4) on the supporting plate (3).
- Lubricate O-ring (7) with a **thin** film of RENOLIT HLT2-KB grease and put it in the plate (6).



- Place plate (6) on housing (1) in the correct position and attach to housing (1) using hex-head bolts (8) and washers (9). Tighten the hex-head bolts (8) alternately step by step.
Tightening torque: 5.4 Nm
- Screw in the venting valve (12) into housing (1).



NOTE

The sectional side of spring washer (16) points towards the housing.

- Lubricate the threads of hex-head bolt (15) with a **thin** film of RENOLIT L20 grease and screw the bolt plus spring washer (16) into the housing (1).
Tightening torque: 4 Nm



NOTE

The installation position of the chokes (23 and 24) and the strainer (17) depends on the device.

Installation of the chokes (23 and 24) in the housing (1) and installation of the strainer (17) in the valve bracket (19) can be performed.

- Insert strainers (17) into the bores of the housing (1).
- If present, screw in the chokes (23 and 24) into the housing (1).
- Lubricate the O-rings (18) with a **thin** film of RENOLIT HLT2-KB grease and insert them into the grooves of the housing (1) and, if present, into the grooves of the plate (26).

Removed anti-skid valve without valve bracket (19):

- If present, screw in the chokes (23 and 24) into the valve bracket (19) or, if present, into the plate (26).



NOTE

The installation position of the chokes (23 and 24) and the strainer (17) depends on the device.

Installation of the chokes (23 and 24) in the housing (1) and installation of the strainer (17) in the valve bracket (19) can be performed.

- If present, screw the pressure sensor (27) into the plate (26) as directed in the relevant documents (see section 2.1):
 - Lubricate the threads of the pressure sensor (27) with a **thin** film of STABURAGS NBU 30 PTM grease.
 - Make sure that the greased seal is present and seated correctly on pressure sensor (27).
 - Screw the pressure sensor (27) into the base plate (26).
Tightening torque: 20 Nm
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



Removed anti-skid valve with valve bracket (19):

- If present, screw in the chokes (23 and 24) into the valve bracket (19) or, if present, into the plate (26).
- If present, screw the pressure sensor (27) into the plate (26) as directed in the relevant documents (see section 2.1):
 - Lubricate the threads of the pressure sensor (27) with a **thin** film of STABURAGS NBU 30 PTM grease.
 - Make sure that the greased seal is present and seated correctly on pressure sensor (27).
 - Screw the pressure sensor (27) into the base plate (26).
Tightening torque: 20 Nm
- Grease the O-ring (21) with a **thin** film of RENOLIT HLT2-KB.
- Place the O-ring (21) on the screw plug (20) and screw the screw plug (20) into the valve bracket (19).
Tightening torque: 15 Nm
- Position and the valve bracket (19) and, if present, the plate (26) on the housing (1).
- Attach the valve bracket (19) and, if present, the plate (26) in the correct installation position on the housing (1) using the hex-head bolts (22) and washers (25). Tighten the hex-head bolts (22) alternately step by step.
Tightening torque: 21.5 Nm
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested and adjusted on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.



CAUTION

Beware of failure to protect parts during storage and shipment!
The unit might be damaged, e.g. connector contacts deformed.
Put a protective cap on the unit's electric connector.

.....
.....
U - G Q 1 0 . 2 1

Rev. 05 - 18.11.2016 - en
.....

.....
Overhaul Instructions

Air filter
LF7-T
LF7-TF
LF7-TFF



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
05	17/11/2016	all			x		x	x



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working substances	10
4.1.2	Special tools	10
4.2	Disassembly	11
4.3	Disposal	13
4.4	Cleaning	13
4.5	Inspection	14
4.6	Assembly	15
4.7	Check	17



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to modify the unit or this document at any time without making any specific announcements.

1.2 Target group for this document

The target group of this documentation are people who, due to training from KNORR-BREMSE,

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-GQ10.21 Description of air filters LF7-T, LF7-TF, LF7-TFF

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I88747

I88747K

II61476

STK8645



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possess the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools.



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

See Figure 1



NOTE

Press the plug-in dowel pins (10) into the housing (1) until they stop. Only remove in case of damage.

- If present, release the O-rings (2) from the grooves on the housing (1).



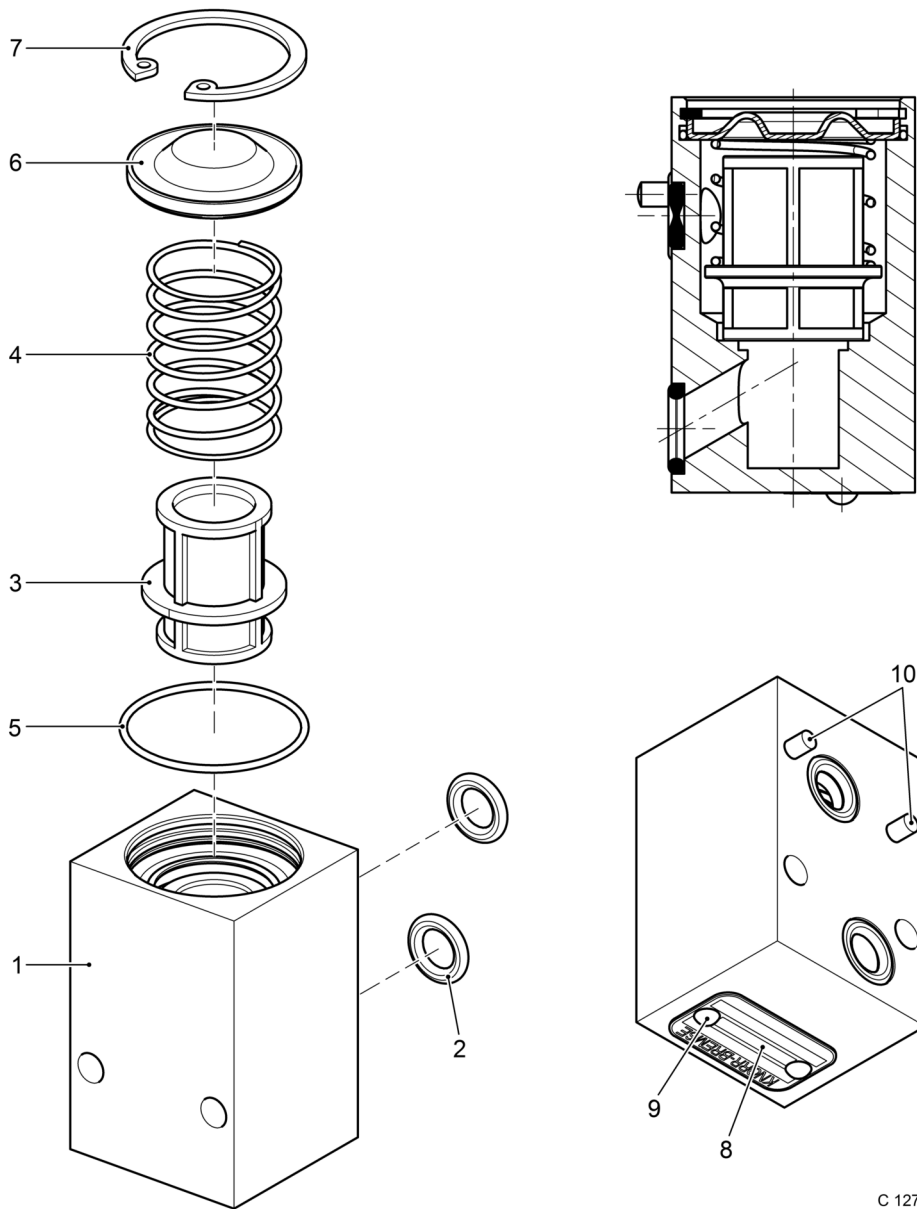
CAUTION

Pre-tensioned compression spring (4)!

The cover (6) is pre-tensioned by a compression spring (4). Pre-tensioned parts and compression springs (4) can pop out of housing (1) and cause eye injuries.

Perform all the working steps in the specified sequence.

- Hold down the cover (6) and remove the retaining ring (7).
- Carefully decrease the pressure on the cover (6) while relaxing the compression spring (4).
- Remove cover (6), compression spring (4), and strainer (3) from housing (1).
- Release the O-ring (5) from its seat on the housing (1).



C 12741/4

- | | | | |
|---|--------------------|----|-------------------|
| 1 | Housing | 6 | Cover |
| 2 | O-ring | 7 | Retaining ring |
| 3 | Strainer | 8 | Name plate |
| 4 | Compression spring | 9 | Rivet |
| 5 | O-ring | 10 | Plug-in dowel pin |

Figure 1 Air filter LF7-T
(unit with item number I88747 shown here by way of example)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)

4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.
- Any missing or barely legible signs or name plates must be replaced or added.



WARNING

Compression springs under tension!

Compression spring jumping out of the measuring fixture.

Put the compression spring in the measuring fixture provided for this purpose, check for correct seating and use a suitable cage for protection.

Item	Designation	Notes
4	Compression spring	The spring force must be 14.9 ± 1 N at a clamped length of 18.5 mm. Failing this requirement, exchange the part.

Table 1 Separate inspection of special components



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



See Figure 1

- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
 - Grease the O-rings (5, 2) and the contact surface of strainer (3) in the housing (1) **lightly** with RENOLIT KBS 1.
- For all other units:
 - Grease the O-rings (5, 2) and the contact surface of strainer (3) in the housing (1) **lightly** with RENOLIT HLT2-KB.
- Insert the greased O-ring (5) in the seat on the housing (1).
- Slip strainer (3) into housing (1).
- Insert compression spring (4) and strainer (3) in housing (1).
- Place cover (6) onto compression spring (4) in the housing (1), press down and secure it with retaining ring (7).
- Insert the greased O-rings (2) in the seats of the housing (1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Check

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.

.....
.....
U - T D 2 0 . 2 8

Rev. 01 - 21.07.2014 - en
.....

.....
Overhaul Instructions

Overflow valve without reflux
DR07-T
.....



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
01	21/07/2014	1, 1.1, 1.2, 1.3, 2.1, 3.1, 3.2, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 4, 4.1, 4.1.2, 4.2, 4.4		x				
		4.1.2, 4.3, 4.7					x	
		4.5						x
		4.6		x			x	x



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working substances	10
4.1.2	Special tools	10
4.2	Disassembly	12
4.3	Disposal	15
4.4	Cleaning	15
4.5	Inspection	16
4.6	Assembly	18
4.7	Testing	21



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to modify the unit or this document at any time without making any specific announcements.

1.2 Target group for this document

The target group of this documentation are people who, due to training from KNORR-BREMSE,

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-TD20.28 Description of overflow valve DR07-T without reflux

WB420332A Table of specified tightening torques

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

II63947/0...

II63947/0...K



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics

a) Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):

- RENOLIT KBS 1 grease (order number: ID No. 505887)

b) For all other units:

- RENOLIT HLT2-KB grease (order number: ID No. 502647)

4.1.2 Special tools

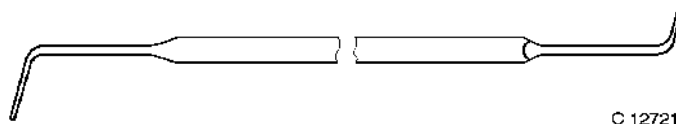
The unit can be dismantled and assembled with standard tools and the following special tool.

- Special tool according to Figure 1



NOTE

Special tools with an order number can be purchased from KNORR-BREMSE. Special tools with a tool drawing number must be made to the specifications of the tool drawings supplied by KNORR-BREMSE. Special tools without an order number or tool drawing number must be made to the specifications in the figures. The dimensions specified in the figures are mandatory values. Unspecified dimensions are left to the toolmaker's discretion.



C 12721

Figure 1 Special hook (order number B64617)

Directions for the use of the special hook



C 8748/4

Figure 2 Removing KNORR K-rings (inner ring)
Blow a jet of compressed air slantingly into the groove. The KNORR K-ring is blown up behind its sealing lips and jumps out of the groove.
Or:
Slip the special hook into the groove above the KNORR K-ring. Push out the KNORR K-ring by applying light pressure downwards.



C 8748/5

Figure 3 Installing KNORR K-rings (inner ring)
Squeeze the thinly greased KNORR K-ring into an oval and slip slantingly into the hole. Using the special hook, press the ring flat at the front and push into its groove. Push the remainder downwards and into the groove. Run the special hook round between the KNORR K-ring and the groove wall.



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

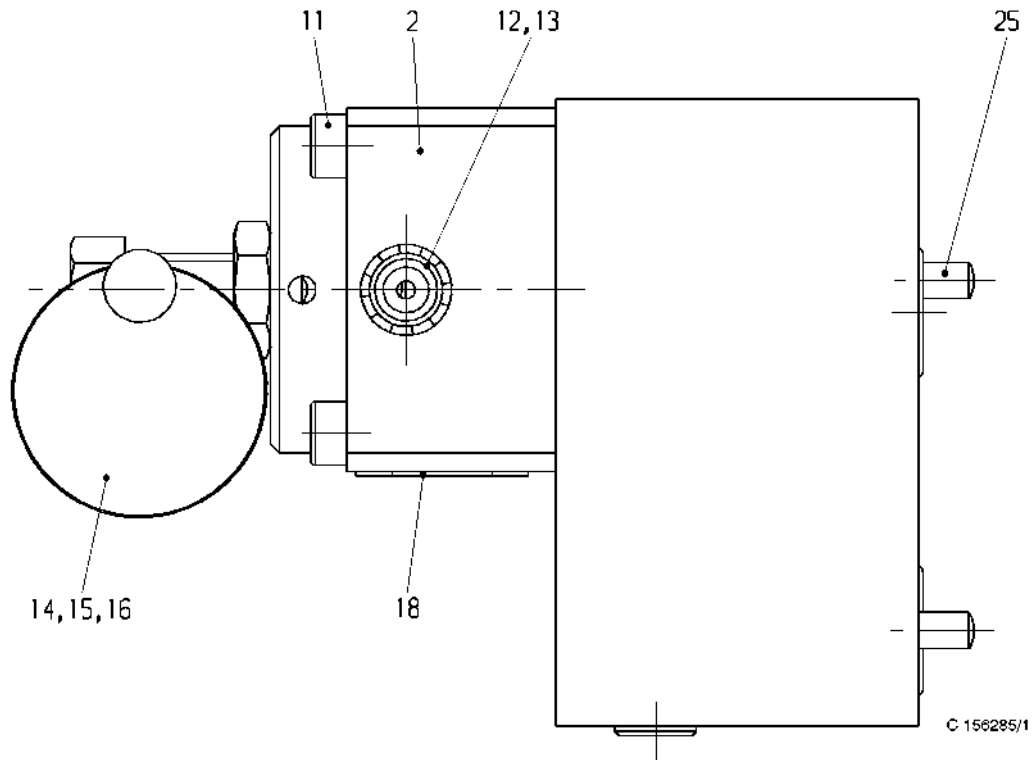


NOTE

Depending on the revision level, the adjustment screw setting of the unit to be overhauled is to be secured with lead sealing or sealing lacquer.

