

Enclosed Slip Ring Assembly Types 45/1, 45/2 and 45/3

Assembly and operation manual

Read this manual prior to performing any task!

Assembly and operation manual (translation of the original)



Table of contents

1	⚠ Safety	5
1.1	Warnings and symbols	5
1.2	Intended use	5
1.3	Improper use	6
1.4	Operator responsibility	6
1.5	Personnel requirement	6
1.6	Personal protective equipment	7
1.7	Product-specific safety instructions	8
1.7.1	Electrical hazards	8
1.7.2	Mechanical and thermal hazards	8
1.7.3	Danger due to substances	9
1.8	5 Safety Rules for working on electrical systems	9
2	General information	10
2.1	Copyright	10
2.2	Brands	10
2.3	Limitation of liability	10
2.4	Warranty	11
2.5	Customer service	11
2.6	About this document	12
3	Technical Data	13
3.1	Slip ring assembly, Type 45/1 (standard)	13
3.2	Slip ring assembly, Type 45/2 (standard)	14
3.3	Slip ring body, Type 45/3 (standard)	16
3.4	Tolerances	17
3.5	Tightening torques	17
4	Description and Functional Principles	19
5	Scope of delivery	21
6	Transport and Storage	22
6.1	Transport inspection	22
6.2	Storage	22
7	Tools and materials	24
8	Assembly	25
8.1	Mount slip ring assembly to end consumer	25
8.2	Electrically connect slip ring assembly to end consumer	26

9	Commissioning.	28
9.1	Check list.	28
9.1.1	Checking the system.	28
9.1.2	Check the slip rings.	28
9.1.3	Checking the current collectors.	29
9.2	Measuring insulation resistance.	29
10	Operation.	30
11	Faults.	31
11.1	Troubleshooting.	31
11.2	Handling unknown faults.	32
12	Service and Maintenance.	33
12.1	Maintenance schedule.	33
12.1.1	General functionality test.	34
12.1.2	Functionality test of insulating components.	34
12.1.3	Functionality test of slip ring.	35
12.1.4	Current collector functional check.	35
12.1.5	Visual inspection of cables.	36
12.1.6	General overhaul.	36
12.2	Replacing the current collector.	37
12.3	Replace slip rings.	41
12.4	Replace bearing.	45
12.5	Replace hood and sealing.	50
12.6	Clean slip ring assembly.	52
13	Disassembly and Disposal.	54
13.1	Disassembly.	54
13.2	Disposal.	54
14	Approvals and standards.	56
15	Abbreviations.	57

1 Safety

1.1 Warnings and symbols

This document contains safety-relevant information in various places. The safety chapter contains general safety instructions that are relevant for several or all phases of the product life cycle. Further safety instructions relating to a specific phase of the product life cycle can be found at the beginning of the corresponding chapter.

Warnings are also used. These are identified by symbols and signal words. The symbol indicates the type of danger, the signal word indicates the degree of danger. Warnings are handling-related additions that are placed directly next to the respective work step.

Always observe all safety and hazard information and work carefully to avoid accidents, bodily injury or material damage.

The product safety labels, i.e. the symbols affixed to the product, must also be observed. Product safety labels must not be removed from the product. If they have been removed from the product, they must be replaced.

Signal word	Meaning
WARNING	This combination of symbol and signal word indicates a potentially dangerous situation that can result in death or serious injury if it is not avoided.
NOTICE	This combination of symbol and signal word indicates a potentially dangerous situation that can result in material and environmental damage if it is not avoided.
ENVIRONMENT	This combination of symbol and signal word indicates a potentially dangerous situation that can result in material and environmental damage if it is not avoided.

Warning signs	Type of danger
	Warning – suspended load.

1.2 Intended use

The slip ring assembly supplies rotating end consumers with electrical energy and/or electronic data.

A slip ring assembly is exclusively intended for the following areas of application:

- Industrial sector
- Business/Commercial Sector
- Light industrial environments
- Theaters
- Amusement parks

The standard installation orientation of the slip ring assembly is vertical, although it can optionally be installed horizontally.

Intended use also includes compliance with all the information in this document.

Any use beyond the intended use or any other use, reconstruction or other modifications are considered misuse and is prohibited.

1.3 Improper use

Any use that deviates from or goes beyond the intended use described here involves considerable risks to persons and materials.

