Maintenance manual

Air Spring System

GMT Part No. 17305201

edition en | original edition

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1 On this Manual

This maintenance manual describes the necessary maintenance operations incurring throughout the service life of the rubber metal parts and air spring systems.

Proposals are made for the necessary tools and auxiliary devices and the necessary dimensions are named.

The maintenance intervals are based on the specification data and may be adapted according to the findings from the operation.

Criteria are described in which the parts are to be replaced or respectively forwarded to the supplier for an assessment of the further applicability.

1.1 Applicable Documents

- Drawing GMT Part No. 17305201
- Drawing GMT Part No. 17104501
- DIN 7716:1982-05: Rubber products; requirements for storage, cleaning and maintenance
- ISO 2230:2002-04: Rubber products - Guidelines for storage
- DIN 5514-2:1980-04: Materials for railway vehicles; elastomers, testing

1.2 Convention of Description

The following representations are used in these manual:

1.2.1 Notice and Information

NOTICE

- Indicates situations or maloperation that may lead to material damage.

INFORMATION

- Indicates important information or instructions.
- Failure to comply with these instructions will prevent or substantially hinder the successful completion of the actions described in this documentation.

2 Safety

2.1 Warning and Safety Messages

This manual contains important warnings and safety instructions which must be observed by the user.

The product may only be used and operated by qualified personnel who are capable of complying with the necessary safety precautions for use and operation.

The repair of the product may only be carried out in the delivery unit or by the qualified personnel trained for this purpose.

Any damage resulting from non-compliance with the safety regulations and operating instructions described in this manual are excluded from the warranty and liability claims against the manufacturer!

2.2 Accident Prevention Regulations

Besides the instructions in this manual, the personnel must be familiar with all applicable local accident prevention regulations and the national safety regulations and must always comply with them.

2.3 Graduated Warning and Safety Messages

The following icons and standard text formats are used in this manual:

2.3.1 Caution

⚠ CAUTION

- Indicates a hazard that may result in minor or moderate injuries.
- This is the general warning sign. It is used to alert the product user to potential hazards. All safety statements that follow this symbol must be followed in order to prevent possible damage.

2.4 Intended Use

The Air Spring System GMT Part No. 17305201 is intended only for use in rail vehicles and shall be used only in the destined vehicle by the vehicle manufacturer / developer. The components shall be installed as specified and shall only be subjected to the specified operating conditions. Should individual parameters deviate or disturbances appear, GMT has to be contacted to avoid risks and damages. Intended use also includes compliance with the instructions in this maintenance manual, conducting tests and maintenance.

3 Product description

3.1 Designation of Delivery Item

Air Spring System GMT Part No. 17305201

3.2 Description of Delivery Item

The Air Spring System is assembled between car body and bogie frame and is used as isolation element and rotary element.

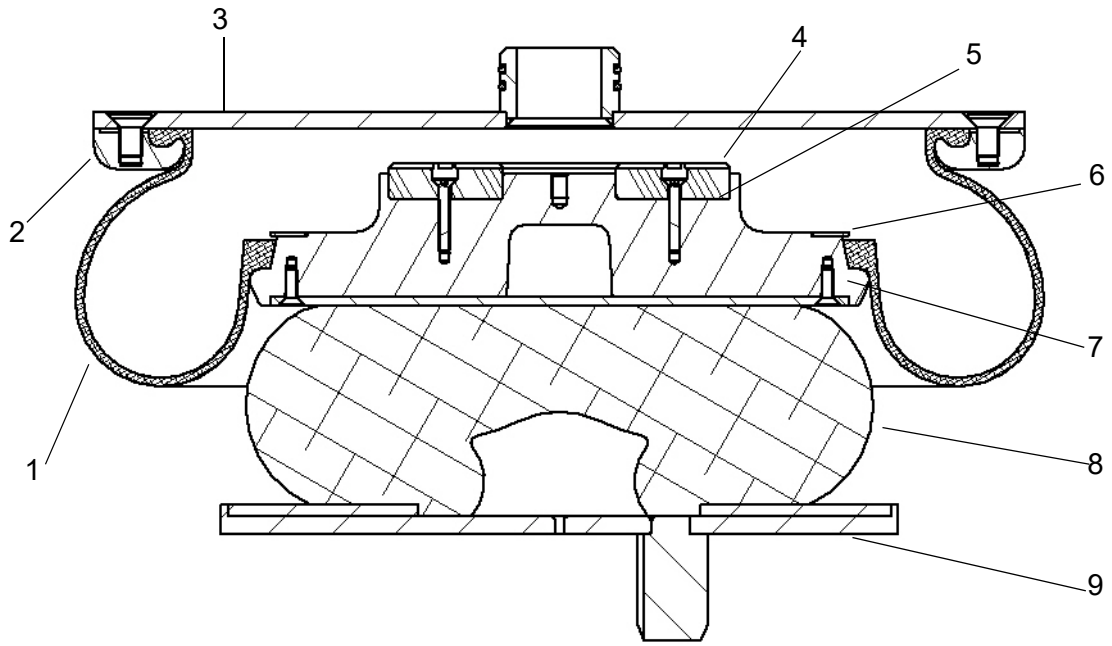


Figure 1: Air Spring System

The air spring system consists of an air bellows and an additional spring.

1 Air spring bellows 17014803

2 Mounting ring E860500

3 Top plate E860498

Additional Spring

The additional spring consists of:

4 Sliding plate E860501

5 Washer E860514 / E860516 / E860517

6 Clamping plate E860400

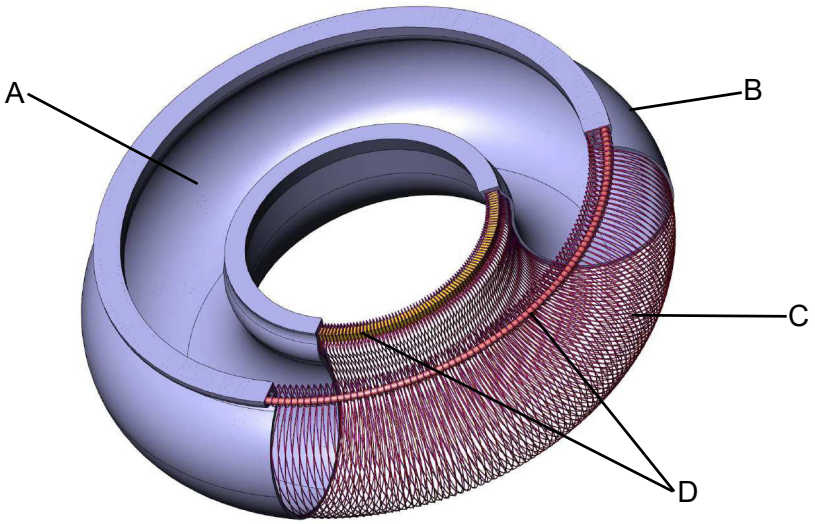
7 Rim E860496

8 Half Hour Glass Spring 73900504

9 Ground plate E860499

3.3 Construction of the Air Spring Bellows

The air spring bellows consists of several layers of high-quality elastomers in which reinforcing material [C] is bedded. The inner layer [A] mainly has sealing function and the outer layer [B] is resistant against ozone and is weatherproof. Moreover the outer layer protects against mechanical damages. The steel core [D] in the top and lower bulge area serves for sealing between air spring and the respective holding fixtures.



[A] Inner rubber layer
[B] Outer rubber layer
[C] Reinforcing material
[D] Steel core

Figure 2: Construction bellows

3.4 Technical Specification

Technical Specification	
Diameter	710 mm / max. 755 mm
Height (inflated, under load 70 kN)	300 mm
Weight	122,5 kg ± 5%

Table 1: Technical Specification

4 Transport and Storage

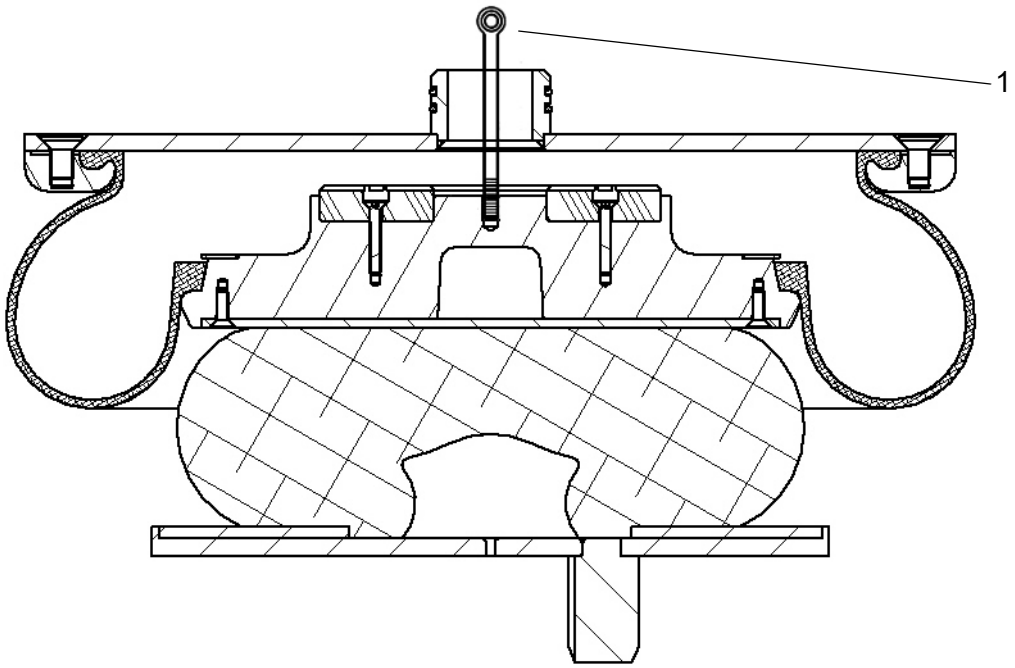
4.1 Transport

The air spring system is delivered completely assembled.

⚠ CAUTION

High weight of the air spring system

- The air spring system always carry a couple or with a lifting device.
- Lift the air spring system only by using an eye bolt
- Wear safety shoes!



[1] Eye bolt DIN 444 A - M12x180

Figure 3: Lifting air spring system by an eye bolt

4.2 Storage

The storage of rubber parts is regulated in DIN7716:1982-05 and ISO 2230: 2002-04 and mainly covers long-term storage (longer than 6 months). However, it can also be used for short-term storage (less than 6 months), e.g. production or delivery storage with continuous material flow.

Storage and storage time recording of vulcanized rubber products are described in ISO 2230:2002-04. In this standard the elastomer products are divided into three groups with different storage times. These are shown in Table 2.

The elastomer of Air Spring System is part of group 1

Classification acc. to ISO 2230:2202-04	Designation	Storage time (in years)	Extension (in years)
Group 1	NR, AU, EU, SBR	5	2
Group 2	NBR, HNBR, ACM, AEM, XNBR, ECO, CR, IIR	7	3
Group 3	FKM, VMQ, EPDM, FVMQ, PVMQ, FFKM, CSM	10	5

Table 2: storage times of elastomers

The storage temperature shall be below 25 °C and products shall be stored away from direct sources of heat such as boilers, radiators and direct sunlight.

If the storage temperature is below 15 °C, care should be exercised during the handling of stored products as they may have stiffened and become susceptible to distortion if not handled carefully.

The temperature of products taken from such low-temperature storage should be raised to approximately 30 °C throughout their mass, before the products are put into service.

Rubber products made of certain chloroprene rubber types may not be stored at temperatures lower than + 12 °C.

Care must be taken to ensure that the components are protected from air supply, in particular to keep away the ozone which is detrimental to elastomers.

The storage of elastomeric products in humid storage areas is to be avoided. Condensation should not occur. A relative humidity of 65 % in the storage room is most favorable.

NOTICE

- Solvents, fuels, lubricants, chemicals, acids, brines, disinfectants or else are not allowed in the storage room.
- Vapors of these substances can damage the rubber.

Elastomer products are to be stored stress-free which means without tension, compression or any other deformation since stress promotes a lasting deformation as well as the development of cracks, unless this is provided for constructively.

NOTICE

- Particular metals, especially copper and manganese have a damaging effect on rubber products

Due to this, rubber products should not be stored in contact with these metals but have to be protected by packaging them or by covering them with a layer of a suitable material, e.g. paper or polyethylene.

The material of the containers and the material for packaging- and covering should not contain any damaging ingredients for the rubber products, e.g. copper or copper-containing alloys, petrol, oil or suchlike.

