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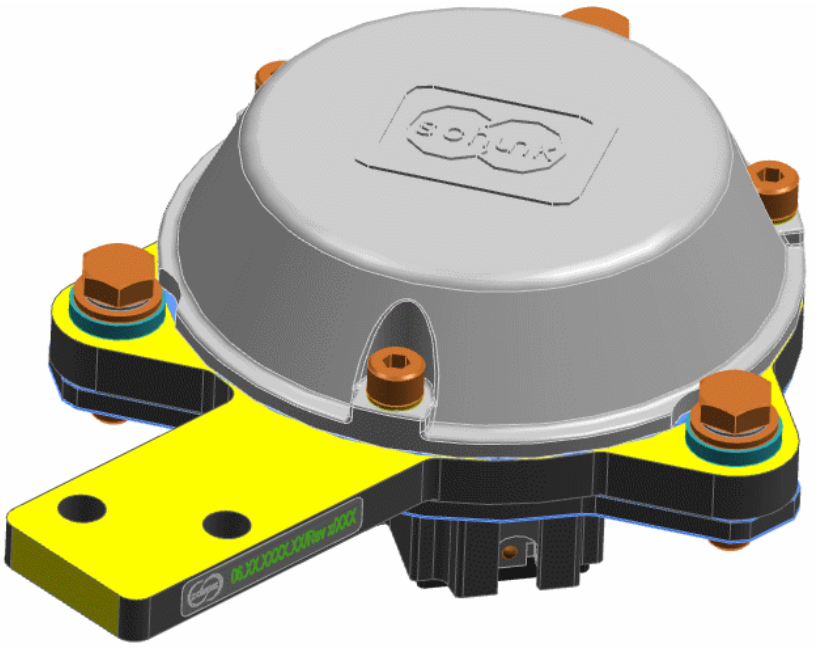
Documentation
B 0052 15
Version 1.0

POLYAX Grounding Contact
Drawing no. 06.21.0110.15



Version: 1.0
Date: 22.02.2022
Author: Schunk

Original instruction

Document Information

Version	Date	Changes	Chapter	Edited by
1.0	22.02.2022	First version		S. Kahl

Table of Contents

1 General Information

1.1 Using this Installation and Maintenance Instructions

NOTE

To ensure safe operation and to prevent personal injury and damage to equipment:

- Carefully read through this manual.
- Take note of all warning notices.
- Follow all instructions.
- Keep this manual in a safe place for further use.
- Use the most recent drawing additional to this manual.

This installation and maintenance instructions, hereafter "manual", describes the structure and function of the grounding contact and contains all the information and specifications required for assembly and disassembly, commissioning and for maintenance and repair work. All work must be carried out in accordance with the manual. Any deviations must be coordinated with the manufacturer.

It may happen that an illustration in this manual does not correspond exactly to the type of your grounding contact – nevertheless, the full information content of the illustrations is also retained for your type. In case of any doubt, please contact the address given in section ↗ 1.9.

1.2 Applicable and Referenced Documents

The following documents are to be considered part of this manual, insofar as reference is made to them. Where the contents differ, this manual takes precedence.

1.2.1 Standards and Directives

All standards and directives that are defined in accordance with the technical specifications or contractual agreements.

Document	Title
EN 50110-1	Operation of electrical installations
DIN VDE 0105-100	Operation of electrical installations (valid to German customers)
EN 50153	Railway applications - Rolling stock - Protective provisions relating to electrical hazards

Tab. 1: Applicable documents - Standards and directives

1.2.2 System Specifications

Document	Title
Section 3 of this manual	Technical Data
Section 4 of this manual	Technical Description

Tab. 2: Applicable documents - System specifications

1.3 Conformity

Schunk Transit Systems GmbH declares that the grounding contact described below satisfies all relevant regulations and is compliant with the requirements of these directives:

- Section ↗ 1.2.1 Standards and Directives

The grounding contact may only be transported, installed, operated, dismantled and maintained in compliance with the associated user manual.

1.4 Intended Use

The grounding contact is only designed for vehicles in accordance with the technical specifications or the contractually agreed intended usage. Operation under other conditions can result in damage to the grounding contact or the vehicle.

All installation and maintenance work on the grounding contact may only be undertaken by trained and authorised personnel in compliance with all safety instructions listed in the relevant documentation. These personnel must be familiar with the warning signs and the measures that are included in this specification for the transport, installation and dismantling of the devices.

The safe and proper use and operational reliability of the grounding contact are only guaranteed when used as intended in accordance with the information in this manual.

Intended use includes the observance and compliance with all work steps, safety instructions listed in this manual and all applicable professional association regulations and applicable legislation on environmental protection.

Similarly, compliance with the operating and maintenance instructions prescribed in this manual is also included under intended use.

1.5 Trained Personnel

Trained personnel in the sense of this specification are persons who are familiar with installation, commissioning and operation of the products. They have an appropriate qualification in accordance with EN 50110-1 or DIN VDE 0105-100. In particular, they are trained and instructed in accordance with safety engineering standards in the care and use of appropriate safety equipment.

If these requirements are not met, then in addition to the training of the operator's personnel during commissioning, an additional, in-depth training session may be offered either on site or at the supplier's offices.

1.6 Warranty and Liability

It should be noted that the contents of this specification are not part of any previous or existing agreement, assurance or substance of a legal contract and shall not amend any such contract.

All obligations incumbent on Schunk Transit Systems GmbH result from the respective contract; this contract also includes the sole and fully valid warranty provision. These contractual warranty provisions are neither extended nor limited by this specification.

The operator shall be solely liable for any damage resulting from the improper use of the grounding contact. The manufacturer assumes no liability for personal injury or damage to property caused by improper assembly, disassembly or procedural errors, improper operation and commissioning or by improper or inadequate maintenance.

1.7 Condition upon Delivery

The grounding contact is supplied as an assembled unit, loosely enclosed parts and parts packed in plastic bag. Item 7, 8, 9 and 18 fixed with cable tie on item 1.

1.7.1 Assembled Unit

- Grounding contact
- 3x Washer (18),
- 3x Insulating bushing (9),
- 2x Sealing (7),
- 1x Insulating part (8)

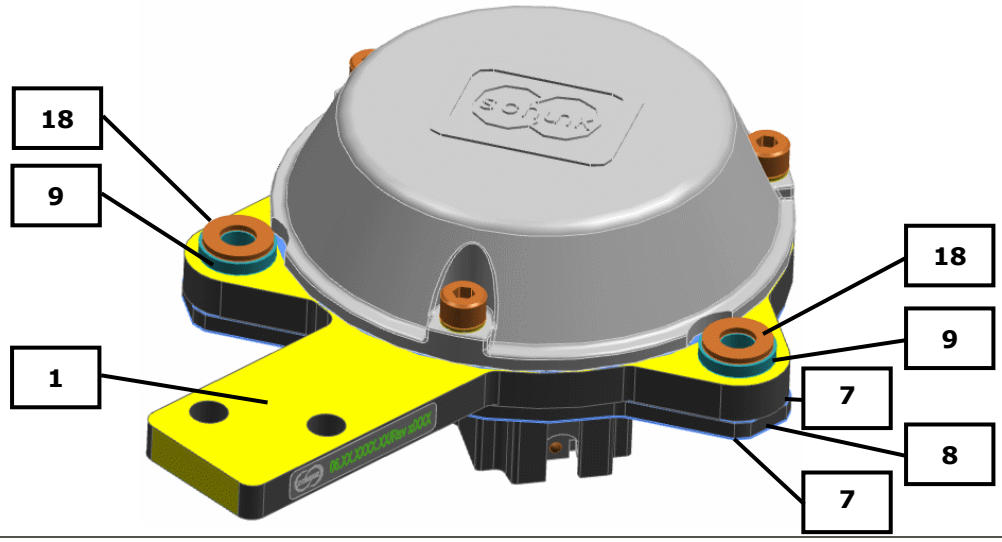


Fig. 1: Assembled Unit

1.7.2 Parts Packed in Plastic Bag

- 3x Hex screw (20),
- 3x Lock washer (19),
- 4x Cap screw (17),
- 3x Cap screw (3), 3x lock washer (15)

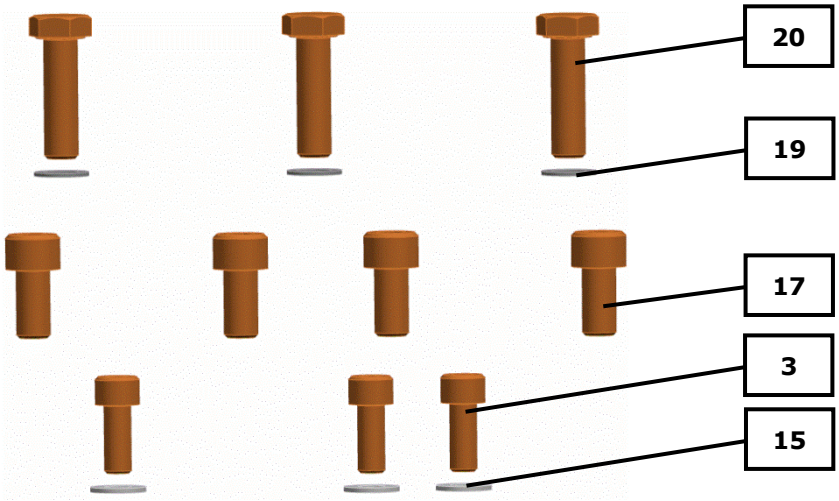


Fig. 2: Parts packed in plastic bag

1.7.3 Loosely Enclosed Parts

- 2x Brush (4),
- 1x Adapter flange (16),
- 1x Gasket (22),
- 1x Contact disc (14)

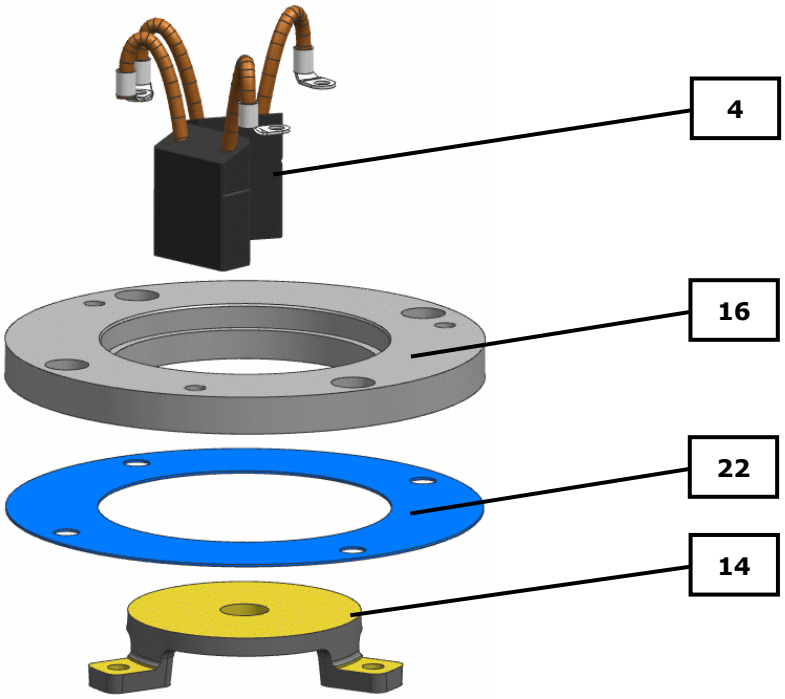


Fig. 3: Loosely enclosed parts

1.8 Ordering Spare Parts

ATTENTION
Impairment of the function

To avoid impairment of the function of the grounding contact and to observe maintenance intervals.

- Use original spare parts only.

All orders must specify the item name and the Schunk drawing no. in accordance with the spare parts list (↗ Spare Parts List).

1.9 Contact Details

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2 Safety

2.1 Design of the Safety Indications

Safety indications in this document are divided into the following safety hazard levels:

DANGER

Failure to follow these instructions will result in death or permanent physical injury.

WARNING

Failure to follow these instructions may result in death or permanent physical injury.

CAUTION

Failure to follow these instructions may result in damage to persons.

ATTENTION

Failure to follow these instructions may result in damage to property.

NOTE

Failure to follow these instructions may result in damage to the environment.

NOTE

Important or general information about the device or the manual.

The notes provide information about the nature and source of the danger, about possible consequences and about preventing the danger.