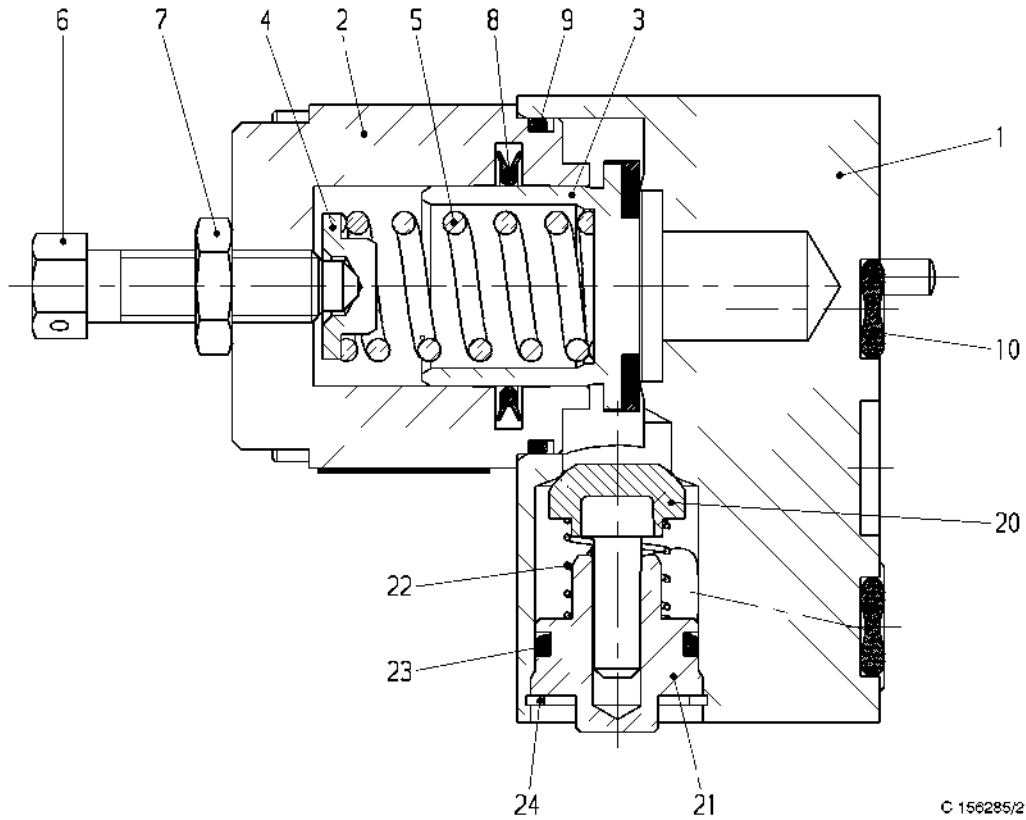
See Figure 4 and Figure 5

- Take O-rings (10) off housing (1).
- Remove the toothed ring (12) from the spring casing (2).
- Remove the round wire netting (13) from the spring casing (2).
- Remove the wire (15) and the twin-hole lead seal (16) from the unit.
- Remove the name plate (14) from the wire (15).
- Undo the hexagon nut (7) and unscrew hex-head bolt (6).
- Unscrew the machine screws (11).
- Remove the spring casing (2) from the housing (1).
- Take the valve head (3), compression spring (5) and spring cap (4) out of spring casing (2).
- Remove the KNORR K-ring (8) using the special hook (see Figure 1) as specified in Figure 2.
- Take O-ring (9) out of the groove.
- Remove retaining ring (24).
- Take the guide (21), compression spring (22) and valve cone (20) out of the housing (1).
- Take O-ring (23) out of the groove.



- | | | | |
|----|--------------------|----|---------------------|
| 2 | Spring casing | 15 | Wire |
| 11 | Machine screw | 16 | Twin-hole lead seal |
| 12 | Toothed ring | 18 | Name plate |
| 13 | Round wire netting | 25 | Plug-in dowel pin |
| 14 | Labelling tag | | |

Figure 4 Overflow valve DR07-T



C 156285/2

- | | | | |
|---|--------------------|----|--------------------|
| 1 | Housing | 9 | O-Ring |
| 2 | Spring casing | 10 | O-Ring |
| 3 | Valve head | 20 | Valve cone |
| 4 | Spring retainer | 21 | Guide |
| 5 | Compression spring | 22 | Compression spring |
| 6 | Hex-head bolt | 23 | O-Ring |
| 7 | Hexagon nut | 24 | Retaining ring |
| 8 | KNORR K-ring | | |

Figure 5 Overflow valve DR07-T (sectional view)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous! This would mean unnecessary and legally punishable harm to the environment. Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)

4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly! The skin or respiratory tracts may be harmed or inflamed. It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling! Malfunctions and leakage due to damaged sealing surfaces. Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.



4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.

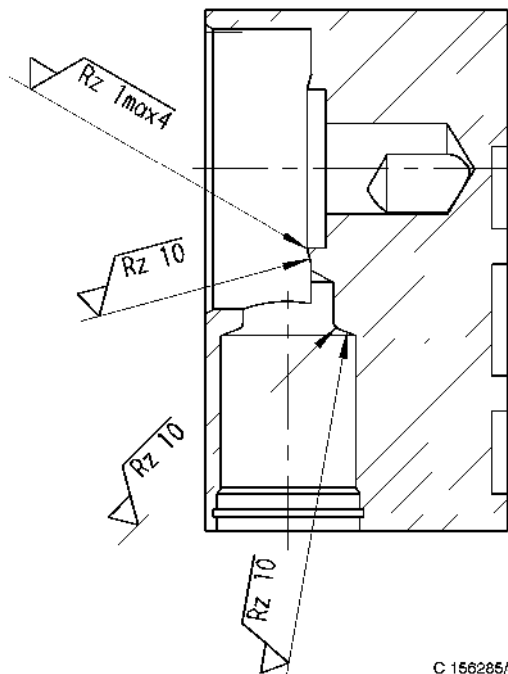


WARNING

Compression springs under tension!

Compression spring jumping out of the measuring fixture.

Put the compression spring in the measuring fixture provided for this purpose, check for correct seating and use a suitable cage for protection.

Item	Designation	Notes
1	Housing	 <p>C 156285/3</p> <p>The surface finishes must be to specification. Failing this requirement, exchange the part.</p>



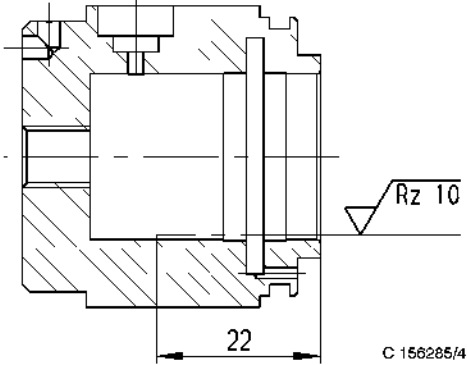
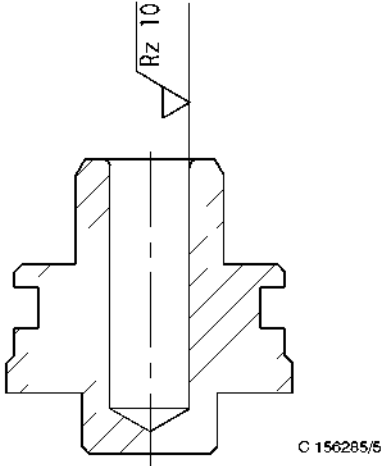
Item	Designation	Notes
2	Spring casing	 <p>The surface finish must be to specification. Failing this requirement, exchange the part.</p>
5	Compression spring	The spring force must be 314 ± 24 N at a clamped length of 22.5 mm. Exchange the part if out of specification.
21	Guide	 <p>The surface finish must be to specification. Failing this requirement, exchange the part.</p>

Table 1 Separate inspection of special components



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.

**NOTE**

Unless indicated specially in the following text, tighten all bolted joints **evenly** to the specifications in document WB420332A - doing so crosswise if there are four or more mounting points.

See Figure 4 and Figure 5

**CAUTION**

Beware of choosing the wrong lubricant!

Functionality will be impaired or the unit might even fail.

Use the specified lubricant. This applies especially to the units with enhanced resistance to low temperatures.

- Only for units with enhanced resistance to low temperatures (letter "K" at the end of the item number):
Treat the components listed in the following with RENOLIT KBS 1.
 - Lubricate the KNORR K-ring (8) with a **thin** film of grease.
 - Lubricate the O-rings (9), (10) and (23) with a **thin** film of grease.
 - Lubricate the seal of valve head (3) with a **thin** film of grease.
 - Lubricate the seal of valve cone (20) with a **thin** film of grease.
 - Lubricate the sliding surfaces (guideways) between spring casing (2) and valve head (3) with a **thin** film of grease.
 - Lubricate the sliding surfaces (guideways) between guide (21) and valve cone (20) with a **thin** film of grease.
 - Lubricate the thread of the hex-head bolt (6) with a **thin** film of grease.
 - Lubricate the thread of the machine screws (11) with a **thin** film of grease.
- For all other units:
Treat the components listed in the following with RENOLIT HLT-2.
 - Lubricate the KNORR K-ring (8) with a **thin** film of grease.
 - Lubricate the O-rings (9), (10) and (23) with a **thin** film of grease.
 - Lubricate the seal of valve head (3) with a **thin** film of grease.
 - Lubricate the seal of valve cone (20) with a **thin** film of grease.
 - Lubricate the sliding surfaces (guideways) between spring casing (2) and valve head (3) with a **thin** film of grease.
 - Lubricate the sliding surfaces (guideways) between guide (21) and valve cone (20) with a **thin** film of grease.
 - Lubricate the thread of the hex-head bolt (6) with a **thin** film of grease.
 - Lubricate the thread of the machine screws (11) with a **thin** film of grease.



- Put the O-ring (23) in the groove on the guide (21).
- Insert valve cone (20), compression springs (22) and guide (21) one by one into housing (1).
- Insert the retaining ring (24) in the groove provided. Take care to seat the retaining ring correctly.
- Install KNORR K-ring (8) in its seat on spring casing (2), using the special hook (see Figure 1) as shown in Figure 3.
- Put the O-ring (9) in its seat on the spring casing (2).
- Screw the hexagon nut (7) onto the hex-head bolt (6) (nut should be in the centre of the screw).
- Screw the hex-head bolt (6) into the spring casing (2) until the hexagon nut (7) is lying on the spring casing.



NOTE

The unit needs to be adjusted, and the hex-head bolt (6) sealed, when the unit is being tested.

- The hexagon nut (7) should initially only be tightened by hand.
- Insert spring retainer (4), compression spring (5) and valve head (3) into the spring casing (2).
- Position the spring casing (2) and the components previously inserted carefully on the housing (1) and fix in place with machine screws (11).
- Insert round wire netting (13) in its bore in spring casing (2).
- Insert the toothed ring (12) in the same bore of the spring casing (2) and press it in as far as it will go.
- Insert the O-rings (10) in the grooves on the joining flange of housing (1).
- Test the unit. Plug the ports and connections by covering up the joining flange, unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested and adjusted on a test bench in accordance with the applicable Test Instructions.

Secure the unit with sealing lacquer after completing adjustment.