NOTICE

- Foils containing softeners are not allowed to be used as packaging material.

If rubber products have to be powdered, the powder should not contain any harmful ingredients for rubber-products. Appropriate materials for powdering purposes are French chalk, prepared chalk, fine-grained mica flour and rice starch.

5 Assembly / Disassembly

INFORMATION

Incorrect mounting / dismounting

- Incorrect procedure leads to damages of the air spring bellows or the sealing areas of the top plate or rim.
- Perform the dismounting and mounting carefully by adequately trained and experienced staff.

5.1 Safety Messages

Note to Reader

Please read and observe the following safety instructions before and during assembly / disassembly or when using this air spring system.

Maintenance and control work as well as the exchange of components must be carried out by suitably trained and knowledgeable personnel.

⚠ CAUTION

High weight of the additional spring system

- If the complete system is lifted, the additional spring may separate from the air spring bellows (see picture below).
- This leads to risks for injuries.
- Do not lift the complete system at the top plate for transportation, disassembly or similar.
- Wear safety shoes!

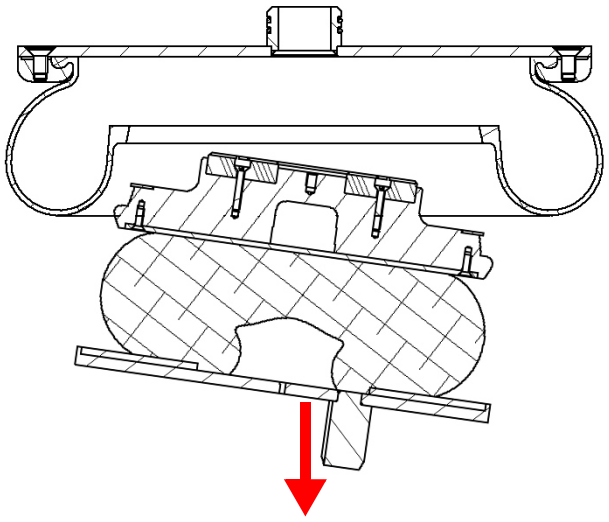


Figure 4: Loosen of the additional spring

⚠ CAUTION

High Pressure in the air spring bellows

- If the system is not fixed, the air spring bellows can separate explosively from the additional spring.
- This leads to risks for injuries.
- Fix the system in a suitable mounting device or in the bogie and load the air spring system with the appropriate axial force, before applying pressure.

⚠ CAUTION

High Pressure in the air spring bellows

- When the air bellows will be set under pressure, it is possible that the bellows instantly become detached.
- This leads to risks of injury to people in the immediate vicinity (hearing damage).
- A hearing protection has to be worn all the time.

5.2 Required Tools

For the assembly and disassembly the following tools are required:

- Torque key (torque range 0 Nm up to 120 Nm)
- Hexagon socket screw key
- Hammer (1000 g)
- Assembling aid (hard wood)
- Cleaning wipes
- Grease
- Soap water
- Compressed air supply
- Press
- Mounting level

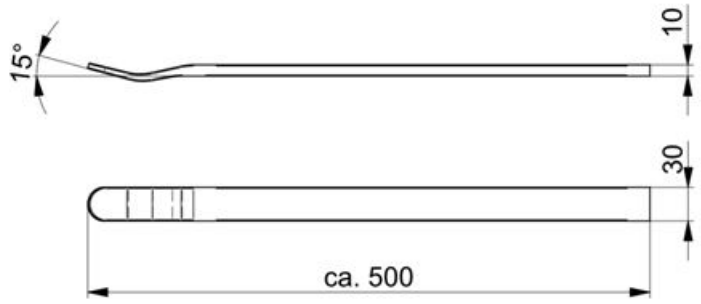


Figure 5: Mounting lever

NOTICE

Sharp edges of the mounting levers

- Sharp edges can cause damages on the bellows.
- Make sure that the mounting levers have no sharp edges to avoid damages on the bellows.

5.3 Disassembly of Air Spring System

INFORMATION

Perform the disassembly only in a pressure-free state!

1. The additional spring should stand on to a solid support and not hang in the air.
2. Loosen the screws and remove the Top Plate.

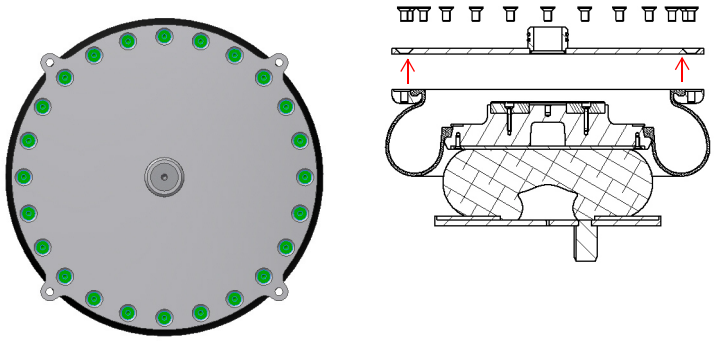
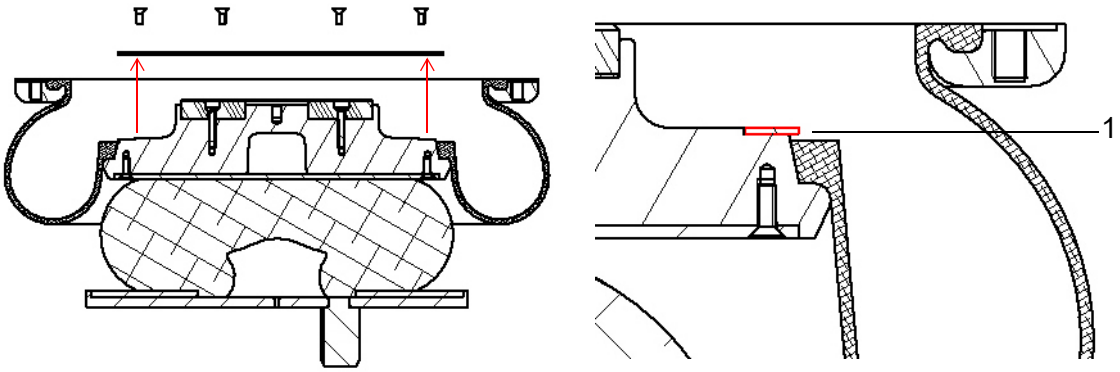


Figure 6: Disassemble the Top Plate

3. Loosen the screws and remove the Clamping Plate.



[1] Clamping plate

Figure 7: Disassemble the Clamping Plate

4. In the next step, the mounting lever is slowly inserted between the lower bulge of the air spring and the shoulder of the rim (see Picture below). The mounting lever is inserted until metal contact between the mounting lever and the conical receiving area takes place.