Improper use particularly includes, but is not limited to:

- Operation outside the stated technical specifications
- Operation outside the specified operating and ambient conditions.
- Operation without initiating measures resulting from the operator's risk assessment.
- Operation under environmental conditions that permanently damage the material properties and/or reduce the insulating properties.
- Operation in areas with flammable or explosive gases and/or dusts.
- Operation in white rooms and/or clean rooms.
- Operation in an area accessible to the public without protective equipment.
- Operation within hand reach.
- Overloading of current collectors and slip rings due to excessive current and voltage.
- Operation in areas that require a higher degree of protection than specified.
- Use of the slip ring assembly as a step.
- Use of unsuitable cleaning agents.
- Use of accessories not supplied and not approved or authorized by the manufacturer.
- Use of spare parts that have not been approved by the manufacturer.
- Use of tools that are not intended for professional use.
- Operation of the system by untrained and insufficiently qualified personnel.
- Execution of any work on the system by insufficiently qualified personnel.
- Disabling of safety devices.
- Use of different conductor materials without additional measures.

1.4 Operator responsibility

The product is used in the commercial sector. The operator is therefore subject to the legal obligations relating to workplace safety. In addition to the warning and safety instructions in this document, all safety, accident protection and environmental regulations valid in the place of operation of the product must also be observed.

The operator must ensure that all employees have read and understood this documentation.

1.5 Personnel requirement

All activities may only be carried out by qualified and trained personnel. Inadequate training in the use of the product may result in serious personal injury or material damage. The qualifications listed for various areas of application are stated in this document.

Qualified electricians

- are specially trained for the working environment surrounding electrical systems,
- are capable of independently performing assigned tasks on electrical systems based on their professional training, knowledge and experience, who also are able to independently recognize and avoid potential hazards and
- possess an understanding of the applicable standards and regulations.

Specialist personnel

- Consists of persons who are capable of independently performing assigned tasks based on their professional training, knowledge and experience, who also are able to independently recognize and avoid potential hazards and
- possess an understanding of the applicable standards and regulations.

Users

- may take on tasks within the scope of normal operations.
- have been instructed by the operator in this regard and familiarized with the potential dangers.

1.6 Personal protective equipment

The protective equipment that the persons involved must wear may be specified at the beginning of the instructions.



FFP3 protective mask

For protection against serious and permanent respiratory diseases.



Protective eyewear

For eye protection against mechanical and chemical hazards.



Protective footwear

For protection against heavy falling parts and slipping on slippery floors.



Protective gloves (mechanical)

For hand protection against mechanical hazards such as friction, abrasions, punctures or deeper wounds.



Protective headgear

For protection against falling and flying parts.

1.7 Product-specific safety instructions

The dangers described here describe residual risks that may arise from the product even when used as intended.

1.7.1 Electrical hazards

Potential hazards

- Electric shock
- Life-threatening injuries
- Fire hazard

Working on these components is potentially hazardous

- Components that carry electrical current
- Components that are live as a result of a fault
- Damaged components

Before starting work, ensure that

- No damaged electrical components and/or cables are used.
- Always follow the Five Safety Rules when working on electrical systems.

During the work

- Use personal protective equipment.
- Observe installation tolerances.

Before switching the power supply back on

- Before each time the equipment or system is restarted, check the insulation resistance according to locally applicable technical standards, directives and laws.
- Comply with permissible current ratings.
- Easily combustible materials may not be stored near the product.

Maintain electrical safety

- Regularly test and maintain electrical equipment.
- If hazardous defects are discovered, immediately take measures to remedy them.

1.7.2 Mechanical and thermal hazards

Potential hazards

- Injuries due to crushing, shearing and cutting.
- Ensnarement of limbs and/or clothing.
- Burn hazard

Working on these components is potentially hazardous

- Components that rotate during operation.
- Heated components

Ensure before beginning the work

- The housing is closed.
- Allow heated components to cool down.

- During the work**
- Use personal protective equipment.
 - Do not manually interfere with the rotational movement.

- Before the restart**
- All installation work has been completed.
 - The housing is closed.

1.7.3 Danger due to substances

- Potential hazards**
- Sensitization
 - Irritations of the mucous membranes
 - Respiratory diseases

- Working on these components is potentially hazardous**
- Slip rings
 - Current collector

- During the work**
- Wear an FFP3 protective mask.
 - Remove soiling and dust from the current collector using a vacuum cleaner with a Class H filter.

- Before restarting**
- The housing is closed.

1.8 5 Safety Rules for working on electrical systems

- Follow the 5 Safety Rules (see DIN VDE 0105-100)**
1. Turn on the system.
 2. Secure against unintentional restart.
 3. Ensure that the system is disconnected by measuring the current.
 4. Ground and short-circuit parts of the system on which work will be conducted.
 5. Cover or block off adjacent energized parts.

2 General information

This document is part of the product and enables safe and efficient handling of the product. It must be kept accessible to personnel at all times.

Compliance with all warnings, safety instructions and instructions for use is a basic prerequisite for safely working with the product. Furthermore, the local accident prevention regulations and general safety regulations for the use of the system or machine apply.

This document does not provide instructions for operating the system or machine in which the product is integrated.



Images and illustrations as examples

The images and illustrations shown are for illustrative purposes only and may differ in detail from your project-specific design.