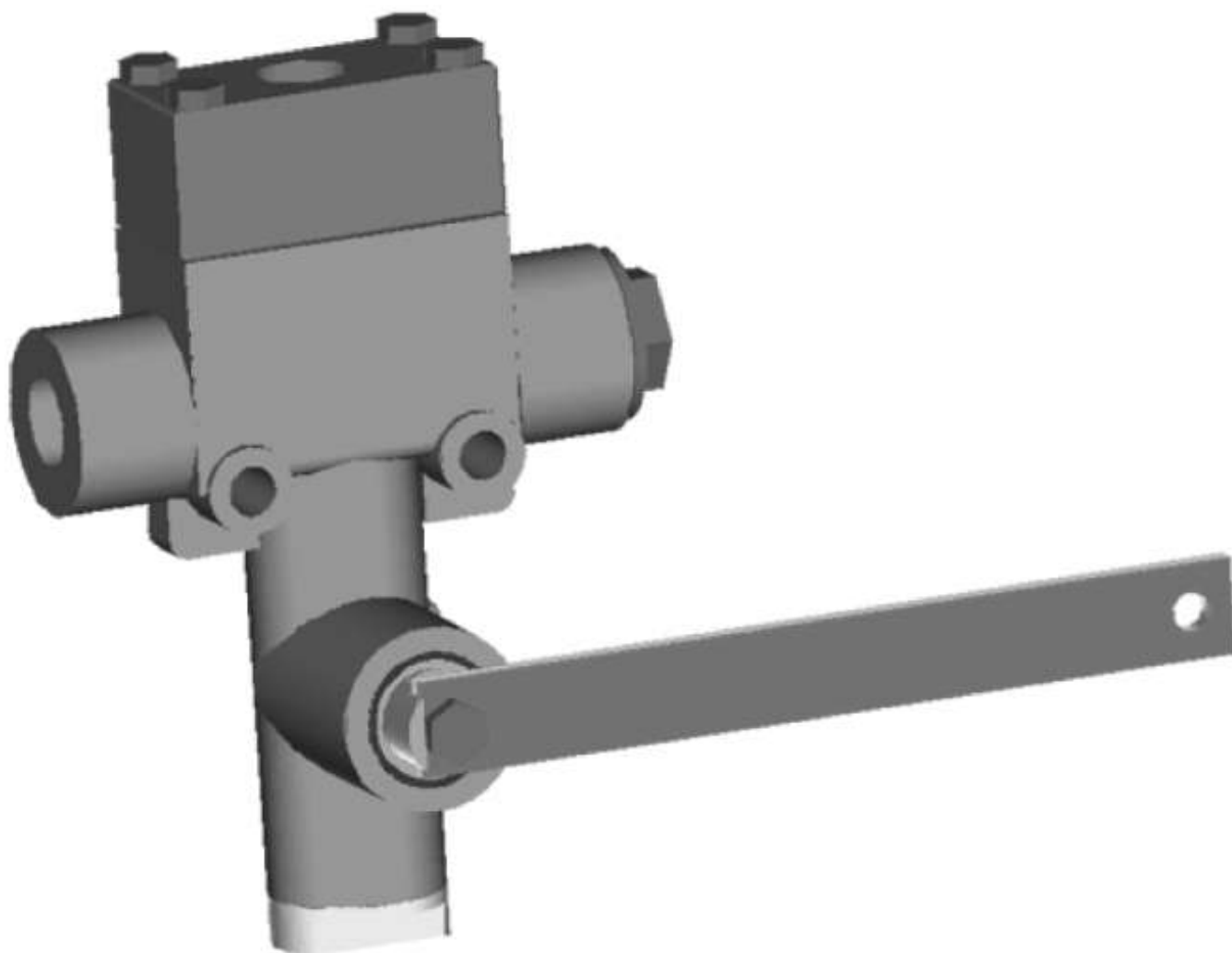


NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.

Levelling Valves SV 1205 ...



For use in rail vehicles

- Double-seat valve regulates the car body level by charging and exhausting the air spring bellows
- Designed for installation in pipeline systems
- Requires little servicing

KNORR-BREMSE
Systems for Rail Vehicles



Contents

	Page
1 General	4
2 Servicing	4
3 Troubleshooting	5
4 Removal and installation	5
5 Overhaul	6
5.1 Tools	6
5.2 Disassembly	6
5.3 Cleaning	6
5.4 Inspection and reconditioning	6
5.5 Assembly	10
5.5.1 Greasing the components	10
5.5.2 Assembling the valve	10
6 Testing	10
6.1 Test setup	10
6.2 Calculating the dead stroke	10
6.3 Leakage test	10
6.4 Function test	11
6.5 Terminating the tests	11

Tables

Table 1	Levelling valves	4
Table 2	Troubleshooting	5
Table 3	Inspection of components	7
Table 4	Amounts of dead stroke	11
Table 5	Charging and exhausting times	12
Table 6	Spare parts list	13

The following document is required as well:

- Description - see the part number for the levelling valve

Ordering spare parts

To order spare parts, always refer to the latest spare parts list and state the part numbers indicated there.

Always use genuine KNORR spare parts to replace any items found in need of renewal. The same applies to all parts that must be replaced at every overhaul.

To be processed quickly and correctly, spare part orders must contain the following particulars:

- Exact names of parts, their part numbers and the quantity wanted
- Type designation of the unit and its part number
- Name of the project
- Full address
- Wanted type of shipment

1 General

These overhaul instructions apply to the levelling valves listed in Table 1.

The differences between the various levelling valves are based partly on the charging and exhausting times (see Table 5), on the direction in which the actuating lever (23) turns for charging and exhausting, and on the dimensions of the actuating lever (23) (see Fig. 1) and air pipe threads on body (1). To obtain the necessary data and particulars please refer to the installation drawing for the levelling valve in question.

For full working details of the levelling valves please refer to KNORR Description B-TD10.23-EN.

Only qualified personnel is allowed to service and overhaul the levelling valves. The applicable accident prevention regulations must be observed.

Please read this documentation carefully before beginning any work. All directions and instructions must be followed exactly. In this way you will avoid wasting time and money.

If servicing is in any way neglected or ignored, KNORR will understandably be unable to meet its warranty commitments under the terms of supply and delivery.

Table 1 Levelling valves

Type	
SV 1205	For Indian Railways

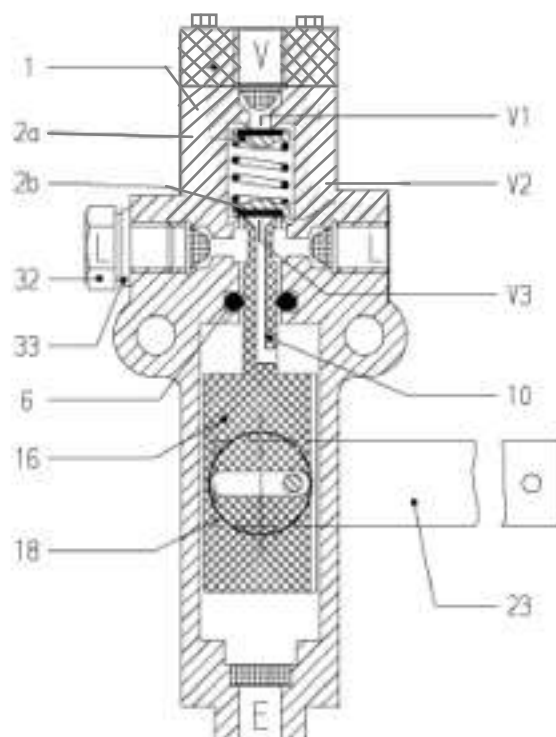
2 Servicing

The unit must be checked for good external condition and proper operation at regular intervals in accordance with the applicable railway administration regulations.

Levelling valve overhauls must be timed according to both the operating conditions and the environmental influences in the areas where the vehicle is run.

To judge when the next overhaul is required under the actual operating conditions, it is recommended that a few randomly selected levelling valves be disassembled after a lengthy period of operation, and checked for wear and condition (see Section 5).

Fig. 1 Levelling valve (schematic)



- | | |
|--------------------|--|
| 1 Body | E Exhaust port |
| 2a Valve head | L Port for air spring below |
| 2b Valve head | V Port for auxiliary reservoir |
| 6 O-ring | V ₁ , V ₂ , V ₃ Valve seats |
| 10 Piston rod | |
| 16 Piston | |
| 18 Driver | |
| 23 Actuating lever | |
| 32 Screw plug | |
| 33 Sealing ring | |

3 Troubleshooting, Table 2

(please refer to Fig. 1 and 10)

Problem	Cause	Remedy
Charging or exhausting of air spring bellows does not agree with the vehicle load	Actuating lever (23) loose	Secure actuating lever (23) with hex-head screw (24) as instructed in Section 5.5, and re-adjust the levelling valve as instructed in Section 6.2.
	Driver (18) or piston (16) sticking	Disassemble and overhaul the levelling valve as instructed in Section 5.
Air discharging constantly at exhaust port E. Note: Provided the levelling valve is working properly, air is only to be discharged briefly for level adjustment when the vehicle load is lightened.	Valve seat V ₃ of piston rod (10), or the applied rubber seal of valve head (2b) is dirty or damaged	Clean the valve seat of piston rod (10) and, if necessary, recondition as instructed in Section 5.4. Clean the rubber seal of valve head (2b), examine, and replace if necessary.
	O-ring (6) defective	Disassemble the levelling valve as instructed in Section 5.2 and replace the O-ring.
	Linkage to actuating lever (23) maladjusted	Re-adjust the linkage.
Air reflux from the air spring bellows to the auxiliary reservoir when the air supply is turned off	Valve seat V ₁ of cover or the applied rubber seal of valve head (2a) is dirty or damaged	Clean valve seat V ₁ in cover and, if necessary, recondition as instructed in Section 5.4. Clean the rubber seal of valve head (2a), examine, and replace if necessary.
Air discharging constantly at screw plug (32)	Screw plug loose and/or sealing ring (33) defective	Tighten the screw plug and/or replace the sealing ring.

4 Removal and installation

4.1 Removal

- Exhaust the air pipe V coming from the auxiliary reservoir.
- Unscrew the hinged joint with the vehicle from actuating lever (23).
- Turn the levelling valve's actuating lever (23) in the direction of Exhausting, and allow the air pipe L from the air spring bellows to exhaust through port E.
- Unscrew the pipe unions and detach the levelling valve from the vehicle.

4.2 Installation

- Re-install the levelling valve in the reverse sequence to removal.

- Charge the levelling valve after completing installation.

- Upon reaching the maximum working pressure in the valve and the vehicle's air spring bellows, check the pipe fittings for leakage. Apply a leakage testing agent; no air is allowed to escape.

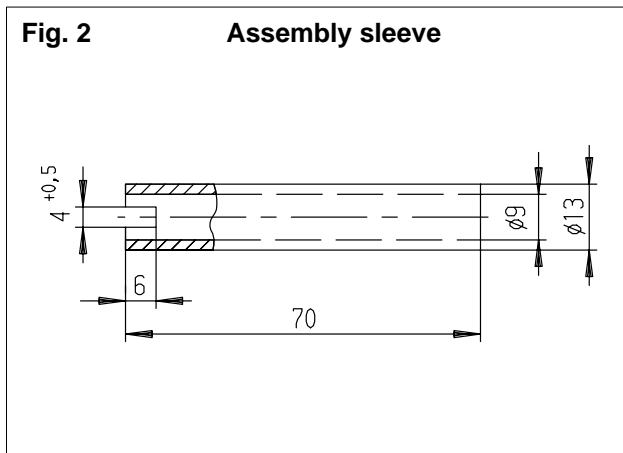
- Upon reaching the maximum working pressure in the valve and the vehicle's air spring bellows, check the pipe connections for leakage using a leakage testing agent such as *Nekal*, *Erkantol*, *Gupoflex* or equivalent. No air bubbles are to form.

If no special leakage testing agents are available, the test may alternatively be performed with a soap solution. All traces of soap must be removed immediately after the test.

5 Overhaul

5.1 Tools

All tools are standard except for a precision torque wrench, and a sleeve for assembling the piston rod assembly. The latter must be made by the customer to the specifications in Fig. 2.



C 8765/4

5.2 Disassembly

Break down the levelling valve while referring to Fig. 10 and observing the following instructions:

- Withdraw the piston assembly after unscrewing filter screw (27).
- Drive out the two pins (9) into the cavity inside body (1); this will expose the parts (6, 7, 8) still left inside.

Only remove name plate (29) if it has become illegible.

Parts which must always be replaced by new ones **after removal** (see Spare parts list table 6, WEC "A") or **at every overhaul** (WEC "B") need not be cleaned. They are best sorted out and discarded while the levelling valve is being disassembled.

5.3 Cleaning

- Use a soft wire brush to remove traces of corrosion and severe dirt deposits.
- Using lukewarm soapy water, wash valve head (2) as a rubber-bonded metal component, and piston (16), roller (17) and washer (20) as plastic parts. Then rinse them off immediately with clear water and blow dry with compressed air.
- Clean wire strainers (31) with light-grade petrol.
- Clean all metal parts (no rubber-bonded metal components) with a chemical cleaning agent in a bath at 70°C to 80°C and then blow dry with compressed air. The chemical cleaning agent must not erode more than 420 mg/m²h on aluminium alloys. The maker's directions for the use of the cleaning agent must be observed.

5.4 Inspection and reconditioning

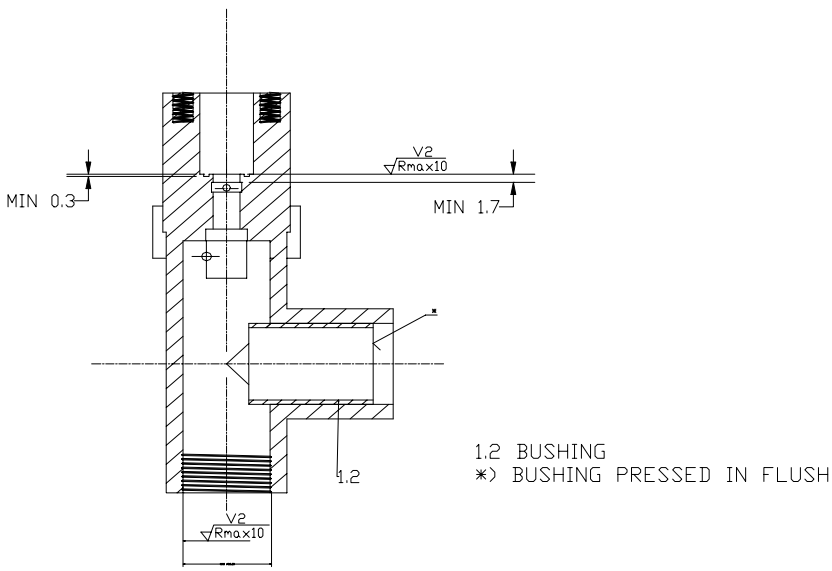
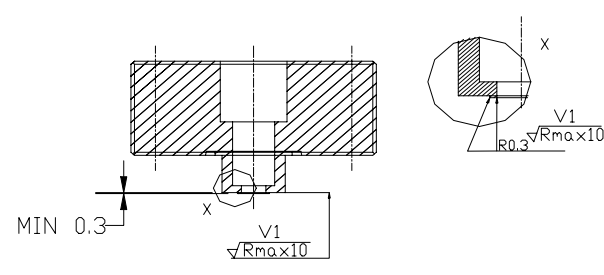
Having cleaned all components, give them a careful visual inspection. Replace any part showing damage such as cracking, distortion, corrosion or thread deformation that would make its further use appear ill-advised.