2.2 Symbols Used

The symbols shown are used throughout this manual to warn of possible dangers. These symbols mean increased attentiveness is necessary.

The relevant instructions must be followed to avoid the danger. Read and follow all safety indications.

Symbol	Meaning
	Risk of electric shock; electrocution
	Risk of crushing from moving or falling parts
	Risk of cutting from sharp corners
↗	Cross-reference "See document" "XYZ" section "xx"

Tab. 3: Safety - Symbols used

2.3 General Safety Indications

NOTE

All work on the unit, such as installation, operation, maintenance and repairs, must only be carried out by qualified and authorised personnel and with the tools intended for that purpose.

NOTE

In all cases take into consideration the safety regulations of the depot.

DANGER

Danger to life due to electric shock

Contact with live parts can result in permanent injury or death.

- Disconnect the unit from the power supply before maintenance work.
- Ensure that the unit cannot be put into operation during work.

WARNUNG

Risk of injury due to falling unit

A falling unit can result in permanent injury to persons.

- Secure the components against accidental falling **before** beginning work.
- Wear protective equipment while working on the unit.
- Adhere to the instructions of the safety briefing.

WARNING

Risk of crushing from moving parts

Body parts may get caught between moving parts, resulting in permanent injuries from crushing.

- Take all necessary safeguards against the risk of crushing during work.
- Ensure that the unit cannot be put into operation during work.

WARNING

Risk of cutting from sharp corners

Sharp edges and corners can result in accidents with cutting injuries.

- Take all necessary safeguards against the risk of cutting injuries during work.
- Ensure that the unit cannot be put into operation during work.

3 Technical Data

The specified technical data refer exclusively to products supplied by Schunk taking into consideration the respective documentation related to the product.

The specified technical data may be based on experience resulting from tests, measurements and many years of product experience. Variances from the specified reference values are possible due to the respective prevailing operating conditions.

3.1 Grounding Contact

Feature	Data
Weight Grounding contact:	Approx. 6,7 kg
Outer dimension Grounding contact:	Approx. 175 mm 250 mm 125 mm (WxLxH)

Tab. 4: Technical data of the grounding contact

3.2 Brushes

Feature	Data
Number of brushes:	2 pieces
Brush dimensions:	Approx. 20 mm x 40 mm x 52 mm (WxLxH)
Brush material:	C40Z3
Nominal brush pressure:	300 cN/cm² $\frac{+15\%}{-30\%}$
Wear height:	Approx. 32 mm

Tab. 5: Technical data of the brushes

3.3 Counter Contact Surface (Contact Disc)

Feature	Data
Material:	CuSn6

Tab. 6: Technical data of the counter contact surface

3.4 Current Load

Feature	Data
Max. continuous current load: I_{eff}	 400 A
Max. short term overload: I_{eff} x 1.5 / 1 hr.: I_{eff} (≤ 600 A) x 15 / 100 ms.:	 600 A 6.000 A

Tab. 7: Technical data – Current load

NOTE

The values for temporary short-term capacity result from tests to determine the max. short-circuit current value by the grounding contact, in which the voltage failure may not exceed 40 V for safety reasons.

ATTENTION

Material damage due to failure to comply

The grounding contact could be damaged after exposure to such a short-circuit current.

- Service the grounding contact in accordance with section ↗ 8.

3.5 Contact Resistance

Feature	Data
Complete grounding contact	≤0.020 Ohm
Measuring equipment	Digital micro-ohmmeter DSM200 - 0-200 A DC measuring current - 0.1 µOhm resolution
Measurement path	From the main power connection to the fixed contact terminal on the axle end
Measuring current	50 A

Tab. 8: Technical data - Contact resistance

4 Technical Description

4.1 Function of the Grounding Contact

Basically, the grounding contact serves as a low resistance bridge to transmit current from stationary vehicle parts to rotating vehicle parts.

The main functions of the grounding contact are:

- Transmission of operating current
- Transmission of signal current
- Vehicle grounding and/or protective grounding.

The grounding contact is responsible for producing a safe electrical connection to a defined current path in all operating situations of the vehicle.

The operational and functional safety is only given if the grounding contact is undamaged and the contact area is free of grease, oil and moisture.

4.1.1 Transmission of Operating Current

The operating current for electric locomotives, motor power units and travel units is taken from an overhead line or third rail to supply the consumers. The current is fed to the running rail (energy source earth) via the axle shafts and wheels, thus closing the circuit.

Current is transmitted from the stationary parts of the vehicle to the rotating axles and wheels using special current bridges, which are usually referred to as "grounding contacts".

The bearings of the axles can be in the active current circuit or the interference circuit. In order to protect against circuit continuity and to provide a secure connection to earth, the grounding contact must form a low resistance current bridge.

The current starts to flow through the bearing at a voltage applied above the bearing, from about 1 volt (Fritt voltage). Associated with a sudden increase of current, the value of the transient voltage falls to approximately 0.5 volts.

4.1.2 Transmission of Signal Current

In contrast to the operating current, the various alarm and signalling systems have very low current flows. However, these must be transmitted with absolute reliability in every operating situation.

The material combination of contact brush and counter contact material is especially important for this type of current transmission, since in this case the grounding contact has to form a permanent low resistance current bridge at extremely low electrical load, depending on operating conditions.

4.1.3 Vehicle Grounding and/or Protective Grounding

Here all electrically conductive components are connected to the energy source (earth) by means of the grounding contact via the axles and wheels, thus they are grounded.

Normally there is no voltage difference in these components compared to the earth and therefore no electrical currents. Grounding provides protection against contact voltage and the associated risks (Personal protection, risk of fire, etc.).

4.2 Design and Function

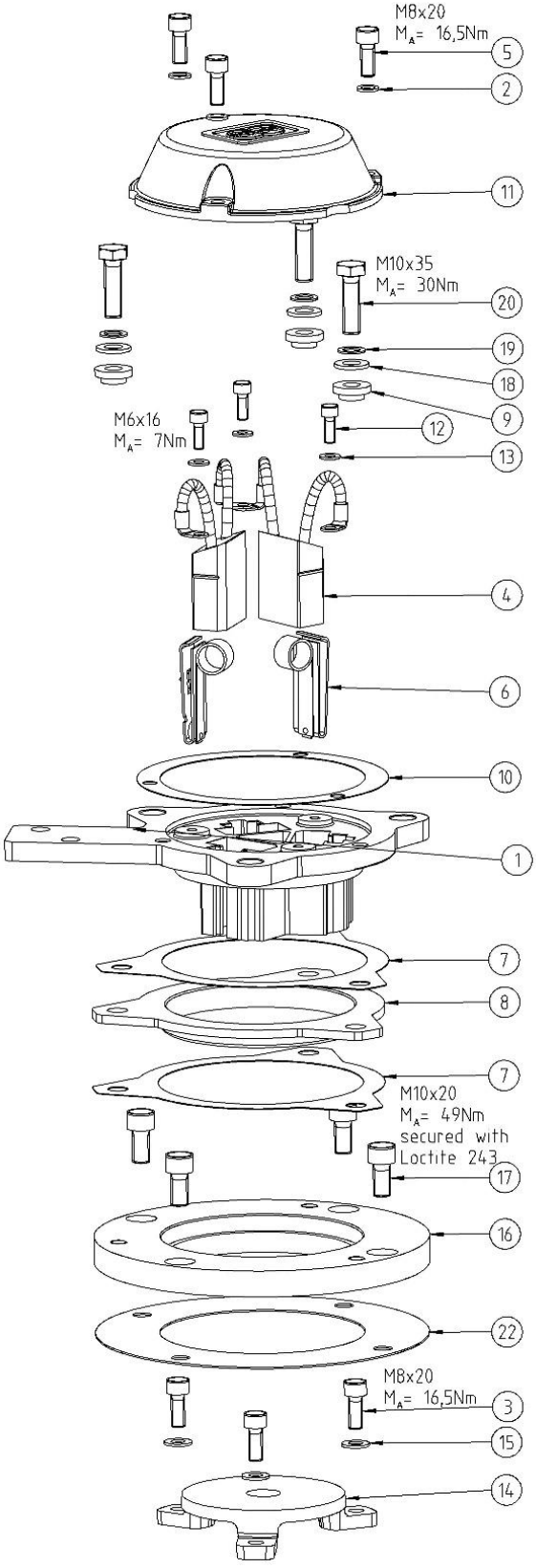


Fig. 4: Design of the Polyax grounding contact 06.21.0110.15

The Polyax grounding contact 06.21.0110.15 is supplied partially pre-assembled. The pre-assembled unit consists of the cover (11), the sealring (10), which are screwed to the brush guide (1) using cylinder screws (5) and lock washers (2).

The main components of the grounding contact are contact disc (14), adapter flange (16), insulating part (8), brush guide (1), pressure device (6), brushes (4), and cover (11).

The contact disc (14) is electrically and mechanically connected to the axle end using the lock washers (15) and Cap screws (3) and thus rotates with the vehicle movement. Gasket (22) seals the interface between the interface and the adapter flange (16).

The brush guide (1), insulating part (8) and sealings (7) are mounted to the adapter flange (16) using the hex screws (20), lock washers (19), washers (18) and insulating bushings (9).

The sealings (7) seal the contact to the adapter flange (16), insulating part (8) and the brush guide (1).

Brushes (16) are free gliding in the brush slot of brush guide (1) and are electrically connected to the brush guide (1) using lock washers (2) and cap screws (3). The brushes (16) are pushed onto the front face of the contact disc (15) by the constant spring of pressure de-vices (4).’ 06.21.0110.16

The cover (11) and the sealring (10) must be fixed to the brush guide (1). The sealring (10) seals the contact to the cover (11).

When correctly assembled, a defined current path is created from the grounding current-, signal current- or return current connection via the brush guide (1) and the brushes (4) to the contact disc (14), axle and wheel.

5 Transport and Storage

5.1 Measures for Transporting

ATTENTION

Damage due to mechanical effects

Mechanical effects such as impact and compression can damage the grounding contact.

- Use suitable packaging materials.

1. Protect the brushes and contact disc against damage.
2. Pack each grounding contact separately.
3. Only stack properly packaged grounding contacts/systems on top of each other.
4. Secure the load against slippage.
5. Note the weight specifications for the transport (Section ↗ 3.1).

Only use suitable hoisting equipment for lifting and/or transporting, for example lift trucks, pallet transporters.

5.2 Measures for Storage

ATTENTION

Damage due to improper storage

Failure to follow the manufacturer's instructions for storage can result in significant damage to the unit.

- Pay attention to the manufacturer's recommended storage conditions.

The grounding contacts and all included loose parts may be stored indefinitely under suitable ambient conditions (dry, free of dust and away from direct UV radiation).

Storage conditions	permitted	Ideal
Storage temperature	-25 °C to +40 °C	-5 °C to +30 °C
Relative humidity	0 to max. 100 % non-condensing	0 to 50 % non-condensing

Tab. 9: Storage conditions

A complete functional test is strongly recommended after a storage period of more than 5 years.

5.2.1 Recommended Functional test after storage of more than 5 years

- ✓ Verification of completeness.
- ✓ Check the grounding contact for porosity, damage and contamination.
- ✓ Check the electrical contact surfaces, they must be metallically bright.
- ✓ Check the sealing surfaces, they must be clean.
- ✓ Check functionality of the bearing (smooth rotation without noises).

6 Assembly and Disassembly

NOTE

When disposing of the components, please comply with all relevant requirements and regulations of the environmental protection in your country.

6.1 Preparations

NOTE

All general safety indications (Section ↗ 2.3) must be observed.

1. Ensure the power supply is safely disconnected before starting assembly and/or disassembly work.
2. Observe the following rules:
   - ✓ Insulate,
   - ✓ Secure against restarting,
   - ✓ Ensure no voltage is present,
   - ✓ Ground and short circuit the vehicle,
   - ✓ Cover or block off adjacent live parts.

Approval for work may only be given by the person responsible after these rules have been satisfied.

6.2 Technical Requirements

Of the mounting surfaces of the grounding contact interface at the vehicle:

- ✓ The mounting surfaces on the axle end must be clean, metallically bright, burr-free and flat.
- ✓ The mounting surfaces on the interface must be clean, burr-free and flat (≤ 0.1mm). A primer on this surface is possible, ensure a thin and even coating. Do **not** use lacquering for the mounting and sealing areas.
- ✓ The parallelism between the mounting areas of the axle to the mounting areas of the interface must be ≤ 0.1mm.