2.1 Copyright

The content in this document is protected by copyright and is subject to industrial property rights if applicable.

Reproduction of this document, including excerpts, is only permitted within the limits of the statutory provisions of copyright law. Any modification or abridgment, except for internal purposes, without the express consent of Conductix-Wampfler is prohibited.

2.2 Brands

The names, trade names, goods identification, etc. used in this document may be trademarks even if not specifically marked as such and as such are subject to legal provisions.

2.3 Limitation of liability

The contents of this document have been compiled taking into account the applicable standards and regulations, the state of the art and Conductix-Wampfler's many years of knowledge and experience.

Conductix-Wampfler accepts no liability for damage or operational faults resulting from:

- Non-compliance with the technical documentation
- Improper use
- Use of untrained specialist personnel
- Unauthorized modifications and technical changes
- Use of unauthorized spare parts or accessories
- Use of the product, despite a negative transport inspection
- Disadvantages resulting from using the product when it is evident that it is not functioning properly

The actual scope of delivery may differ from the explanations and descriptions provided here if the design in question is a special one, if additional equipment has been ordered or due to recent technical changes.

The obligations agreed upon in the Delivery Agreement and our General Terms and Conditions of Business apply, as do the delivery conditions of the manufacturer and the legal obligations applicable at the time the contract was concluded.

Conductix-Wampfler reserves the right to make technical changes within the context of improvement of function and further development.

2.4 Warranty

The warranty period and the scope of the warranty are determined by your contractual conditions and by Conductix-Wampfler's General Terms of Delivery.

The warranty does not apply in the following circumstances:

- Changes to the product without the consent of Conductix-Wampfler
- Improper handling, transportation or maintenance of the product
- Use of parts that are not original Conductix-Wampfler parts
- Non-compliance with this document
- Non-compliance with tolerances

2.5 Customer service

All Conductix-Wampfler employees are always interested in new information and on-site experience that can contribute to improving the products.

Customer service is available for all technical questions.

Conductix-Wampfler GmbH
Rheinstrasse 27 + 33
D – 79576 Weil am Rhein – Markt
Phone: +49 (0) 7621 662 – 0
Fax: +49 (0) 7621 662 – 144
Email: info.de@conductix.com
➔ www.conductix.de
Country of origin: Germany

Worldwide sales and service location addresses:

➔ www.conductix.contact

2.6 About this document

Explanation of symbols

Pen



Instruction-related information for when markings or labels must be made with a pen is available in graphic form.

Slot-head screwdriver



Instruction-related information on loosening or tightening screws using a slot-head screwdriver is available in graphic form.

Cross-head screwdriver



Instruction-related information for when screws are to be loosened or tightened using a cross-head screwdriver is available in graphic form.

Wrench



Instruction-related information for when screws are to be loosened or tightened is available in graphic form. If a tightening torque is specified, a torque wrench is to be used.

Hex key



Instruction-related information for when screws are to be loosened or tightened is available in graphic form. If a torque is specified, a torque wrench is to be used.

Tube



Instruction-related information is available in graphic form when substances such as, e.g., an adhesive, screw-locking device, lubricant, etc. are necessary.

Entries in abbreviations list

The blue plus sign indicates an entry in the abbreviations list. Clicking on the entry allows you to jump directly to that entry in the abbreviations list when viewing the document in a PDF viewer.

For example: *RTG*⁺

Dimensions within the document

Dimensions without units are given in millimeters.

3 Technical Data

On the enclosed slip ring assembly, the type plate is located on the housing.



Type plate information specification

The information on the type plate must be provided for all inquiries regarding the product.

3.1 Slip ring assembly, Type 45/1 (standard)

Mechanical and electrical data

Data	Value	Unit
Max. current	21	A
Max. current at standstill	10	A
Max. voltage	415	V
Protection class	IP 65	
Rotational speed without data transmission	1 – 100	min ⁻¹
Rotational speed with data transmission	1 – 30	min ⁻¹
Installation orientation	Vertical	

Electrical interfaces

Data	Value	Unit
Connection to terminal block with mantle terminal, up to 12 poles	Type MUB-17	
Connection to terminal block with mantle terminal, 13 to 18 poles	Terminal strips	
Connection of current collector with flat plug	6.3	
Cross section of connecting cable up to max. 15 poles	4	mm ²
Cross section of connecting cable up to max. 18 poles	2.5	mm ²

Mechanical interfaces on ring side

Data	Value	Unit
Connection thread, internal	M25 x 1.5	
Flange	□125 x 125	mm
Mounting holes, bolt circle 100 mm	4 holes Ø 13	mm
Mounting holes, bolt circle 125 mm	4 holes Ø 11	mm

Mechanical interfaces on current collector side

Data	Value	Unit
Towing device	30 x 14	mm

Technical data for current collector

Data	Value
Sliding contact material for power transmission	Copper
Sliding contact material for data transmission	Silver
Design	Holder with two sliding contacts
Data transmission	Yes