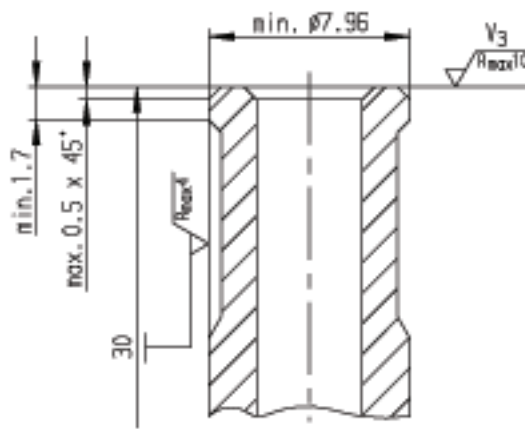
Parts that are identified by wearing code (WEC) "C" in Table 6 of the spare parts lists, and that need reconditioning and/or examining in addition to the mandatory visual inspection are discussed accordingly in the **Remarks** column of the following inspection chart (see Table 3). Where applicable, such parts are also shown in illustrations.

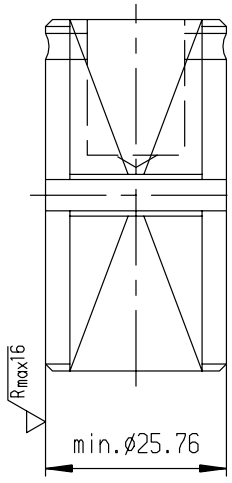
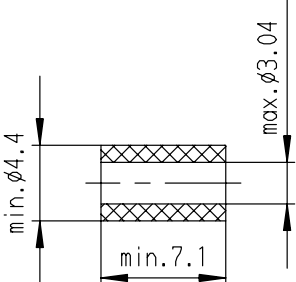
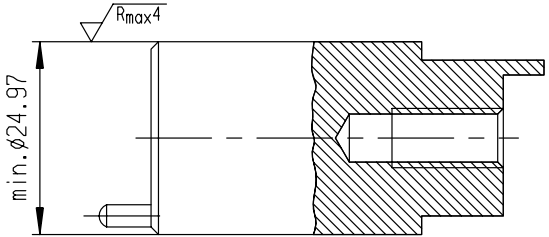
The name plate (29) must be replaced if it has become difficult to read. Use new rivets (30) to attach the new plate.

Table 3

Inspection of components
(open out Fig. 10)

Item	Part	Remarks
1	Body	<p>Fig. 3</p>  <p>1.2 BUSHING *) BUSHING PRESSED IN FLUSH</p> <p>- Minor scratching at valve seat V_2 on the body can be corrected by polishing. The dimensions specified in Fig. 3 and the surface finish must be observed, otherwise replace the body. If bushing (1.2) is scored, a new bushing must be fitted.</p>
2	Valve head	<p>- Examine the rubber valve seat for damage. If the vulcanized rubber is indented by 0.2 mm or swollen in excess of 0.1 mm, the valve head must be replaced.</p>
3	Compression spring	<p>- The spring force must be at least 0.53 N at a clamped length of 10 mm, otherwise replace the compression spring.</p>
5	Adapter nipple	<p>Fig. 4</p>  <p>14200/2</p> <p>- Minor scratching at valve seat V_1 can be corrected by polishing. The dimensions specified in Fig. 4 and the surface finish must be observed, otherwise replace the : cover</p>

Item	Part	Remarks
10	Piston rod	<p>Fig. 5 For : SV 1205, *</p>  <p style="text-align: right;">C 142003</p> <p>- Minor scratching at valve seat V₃ on the piston rod can be corrected by polishing. The dimensions specified in Fig. 5 and the surface finish must be observed, and the total piston rod length must be at least 56.5 mm, otherwise replace the piston rod.</p>

Item	Part	Remarks
8	Washer	<ul style="list-style-type: none"> - The diameter of the hole in the washer is not to exceed 8.6 mm, otherwise replace the washer.
13	Compression spring	<ul style="list-style-type: none"> - The spring force must be at least 89 N at a clamped length of 11 mm, otherwise replace the compression spring.
16	Piston	<p>Fig. 6</p>  <p style="text-align: right;">C 14200/6</p> <ul style="list-style-type: none"> - Traces of wear in the piston shank must be smoothed out. The size specified in Fig. 6 and the surface finish must be observed, otherwise replace the piston.
17	Roller	<p>Fig. 7</p>  <p style="text-align: right;">C 14200/7</p> <ul style="list-style-type: none"> - The roller must be replaced if it is deformed one-sidedly or if the dimensions specified in Fig. 7 are not observed.
18	Driver	<p>Fig. 8</p>  <p style="text-align: right;">C 14200/8</p> <ul style="list-style-type: none"> - Minor scratching in the surface of the driver can be corrected by polishing. The size specified in Fig. 8 and the surface finish must be observed, otherwise replace the driver.

5.5 Assembly

Assemble the valve in the reverse sequence to disassembly, while referring to Fig. 10.

5.5.1 Greasing the components

Grease the following parts before assembling the levelling valves:

- The sliding and guide surfaces of the moving parts, the sealing ring (1.3) and the O-ring (6) must be lubricated with a **thin** coat of Fuchs *Renolit HLT 2* universal grease or equivalent.
- The cavities in front of and behind the sealing lips of sealing ring (1.3) in body (1) must be packed with Fuchs *Renolit HLT 2* universal grease.
- The sealing rings (4), (28) and (33), and the felt ring (19) need oiling.

5.5.2 Assembling the valve

- In order to assemble piston rod (10) and piston (16), you must depress compression spring (13) with the help of the sleeve (Fig. 2) and then install needle roller (11).
- Having been placed in the interior of body (1), the O-ring (6), the spiral jaw ring (7) and the washer (8) need anchoring in position with the two pins (9).
- The driver (18) must turn easily through 360°. All other moving parts must also move freely in their guides.
- In the lap condition, the actuating lever (23) might, when swung by 180°, diverge inadmissibly from its centre position owing to the manufacturing tolerances of the valve components.

The detected deviation from the centre position must be allotted evenly to the starting point of the lever and its opposite position; this is accomplished by relocating the lever relative to the driver (18). The maximum permissible deviation from the centre position is $\pm 2.5^\circ$.

- Torque hex-head screw (24) to between 35 and 40 Nm; on levelling valve **SV 1205 K**, torque it only to between 20 and 25 Nm. Apply a 17 mm wrench to driver (18) as a counter-support for torquing the screw.

6 Testing

In order to test and adjust the levelling valve, you require an instrument to measure the angle of the lever position; see Fig. 9.

6.1 Test setup

Install the levelling valve in a test setup according to Fig. 9.

The line between port **L** and reservoir **R2** must be 0.35 m long and have an inside bore of 13 mm.

- Close all cocks.
- Set pressure reducing valve DMV to 8 bar (pressure gauge M1).

6.2 Calculating the dead stroke

- Open cocks H1 and H4, turn lever (23) towards Charging and observe pressure gauge M2. As soon as the pressure gauge reads 4 bar, move the lever to the 0 position on the graduated scale.
- Turn lever (23) slowly towards Charging and observe pressure gauge M2. As soon as the pressure begins to rise, mark the position of the lever on the graduated scale (valve lap position).
- Turn lever (23) slowly towards Exhausting and observe pressure gauge M2. As soon as the pressure begins to fall, mark the position of the lever on the graduated scale (valve lap position).

The dead stroke (angle between the two valve lap positions) must be within the limits specified in Table 4.

6.3 Leakage test

Carry out the leakage test using a leakage testing agent such as *Nekal*, *Erkantol*, *Gupoflex* or equivalent. If no special leakage testing agents are available, the test may alternatively be performed with a soap solution. All traces of soap must be removed immediately after the test.

Table 4 Amounts of dead stroke

Levelling valve	Effective lever length	Dead stroke
SV 1205	160 mm	$\pm (40' \text{ to } 1^\circ 20')$ $\Delta \pm (1.9 \text{ to } 3.7 \text{ mm})$

Pressure gauge M1 must read 8 bar, M2 0 bar. All cocks are closed.

- Move lever (23) to the 0 position.

Charging

- Open cocks H1 and H4.
- Turn lever (23) towards Charging and observe pressure gauge M2. As soon as the pressure gauge reads 0.5 bar, close cock H1.
- Open cock H2.
- Test for leakage at E and at cock H2. No air is allowed to escape. The reading on pressure gauge M2 must remain constant at 0.5 bar, though not for levelling valve SV1205 DO which must yield a pressure drop to 0 bar.

Exhausting

- Turn lever (23) towards Exhausting. The reading on pressure gauge M2 must fall to 0 bar.
- Close cocks H2 and H4.
- Open cocks H1 and H3.
- Check for leakage at E and at cock H3. No air is allowed to escape.

6.4 Function test

Pressure gauge M1 must read 8 bar, M2 0 bar. All cocks are closed.

Charging

- Open cock H4.
- Turn lever (23) to an angle of 4° towards Charging.
- Open cock H1 and observe pressure gauge M2.
- Using a stopwatch, record the time taken by the pressure to rise from 2 bar to 6 bar. The time must be within the tolerances specified in Table 5.
- Repeat the time recording at a lever angle of 10° .

Exhausting

- Set lever (23) to Charging. As soon as pressure gauge M2 shows 8 bar, close cocks H1 and H4.
- Set lever (23) to an angle of 4° towards Exhausting.
- Open cock H4 and observe pressure gauge M2.
- Using a stopwatch, record the time taken by the pressure to fall from 6 bar to 2 bar. The time must be within the tolerances specified in Table 5.
- Repeat the time recording at lever angles of 10° and 8° (see Table 5).

6.5 Terminating the tests

- Close cock H1.
- Exhaust the test setup by opening cocks H2, H3 and H4. Pressure gauge M2 must read 0 bar.
- Remove the levelling valve from the test setup.
- Affix a durable test mark to the levelling valve if it has successfully passed the tests.

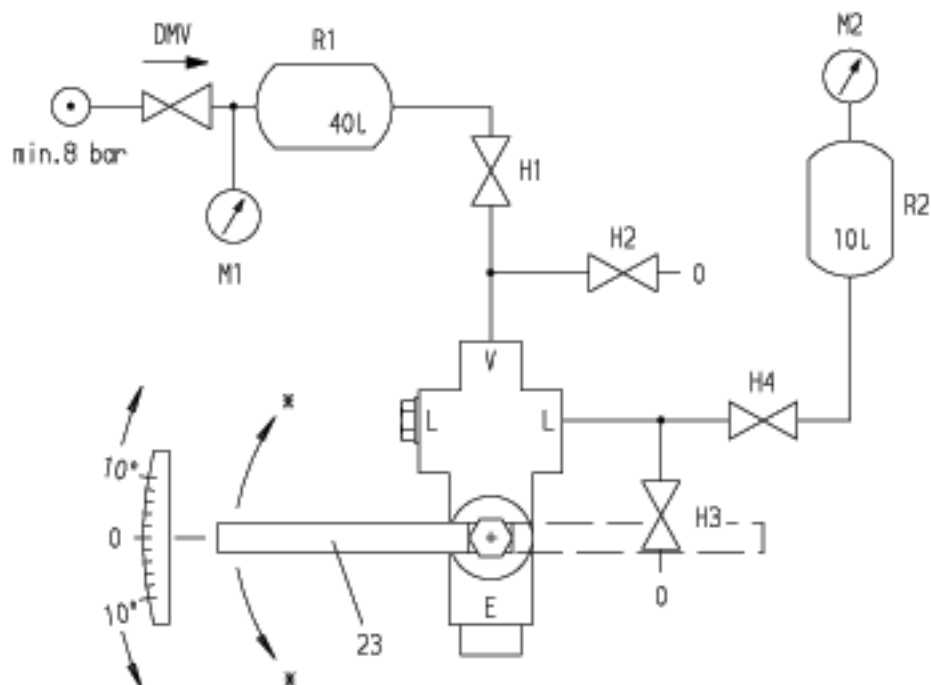
Table 5

Charging and exhausting times

Levelling valve	Charging time [s] at a lever angle of		Exhausting time [s] at a lever angle of		
	4°	10°	4°	8°	10°
SV 1205	65 ± 30	7 ± 2	135 ± 60	-	13 ± 3

Fig. 9

Test setup



- | | | | |
|------|-------------------------|---|------------------------------|
| 23 | Actuating lever | E | Exhaust port |
| DMV | Pressure reducing valve | L | Port for air spring bellows |
| H... | Stopcock | V | Port for auxiliary reservoir |
| M... | Pressure gauge | O | Exhaust |
| R... | Air reservoir | | |

* The direction in which the lever is turned for charging and exhausting is indicated in the applicable installation drawing for each levelling valve.