Other requirements:

- ✓ The mounting threads on the axle end and bearing housing must be in a perfect condition and their usable thread depth must be matched with the fastening elements. (Use drawing 06.21.0110.15)
- ✓ Electrical contact surfaces must be metallically bright.
- ✓ All fastening elements must be in a perfect condition. Replace damaged elements.

6.3 Functional Test Before and During Assembly

- Check the technical requirements (Section ↗ 6.2).
- Check the mounting-/sealing surfaces for damage and contamination.
- Tighten all mounting screws with a torque wrench in accordance with the specified tightening torque (Section ↗ 6.5).
- Check proper assembly of the sealings, gasket and insulating parts.
- Check proper assembly and secure locking of the pressure devices.
- The brush flexes must be placed in that way that they can follow the reduction of the brush during the abrasion, do not jam and cannot be touched by the spring of the pressure device.
- Check ease of movement of the brushes in the brush guide.
- Secure the fastening elements in accordance with the instructions.

6.4 Required Tools/ Material

ATTENTION

The use of an impact wrench is forbidden.

- Socket wrench for internal hex SW 5, SW 6 and SW 8
- Socket wrench for external hex SW 16
- Torque wrench
- Loctite 243

6.5 Tightening Torques

ATTENTION

Damage due to disregard

The use of incorrect tightening torques, materials and screw locking for the not included fastening elements result in damage to the property.

- The material of the fastening elements and components must be matched.
- The tightening torque must be chosen, that the components cannot fall off or get damaged.
- The usable thread depth must be matched with the fastening elements.

The standard tightening torques are listed in the table below. If a mismatch of the tightening torques in the manual should be found, the tightening torques in this section have priority.

Item	Type of screw	Standard	Size	Tightening torque
3	Cap screw	DIN 912	M8x20	25 Nm*
5	Cap screw	DIN 912	M8x20	16.5 Nm
12	Cap screw	DIN 912	M6x16	7 Nm
17	Cap screw	ISO 4762	M10x20	49 Nm*
20	Hex screw	ISO 4017	M10x35	30 Nm

Tab. 10: Tightening torques assembly

*Use Loctite 243

6.6 Assembly and Disassembly of the Grounding Contact

WARNING

Risk of injury due to falling unit

A falling unit can result in permanent injury to persons.

- Secure the grounding contact against accidental falling **before** beginning work.
- Wear protective equipment while working on the unit.
- Adhere to the instructions of the safety briefing.

WARNING

Risk of injury from protruding edges and corners

Some areas of the grounding contact contain protruding parts with edges and corners that may result in serious injury.

- Wear protective equipment while working on the unit.
- Adhere to the instructions of the safety briefing.

ATTENTION

Risk of damage to property due to grease, oil and moisture

Grease, oil and moisture in the contact area results in failure of the grounding contact.

- Ensure before, during and after undertaking assembly and maintenance work that no grease, oil or moisture can penetrate into the contact area of the grounding contact.
- Check the mounting-/sealing surfaces for damage and contamination.

ATTENTION

Risk of damage to property due to falling unit

A falling unit can result in considerable material damage to the unit.

- Secure the grounding contact against accidental falling **before** beginning work.

NOTE

The functional tests (Section ↗ 6.3) must be observed and followed without exception before and during assembly.

NOTE

All tightening torques (Section ↗ 6.5) and thread locking's are given in the current drawings.

NOTE

Place all disassembled parts they are not discarded, to a dry and clean place.

NOTE

The tightening procedure of the fixing screws must be done in three steps.

First step is a hand-tight bolting of the screws in a crosswise sequence.

In the second step screws must be bolted in crosswise sequence with 50% of the final tightening torque.

Finally, in the third step screws must be bolted with the full prescribed tightening torque in a crosswise sequence.

6.6.1 Assembly

NOTE

The first step of the assembly of the grounding contact is the mounting of the contact disc. After this, the assembly of the grounding contact, brushes and main connection will follow.

Use the current drawing 06.21.0110.15 and the spare parts list (Section ↗ 9) additionally to this manual.

6.6.1.1 Contact disc

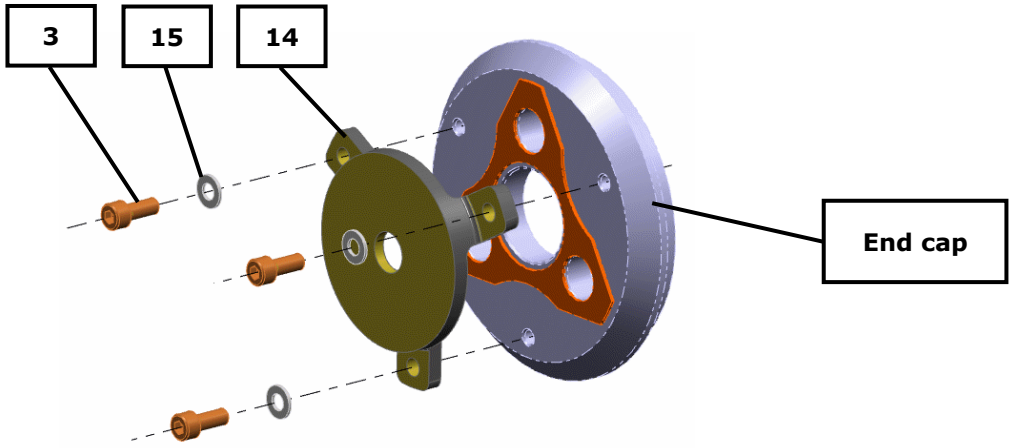


Fig. 5: Mounting of the contact disc

1. Attach the contact disc (14) to the **end cap** using the cap screws (3) and lock washers (15) (T_T= 25 Nm, secured with Loctite 243).

NOTE

The fastening elements for the mounting of the axle bearing cover (20) is not in the scope of delivery of the grounding contact 06.21.0110.15.

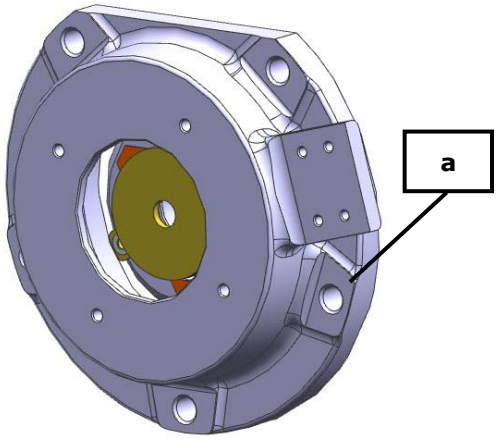


Fig. 6: Mounting of the axle bearing cover

2. Attach the axle bearing cover (a) to axle end (customer responsibility).

6.6.1.2 Grounding Contact

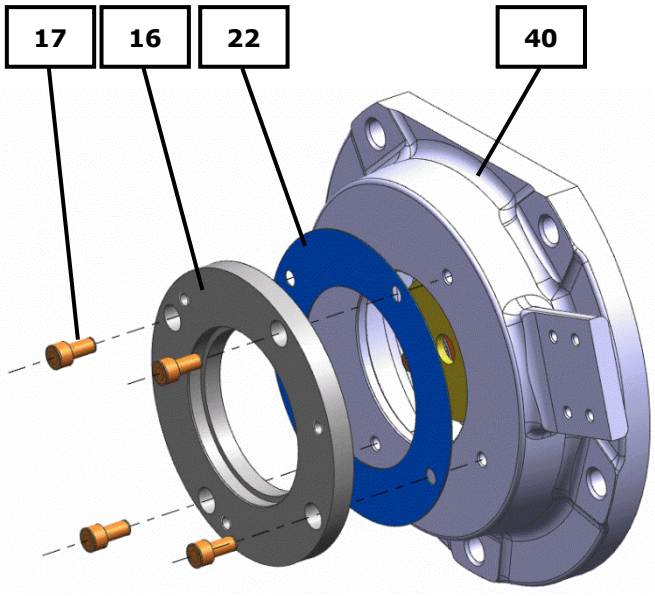


Fig. 7: Mounting of the grounding contact I

1. Attach the adapter flange (16) and the gasket (22) to the interface (40) using the cap screws (17) (T_T= 49 Nm, secured with Loctite 243).

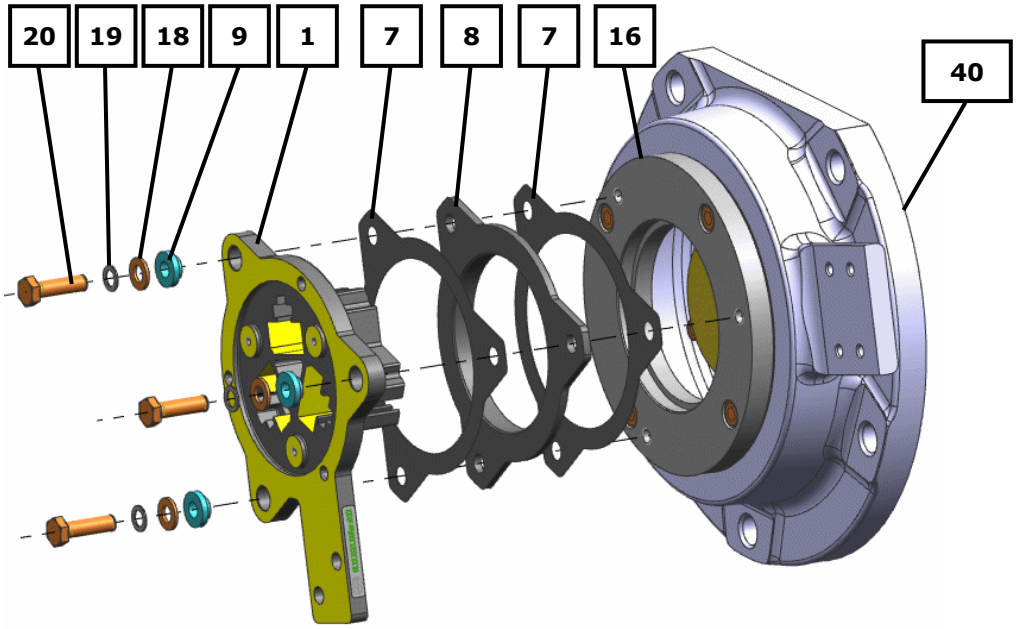


Fig. 8: Mounting of the grounding contact II

2. Attach the brush guide (1), sealings (7) and the insulating part (8) to adapter flange (16) using the hex screw (20) (T_T= 30 Nm), lock washers (19 and 18) and insulating bushes (8).