Technical data for slip ring

Data	Value	Unit
Diameter	Ø45	mm
Material for power transmission	Brass	
Material for data transmission	Brass, multi-layer coated	
Ring spacing	14	mm

Housing

Data	Value
Material	Polyamide
Hood design	One-piece
Connection thread for cable fitting	M25 x 1.5
Connection thread for cable fitting	M32 x 1.5
Option	Vent screw

Ambient conditions

Data	Value	Unit
Storage temperature indoors	+10 and +30	°C
Ambient temperature	-30 to max. +50	°C
Humidity (non-condensing)	Max. 85	%
Recommended operating range	40 – 60	%

3.2 Slip ring assembly, Type 45/2 (standard)

Mechanical and electrical data

Data	Value	Unit
Max. current	47	A
Max. current at standstill	47	A
Max. voltage	690	V
Protection class	IP 65	
Rotational speed	1 – 100	min ⁻¹
Installation orientation	Vertical	

Electrical interfaces

Data	Value	Unit
Connection to terminal block with mantle terminal	Type MUB-17	
Connection of current collector with flat plug	6.3	
Cross section of connecting cable up to max. 5 poles	10	mm ²

Mechanical interfaces on ring side

Data	Value	Unit
Connection thread, internal	M25 x 1.5	
Flange	□125 x 125	mm
Mounting holes, bolt circle 100 mm	4 holes Ø 13	mm
Mounting holes, bolt circle 125 mm	4 holes Ø 11	mm

Mechanical interfaces on current collector side

Data	Value	Unit
Towing device	30 x 14	mm

Technical data for current collector

Data	Value
Sliding contact material	Copper
Design	Holder with two sliding contacts
Number of current collectors per slip ring	2
Data transmission	No

Technical data for slip ring

Data	Value	Unit
Diameter	45	mm
Material	Brass	
Ring spacing	36.6	mm

Housing

Data	Value
Material	Polyamide
Cover design	One-piece
Connection thread for cable fitting	M25 x 1.5
Connection thread for cable fitting	M32 x 1.5
Option	Vent screw

Ambient conditions

Data	Value	Unit
Storage temperature indoors	+10 and +30	°C
Ambient temperature	-20 to max. +50	°C
Humidity (non-condensing)	Max. 85	%
Recommended operating range	40 – 60	%

3.3 Slip ring body, Type 45/3 (standard)

Mechanical and electrical data

Data	Value	Unit
Max. current	21	A
Max. current at standstill	10	A
Max. voltage	690	V
Protection class	IP 65	
Rotational speed	1 – 100	min ⁻¹
Installation orientation	Vertical	

Electrical interfaces

Data	Value	Unit
Connection to terminal block with mantle terminal	Type MUB-17	
Connection of current collector with flat plug	6.3	
Cross section of connecting cable up to max. 9 poles	2.5 or 4	mm ²

Mechanical interfaces on ring side

Data	Value	Unit
Connection thread, internal	M25 x 1.5	
Flange	□125 x 125	mm
Mounting holes, bolt circle 100 mm	4 holes Ø 13	mm
Mounting holes, bolt circle 125 mm	4 holes Ø 11	mm

Mechanical interfaces on current collector side

Data	Value	Unit
Towing device	30 x 14	mm

Technical data for current collector

Data	Value
Sliding contact material	Copper
Design	Holder with two sliding contacts
Data transmission	No

Technical data for slip ring

Data	Value	Unit
Diameter	45	mm
Material	Brass	
Ring spacing	28	mm

Housing

Data	Value
Material	Polyamide
Cover design	One-piece
Connection thread for cable fitting	M25 x 1.5
Connection thread for cable fitting	M32 x 1.5
Option	Vent screw

Ambient conditions

Data	Value	Unit
Storage temperature indoors	+10 and +30	°C
Ambient temperature	-30 to max. +50	°C
Humidity (non-condensing)	Max. 85	%
Recommended operating range	40 – 60	%

3.4 Tolerances

The following tolerances apply to mechanical machining:

Dimension [mm]	Tolerance [mm]
From 0.5 to 6	±0.1
Over 6 to 30	±0.2
Over 30 to 120	±0.3
Over 120 to 400	±0.5
Over 400 to 1000	±0.8
Over 1000 to 1200	±1.2
Over 2000 to 4000	±2

3.5 Tightening torques

Unless another tightening torque is specified, use the applicable tightening torques specified in VDI 2230 (Edition 02-2003):

Thread size according to DIN ISO 262	Tightening torque [Nm]
M4	3.3
M5	6.5
M6	11.3

Thread size according to DIN ISO 262	Tightening torque [Nm]
M8	27.3
M10	54
M12	93
M16	230
M20	464
M22	634
M24	798
M27	1176
M30	1597

4 Description and Functional Principles

A slip ring assembly (SRA) + consists of a rotating component and a stationary component. The connection is made via the flange to the end consumer's stationary machine component and via a towing device to the rotating machine component.