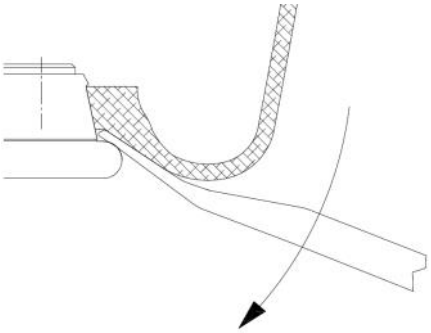


Figure 8: Disassembly additional spring (sample)

INFORMATION

- Push the mounting lever as far as possible. Otherwise damage may be caused to the air spring top plate and the bellows, or the bellows can not be disassembled.
- A second mounting lever in the near the first (approximately 10 cm) can be used for support.
- Damage to the corrosion protection that have arisen through the disassembly must be corrected.
- Sharp scratches can cause damage to the bellows.
- Remove sharp scratches on affected parts.

5.4 Assembly of the Bellows on Mounting Ring

1. Clean the air spring bellows with a cleaning cloth.
2. The mounting ring is clamped in a corresponding mounting device.

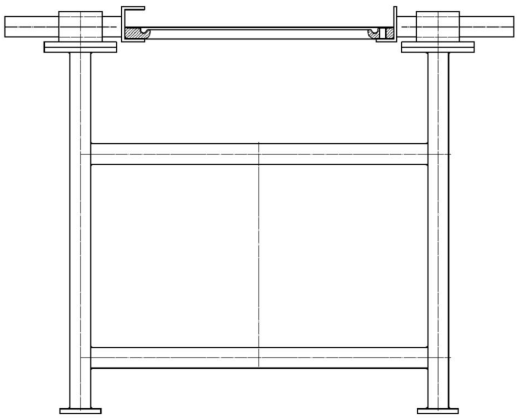


Figure 9: Mounting device

3. Moisten the outside of the bellows with soapy water so that the bellows can easily slide through the ring.
4. Set the bellows one-sided at the clamped mounting ring and press it step by step behind the clamp nose.

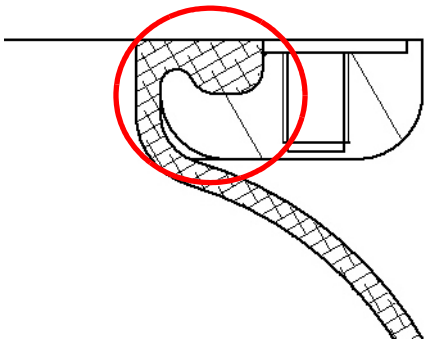
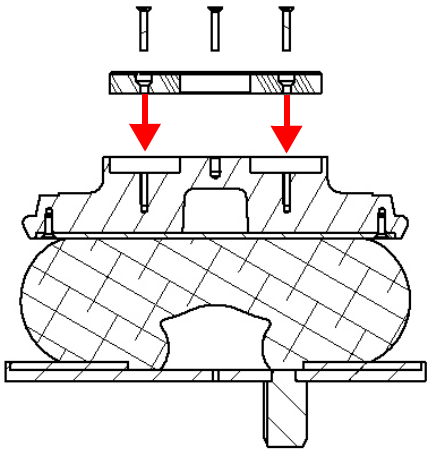


Figure 10: fix bellows to mounting ring

5. The bellows must be located on each point on the circumference clean and completely behind the clamp nose.

5.5 Mounting the Sliding Plate



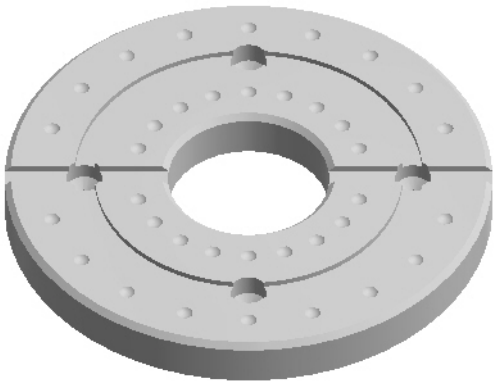


Figure 11: Mounting the Sliding Plate

1. Place the sliding plate with the appropriate washer on the rim.
2. Wet the 4 screws M8x50 - A2-70 DIN 25201-G2 with Loctite 243 and place them in the corresponding holes.
3. Tighten the screws with a torque of 3 Nm according to drawing GMT-No. 17104501.
4. After exchange the bellows or the additional spring fill the indentations with Berusil FO 22 to lubricate the sliding plate.

5.6 Assembly of the Bellows

1. Clean the air bellows with a cleaning cloth. The cleaned areas are then coated with clear or soapy water.
2. The bellows is initially manually placed on the rim by hand. Ensure that the air spring bellows is placed in a straight position in order to avoid tilting.

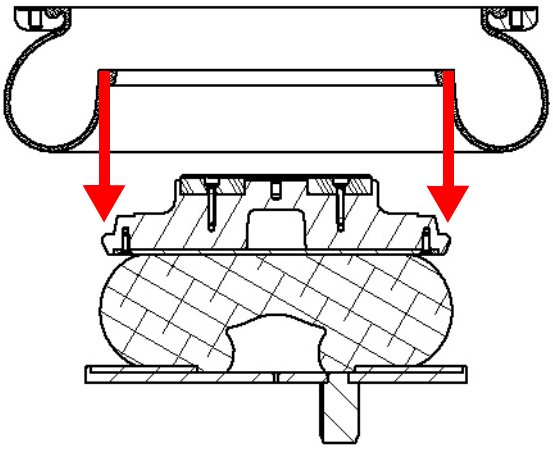


Figure 12: Place bellows on additional spring

3. After being fitted, the air spring bellows is pressed downwards along the circumference by hand to ensure a uniform fit. The assembly can be supported by means of a hammer (1000 g) and the assembly aid (hardwood).