6.6.1.3 Brushes

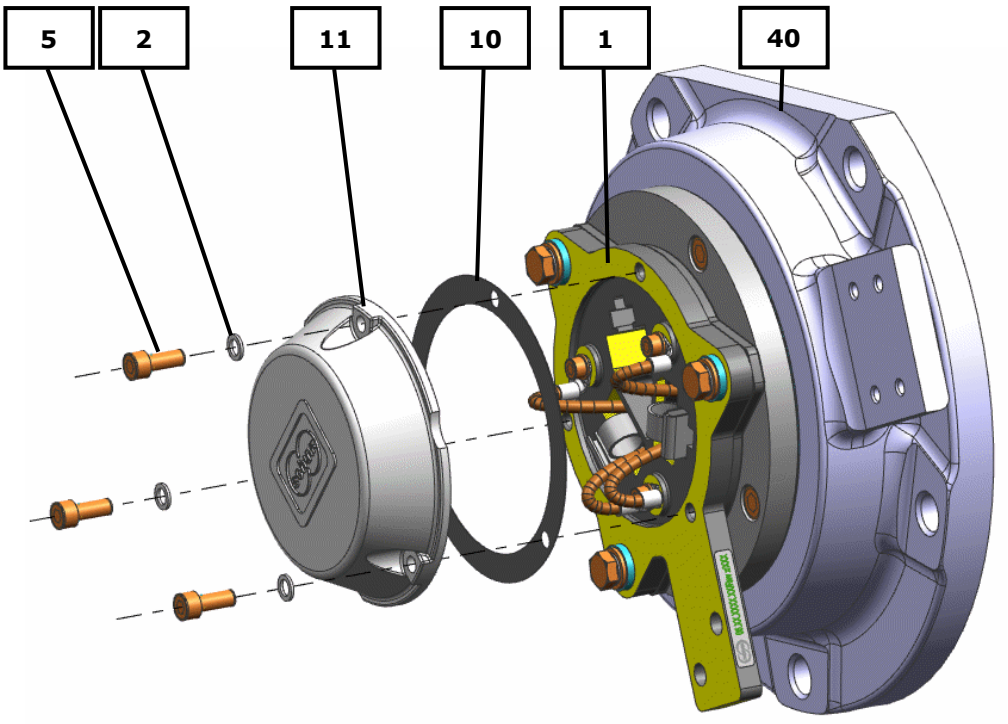


Fig. 9: Removal of the cover

1. Loosen and remove the cap screws (5), lock washers (2), cover (11) and sealring (10) from the brush guide (1).

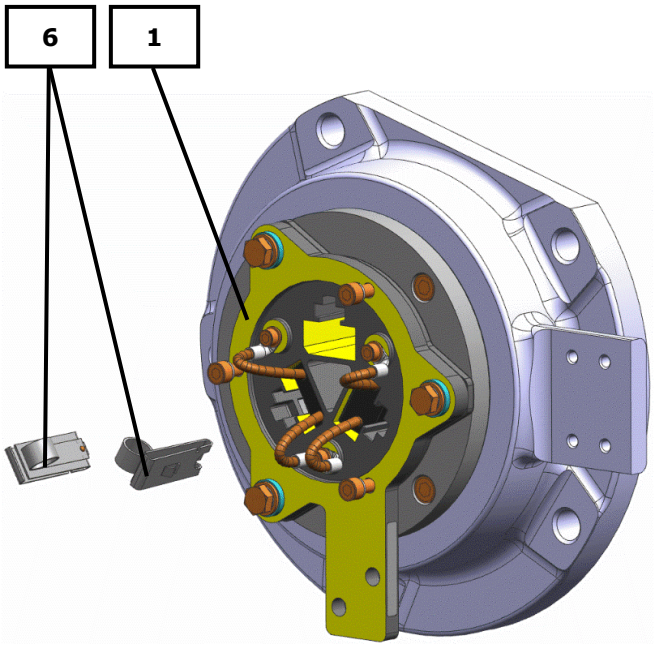


Fig. 10: Removal of the pressure devices

CAUTION

Injuries by tension

The pressure devices (6) are under tension, they can pop out wildly during loosening and may cause serious injuries!

- Remove pressure devices (6) **carefully** from brush guide (1).

2. Remove the pressure device (6) **carefully** from the brush guide (1).

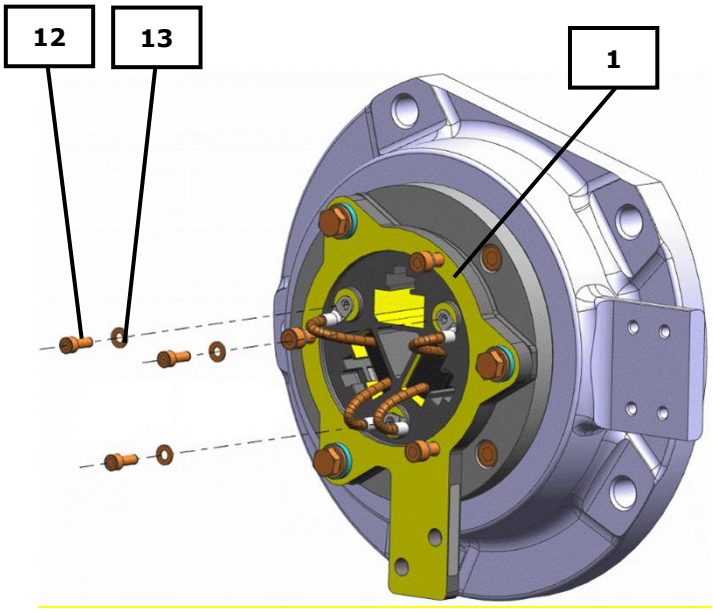


Fig. 11: Removal of the brush fastening elements

3. Loosen and remove the cap screws (12) and lock washers (13) from the brush guide (1).

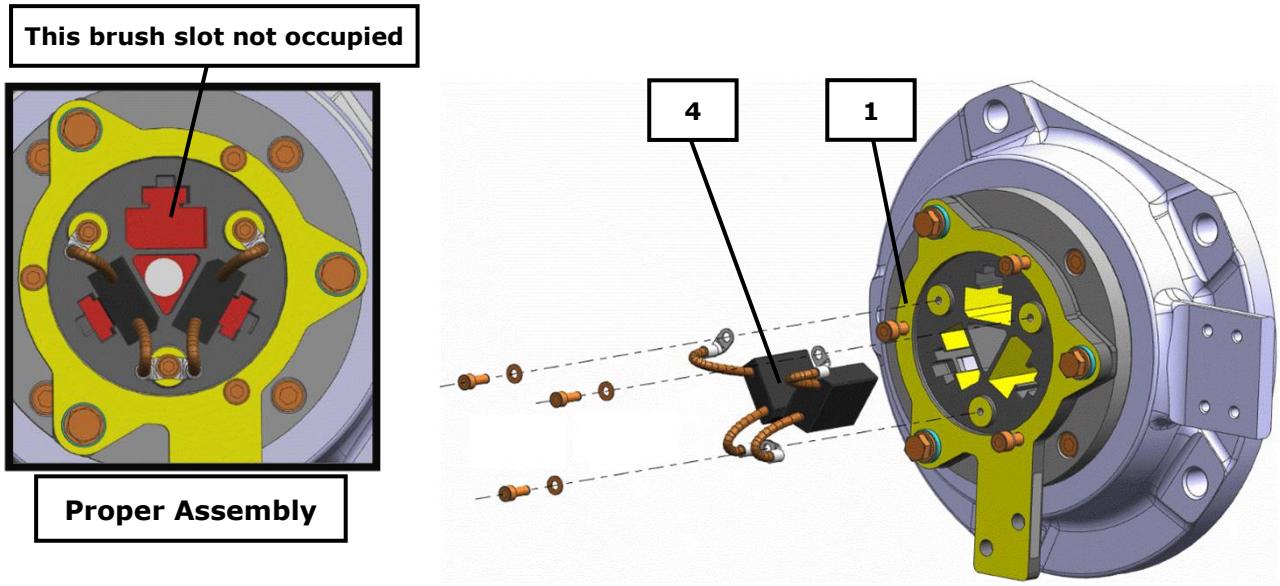


Fig. 12: Insertion of the brushes

NOTE

Ensure that the brushes (4) are properly assembled to the brush guide (1). A chamfer on the brush guide (1) and the brush (4) prevents an improper assembly.

4. Insert the brushes (4) into the brush guide (1).

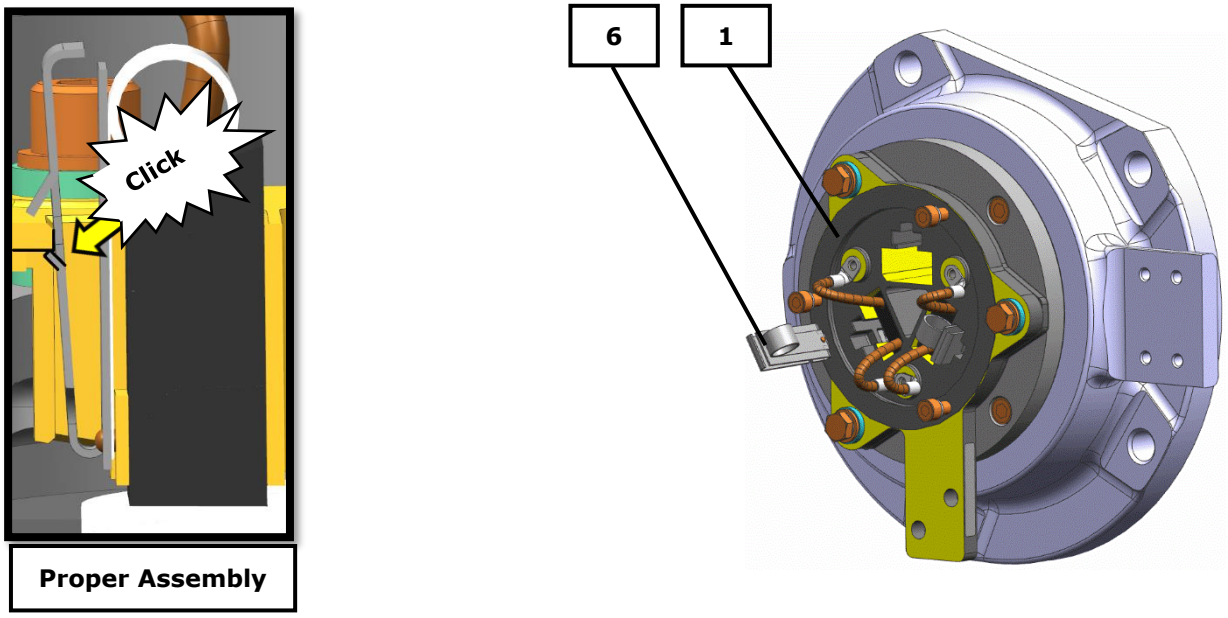


Fig. 13: Insertion of the pressure devices

CAUTION

Injuries by tension

The pressure devices (6) are under tension, if they are not properly assembled, they can pop out wildly and cause serious injuries!

- Ensure that the notch of the pressure device (6) engages in the corresponding recess in the brush guide (1). **(click)**

5. Insert the pressure devices (6) into the brush guide (1).
6. Ensure **proper assembly** of the pressure device (6). **(click)**

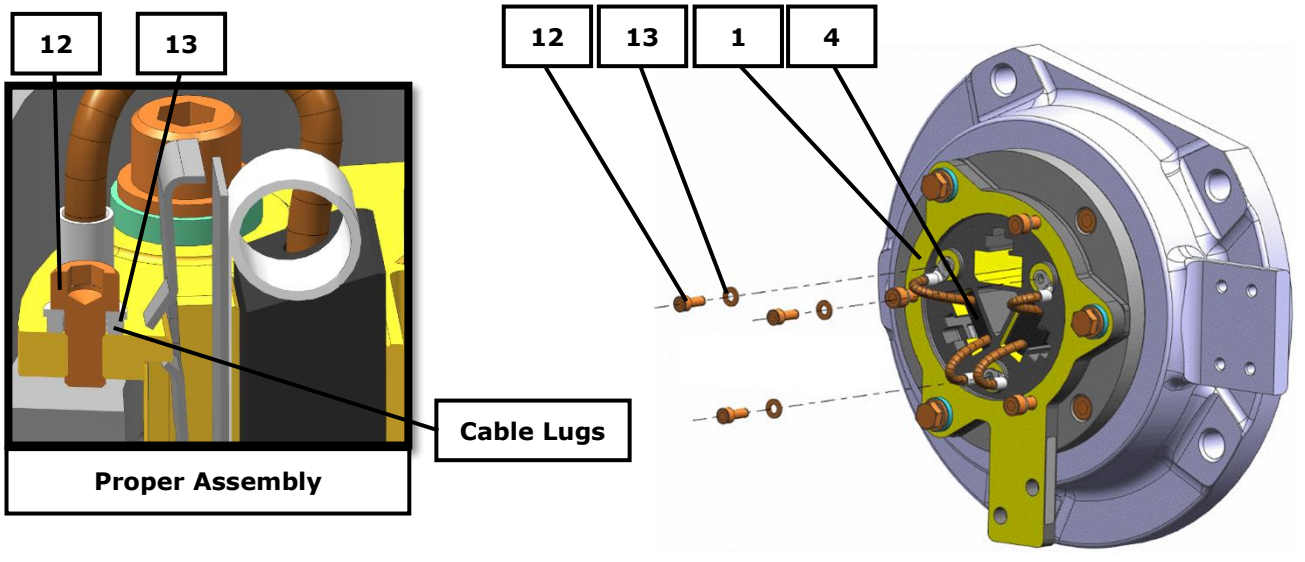


Fig. 14: Mounting of the brush fastening elements

NOTE

Risk of damage to property due to disregard

Incorrect assembly of the brush flexes can result to damage.

- The brush flexes must be placed in that way that they can follow the reduction of the brush during the abrasion, do not jam and cannot be contacted by the spring of the pressure device.
- Do not bend the brush flexes.
- Do not mount the brush flexes overtwisted or unwound.
- Ensure sure that the brush flexes can move freely.
- Ensure that the cable lugs of the brushes are mounted below the lock washers.