The slip rings are arranged in a row on an axle and connected to the stationary flange. The current collectors are connected to the rotating housing and engage with the slip rings. Depending on the type, this transmits electrical signals, data or current.

The housing is made of polyamide. It is sealed to protect the internal components from mechanical stress, dust, moisture and chemical influences. An optional vent screw allows for controlled airing and ventilation. The bearing flange is connected to the end consumer, while the hood can be removed in one piece for maintenance.

Depending on the application – data transmission or power transmission – current collectors and slip rings are made of different materials. While current collectors for data transmission are made of silver and the slip rings are made of multi-layer coated brass, current collectors for power transmission are made of copper and the slip rings are made of brass.

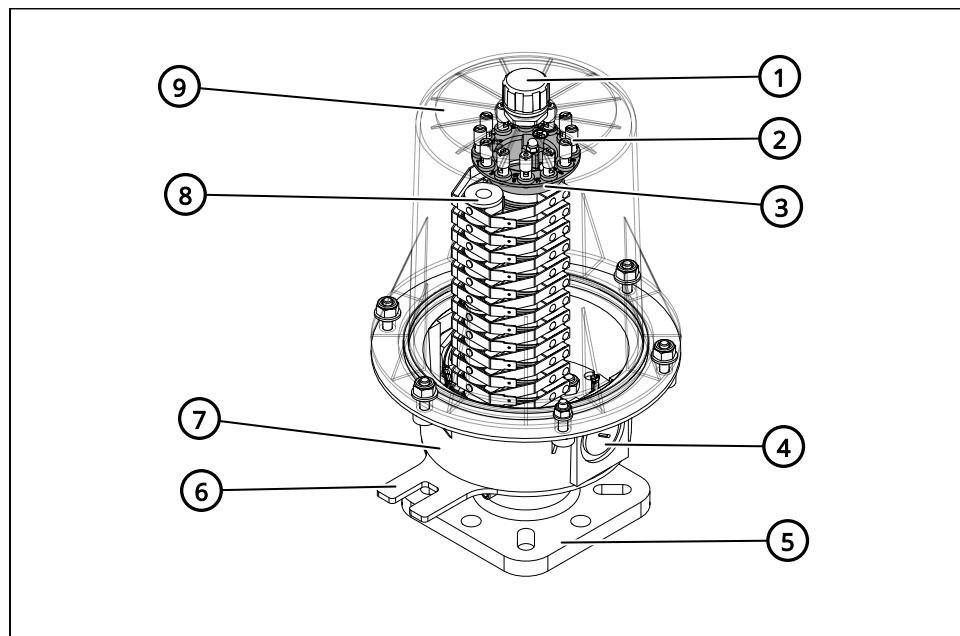


Fig. 1: Type 45 Enclosed slip ring assembly

- 1 Vent screw
- 2 Mantle terminal
- 3 Terminal block
- 4 Screw plug or cable fitting
- 5 Flange
- 6 Towing device
- 7 Housing lower part
- 8 Insulator
- 9 Hood