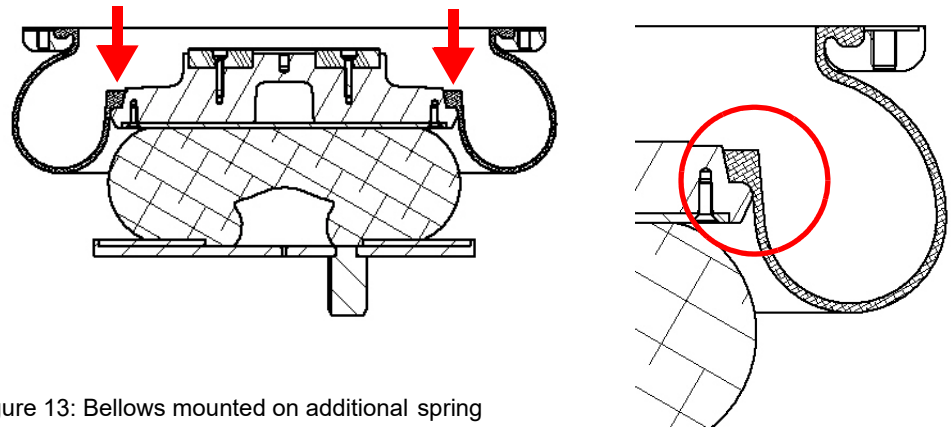
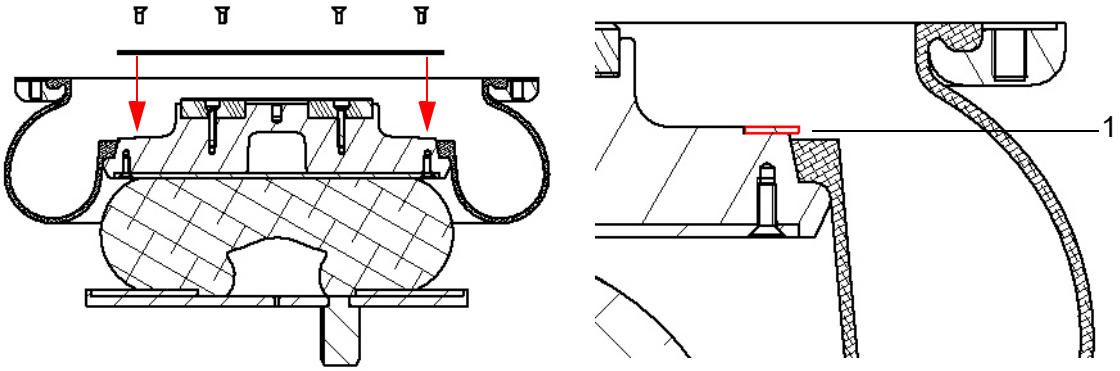


Figure 13: Bellows mounted on additional spring

4. Place the clamping plate on the inside of the rim.



[1] Clamping plate

Figure 14: Mounting the clamping plate

5. Wet the screws with Loctite 243 and tighten them with a torque of 20 Nm.
6. Note the curing time of the adhesive manufacturer.

5.7 Mounting the Top Plate

1. Place the top plate on the pre-assembled system.

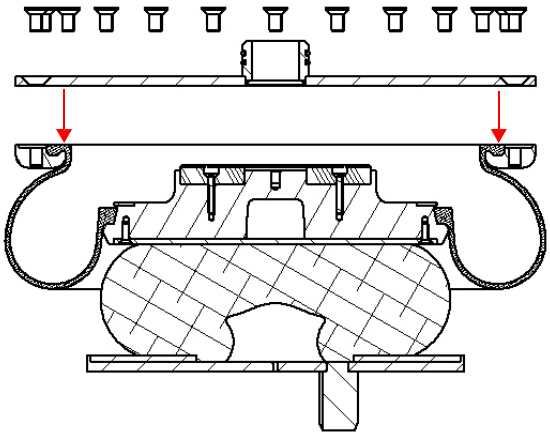


Figure 15: Mounting the top plate

2. Wet the screws ISO 10642 - M16x30 - A2-70 with Loctite 243 and place them in the holes.

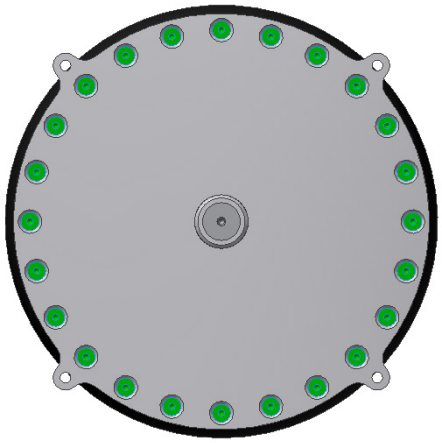


Figure 16: Screws on top plate

3. Tighten the screws step by step to the specified torque.
   - pre-assembly: 20 Nm clockwise
   - step 1: 90 Nm crosswise
   - step 2: 120 Nm clockwise
   - step 3: serial test
   - step 4: 120 Nm clockwise
4. Note the curing time of the adhesive manufacturer.

5.8 Leakage Test

The leakage test shall be performed after assembling completely the air spring system. During the test, appropriate safety precautions such as the wearing of safety gloves, safety goggles

and hearing protection must be strictly observed. The leakage test can be performed at the completed bogie.

⚠ CAUTION

High pressure in the bellows

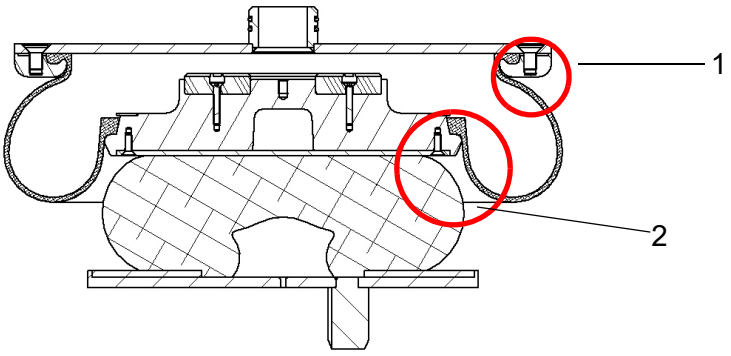
- If the installation height is not fixed, the bellows can explosively separate from the additional spring.
- This leads to risks of injury
- Fix the system in a suitable mounting device or in the bogie and load the air spring system with the appropriate axial force before applying pressure.