7. Attach the brushes (4) to the brush guide (1) using the lock washers (13) and cap screws (12) (T_T= 7 Nm).

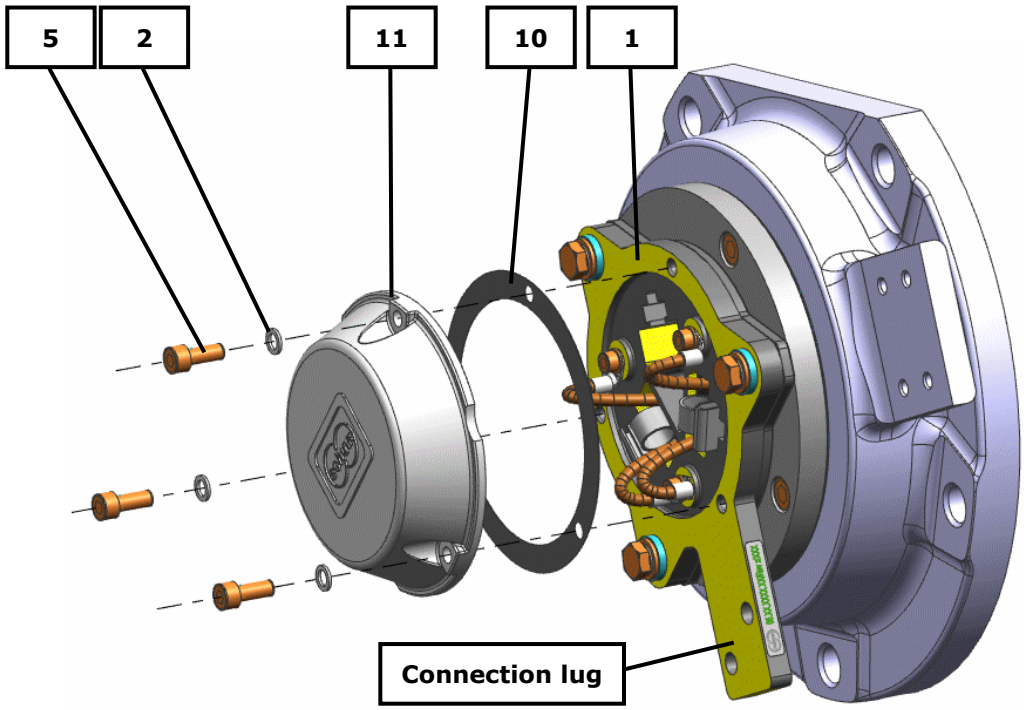


Fig. 15: Mounting of the cover

ATTENTION

From a free cable length of 200-400 mm, "cable strain relief" is required in the form of a cable support.

Fastening additional distributor plates or similar requires additional testing and permission from Schunk.

8. Attach the cover (11) to the brush guide (1) using the sealring (10), lock washers (2) and hex cap screws (5) (T_t= 16.5 Nm).
9. Tighten the grounding current-, signal current- or return current connection to the brush guide (1) using suitable fastening elements and an adequate torque.

NOTE

When correctly assembled, a defined current path is created from the grounding current-, signal current- or return current connection via the brush guide (1) and the brushes (4) to the contact disc (14), axle and wheel.

NOTE

Grounding contact is completely assembled now.

6.6.2 Disassembly

DANGER

Danger to life due to electric shock

Contact with live parts can result in permanent injury or death.

- Disconnect the unit from the power supply before maintenance work.
- Ensure that the unit cannot be put into operation during maintenance work.

6.6.2.1 Brushes

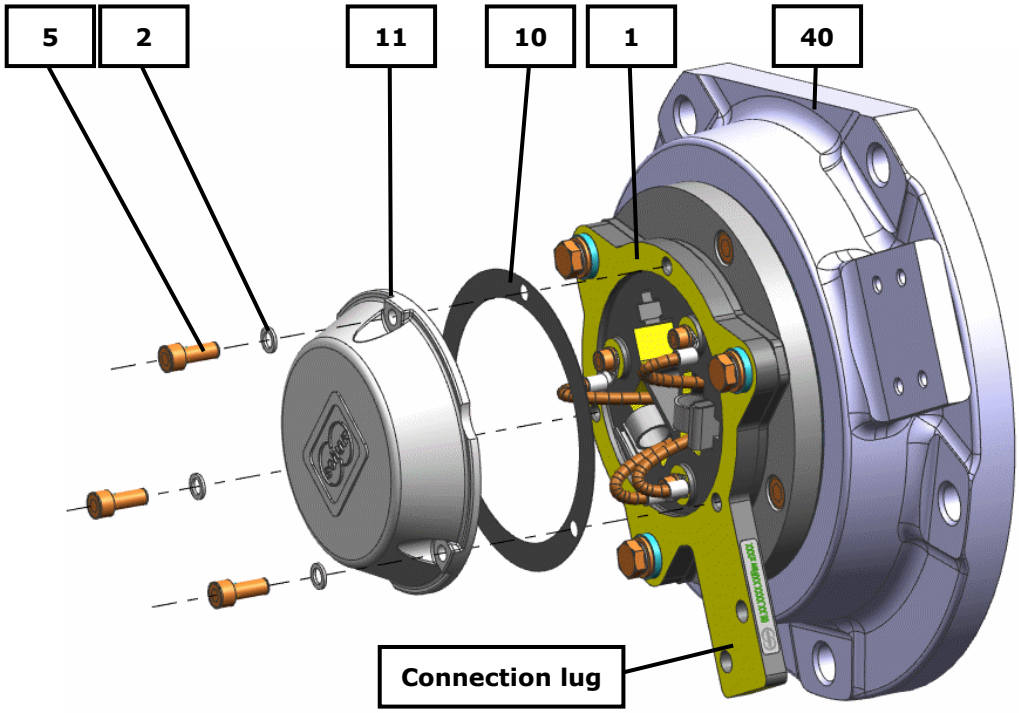


Fig. 16: Removal of the cover

1. Remove the grounding current-, signal current- or return current connection from the connection lug.
2. Loosen and remove the cap screws (5), lock washers (2), cover (11) and sealring (10) from the brush guide (1).
3. Dispose of the sealring (10) and lock washers (2). Removed sealring and lock washers must be disposed of.

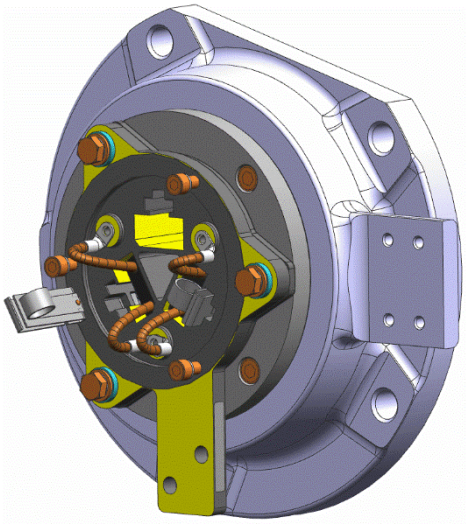


Fig. 17: Removal of the pressure devices

CAUTION

Injuries by tension

The pressure devices (6) are under tension, they can pop out wildly during loosening and may cause serious injuries!

- Remove pressure devices (6) **carefully** from brush guide (1).

4. Remove the pressure devices (6) **carefully** from the brush guide (1).

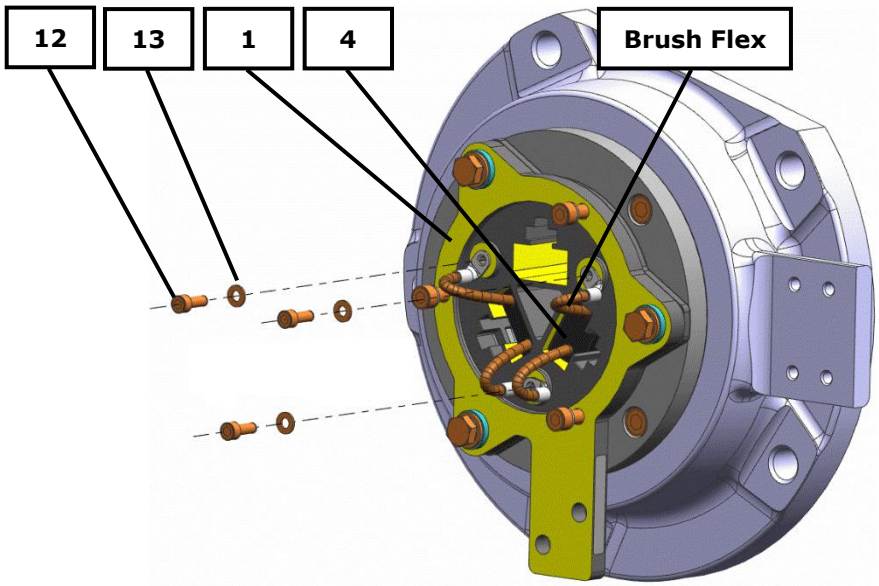


Fig. 18: Removal of the brushes

5. Loosen and remove the cap screws (12) and lock washers (13) from the brush guide (1).
6. Dispose of the lock washers (13). Removed lock washers must be disposed of.
7. Remove the brushes (4) using the **brush flexes**.

6.6.2.2 Grounding Contact

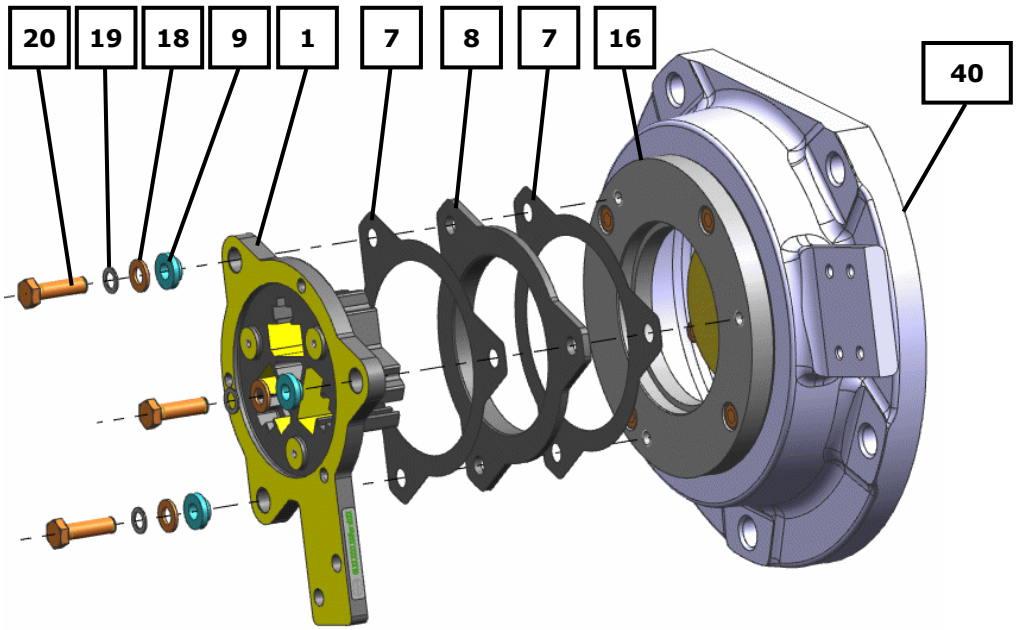


Fig. 19: Removal of the grounding contact, step 1

WARNUNG

Risk of injury due to falling unit

A falling unit can result in permanent injury to persons.

- Secure the components against accidental falling **before** beginning work.
- Wear protective equipment while working on the unit.
- Adhere to the instructions of the safety briefing.

1. Loosen and remove the hex head screws (20), lock washers (19), washers (18) and insulating bushings (9). The brush guide (1) is loose now.
2. Remove the brush guide (1), sealings (7) and insulating part (8) from the adapter flange (16).
3. Dispose of the lock washers (19) and sealings (7). Removed lock washers and sealings must be disposed of.