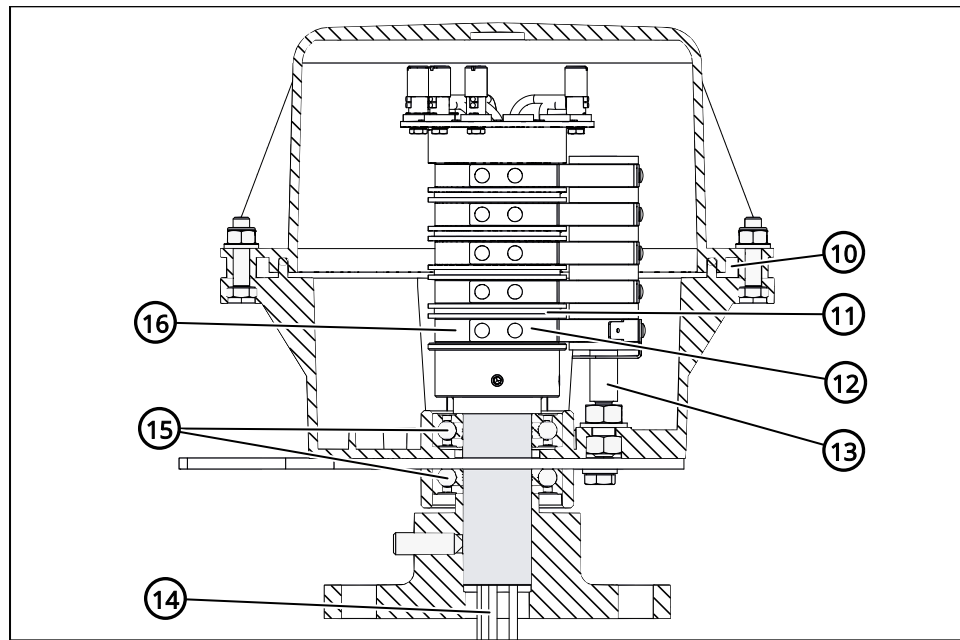


Fig. 2: Type 45 Enclosed slip ring assembly

- 10 Sealing
- 11 Insulating body
- 12 Current collector
- 13 Brush bolt
- 14 Slip ring connecting cables
- 15 Bearing
- 16 Slip ring

5 Scope of delivery

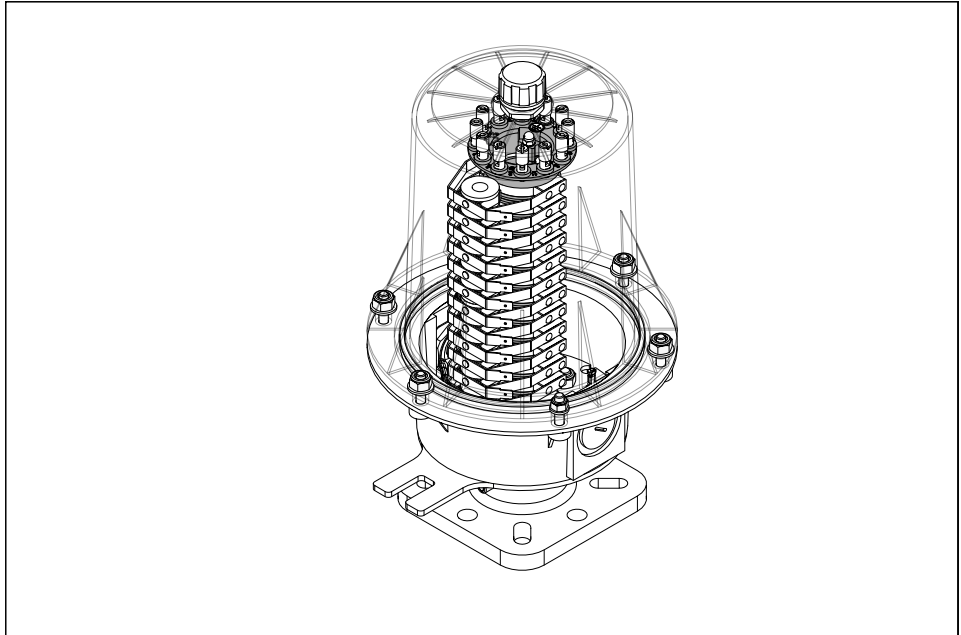


Fig. 3: Type 45 Enclosed slip ring assembly

6 Transport and Storage

Personnel:

- Specialist personnel

Protective equipment:

- Protective footwear
- Protective gloves (mechanical)
- Protective headgear



WARNING

Risk of death due to suspended loads

When lifting loads, there is a risk of death due to falling or swinging parts.

- Never walk under suspended loads.
- Only move loads under supervision.
- Observe the specifications for the intended attachment points.
- Never attach parts to projecting machine parts or to eyelets on installed components.
- Check that lashing components are securely fastened.
- Only use authorized lifting gear and separate lifting accessories with sufficient load capacity.
- Do not use torn or worn ropes or straps, replace with new ones if necessary.
- Do not attach ropes or straps to sharp corners and edges.
- Do not knot or twist ropes or straps.
- Set down all suspended loads before leaving the work area.

6.1 Transport inspection

Immediately check the delivery for completeness and transport damage upon delivery, since claims for damages can only be asserted within the complaint periods.

Proceed as follows in the event of externally visible transport damage:

- Document and report any defects identified.
- Do not accept damaged goods or only accept them with reservations.
- Note the extent of the damage on the transport documents or on the transport company's delivery note.
- If Conductix-Wampfler is the deliverer, report the incident to Conductix-Wampfler.

➔ *Chapter 2.5 "Customer service" on page 11*

6.2 Storage

Store packaged parts under the following conditions:

- Dry and dust-free
- Do not expose to aggressive media
- Protect from direct sunlight
- Avoid mechanical vibrations

- Only set on level surfaces
- Do not destroy the packaging; remove it shortly before installation.
- Maintain the ambient conditions according to the technical specifications.
➔ *Chapter 3 "Technical Data" on page 13*
- Check the condition of the parts and their packaging regularly if the storage period exceeds three months. Relocate the packages if necessary

7 Tools and materials

For installation

Tool:

- Wrench, AF10
- Screwdriver for slotted screw

For commissioning

Tool:

- Resistance meter according to IEC / EN 61010-1

For faults

Tool:

- Sandpaper grain size 240
- Insulated tool

For service and maintenance

Tool:

- Hex key AF4
- Hex key AF6
- Screwdriver for slotted screw
- Wrench, AF10
- Wrench, AF13

Material:

- Loctite 243 (not included in scope of delivery)

For disassembly

Tool:

- Hex key AF4
- Hex key AF6
- Screwdriver for slotted screw
- Wrench, AF7
- Wrench, AF10
- Wrench, AF13

8 Assembly

8.1 Mount slip ring assembly to end consumer

Preparation

Personnel:

- Specialist personnel

Protective equipment:

- Protective gloves (mechanical)
- Protective footwear

Requirements:

- The end consumer is designed to withstand the mechanical stress of the slip ring assembly.
- Any forces or vibrations that may occur have been taken into account.

Work steps

- Inspect the slip ring assembly for damage incurred during transport.
- Mount the flange on the stationary part of the end consumer.

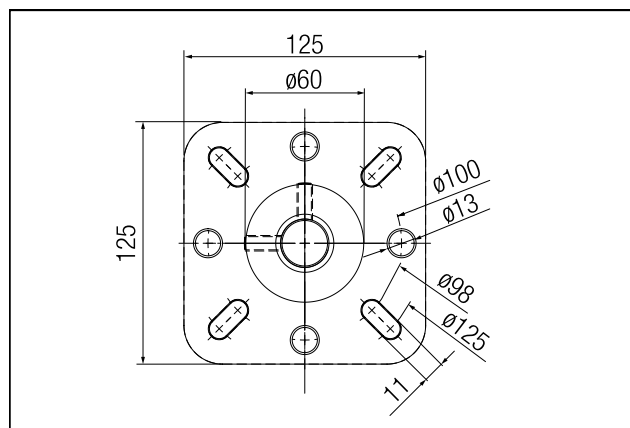


Fig. 4: Flange

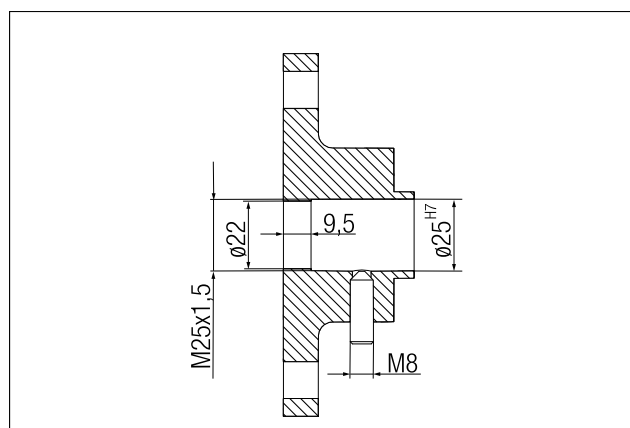


Fig. 5: Flange cross section

3. Attach the towing device to the rotating part of the end consumer.

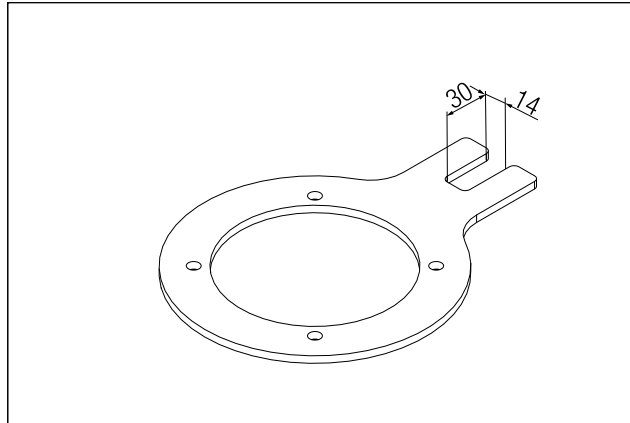


Fig. 6: Towing device

4. Balance tolerances between the rotating parts.
5. Check whether the end consumer and the slip ring assembly come into contact.
6. Perform a mechanical functionality test of the slip ring assembly.

8.2 Electrically connect slip ring assembly to end consumer

Preparation

Personnel:

- Qualified electricians

Protective equipment:

- Protective gloves (mechanical)
- Protective footwear

Tool:

- Screwdriver for slotted screw
- Wrench, AF10

Requirements:

- The slip ring assembly has been mechanically installed to the end consumer.
➔ Chapter 8.1 "Mount slip ring assembly to end consumer" on page 25
- A connection diagram or terminal connection table is available.
- The hood has been removed.
➔ Chapter 12.5 "Replace hood and sealing" on page 50

Work steps

1. Guide the end consumer connecting cable for the slip rings through the inner diameter of the flange.
2. Mount the single strands of the connecting cable at the terminal block with a slot-head screwdriver.