**Table 6 Spare parts list
for levelling valve SV 1205 ...**

Item	Part	WEC	Qty.
–	For the part numbers of each valve see Table 1	–	–
1	Body	C	1
1.2	Bushing	C	1
1.3	Sealing ring	B	1
2	Valve head	C	2
3	Compression spring	C	1
4	Sealing ring	B	1
5	Cover	C	1
6	O-ring	B	1
7	Spiral jaw ring	B	1
8	Washer	C	1
9	Pin	A	2
10	Piston rod	C	1
11	Needle roller	-	1
12	Disc	-	1
13	Compression spring	C	1
14	Lock washer	A	1
15	Washer	-	1
16	Piston	C	1
17	Roller	C	1
18	Driver	C	1
19			

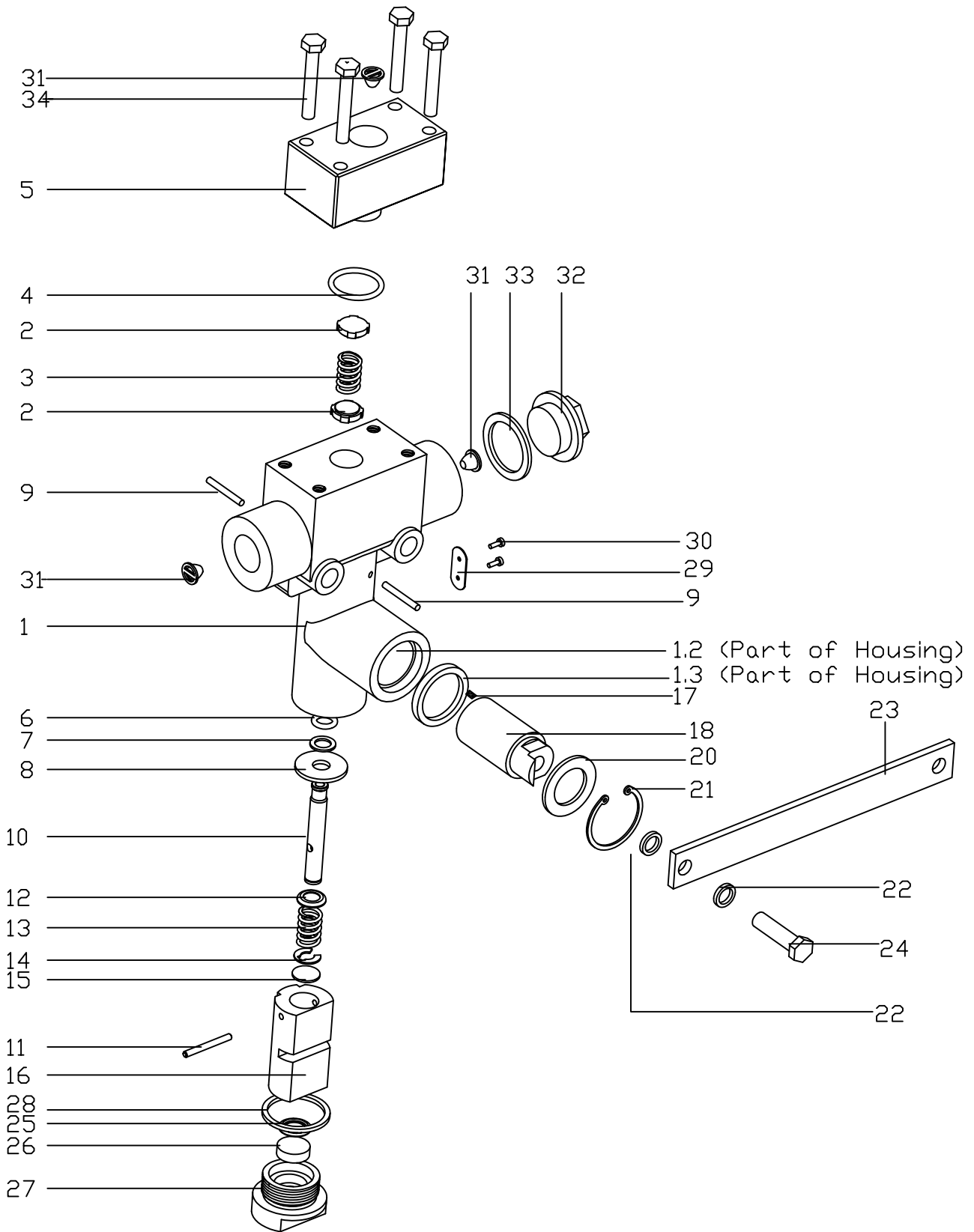
20	Washer	-	1
21	Retaining ring	A	1
22	Toothed washer	A	2
23	Actuating lever	-	1
24	Hex-head screw	-	1
25	Star washer	-	1
26	Filter	B	1
27	Filter screw	-	1
28	Sealing ring	B	1
29	Name plate	C	1
30	Rivet	A	2
31	Wire strainer	-	3
32	Screw plug	-	1
33	Sealing ring	B	1

34 Hexhead Bolts 4

What the letters in the WEC (wearing code) column of Table 6 mean:

- A These parts must always be replaced by new ones **after removal**.
- B These parts must be replaced by new ones **at every overhaul**.
- C These parts must be reconditioned or replaced by new ones if wear is so great that the unit cannot be guaranteed to function reliably with them until the next overhaul (see Section 5.4)

EXPLODED VIEW OF LEVELLING VALVE SV



D

KNORR-BREMSE
Systeme für Schienenfahrzeuge GmbH
Moosacher Strasse 80
D-80809 München
Germany
Tel.: +49 89 3547-0
Fax: +49 89 3547-2767

KNORR-BREMSE Berlin
Zweigniederlassung der KNORR-BREMSE
Systeme für Schienenfahrzeuge GmbH
Landsberger Allee 399
D-12681 Berlin
Germany
Tel.: +49 30 9392-0
Fax: +49 30 9392-2409

A

KNORR-BREMSE Ges.m.b.H.
Steinfeldergasse 12
A-2340 Mödling
Austria
Tel.: +43 2236 409-0
Fax: +43 2236 409-412

CH

OERLIKON-KNORR
EISENBAHNTECHNIK AG
Mandachstrasse 50
CH-8155 Niederhasli
Switzerland
Tel.: +41 1 8523111
Fax: +41 1 8523131

H

KNORR-BREMSE Vasúti Járjú
Rendszerek Hungária Kft.
Helsinki út 86
H-1201 Budapest
Hungary
Tel.: +36 1 4211 100
Fax: +36 1 4211 190

E

SOCIEDAD ESPANOLA DE FRENOS
CALEFACCION Y SENALES S.A.
Calle Nicolás Fúster, 2
E-28320 Pinto (Madrid)
Spain
Tel.: +34 1 6910054
Fax: +34 1 6910100

F

FREINRAIL S.A.
47, 49 Rue Gosset
F-51100 Reims
France
Tel.: +33 326 797211
Fax: +33 326 797201

I

FRENSISTEMI S.R.L.
Via della Cupola 112
I-50145 Firenze
Italy
Tel.: +390 55 3020-1
Fax: +390 55 3020-333

CDN

KNORR-BRAKE LIMITED
675, Development Drive
Kingston Ontario K7M 4W6
Canada
Tel.: +1 613 389-4660
Fax: +1 613 389-8703

USA

NEW YORK AIR BRAKE CORPORATION
748, Starbuck Avenue
Watertown, NY 13601
USA
Tel.: +1 315 786-5200
Fax: +1 315 786-5676

KNORR BRAKE CORPORATION
P.O. Box 9300
Westminster, MD 211 58-9300
USA
Tel.: +1 410 875-0900
Fax: +1 410 875-0830

AUS

KNORR-BRAKE AUSTRALIA PTY. LTD.
2/45 Salisbury Road
Hornsby, N.S.W. 2077
Australia
Tel.: +61 2 4765266
Fax: +61 2 4821949

BR

FREIOS KNORR SISTEMAS
FERROVIÁRIAS LTDA.
Av. Eugo Eusebio Stevaux, 873
CEP 04696-902
São Paulo
Brazil
Tel.: +55 11 5246099
Fax: +55 11 2468954

IND

KNORR-BREMSE RAIL SYSTEMS
India Private Ltd.
14/6, Mathura Road
Faridabad - 121003
Haryana
India
Tel.: +91 129 276409
Fax: +91 129 275935

J

KOSHIN-KNORR LTD.
Kamimura No. 2 Bldg., 4th Floor
45-9, Higashi-ikebukuro 2-chome
Toshima-ku
Tokyo 170-0013
Japan
Tel.: +81 3 5391-1013
Fax: +81 3 5391-1022

RSA

KNORR-BREMSE (S.A.) PTY. LTD.
3, Derrick Road
Kempton Park 1620
South Africa
Tel.: +27 11 3943120
Fax: +27 11 9751513

HK

KNORR-BREMSE FAR EAST LTD.
1301 CRC Protektive Tower
38 Gloucester Road
Wanchai
Hong Kong
Tel.: +852 2861-2669
Fax: +852 2520-6000

ROK

KNORR-BREMSE RAIL SYSTEMS KOREA LTD.
402 Im-Sung Bldg.
788-2 Yeok Sam-Dong, Kangnam-Ku,
Seoul
Republic of Korea
Tel.: +82 2 5388727
Fax: +82 2 5388729



KNORR-BREMSE
Systeme für Schienenfahrzeuge GmbH

Moosacher Str. 80 D-80809 München Tel.: (089) 3547-0 Fax (089) 3547-2767

Subject to modifications.

For application studies and use of our products please
contact us, requesting specific documentation.

Reproduction, as a whole or in part, is not permitted..

Printed in Germany.

.....
.....
U - V E 2 0 . 2 3

Rev. 03 - 07.02.2018 - en
.....

.....
Overhaul instructions

Tyfon
MKT75/...
MKTH75/...



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
01	20.02.2015	3.1	x					
		4.2		x				
02	09.03.2017	3.1	x					
		4.2, 4.3, 4.4, 4.5, 4.6					x	
		4.3						x
		4.7		x				
03	07.02.2018	3.1	x					



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group of this documentation	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working substances	10
4.1.2	Special tools	10
4.2	Disassembly	11
4.3	Disposal	14
4.4	Cleaning	14
4.5	Inspection	15
4.6	Assembly	15
4.7	Check	17



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group of this documentation

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-VE20.23 Description of the Typhone MKT...

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

II51213	II75020-N
II51214	II75020-N/1
II51466	II75020-X
II51484	II81048
II51485	II81820
II51486	II88956
II51487	II89196
II51759	II87052/...
II59466	II87053/...
II62257	II98853/...
II64702	II98854/...
II64703	II101056/...
II70839	II101057/...
II70840	II101126/...
II75020	II103214



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possess the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools.



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

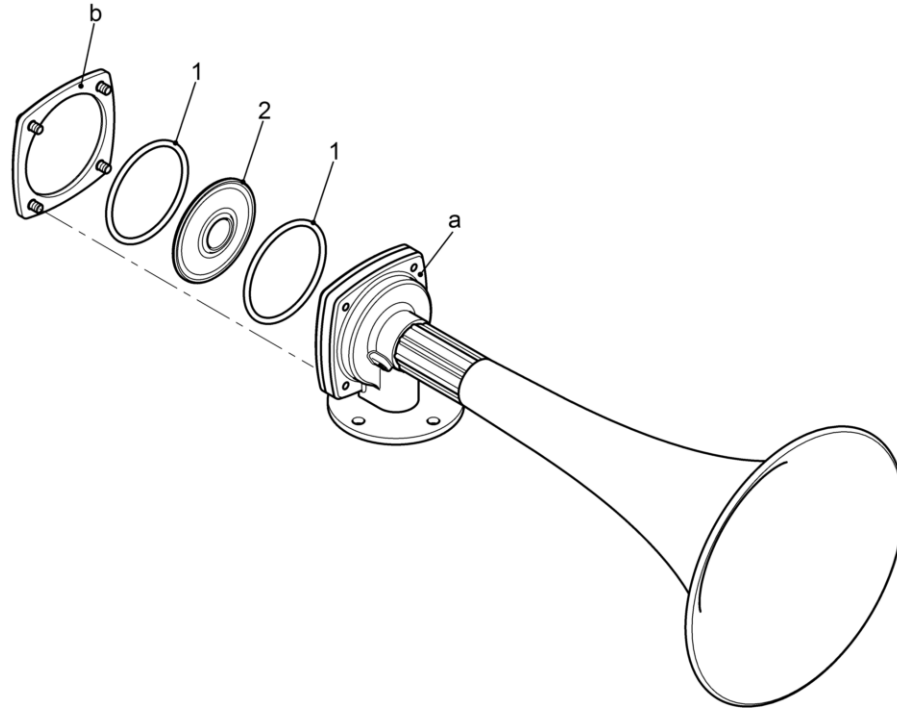
See Figure 1 and Figure 2

- Unscrew the fastening screws from housing (a) for the Typhone and take off the cover (b).
- Remove the O-ring (1).
- Remove the diaphragm (2) and O-ring (1) from housing (a).



NOTE

On devices with a pressure regulator, the pressure regulator must be replaced.