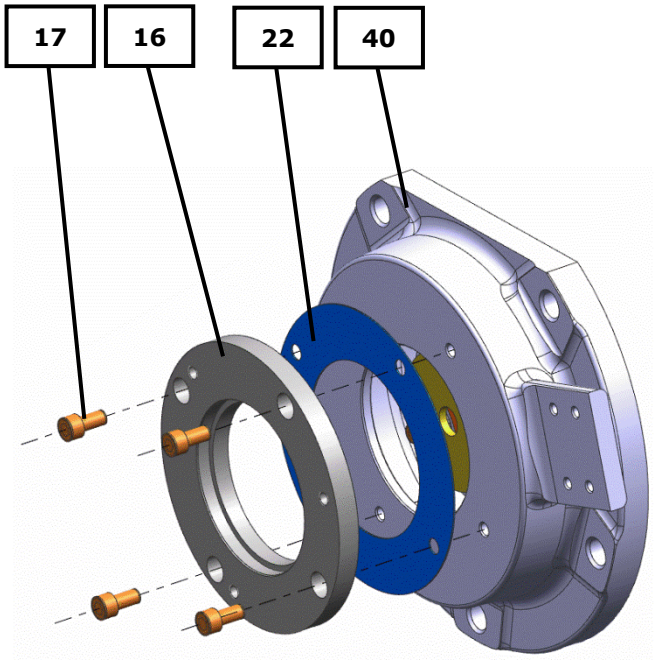


Fig. 20: Removal of the grounding contact, step 2

WARNUNG

Risk of injury due to falling unit

A falling unit can result in permanent injury to persons.

- Secure the components against accidental falling **before** beginning work.
- Wear protective equipment while working on the unit.
- Adhere to the instructions of the safety briefing.

4. Loosen and remove the cap screws (17) from the axle bearing cover (40) and remove the grounding contact from the axle bearing cover.

6.6.2.3 Contact disc

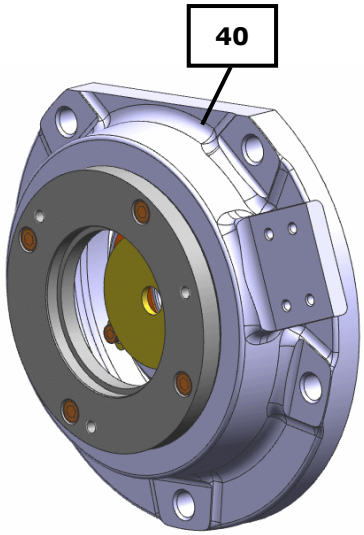


Fig. 21: Removal of the contact disc

1. Loosen and remove the axle bearing cover (40) from the axle end (customer responsibility).

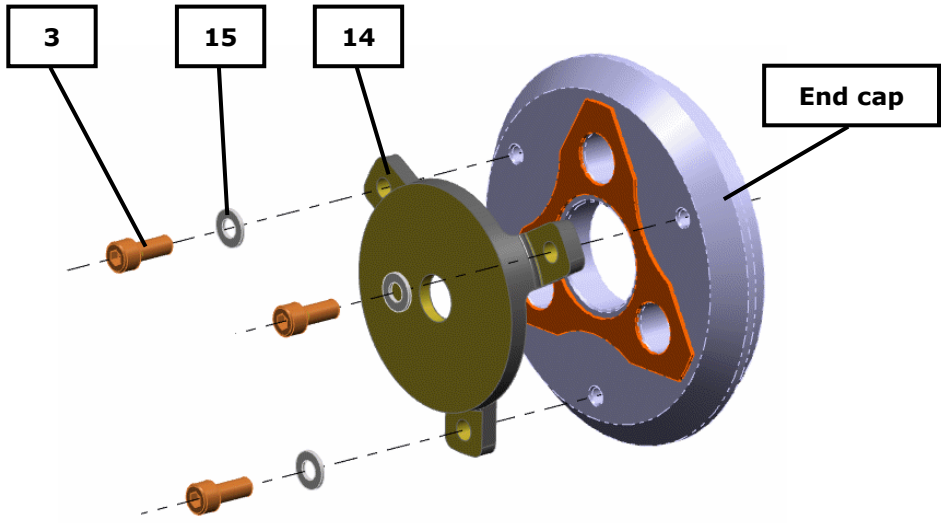


Fig. 22: Removal of the adapter

2. Loosen and remove the contact disc (14) from the end cap by cap screws (3) and lock washers (15)

NOTE

Grounding contact is completely disassembled now.

7 Troubleshooting

Proper assembly in accordance with this technical specification and under normal operating conditions ensures the fault-free operation of the grounding contact.

Only maintenance work (Section ↗ 8) needs to be executed.

However, should faults occur during operation then fault detection and troubleshooting can be carried out in accordance with the separate specification "Fault Detection and Troubleshooting" (↗ Appendix).

8 Maintenance and Servicing

NOTE

When disposing of the components, please comply with all relevant requirements and regulations of the environmental protection in your country.

8.1 Preparations

NOTE

All general safety indications (Section ↗ 2.3) must be observed.

1. Ensure the power supply is safely disconnected before starting assembly and/or disassembly work.
2. Observe the following rules:
   - ✓ Insulate,
   - ✓ Secure against restarting,
   - ✓ Ensure no voltage is present,
   - ✓ Ground and short circuit the vehicle,
   - ✓ Cover or block off adjacent live parts.

Approval for work may only be given by the person responsible after these rules have been satisfied.

8.2 Technical Requirements

Of the mounting surfaces of the grounding contact interface at the vehicle:

- ✓ The mounting surfaces on the axle end must be clean, metallically bright, burr-free and flat.
- ✓ The mounting surfaces on the interface must be clean, burr-free and flat (≤ 0.1mm). A primer on this surface is possible, ensure a thin and even coating. Do **not** use lacquering for the mounting and sealing areas.
- ✓ The parallelism between the mounting areas of the axle to the mounting areas of the housing must be ≤ 0.1mm.

Other requirements:

- ✓ The mounting threads on the axle end and housing must be in perfect condition and their usable thread depth must match the fastening elements. (Use drawing 06.21.0110.15)
- ✓ Electrical contact surfaces must be metallically bright.
- ✓ All fastening elements must be in a perfect condition. Replace damaged elements.

8.3 Functional Test Before and During Assembly

- Check the technical requirements (Section ↗ 8.2).
- Check the mounting-/sealing surfaces for damage and contamination.
- Tighten all mounting screws with a torque wrench in accordance with the specified tightening torque (Section ↗ 8.5).
- Check proper assembly of the sealings and gasket.
- Check ease of movement of the brushes in the brush guide.
- The brush flexes must be placed in that way that they can follow the reduction of the brush during the abrasion, do not jam and cannot be touched by the spring of the pressure device.
- Check proper assembly and secure locking of the pressure devices.
- Secure the fastening elements in accordance with the instructions.

8.4 Required Tools/ Material

ATTENTION

The use of an impact wrench is forbidden.

- Socket wrench for internal hex SW 5, SW 6 and SW 8
- Socket wrench for external hex SW 16
- Torque wrench
- Loctite 243
- Rubber or plastic hammer (to loosen seized parts)
- Vacuum cleaner and brush (for cleaning)
- Fine mill file max. coarseness 2, emery cloth grain size ≤240 (for cleaning and smoothing the gasket faces)

8.5 Tightening Torques

ATTENTION

Damage due to disregard

The use of incorrect tightening torques, materials and screw locking for the not included fastening elements result in damage to the property.

- The material of the fastening elements and components must be matched.
- The tightening torque must be chosen, that the components cannot fall off or get damaged.
- The usable thread depth must be matched with the fastening elements.

The standard tightening torques are listed in the table below. If a mismatch of the tightening torques in the manual should be found, the tightening torques in this section have priority.

Item	Type of screw	Standard	Size	Tightening torque
3	Cap screw	DIN 912	M8x20	25 Nm*
5	Cap screw	DIN 912	M8x20	16.5 Nm
12	Cap screw	DIN 912	M6x16	7 Nm
17	Cap screw	ISO 4762	M10x20	49 Nm
20	Hex screw	ISO 4017	M10x35	30 Nm

Tab. 11: Tightening torques maintenance

*Use Loctite 243

8.6 Maintenance Intervals

NOTE

Since users carry out inspections or servicing intervals at shorter time intervals however, it is best to include the grounding contact/system service as part of this practice.

Interval description	Maintenance interval
Inspection, cleaning and brush replacement	1,200,000 km

Tab. 12: Maintenance intervals

Under normal operating conditions, assuming proper assembly of the grounding contact and average brush wear of approx. 2 - 3 mm / 100,000 km, maintenance is only required after approx. 1,200,000 km.

The stated brush wear value is depending on tests and measurements.

Description	Brush mileage
Recommended inspection and cleaning	600.000 km

Tab. 13: Recommended first inspection of the brushes

It is recommended to check the wear of a new brush after a mileage of 600,000 km.

ATTENTION

Improper Function

If the brush or contact disc wear exceeds the stated wear of 2 - 3 mm /100,000 km.

- Contact the manufacturer.
- The procedures in the "Fault Detection and Troubleshooting" section (↗ Appendix) should be carried out.

Maintenance should only be carried out at a mileage of 600.000 km since every interim maintenance unnecessarily endangers the operational reliability.

8.7 Maintenance Tasks


DANGER

Danger to life due to electric shock

Contact with live parts can result in permanent injury or death.

- Disconnect the unit from the power supply before maintenance work.
- Ensure that the unit cannot be put into operation during maintenance work.


WARNING

Risk of injury due to falling unit

A falling unit can result in permanent injury to persons.

- Secure the grounding contact against accidental falling **before** beginning work.
- Wear protective equipment while working on the unit.
- Adhere to the instructions of the safety briefing.


WARNING

Risk of injury from protruding edges and corners

Some areas of the grounding contact contain protruding parts with edges and corners that may result in serious injury.

- Wear protective equipment while working on the unit.
- Adhere to the instructions of the safety briefing.

ATTENTION

Risk of damage to property due to grease, oil and moisture

Grease, oil and moisture in the contact area results in failure of the grounding contact.

- Ensure before, during and after undertaking assembly and maintenance work that no grease, oil or moisture can penetrate into the contact area of the grounding contact.
- Replace disassembled sealings during every maintenance.
- Check the mounting-/sealing surfaces for damage and contamination.

ATTENTION

Risk of damage to property due to external influences

Operating the grounding contact with faulty components can result in significant material damage.

- Replace the components of the grounding contact / grounding contact damaged by external influences before each start up.

ATTENTION

Risk of damage to property due to falling unit

A falling unit can result in considerable material damage to the unit.

- Secure the grounding contact / grounding contact against accidental falling **before** beginning work.

NOTE

During maintenance the functional tests (Section ↗ 8.3) must be observed and followed without exception before and during reassembly.

NOTE

All tightening torques (Section ↗ 8.5) and thread locking's are given in the current drawings.

NOTE

Place all disassembled parts they are not discarded, to a dry and clean place.

NOTE

The tightening procedure of the fixing screws must be done in three steps.

First step is a hand-tight bolting of the screws in a crosswise sequence.

In the second step screws must be bolted in crosswise sequence with 50% of the final tightening torque.

Finally, in the third step screws must be bolted with the full prescribed tightening torque in a crosswise sequence.

8.7.1 Cleaning

ATTENTION

Impairment of the function

Liquid cleansing agents or compressed air must never be used to remove the brush abrasion debris under any circumstances

- Vacuum the deposits.

The abrasion of the brushes (4) is deposited in the housing and the contact disc. This must be removed during every inspection of the brushes (4). Clean the brush guide slots (1) and restore the ease of movement of the brushes (4). Clean the electrical contact surfaces. Electrical contact surfaces must be metallically bright.

Clean contaminations from the insulating parts to avoid electrical creepage.

Thoroughly clean the sealing surfaces before assembly.

Smooth out damaged sealing surfaces. If necessary, replace components with a damaged sealing surface.

8.7.2 Sealings, Gasket, Lock Rings and Lock Washers

All **disassembled** lock washers, lock rings, gasket and sealings must be replaced during each maintenance.