⚠ CAUTION

When air is supplied, the bellows fills suddenly with the operating pressure

Here is an acute danger that limbs (fingers, etc.) are clamped.

- Do not grab between the bellows and additional spring.
- Do not grab between the bellows and the upper plate.



[1] danger spot bellows - top plate

[2] danger spot bellows - additional spring

Figure 17: place of danger

We recommend following test procedure:

1. Connect a pressure measuring device to the pressure conduction between the stop valve and the air spring system
2. Fill up the air spring up to 1.3 times the maximal pressure P_M 6.5 bar at F_M 160 kN), that means 8.45 bar. Keep the compression constantly for 30 seconds.
3. Reduce the pressure to 0.9 times the nominal pressure, that means 5.85 bar. Close the air supply for at least 10 minutes.
4. Measure the decrease in pressure. This should not exceed 0.15 bar between 5 and 10 minutes.
5. In case of a major pressure loss, the leakage location must be localized with leakage detection spray or soapy water and sealed by appropriate measures.

6 Initial Operation

- not applicable -

7 Operation

- not applicable -

8 Maintenance

8.1 General Instructions

Controlling, cleaning and maintaining rubber-metal parts and molded rubber parts

8.2 Range of Coverage

The following guidelines apply to elastomeric components and rubber-metal components, based on the use of caoutchouc and rubber in pure form. Alternatively to metallic materials partially plastics are used. These documentation were drawn up in line with DIN 7716:1985-05 and ISO 2230:2002-04 and are also valid for the use of synthetic rubber products regarding the general conditions.

8.3 General

Under unfavorable storage conditions or improper treatment most elastomer products change their physical properties. This can lead to a significant decrease in lifetime of elastomer products. For example from excessive hardening, softening, permanent deformation as well as from flaking, cracks or other surface damage they can become unusable. The changes can be caused by the influence of oxygen, ozone, heat, light, humidity, solvents or by storing under stress.

Properly stored and treated rubber products remain virtually unchanged in their characteristics for a long time (several years).

INFORMATION

- Rubber-to-metal-bonded parts are mainly suited for the usage in compression- and shear-loads, pulling-loads should be avoided.

8.4 Service Life and Control

The Air Spring System does not require any servicing.

8.5 Visual Check

8.5.1 Air Spring Bellows

Check the air spring bellows visually at least once a month.

NOTICE

In general: If first fabric layers visible, the air spring must be replaced preventively.

INFORMATION

Deposits at the Bellows

- Remove deposits on the bellows or at contact points to other parts according to the specifications for cleaning in the next chapter. An operational risk is not necessarily given at this time.
- On locally damaged areas in the form of cracks, scuffs, rubber peeling or blistering should be checked immediately how far the damage has progressed.
- For this check, use only dull and edgeless tooling.

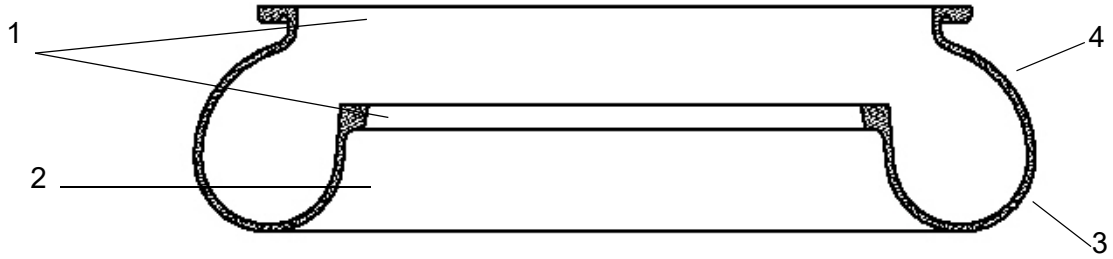


Figure 18: Air Spring Bellows

1. Top and lower sealing surface

These areas are extremely important for the functionality of the air spring bellows and is checked by performing a 100 % tightness check after production. Provided that the air spring bellows has been fitted properly, there is no way of hurting these areas. If any damages are detected there could be following reasons:

- Incorrect mounting
- Incorrect dismounting
- Incorrect storage before initial operation

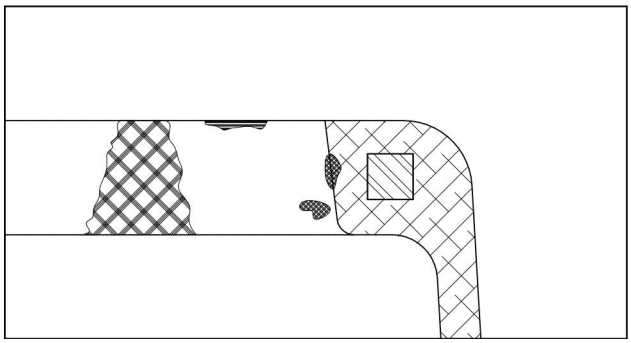


Figure 19: Delamination

NOTICE

- Delamination due to mechanical influences or foreign bodies could cause leaks.
- Do not use spring bellows with these defects again.
- Replace the bellows within the next 3 months!

INFORMATION

- Irregular partial detachments can be caused by former dismounting of the bellows. Usually these defects can be tolerated.