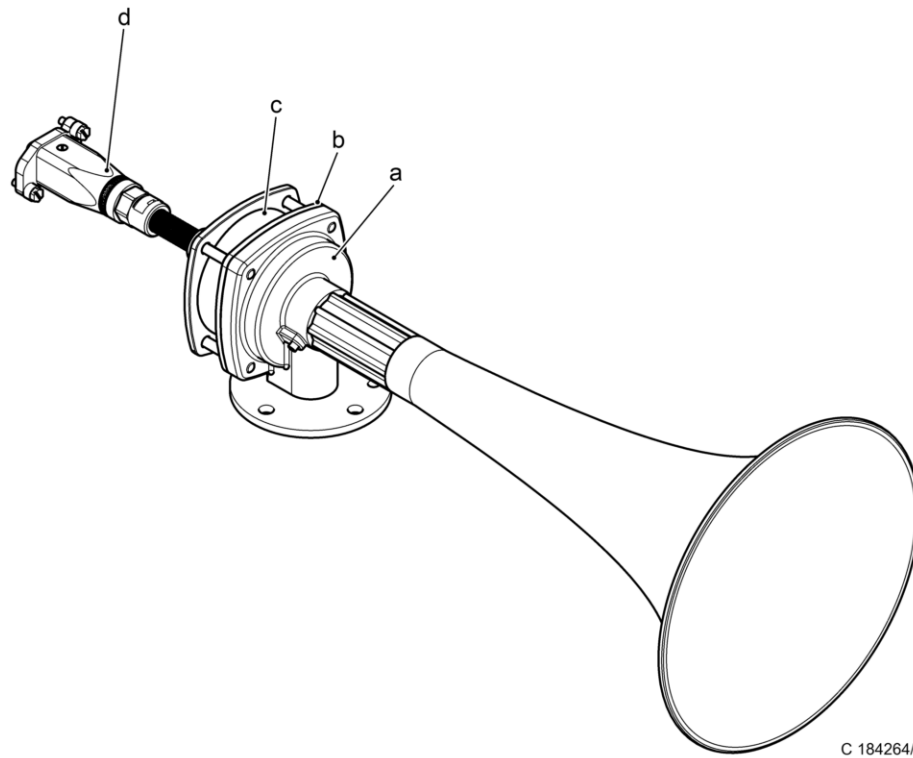


C 184264/1

- a** Housing
- b** Cover

- 1** O-ring
- 2** Diaphragm

Figure 1 Tyfon MKT75/...
(the unit with item number I188956 is shown here by way of example)



- a Housing
- b Cover

- d Electric connector
- c Heater

Figure 2 Typhone MKTH75/...
(the unit with item number I187052/... is shown here by way of example)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous! This would mean unnecessary and legally punishable harm to the environment. Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)

4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly! The skin or respiratory tracts may be harmed or inflamed. It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling! Malfunctions and leakage due to damaged sealing surfaces. Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.

Only valid for units with type designation MKTH...:

- Rub down all cables, cable connecting components and electric connector (d) with a dry cloth.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.

Only valid for units with type designation MKTH...:

- Carefully check the heating (c) for any damage that may affect its operation - such as signs of thermal stress. Exchange the complete typhone if is out of specification.

4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!

The skin or respiratory tracts may be harmed or inflamed.

It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!

Functionality will be impaired or the unit might even fail.

Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.

If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



See Figure 1 and Figure 2

- Insert an O-ring (1) into the groove of the housing (a).
- Insert diaphragm (2) into the housing (a).
- Insert the other O-ring (1) into the housing (a) and onto the diaphragm (2).
- Position the cover (b) on the housing (a) and attach it in the correct mounting position using the fasteners. Tighten the fasteners evenly crosswise.
Tightening torque: 5 Nm
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Check



WARNING

Loud noise is caused by function testing!

Your hearing may be harmed. Do not perform any function test in a closed room.

Do not allow anybody to stand close to the typhone or macrophone during the function test.

After assembly and onboard installation, the unit is to be tested as part of a system check in accordance with instructions from the railway authorities / the vehicle builder.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.



CAUTION

Beware of failure to protect parts during storage and shipment!

The unit might be damaged, e.g. connector contacts deformed.

Put a protective cap on the unit's electric connector.

.....
.....
U - L G 1 0 . 2 2

Rev. 05 - 25.01.2016 - en
.....

.....
Overhaul Instructions

**Motor compressor set
V10-T**



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.



Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
04	26/03/2014	Revision history started		x				
		4.3, 4.6.2		x				
		Table 1					x	
05	25/01/2016	3.1	x	x				
		4.1.1, 4.2, 4.6.1, 4.6.2, Fig. 4, Fig. 7			x		x	x



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Proper usage of the product	9
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spare parts and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working substances	10
4.1.2	Special tools	10
4.2	Disassembly	11
4.3	Disposal	12
4.4	Cleaning	13
4.5	Inspection	14
4.6	Assembly	15
4.6.1	Overview of tightening torques	16
4.6.2	Assembling the motor compressor set	17
4.7	Testing	19
5	Appendix	20
5.1	Figures of motor compressor set V10-T	22
5.2	Figures of assemblies and components	24



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to modify the unit or this document at any time without making any specific announcements.

1.2 Target group for this document

The target group of this documentation are people who, due to training from KNORR-BREMSE,

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-LG10.22	Description of motor compressor set V10-T
U-LG10.23	Overhaul Instructions for compressor V10-T
I-LG00.22	Storage Instructions
PRF9592	Test Instructions for motor compressor set V10-T

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

8.01x.1.321.012.8

8.01x.1.321.024.8

8.01x.1.321.036.8

8.01x.1.321.048.8

8.01x.1.321.072.8

8.01x.1.321.096.8

8.01x.1.321.110.8

8.010.1.321.053.9



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.



NOTE

Dismantling and assembly are described in this document, using item number 8.012.1.321.012.8 as an example.

Among other things, the item numbers differ depending on the assignment of the part numbers. Differences between one unit and another are identified by the use of the item number as a prefix.



3.2 Proper usage of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.

3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possess the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spare parts and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working substances

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics
- Grease (order number: ID No. 502647)
- Regular paint marker red, Edding 8750-2
- Regular permanent marker red, Edding 8300-2

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools and the following special tool.

- Regular strap wrench



4.2 Disassembly



WARNING

Beware of the unit dropping or toppling!
Danger of crushing or fracturing limbs, and damage to the unit.
Prop up remaining assemblies stably on suitable supports (wood chocks).



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of dismantling the unit.

See Figure 4 to Figure 8

- Unscrew both dry-type air filters (3).



NOTE

To detach DC motor (1), it is necessary to detach housing (4.31) (see Figure 6).



NOTE

If the compressor (4) is going to be overhauled (see related Overhaul Instructions U-LG10.23), you should first detach the cylinder and then remove the DC motor (1).

- Unscrew four machine screws (4.44). Remove spring washers (4.39), housing (4.31) and valve plate (4.33). Remove seals (4.29) (see Figure 6).
- Working through the opening in crankcase (4.1), release machine screw (2) (see Figure 7).
- Unscrew the machine screws (9), take off spring washers (7), and draw compressor (4) off DC motor (1).



NOTE

Dismantle compressor (4) as directed in the relevant Overhaul Instructions U-LG10.23.



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous! This would mean unnecessary and legally punishable harm to the environment. Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced must be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)



NOTE

Arrange for the disposal of the component assemblies as directed in the associated documents (see section 2.1).



4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.



NOTE

Prior to cleaning the bonded metal-to-plastic component (part No. 3), check the plastic part for compatibility with the chemical cleaning spirit. The bonded component will have to be handled and cleaned entirely like a non-metallic part if the plastic is suspected of attack by the chemical cleaning spirit.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.



NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.



4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- Exchange any sign or plate that has become difficult to read.
- Mend damaged coats of paint or repaint the parts affected. Unpainted surfaces, signs, plates, labels, mounting holes and connecting ports must be carefully masked beforehand.



NOTE

Inspect the compressor (4) as directed in the related Overhaul Instructions (see Section 2.1).



4.6 Assembly

See Figure 4 to Figure 8



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



CAUTION

Beware of the unit toppling or dropping!
Danger of crushed or broken limbs, and damage to the unit.
Make sure that the compressor remains stable throughout assembly, and support assemblies after attaching them.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.

4.6.1 Overview of tightening torques



WARNING

Beware of bolting joints incorrectly!

Damage to the screwed members and the area around them. The following consequences are imaginable in given mounting scenarios: loss of functionality, damage to motor compressor set, derailment due to loss of motor compressor set mounted underfloor.

The use of impact screwdrivers is prohibited.



NOTE

The specified tightening torques apply to lubricated screw threads, except when a sealant is used.



NOTE

Mark screw connections (entry X or X1 in the following table) with the stipulated torque after tightening (see appendix).

X - outdoor use - marking with paint marker, Edding 8750-2.

X1 - indoor use - marking with red permanent marker, Edding 8300-2.



NOTE

For tightening torque values and thread treatment, see Table 1.



NOTE

The customer is responsible for ensuring that the bolted joints will be assembled in accordance with the quality demands and standardization requirements of DIN 25201.

The requirements set out in this standard must be met, observed and translated correspondingly into practice.



Item	Designation	Tightening torque [Nm]	Thread	Marking (K)	Thread treatment (ID No.)	Risk class ¹⁾
2	Machine screw to fasten crankshaft (4.2) and motor shaft (M)	15	M6	X1	502647	M
3	Fastening the dry-type air filter (3)	16	M22	X	502647	M
9	Machine screws to fasten DC motor (1) to crankcase (4.1)	23	M8	X	502647	M
14	Screw plugs (14) for the cable lead-through opening	16	-	X	502647	G

¹⁾ according to DIN 25201

* Tighten by using a strap wrench (see Section 4.1.2)

Table 1 Tightening torques



NOTE
All joints must be clean and free from grease.

4.6.2 Assembling the motor compressor set



CAUTION
Beware of assembling the unit incorrectly!
The unit will be damaged and/or its functionality impaired.
Attach DC motor (1) prior to installing the cylinder (see related Overhaul Instructions U-LG10.23).



NOTE
As regards assembling the compressor (4) please refer to the related Overhaul Instructions U-LG10.23.

- Push compressor (4) towards DC motor (1), introducing the motor shaft (M) into the centre of the bore in crankshaft (4.2) and making the motor flange bear flush against crankcase (4.1) (see Figure 7).



- Attach the DC motor to the crankcase by machine screws (9) and spring washers (7). For the tightening torque, see Table 1.
- Screw the machine screw (2) into crankshaft (4.2), thereby fixing the connection between crankshaft (4.2) and motor shaft (M). Thread treatment, tightening torque and colour marking according to Table 1.
- Continue assembling the compressor as directed in the related Overhaul Instructions U-LG10.23.
- Attach housing (4.31) as shown in Figure 6 and as directed in the related Overhaul Instructions U-LG10.23.
- Screw in both dry-type air filters (3) with new filter elements. Thread treatment, tightening torque and colour marking according to Table 1.
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

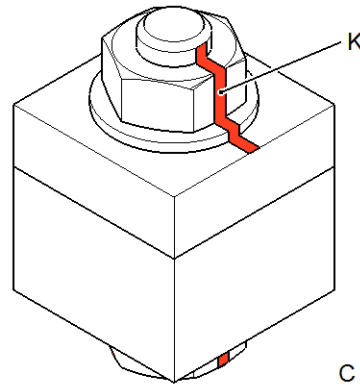
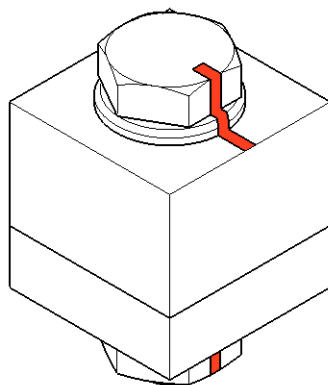
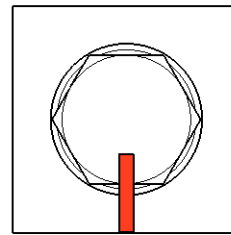
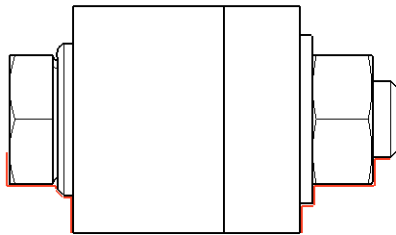
The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.



5 Appendix

B

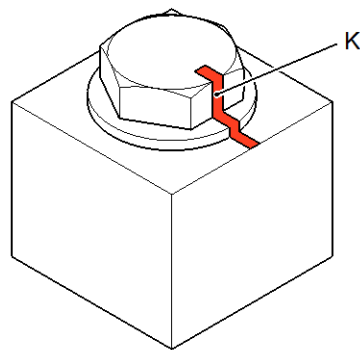
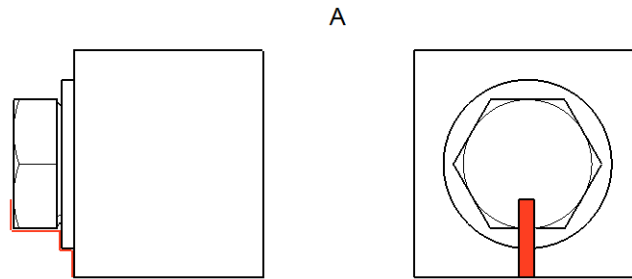