8.7.3 Inspection of the Brush (4)

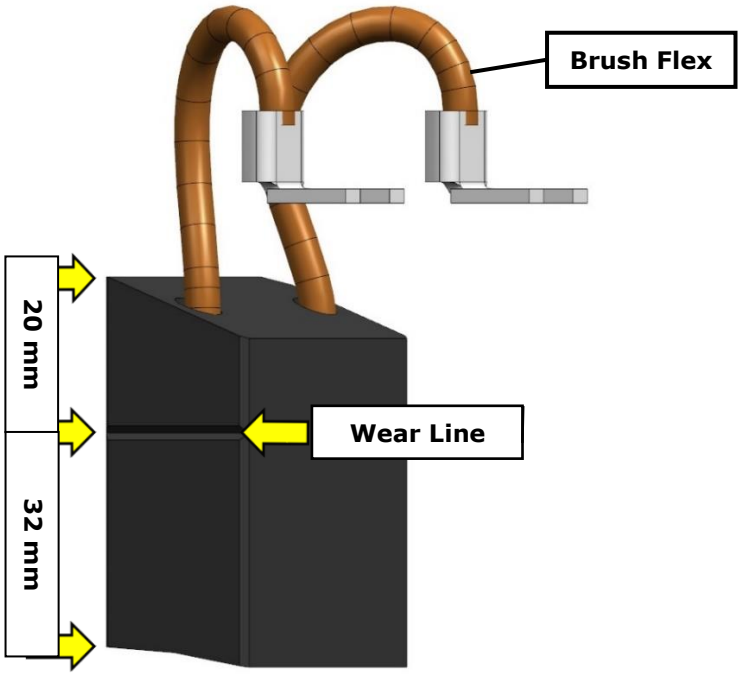


Fig. 23: Wear line

NOTE

Risk of damage to property due to disregard

Incorrect assembly of the brush cords can result to damage.

- The brush cords must be placed in that way that they can follow the reduction of the brush during the abrasion, do not jam and cannot be contacted by the spring of the pressure device.
- Do not bend the brush cords.
- Do not mount the brush cords overtwisted or unwound.
- Make sure that the brush cords can move freely.
- Make sure that the cable lugs on the brushes are mounted under the washers.

A new brush has a height of approx. 52 mm and a wear height of approx. **32 mm**. A worn brush has a remaining height of approx. **20 mm**. Optically, a worn-out brush can be recognized when the **wear line** is reached.

To inspect the brush. Simply remove the cover (11) and the pressure device (6) from the brush guide (1), see section ↗ 6.6.2.1 step 1 and 3. Pull out the brushes using the **brush flexes**, to inspect the brush.

The brush must be checked in accordance with the following criteria:

- Brush wear,
- Oblique or spherical brush contact surface,
- Scoring on the brush contact surface,
- Chipping on corners and edges,
- Traces of grease or oil on the brush contact surface,
- Discolouration on the brush or cable lugs.

Under normal operating conditions an inspection of the ease of movement of the brushes in the brush guide and the brush wear is sufficient. The ease of movement is restored by cleaning the brush guide slot. The brush should be replaced if necessary, taking into consideration the maintenance interval.

If the brush is worn replace the brush in accordance with section ↗ 8.7.4.

If, apart from the usual brush wear of approx. 2 - 3 mm /100,000 km, one or more of the inspection criteria listed above is identified, there is a long-term risk of impairment or failure of the grounding contact. In this case, proceed in accordance with the description "Fault Detection and Troubleshooting" (↗ Appendix).

Clean the system in accordance with section ↗ 8.7.1. Inspect the contact disc in accordance with section ↗ 8.7.5.

8.7.4 Replacement of the Brush

Before replacement, the cover and the pressure devices must be removed from the brush guide, see section ↗ 6.6.2.1 step 1 to 3. Then pull out the brushes using the **brush flexes.**

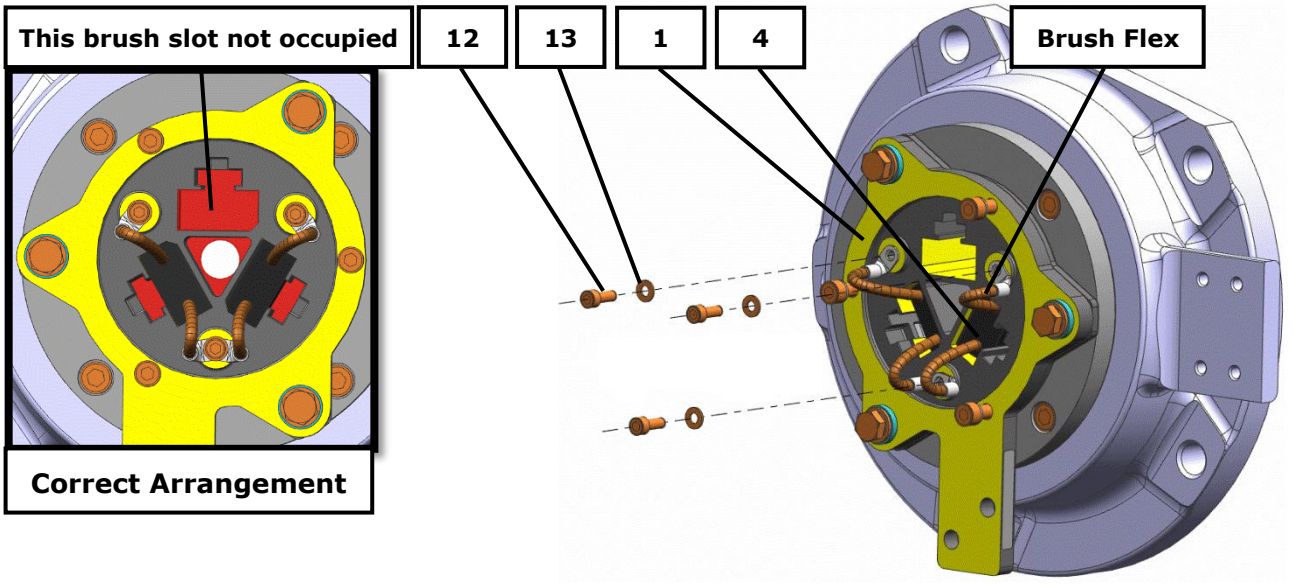


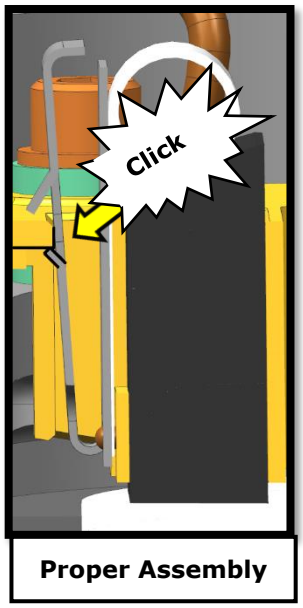
Fig. 24: Replacement Brushes

1. Loosen and remove the cap screws (12) and lock washers (13) from the brush guide (1).
2. Dispose of the lock washers (13). Removed lock washers must be disposed of.
3. Remove the brushes (4) using the brush flexes and dispose of.
4. Clean the system in accordance with section ↗ 8.7.1.
5. Inspect the contact disc (14) in accordance with section ↗ 8.7.5.

NOTE

Ensure that the brushes (4) are properly assembled to the brush guide. A **Chamfer** on the brush guide and the brush (4) prevents an improper assembly.

6. Insert the **new** brushes (4) into the brush guide (1).



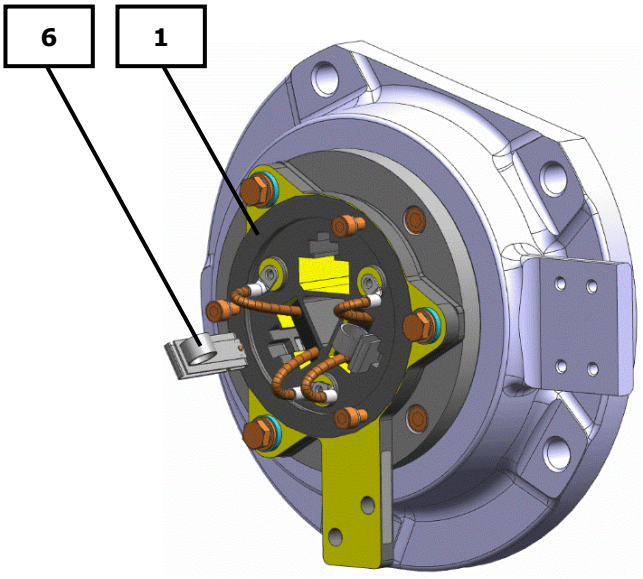


Fig. 25: Insertion of the pressure devices

CAUTION

Injuries by tension

The pressure devices (6) are under tension, if they are not properly assembled they can pop out wildly and cause serious injuries!

- Ensure that the notch of the pressure device (6) engages in the corresponding recess in the brush guide (1). **(click)**

NOTE

Damage due to disregard

During the removal of the pressure devices the brushes can fall out.

- Secure the brushes against accidently falling out.

7. Insert the pressure devices (6) into the brush guide (1).
8. Ensure **proper assembly** of the pressure device (6).

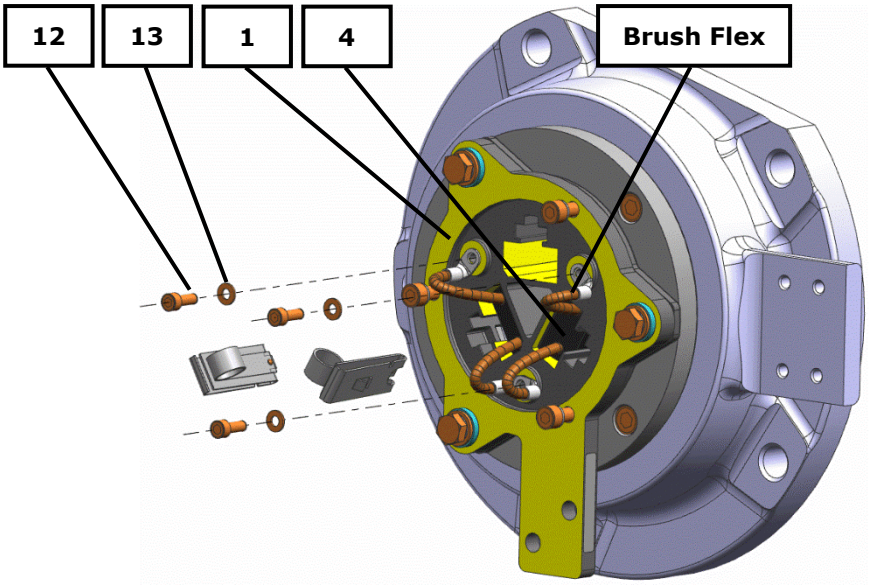


Fig. 26: Assembly of the brush fastening elements

NOTE

Risk of damage to property due to disregard

Incorrect assembly of the brush flexes can result to damage.

- The brush flexes must be placed in that way that they can follow the reduction of the brush during the abrasion, do not jam and cannot be contacted by the spring of the pressure device.
- Do not bend the brush flexes.
- Do not mount the brush flexes overtwisted or unwound.
- Ensure sure that the brush flexes can move freely.
- Ensure that the cable lugs of the brushes are mounted below the lock washers.

9. Attach the **cable lugs** to the brush guide (1) using the lock washers (13) and cap screws (12) (T_t= 7 Nm).

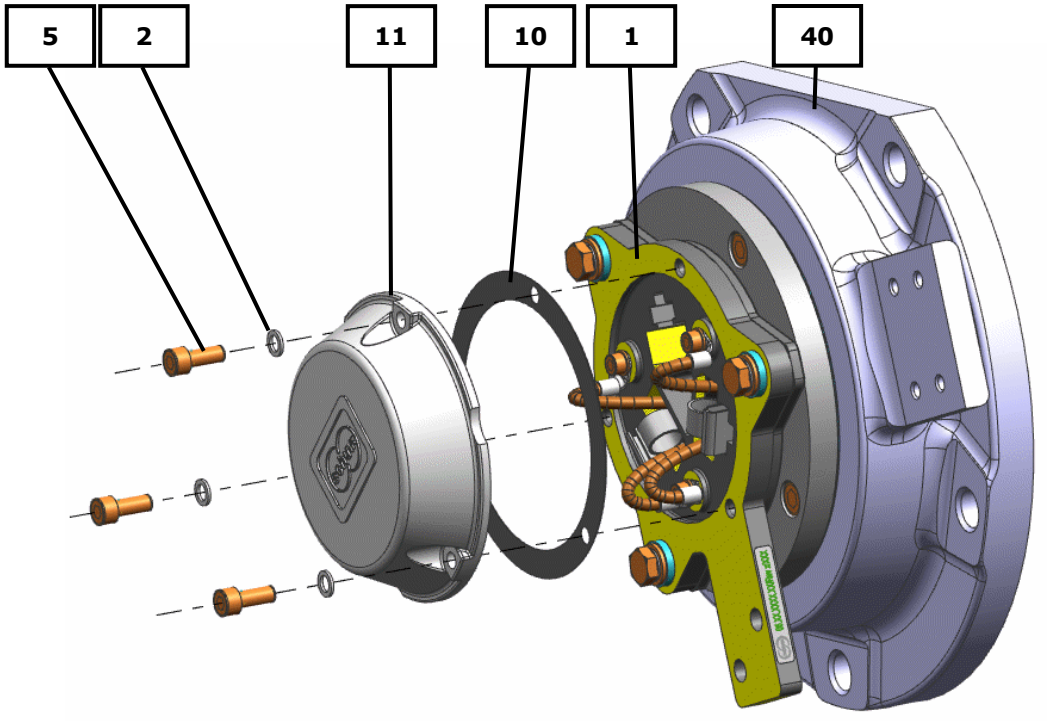


Fig. 27: Assembly of the cover

10. Attach the cover (11) to the brush guide (1) using the sealing (10), lock washers (2) and cap screws (5) (T_t= 16.5 Nm).