2. Cuts in the lower area of the loop

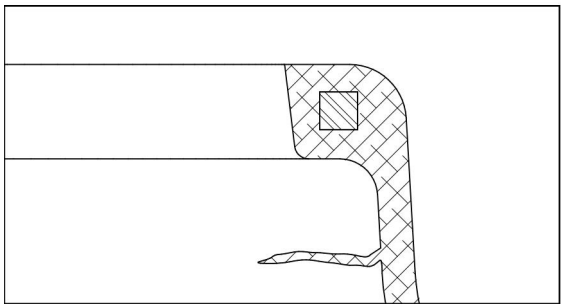
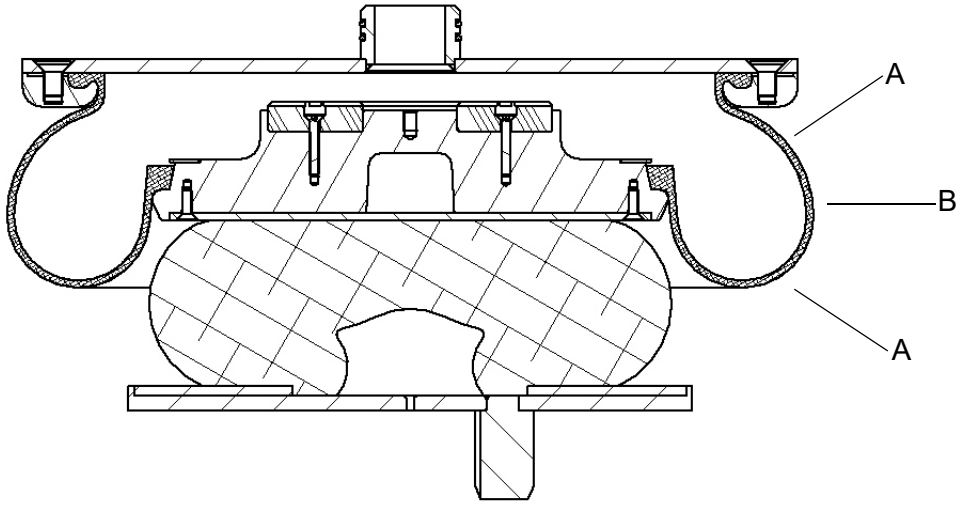


Figure 20: Cuts

NOTICE

- **Exchange the air spring bellows within the next 3 months if any cuts are detected in this area during inspection.**

3. Abrasive damages and cuts



A - Abrasive damages

B - Cuts

Figure 21: Abrasive damages and cuts

NOTICE

- Abrasive damages or small cuts on the outer rubber layer of the bellows can be tolerated as long as the reinforcing material is not visible.
- **Exchange the air spring bellows within the next 3 months, if it is visible and frayed (A) or incised (B).**

4. Detachment of the outer layer of the rubber

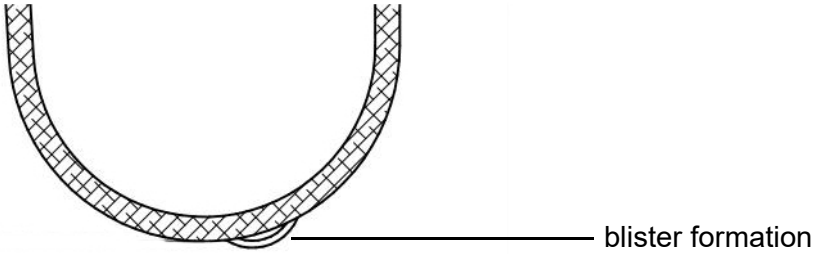


Figure 22: Blistering

When a bubble appears on the surface during operation, it is usually caused by incorrect storage and long-term oil contact.

Small bubbles:

Highlight the bubbles. Pierce the bubbles with the dimensions (diameter or length) <30 mm with a needle. The needle should penetrate into the bubble as far as possible parallel to the surface of the air spring bellows.

No additional checks are required, visual check of marked area at next regular visual inspection.

Medium bubbles:

Highlight the bubbles. Pierce the bubbles with dimensions between 30 and 50 mm. The bellows may stay in operation under normal service conditions.

Replace it preventively at next opportunity. No additional checks are required, visual check of marked area at next regular visual inspection.

Big bubbles:

Do not pierce the bubbles with dimensions > 50 mm!

Critical: Replace the bellow immediately.

8.5.2 Additional Spring

INFORMATION

Perform a visual check before assembly and afterwards regularly between the general inspections.

The check of the bonding between rubber and metal can be supported by hand by a mechanical bonding test. The rubber may be pressed back with a blunt test iron (rounded corners> 1 mm).

NOTICE

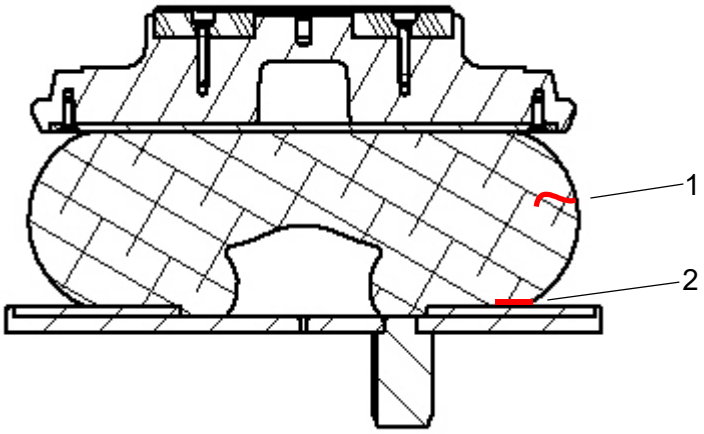
Partial debonding of the edges of the bonding zone between the elastomer and the metal

- Partial debonding of the edges of the bonding zone between the elastomer and the metal up to a depth of 8 mm is acceptable and do not affect the function and safety of the components.
- Exchange the part if the debonding is larger than 8 mm.

8.6 Replacement Criteria

A replacement of elastomer components or elastomer-metal components is required e.g. in the following cases when:

- more than 10 clearly visible cracks per cm² have appeared on the rubber surface as a result of atmospheric exposure
- the parts have swollen strongly, due to inadmissible oil-moistening.
- a loss in the rubber-metal bonding (possibly due to rust creep or corrosion of the metal parts) has occurred
- there is mechanical damage which could lead to a further destruction of the product due to sensitivity for notches of natural rubber
- local bulges are visible that do cover the entire side and with a depth of a multiple of the layer thickness
- Frayed bulges occur parallel to metal parts
- an above-average deformation occurs on metal parts of an elastomer-metal component as a result of deflection
- crack depth < 10 mm is acceptable, no further actions are necessary
- crack depth > 10 mm to 20 mm is to be observed, documenting the crack growth
- crack depth > 20 mm: additional spring is to be exchanged at short notice



[1] Replacement criterion: crack depth

[2] Replacement criterion: debonding T > 8 mm

Figure 23: Replacement criterion

During operation a white-grayish film might show on the rubber surface. This film is aging protecting wax or compounding ingredients that are blended with the elastomer compound to protect against ozone and other environmental influences. Due to component deformations these ingredients migrate to the surface of an elastomeric component. In the area of wrinkles the film might be levigated.