C 148770/9

B Bolt screwed through

K Colour marking

Figure 1 Bolt marking

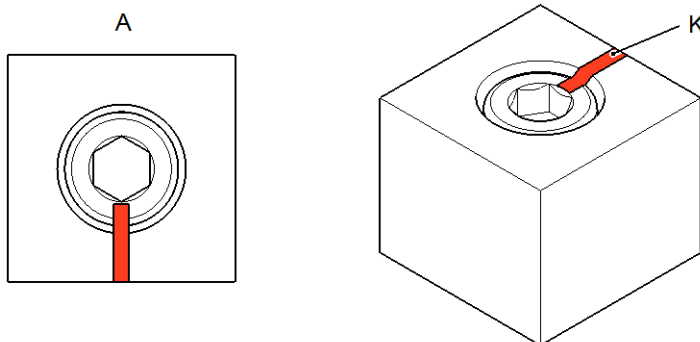


C 148770/8

A Screw fitting

K Colour marking

Figure 2 Bolt marking



C 148770/10

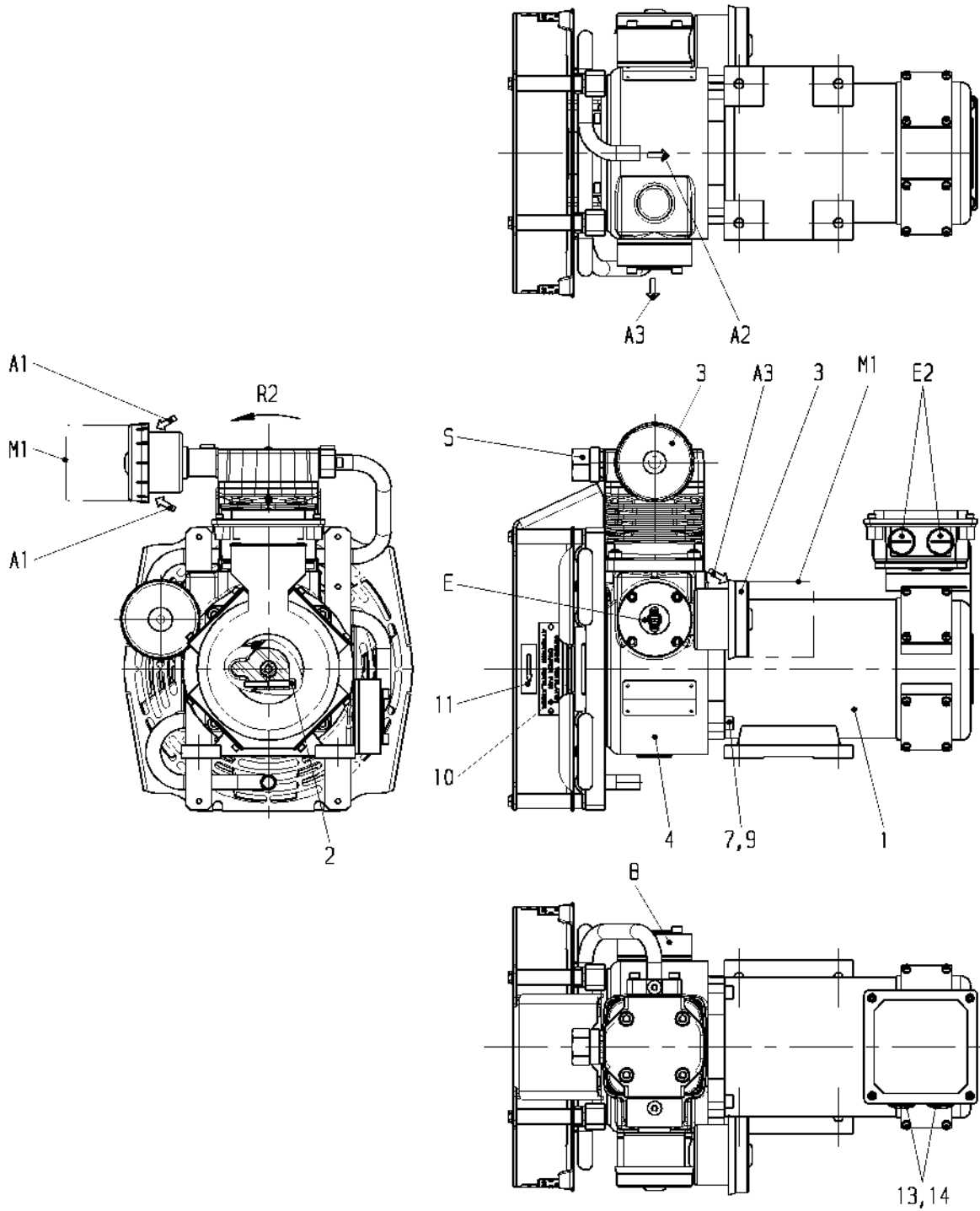
A Screw fitting

K Colour marking

Figure 3 Bolt marking



5.1 Figures of motor compressor set V10-T



C 19372/2



- | | | | |
|-----------|--------------------------------|-----------|--------------------------------|
| 1 | DC motor | 12 | Company logo |
| 2 | Machine screw | 13 | Sealing ring |
| 3 | Dry-type air filter | 14 | Screw plug |
| 4 | Compressor | A1 | Air inlet |
| 5 | Plate | A2 | Air outlet |
| 7 | Spring washer | A3 | Cooling system |
| 9 | Machine screw | E2 | Opening for cable lead-through |
| 10 | Plate | R2 | Rotation anticlockwise |
| 11 | Sign for direction of rotation | | |

Figure 4 Motor compressor set V10-T (example showing 8.012.1.321.012.8)



5.2 Figures of assemblies and components

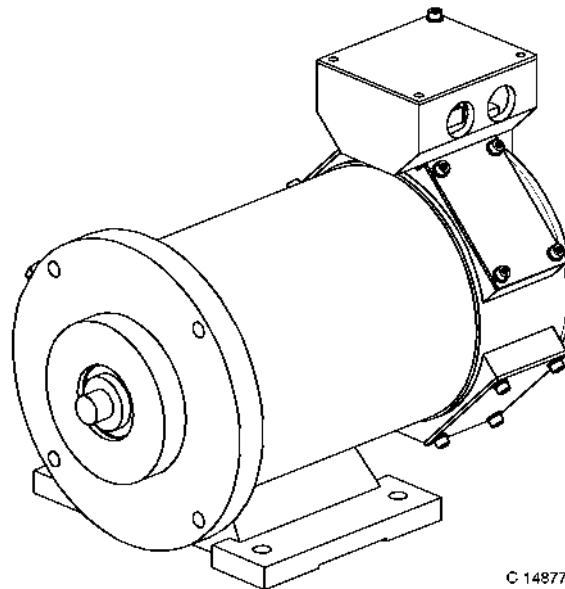
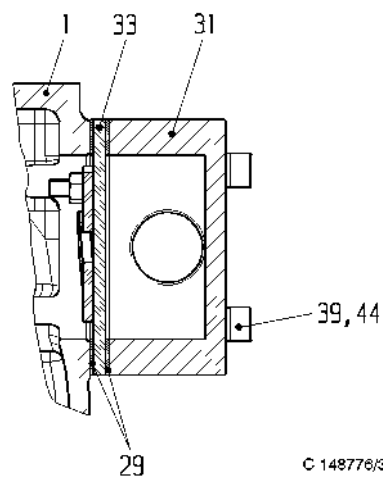


Figure 5 DC motor (1)



1 Crankcase

29 Seal

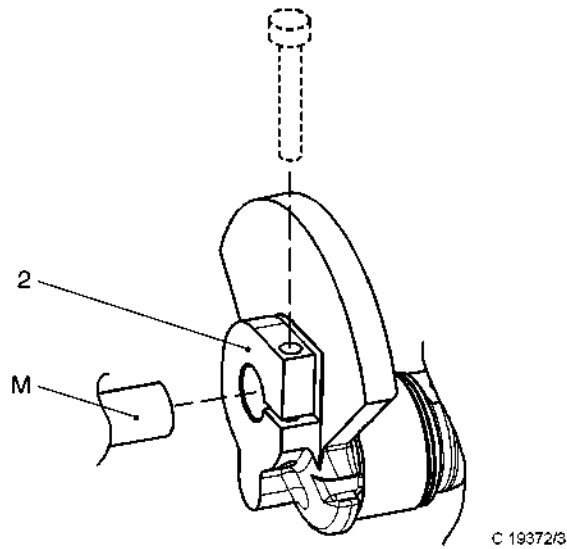
31 Housing

33 Valve plate

39 Spring washer

44 Machine screw

Figure 6 Compressor (4), viewing the cooling air inlet



2 Crankshaft

M Motor shaft

Figure 7 Compressor (4), viewing the motor connection

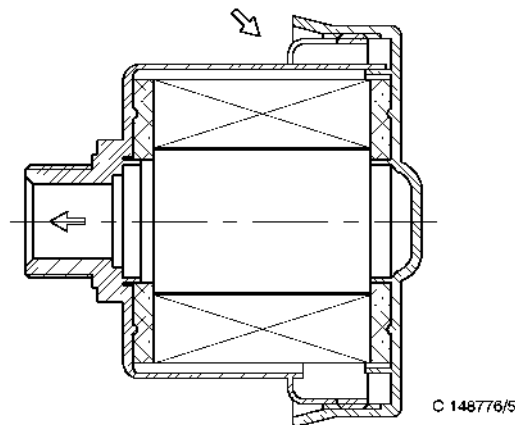


Figure 8 Dry-type air filter (3)

.....
.....
U - G F 1 0 . 2 9

Rev. 01 - 02.09.2013 - en
.....

.....
Overhaul Instructions

Check valve
RV7-T



Contact address

KNORR-BREMSE Systeme für Schienenfahrzeuge GmbH
Moosacher Str. 80
80809 München, Germany
Phone: +49 (89) 3547-0
www.knorr-bremse.com

This document was originally written in German.

Copyright Knorr-Bremse AG. All rights reserved, including industrial property rights applications.
Knorr-Bremse AG retains any power of disposal, such as copying and transferring.





Revision history

Meanings of changes N and R

Type of change		Explanation
N Change has no consequences: Preceding revision may continue to be used	N1	Validity changed
	N2	Text and/or graphics changed
	N3	Document structure changed
R Change has consequences: Preceding revisions are nil and void!	R1	Technical features changed
	R2	Text and/or graphics changed
	R3	Safety notes amended

Changes made:

Revision	Date	Section	Type of change					
			N1	N2	N3	R1	R2	R3
01	02.09.2013	Revision history started		x				
		All			x		x	x



Table of contents

1	General information	5
1.1	Technical changes	5
1.2	Target group for this document	5
1.3	Notes and warning messages	6
2	Introduction	7
2.1	Related documents	7
3	Basic safety information	8
3.1	Validity	8
3.2	Authorized use of the product	8
3.3	Operator's / maintainer's commitment to due care	9
3.3.1	Assignment of personnel	9
3.3.2	Availability of the document	9
3.3.3	Amendments to the document	9
3.3.4	Spares and wearing parts	9
4	Maintenance	10
4.1	Requirements	10
4.1.1	Auxiliary products and working materials	10
4.1.2	Special tools	10
4.2	Disassembly	11
4.3	Disposal	14
4.4	Cleaning	14
4.5	Inspection	15
4.6	Assembly	17
4.7	Testing	19



1 General information



WARNING

Please read this document carefully from start to finish to ensure safety of operation and to avoid personal injuries and damage to equipment.

1.1 Technical changes

KNORR-BREMSE reserves the right to change the unit or this document at any time without giving special notice.

1.2 Target group for this document

This document is intended for use by persons qualified by KNORR-BREMSE, who

- have the skill, experience, safety awareness and professional ability to repair and overhaul the unit,
- have read and understood this document from start to finish and
- are familiar with the safety codes and accident prevention regulations for these activities.



NOTE

This document will be useful to other target groups as well, e.g. project engineers. However, it does not claim to provide complete information for such target groups.



1.3 Notes and warning messages

Warning messages are subdivided into the following hazard levels in this document:



DANGER

Failure to comply with these instructions will lead to irreversible personal injuries which may have fatal consequences.



WARNING

Failure to comply with these instructions may lead to irreversible physical injuries which may have fatal consequences.



CAUTION

Failure to comply with these instructions may lead to personal injuries and/or to damage to the unit or the environment.

Safety notes have a specific structure which is explained here for DANGER:



DANGER

Source of the danger
Consequence of the danger
Remedial measures

Notes do not contain any messages relevant to safety and are intended merely to complete the reader's information.



NOTE

Notes contain useful hints and additional information about the unit.

Warning messages in other parts of these Overhaul Instructions draw your attention to the individual risks concerning your use of the product. Warning messages and notes generally precede the descriptions of the relevant applications.



2 Introduction

These Overhaul Instructions contain particulars specific to the unit and discuss off-board maintenance - repair and overhaul - of the unit.

2.1 Related documents

B-GF10.29 Description of check valve RV7-T

The related Test Instructions specific to each item number must be consulted.

A Spare parts catalogue is provided for every unit. The number of the Spare parts catalogue is composed of the letter "E-" and the unit's item number "XXXXX", i.e. "E-XXXXX". The item number is stated on the name plate attached to the unit.



3 Basic safety information

3.1 Validity



WARNING

Validity note (item number or type designation) ignored!

The consequences may be personal injuries and damage to the unit.

The validity notes in the document must always be taken into account. The item number or type designation is stated on the name plate and must agree with the validity note stated in this document.

This document is valid for units with item numbers:

I90476

STK1893



NOTE

Please contact KNORR-BREMSE Rail Services if the unit cannot be uniquely identified, e.g. because the name plate is illegible or missing.

3.2 Authorized use of the product

The unit named in Section 3.1 shall only be used in the system that has been designed and engineered by KNORR-BREMSE for the accompanying vehicle.

Other applications and assignments, as well as changes, attachments and modifications may jeopardize the safety, reliability and functionality of the system. They invalidate any warranty on the part of KNORR-BREMSE and transfer the liability to the operator.

KNORR-BREMSE must always be consulted before any other application or assignment is implemented.



3.3 Operator's / maintainer's commitment to due care

3.3.1 Assignment of personnel

The operator / maintainer shall ensure that the personnel assigned to the specified activities possesses the qualifications defined for the given target group.

3.3.2 Availability of the document

The operator / maintainer shall ensure that the present document is always available to the relevant personnel in a complete, up-to-date and readable form.

3.3.3 Amendments to the document

The operator / maintainer shall ensure that, at the place of use, the present document is regularly amended by, or replaced with, instructions based on:

- statutory accident prevention regulations
- statutory accident protection regulations
- trade association regulations

3.3.4 Spares and wearing parts

The operator / maintainer shall ensure that none other than genuine KNORR-BREMSE parts or KNORR-BREMSE-approved spares or wearing parts are used.

The installation of spares other than approved may impair the safety and reliability of a particular unit or of the overall system and invalidates any warranty on the part of KNORR-BREMSE.



4 Maintenance

KNORR-BREMSE gives top priority to safety and quality.

To help fulfil this claim, KNORR-BREMSE provides an overhauling service for its own equipment. KNORR-BREMSE performs overhauls in its capacity as the original equipment manufacturer, while accounting for the safety aspects of the production processes.

KNORR-BREMSE Rail Services have the experience and technical equipment needed for performing professional overhauls.

KNORR-BREMSE has the capacity to test the state of its equipment regularly during the life-cycle. The aim of this service is to find jointly with the customer the best maintenance interval for each individual project.

Please contact KNORR-BREMSE Rail Services if the unit happens to develop a malfunction that cannot be corrected.