NOTE

Maintenance is complete now.

8.7.5 Inspection of the Contact disc (14)

Before inspection, the cover and pressure devices must be removed from the brush guide, see section ↗ 6.6.2.1.

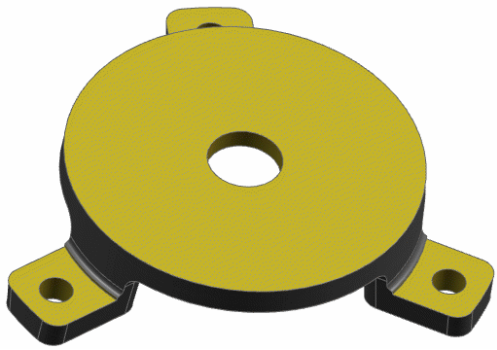


Fig. 28: Inspection contact disc

Under normal operating conditions, maintenance is not required during the service life of the grounding contact.

The contact disc must be checked in accordance with the following criteria:

- Traces of grease or oil on the brush contact surface,
- Scoring on the brush contact surface,
- Damage to the surface,
- One-sided or uneven brush wear marks.

Maintenance of the contact disc during the lifetime of the grounding contact is not required under normal operating conditions.

If one or more of the inspection criteria listed above is identified, then in the long term there is a risk of impairment or failure of the grounding contact.

In this case, proceed in accordance with the description "Fault Detection and Troubleshooting" (↗ Appendix).

If the brushes (4) were **worn**, go on with section ↗ 8.7.4 steps 1 to 10.

If the brushes (4) were **not worn**, insert the brushes (4) into the brush guide (1), attach the pressure devices (6) and the cover (11) in accordance with section ↗ 6.6.1.

9 Spare Parts List

NOTE

Impairment of the function

To avoid impairment of the function of the grounding contact / grounding contact and to observe maintenance intervals.

- Use original spare parts only.

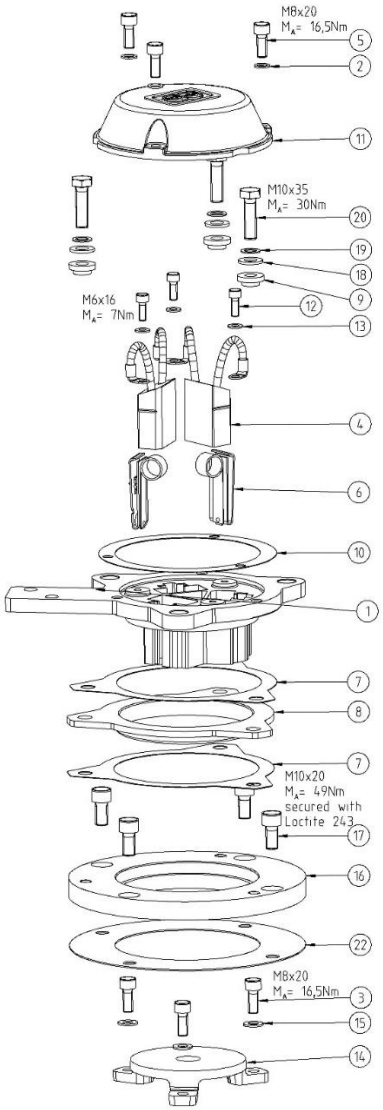


Fig. 29: Components of the grounding contact 06.21.0110.15

- Item numbers 1 to 22 denote the main components that are identical to the Schunk manufacturing parts list.
- The last column (Rep. Qty.) of the table shows the parts which will replaced during the complete preventive maintenance of the grounding contact.

The quantity information refers to the quantity of spare parts required per grounding contact.

Item no.	Document/SAP	Name	SPL Qty.	Rep. Qty.
	06.21.0110.15	**Grounding contact**		
1	51.49.0584.32	Brush guide	1	
2	40.21.427	Lock washer SK Z 8	3	**X**
3	40.02.001	Cap screw DIN912 M8X20 8.8	3	
4	114_113_135_040	Brush C40Z3	2	**X**
5	40.02.201	Cap screw DIN912 M8x20 A2-70	3	
6	06.47.0171.00	Pressure Device	2	
7	51.65.0090.02	Sealing	2	
8	51.66.0403.00	Insulating Part SCC51.66.0403.00	1	
9	51.66.0291.16	Insulating Bushing	3	
10	51.64.0050.02	Sealring 0,5	1	**X**
11	51.49.0582.07	Cover	1	
12	40.02.247	Cap screw DIN912 M6x16	3	
13	40.21.027765	Lock washer	3	**X**
14	51.49.0961.32	Contact disc	1	
15	11027795	Lock washer NF E 25-511 Z M8	3	
16	51.49.1534.01	Adapter flange	1	
17	40.02.261	Cap screw ISO4762 M10x20	4	
18	40.20.364	Washer ISO7089 10	3	
19	40.20.179	Lock Washer	3	
20	40.01.809	Hex screw ISO4017 M10X35	3	
22	51.65.0090.05	Gasket	1	

Figures

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Appendix

Fault Detection and Troubleshooting

1. General Information

The grounding contact is a component that is part of the return current and grounding system. When an impairment or failure of the grounding contact occurs, the grounding contact should be taken into consideration in the troubleshooting process.
The grounding contact is considered from the contact surface of the contact disc / slip ring to the main connector.

2. Malfunctions Due to Incorrect Assembly

2.1 Potential fault	The resistance between the grounding contact and axle or grounding contact and bearing housing is too high.
Possible cause of fault	The corresponding contact surfaces on the axle and the bearing housing / gear casing are not metallically bright.
Remedial action	Take appropriate action to restore the contact surfaces to a metallically bright state.
2.2 Potential fault	The mounting screws cannot be screwed in.
Possible cause of fault	The mounting thread on the axle and on the bearing housing / gear casing is not in perfect condition.
Remedial action	Take appropriate action to restore the mounting thread to a perfect condition.
2.3 Potential fault	The mounting screws cannot be fully screwed in.
Possible cause of fault	The usable depth of thread is not sufficient or the screws are too long.
Remedial action	The usable depth of thread must match the mounting screws.
2.4 Potential fault	The brush guide is incorrectly aligned to the axle.
Possible cause of fault	The parallelism between the front-end mounting surface on the axle to the front-end mounting surfaces of the bearing housing / gear casing must be greater than 0.1 mm.
Remedial action	Take appropriate action to restore the parallelism between the mounting surfaces.

2.5 Potential fault	The contact area of the grounding contact is wet or dirty.
Possible cause of fault	- The sealing surface is damaged or dirty. - The gasket is no longer effective due to repeated usage.
Remedial action	- Damage to the sealing surface must be smoothed by appropriate measures. The parts with damaged sealing surface must be replaced if necessary. Clean the sealing surface carefully before reassembly. - Replace the gasket.
2.6 Potential fault	The mounting screws are loose.
Possible cause of fault	The mounting screws have not been tightened to the specified torque.
Remedial action	All screws must be installed using a torque wrench, taking into account the prescribed tightening torque and using the prescribed screw locks (see documentation of the corresponding assembly and maintenance instructions).
2.7 Potential fault	The carbon brushes got stuck in the brush guide slot.
Possible cause of fault	Moisture, grease or oil in conjunction with the wear debris from the carbon brush can result, that the brushes got stuck in the brush guide slot.
Remedial action	Free movement must be restored by cleaning the brush guide slot.
2.8 Potential fault	The brush cables cannot move freely or are jammed.
Possible cause of fault	The brush cables are impeded or jammed by the constant spring or by the cover.
Remedial action	Position the brush cables so that they can follow the smaller brushes during the abrasion stage and do not jam.
2.9 Potential fault	The carbon brush is loose.
Possible cause of fault	The pressure device is not engaged into the brush guide.
Remedial action	Reassemble the pressure device in accordance with the assembly instructions. The pressure devices must be inserted in such a way that the notch on the pressure device correctly engages in the corresponding recess in the brush guide.

3. Malfunction due to Damaged Components

3.1 Contact disc / slip ring	
3.1.1 **Potential fault**	Scoring on the brush contact surface.
Possible cause of fault	- Moisture, grease or oil in the contact area. - The brush guide is incorrectly aligned to the axle. - Foreign objects in the contact area.
Remedial action	- Take appropriate action to restore correct alignment. - Replace the affected components.
3.1.2 **Potential fault**	Damaged brush contact surface.
Possible cause of fault	Large foreign objects in the contact area.
Remedial action	Remove the foreign objects from the contact area and replace damaged components.
3.1.3 **Potential fault**	Unilateral or uneven brush running tracks.
Possible cause of fault	- The brush guide is incorrectly aligned to the axle. - High current selectivity in the grounding contact or in the return current and grounding system.
Remedial action	Consult the manufacturer.

3.2 Carbon brush	
3.2.1 **Potential fault**	Uneven brush wear.
Possible cause of fault	- Carbon brush is stuck. - Jammed brush cables. - Current selectivity in the grounding contact.
Remedial action	- Free movement must be restored by cleaning the brush guide slot. - Position the brush cables so that they can follow the smaller brushes during the abrasion stage and do not jam. - Check the cable lug mounting and mount properly if necessary. - Consult the manufacturer.

3.2 Carbon brush	
3.2.2 **Potential fault**	Oblique or spherical contact surfaces.
Possible cause of fault	- The brush guide is incorrectly aligned to the axle. - Contact disc/slip ring has become loose. - Foreign objects in the contact area.
Remedial action	- Take appropriate action to restore correct alignment. - Secure the contact disc/ slip ring properly. - Remove foreign bodies. - Replace damaged components if necessary.
3.2.3 **Potential fault**	Nicks on corners and edges of the carbon brush.
Possible cause of fault	- Increased vibration and acceleration due to abnormal operating conditions. - Foreign objects in the contact area.
Remedial action	- Consult the manufacturer. - Remove foreign bodies.
3.2.4 **Potential fault**	Discolouration on the contact brushes, power cables or cable lugs.
Possible cause of fault	Current selectivity and electrical overload.
Remedial action	- Check the cable lug mounting and mount properly if necessary. - Replace the carbon brush if necessary. - Consult the manufacturer.

3.3 Pressure device	
3.3.1 **Potential fault**	Damage to the constant spring.
Possible cause of fault	Increased vibration and acceleration due to abnormal operating conditions.
Remedial action	Replace pressure device.
3.3.2 **Potential fault**	Damage to the spring bracket.
Possible cause of fault	Increased vibration and acceleration due to abnormal operating conditions.
Remedial action	Replace pressure device.

3.4 Contact area	
3.4.1 **Potential fault**	Undefined current path.
Possible cause of fault	- Large amounts of brush abrasion debris in the contact area. - The grounding contact has not been properly cleaned.
Remedial action	Clean the contact area in accordance with the assembly and maintenance instructions.
3.4.2 **Potential fault**	Foreign objects in the contact area of the grounding contact.
Possible cause of fault	Components damaged by foreign objects.
Remedial action	- Remove foreign objects from the contact area. - Replace damaged components if necessary.
3.4.3 **Potential fault**	Moisture, grease or oil in the contact area.
Possible cause of fault	- Repeated usage of the gaskets. - Damaged or contaminated sealing surfaces. - The fastening elements have not been tightened to the specified torque. - Improper maintenance work. - Unsuitable sealing of the contact area against the axle bearing.
Remedial action	- Clean the contact area in accordance with the maintenance and assembly instructions. - Replace damaged components if necessary. - Consult the manufacturer.