At first sight, such an area can be diagnosed incorrectly as cracks in the elastomer or sulfur rash. This folding is typical for the structure of the elastomeric surface and is caused by compression of the component and the incompressibility of the elastomer. Should uncertainty persist, report to the supervisor.

[1] Discoloration

Figure 24: Discoloration example

INFORMATION

- Slippery surfaces of PA or similar materials must be free from cracks and breakouts. A fixed connection to the other component is required.

8.7 Maintenance Plan

MAINTENANCE									
Activity	Interval								Page
	monthly	3 month	6 month	yearly	before assembly	between main inspection	after 8 years	after revision (after exchange bellows/additional spring)	
Visual inspection bellows	X				X				18
Visual inspection additional spring		X			X	X			22
Leakage Test					X				16
Exchange bellows							X		12
Exchange additional spring							X		22
Lubricating Sliding Plate					X			X	14

Table 3: Maintenance Plan

8.8 Media Resistance

8.8.1 General Information

The bogie components include rubber compounds out of natural rubber with different shore hardness and related synthetic rubber composites. The chemical resistance of these rubber compounds is chosen according to the mechanical requirements and therefore is comparable among each other.

8.8.2 Resistance against Environmental Impacts and Loads

The rubber compounds used in bogies are resistant to environmental influences under normal climatic conditions which mean temperatures between –30 °C and +50 °C. Resistance against climatic influence, especially against ozone, and higher temperatures, caused e.g. by the waste heat of motors, is improved by the proportioning of appropriate chemicals.

INFORMATION

- The elastomers used are resistant against loads which are usual in railway application.
- Pollutions caused by oil and lubricants as well as feces have to be removed regularly by using cleaning agents commonly used for bogies.
- Elastomers made of natural rubber are not permanently resistant against mineral oils and fuels.

8.8.3 Resistance against Machine Cleaning

The elastomers used are resistant against phosphoric acids and hydrochloric acids as well as against alkaline cleaning agents used for cleaning of the exterior of vehicles.

The resistance has been proven at selective elastomers made of natural rubber in test fluids according to DIN 5514 part 2 table 3 representing other cleaning agents which are customary in trade.

INFORMATION

Non pH neutral cleaning agents

- Non ph-neutral cleaning agents damage the rubber.
- Use cleaning agents with a neutral pH-value. Do not use cleaning agents containing non-polar solvents (e.g. petrol). The components of the bogie have to be rinsed with water after the cleaning process otherwise the rubber-metal-bonding has to be protected against cleaning agents by constructive measures.

8.9 Cleaning

The components can be cleaned using detergents mentioned in Table 4. The specified concentrations as well as the specifications of manufacturer shall be observed obligatorily. The residues of the detergents shall be rinsed with clear water. The cleaned Air Spring System has to be dried at room temperature.

NOTICE

Use of other differing cleaning agents

- The use of different detergents as mentioned in Table 4 can damage the rubber.
- Only use detergents mentioned in Table 4.

Detergent	Concentration
Alkaline detergent	
Oxalic detergent	
Rapidol A	10 %
Rapidol W	10 %
Rapidol 58	10 %
Rapox	5 %
Rapox OS	5 %

Table 4: Detergents

NOTICE

Cleaning with sharp objects

- Cleaning with sharp objects, e.g. wire brushes, emery paper etc. will cause damage on the air spring system.
- Do not use sharp objects for cleaning.

Brief overview of resistance behavior or different elastomer compounds:

	GROUP 1			GROUP 2							GROUP 3					
	NR	AU / EU	SBR	NBR	HNBR	ACM	CR	IIR	AEM	CIIR	EPDM	FKM	FFKM	VMQ	FVMQ	CSM
acid resistance	B	U	B	B	B	B	A	A	U	B	A	A	A	B	B	A
alkali resistance	B	U	B	B	B	B	A	A	U	B	A	A	A	B	B	A
oil resistance	U	A	U	A	A	A	B	U	A	U	U	A	A	B	A	B
Resistance to fuel	U	A	U	B	B	A	U	U	A	U	U	A	A	U	A	U
Solvent resistance	U	B	U	B	B	B	B	B	B	B	B	B	A	B	B	B
ozone resistance	B	A	B	B	B	A	A	A	A	B	A	A	A	A	A	A
weatherability	B	A	A	A	B	A	A	A	A	B	A	A	A	A	A	A
A = very good, little or no attack																
B = satisfactory, moderate to severe attack. Please contact the manufacturer!																
U = unsuitable for the application																

Table 5: resistance behavior of elastomers

8.10 Fire Protection

The elastomers made of natural rubber used in bogie components do not contain flame retardants. The materials used were tested in accordance with EN45545-2 requirements set R9.

A classification is not possible.

9 Decommissioning

- not applicable -

10 Disassembly

- see chapter 5 Assembly -

11 Disposal

Disposal / Product:

- Rubber-metal bonded materials with high rubber content may be disposed of in compliance with the local regulations of combustion (e.g. thermal recycling).
- Smaller quantities can be disposed of in compliance with the local regulations in the domestic waste dump.
- After dismantling, metallic components can be disposed of in the metal scrap recycling.

12 Error Identification

- not applicable -

13 Annex

13.1 Part numbers of items / components

Description	Quantity	GMT Part No.
Air Spring Bellows	1	17014803
Additional Spring	1	17104501
Top Plate	1	E860498
Mounting Ring	1	E860500
Clamping Plate	1	E860400
Countersunk Screw M8x20	8	E860096
Countersunk Screw M16x30	24	E860494
O-Ring	2	E860009
Sliding Plate	1	E860501
Half Hour Glass Spring	1	73900504
Rim	1	E860496
Ground Plate	1	E860499
Washer	0	E860394
Washer	0	E860395
Washer	0	E860396
Countersunk Screw M8x25	8	E860144
Countersunk Screw M8x20	8	E860109
Countersunk Screw M8x50	4	E860502

Table 6: Spare parts list

14 Subject Index

- not applicable -

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GMT	**Air Spring System**	**17305201**
Manufacturer	Part	Drawing Number
WH_17305201_Air Spring System _en_01		
Document		
2018-10-02	**01**	**C. Palm**
Document Created (Date)	Index	Document Created (Name)

State of Revision

Document Modification										
Mod.	**Index (Record Modified Chapters Here)**									
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