4.1 Requirements

4.1.1 Auxiliary products and working materials

The following auxiliary products and working materials are needed; they can be purchased from KNORR-BREMSE by their order numbers (where stated):

- Chemical cleaning spirit for aluminium alloys, eroding less than 420 mg/(m² h)
- Cold cleaning substance compatible with plastics
- RENOLIT HLT2-KB grease (order number: ID No. 502647)

4.1.2 Special tools

The unit can be dismantled and assembled with standard tools.



4.2 Disassembly



CAUTION

Beware of incorrect handling!

Malfunctions and leakage due to damaged sealing surfaces.

Take care not to damage the sealing surfaces in the course of dismantling the unit.

See Figure 1 and Figure 2



NOTE

Part number 2 in the check valve with item number I90476 is a valve head with a vulcanized rubber disc.

Part number 2 in the check valve with item number STK1893 is composed of a valve cone (2.1) with a fitted valve sealing disc (2.2).



NOTE

Leave plug-in dowel pins (5) in housing (1). Only remove in case of damage.

- If included, remove O-rings (3) from housing (1).



CAUTION

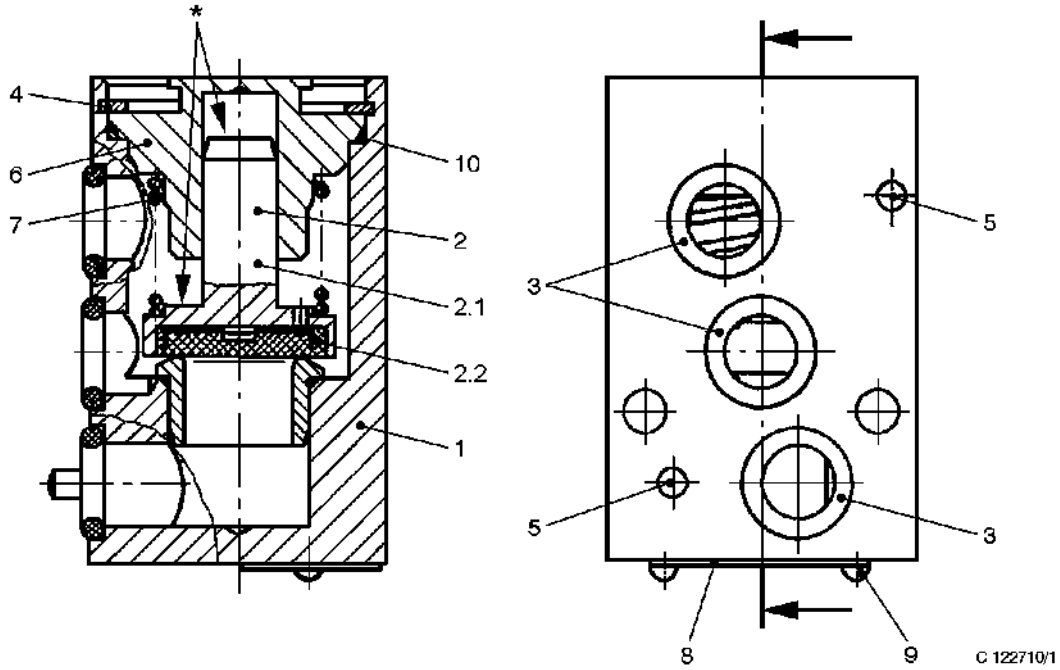
Pretensioned compression spring (7)!

The valve guide (6) is pretensioned by compression spring (7).

The pretensioned compression spring (7) may jump out of housing (1) and cause eye injuries.

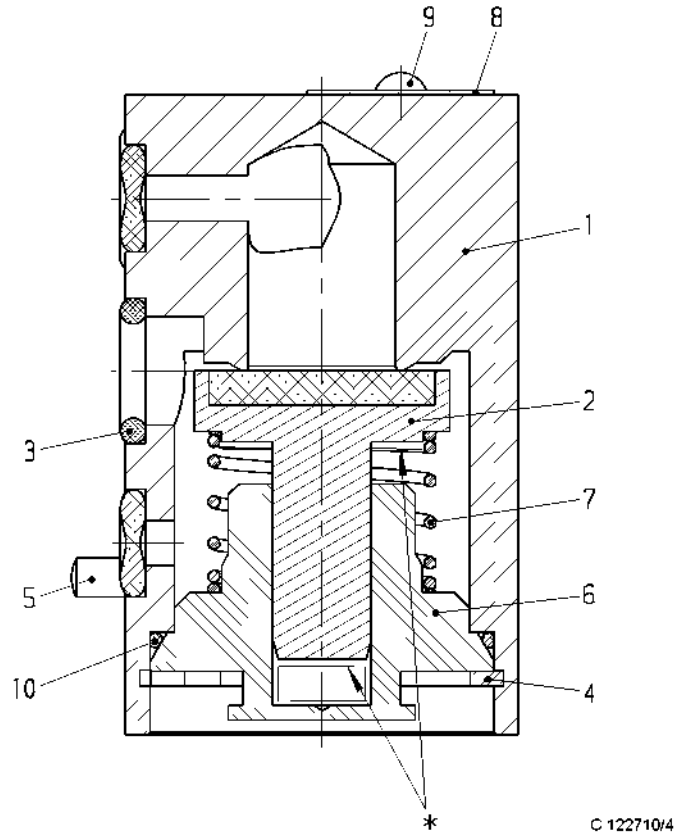
Perform all the working steps in the specified sequence.

- Secure and hold down the valve guide (6) while cautiously releasing the retaining ring (4) from housing (1).
- Decrease the pressure on valve guide (6) while relaxing the compression spring (7).
- Take valve guide (6), compression spring (7) and valve head/valve cone (2) out of housing (1).
- Release valve sealing disc (2.2) from valve cone (2).
- Release O-ring (10) from housing (1).



- | | | | |
|-----|--------------------|----|------------------------|
| 1 | Housing | 6 | Valve guide |
| 2 | Valve cone | 7 | Compression spring |
| 2.1 | Valve cone | 8 | Name plate |
| 2.2 | Valve sealing disc | 9 | Rivet |
| 3 | O-ring | 10 | O-ring |
| 4 | Retaining ring | * | No grease in this area |
| 5 | Plug-in dowel pin | | |

Figure 1 Check valve RV7-T
(the unit with item number STK1893 is shown here by way of example)



- | | | | |
|---|-------------------|----|------------------------|
| 1 | Housing | 7 | Compression spring |
| 2 | Valve head | 8 | Name plate |
| 3 | O-ring | 9 | Rivet |
| 4 | Retaining ring | 10 | O-ring |
| 5 | Plug-in dowel pin | * | No grease in this area |
| 6 | Valve guide | | |

Figure 2 Check valve RV7-T
(the unit with item number I90476 is shown here by way of example)



4.3 Disposal



CAUTION

Improper disposal of environmentally harmful substances is dangerous!
This would mean unnecessary and legally punishable harm to the environment.
Observe the waste disposal regulations of the responsible authorities.

Once dismantled, all the parts needing to be replaced can be sorted out in accordance with the directions in the related Spare parts catalogue, and then submitted for proper disposal.



NOTE

Refer to the Spare parts catalogue for the exact names of parts and recommended replacements. The WEC (wearing code) column shows the times when the component parts have to be exchanged or need to be inspected.

Component parts not having a wearing code need only be sight-checked. Component parts identified by wearing code C must be inspected separately. Any component part displaying functionally harmful damage must be exchanged. (see Section 4.5)

4.4 Cleaning

Clean all parts that are not going to be exchanged.



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of cleaning.

- Clean all metal parts with chemical cleaning spirit in a bath at 70°C to 80°C and then blow dry with compressed air. Read the notes and details on cleaning substances in Section 4.1.1.



NOTE

The cleaning substance must be compatible with plastics.

- Clean all non-metallic parts with a cold cleaning substance and rub dry with a cloth.

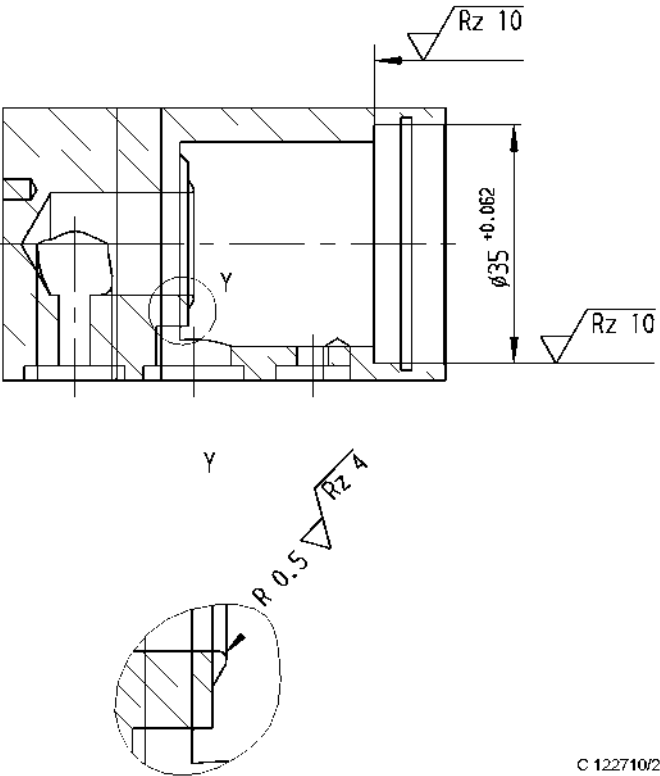


NOTE

Once cleaned, the component parts must be kept in a dry place away from dust and damage.

4.5 Inspection

- Having cleaned all the relevant components, give them a careful visual inspection. Exchange any part displaying damage such as cracking, distortion, corrosion or thread deformation.
- As well as making the mandatory visual inspection named above, carry out additional checks on the parts listed in the following table. Special information is given in the Notes column and illustrated, where applicable, in a figure.

Part No.	Name	Notes
1	Housing	 <p>C 122710/2</p> <p>The dimensions and surface finishes must be to specification. Failing this requirement, exchange the part.</p>



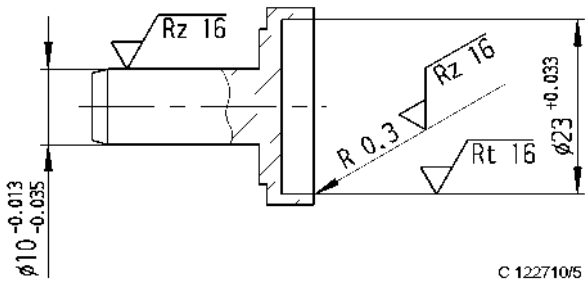
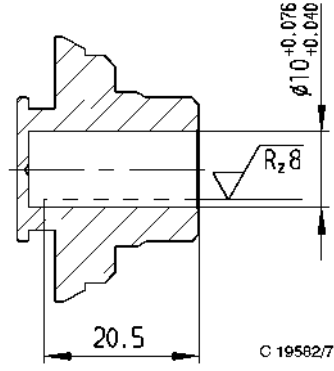
Part No.	Name	Notes
2.1	Valve cone (only valid for item number STK1893)	 <p>C 122710/5</p> <p>The dimensions and surface finishes must be to specification. Failing this requirement, exchange the part.</p>
6	Valve guide	 <p>C 19562/7</p> <p>The dimensions and surface finish must be to specification. Failing this requirement, exchange the part.</p>

Table 1 Separate inspection of special components



4.6 Assembly



WARNING

Beware of using auxiliary products and working materials incorrectly!
The skin or respiratory tracts may be harmed or inflamed.
It is vital to observe the manufacturer's safety codes and directions for use.



CAUTION

Beware of contaminating and damaging the unit!
Functionality will be impaired or the unit might even fail.
Before starting work, clean your place of work and tools and keep them clean throughout assembly.



CAUTION

Beware of incorrect handling!
Malfunctions and leakage due to damaged sealing surfaces.
Take care not to damage the sealing surfaces in the course of assembling the unit.



NOTE

Components must always be checked, and overhauled or repaired, before the unit is assembled. The notes in Section 4.3 on the use of parts and components must be observed.



NOTE

Do not install new elastomers (seals) that are older than four years. Verify the date of manufacture prior to use.
If a spare parts kit is going to be used, its date of manufacture must not be older than one year.



NOTE

Make sure that the thinly greased seals rest and stick correctly in their seats without dust or dirt.



NOTE

The lubricants specified in Section 4.1.1 are the only ones allowed for greasing components. To avoid grease ingress in the air passages, lubricate some of the parts with just a **thin** film of grease. The lubricant and how it is to be used are mentioned at the appropriate places in the following text.



See Figure 1 and Figure 2



NOTE

Do not leave or put any grease on the insides of compression spring (7) or on the area in valve guide (6) below valve head (2) (see marking * in Figure 1 and Figure 2).

- Lubricate O-rings (3 and 10) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the end faces of compression spring (7) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the shank of valve head/valve cone (2) with a **thin** film of RENOLIT HLT2-KB grease.
- Lubricate the guiding bore for valve guide (6) in housing (1) with a **thin** film of RENOLIT HLT2-KB grease.
- Insert the greased O-ring (10) in housing (1).
- Press valve sealing disc (2.2) into valve cone (2).
- Put together valve head/valve cone (2), compression spring (7) and valve guide (6), insert the assembly in housing (1) and secure with retaining ring (4).



NOTE

Make sure that the retaining ring (4) is seated correctly.

- Put the greased O-rings (3) in their seats on housing (1).
- Test the unit. Plug the ports and connections unless the unit is going to be tested immediately after assembly.



4.7 Testing

Once assembled, the unit must be tested on a test bench in accordance with the applicable Test Instructions.



NOTE

The unit must be kept in a dry place away from dust and damage.

The ports and connections must be plugged and closed once the unit has been tested successfully. Joining surfaces (if any) must be protected from damage.