3. Use a green-yellow single strand for the $PE+$ connection.

➔ All slip rings are electrically connected.



NOTICE**Current collector connecting cables**

- Lay connecting cables to stationary component in a collision-free manner.
 - Connecting cables must not be subjected to tensile forces and/or directional forces and/or compressive forces.
 - Do not compress or kink connecting cables.
 - Do not twist the connecting cables.
-

4. Route the current collector connecting cables through the cable fitting and secure them to the current collector using a flat plug 6.3.

5. Use a green-yellow single strand for the $PE+$ connection.

➔ All current collectors are electrically connected.

6. Mount hood.

➔ *Chapter 12.5 "Replace hood and sealing" on page 50*

7. Perform an electrical functionality test.

➔ *Chapter 9.2 "Measuring insulation resistance" on page 29*

9 Commissioning

9.1 Check list

After completing installation, the operator must perform a mechanical and electrical functionality test.

Personnel:

- Specialist personnel
- Qualified electricians

Protective equipment:

- Protective gloves (mechanical)
- Protective footwear

Switch off the system according to the 5 Safety Rules.

➔ *Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9*

9.1.1 Checking the system

Check points:

1. The ambient conditions correspond to the planned design.
2. The connecting cables are dimensioned to withstand the loads and the ambient and/or installation conditions.
3. Hoods and barriers are available as necessary.
4. A test run of the system was performed.
5. The mechanical and electrical connections of the slip ring assembly to the end consumer were inspected.
6. The slip ring assembly is grounded.
7. The insulation resistance was measured.

➔ *Chapter 9.2 "Measuring insulation resistance" on page 29*

Consequences of non-compliance:

- The construction is inoperable.

9.1.2 Check the slip rings

Check points:

1. The slip rings are connected according to the connection diagram.
2. The connecting cables are free of damage.
3. The connection terminals are securely seated.
4. The PE+ slip ring is in the correct position.

Consequences of non-compliance:

- Risk of a short circuit.
- Service life will be shortened.

9.1.3 Checking the current collectors

Check points:

1. The current collectors are connected according to the connection diagram.
2. The connecting cables are free of damage.
3. The connecting cables do not exert any force on the current collectors.
4. The connection terminals are securely seated.
5. The *PE+* current collector is in the correct position.
6. All current collectors are seated symmetric to the slip rings.

Consequences of non-compliance:

- Risk of a short circuit.
- The sliding contacts wear unevenly.
- The current collectors can break off.

9.2 Measuring insulation resistance

Personnel:

- Qualified electricians

Tool:

- Resistance meter according to IEC / EN 61010-1

Requirements:

- The system has been disconnected from the power supply in accordance with the 5 Safety Rules.

➔ *Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9*

1. Connect the resistance meter to the appropriate measuring points.
2. Set the resistance meter to the test voltage.
 - ➔ For constructions with a nominal voltage < 1000 V, the measured voltage must amount to 1000 V and the insulation resistance $\geq 1.0 \text{ M}\Omega$.
3. Begin the measurement and observe the resistance meter display.
4. Document the measured values including a sketch of the measured sections in the corresponding measurement log.
5. Dismantle the measurement setup and ensure that the system is ready to be switched on again.
6. Switch the system back on and check that it is working properly.

➔ *Chapter 9.1.1 "Checking the system" on page 28*

10 Operation



The operator must prevent access to the slip ring assembly during operation.

Personnel:

- Users

1. Normal operation refers to the uninterrupted power supply or data transmission of the end consumer.
2. If faults occur, the conductor rail system must be switched off and secured against being switched on again.

➔ *Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9*

➔ *Chapter 11.1 "Troubleshooting" on page 31*

3. If normal operation has been interrupted and operation must be resumed, the following points must be observed:

- Ensure that all work has been completed.
- There must be no coarse soiling or objects inside the slip ring housing.
➔ *Chapter 12.6 "Clean slip ring assembly" on page 52*
- The current collectors must be mounted absolutely symmetrical to the slip rings.
- The connecting cables must not exert any mechanical forces on the current collector.
- Before each time the slip ring assembly is started again, measure the insulation resistance according to the applicable local technical standards, guidelines and laws.

➔ *Chapter 9.2 "Measuring insulation resistance" on page 29*

11 Faults

11.1 Troubleshooting

Preparation

Personnel:

- Qualified electricians

Protective equipment:

- Protective footwear
- Protective gloves (mechanical)
- FFP3 protective mask
- Protective eyewear

Tool:

- Insulated tool

Requirements:

- The system is switched off according to the 5 Safety Rules.
➔ *Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9*

Fault description	Cause	Remedy
No power transmission or interruption in power transmission	The sliding contacts on the current collectors are worn.	Replace current collectors. ➔ <i>Chapter 12.2 "Replacing the current collector" on page 37</i>
	The connecting cables are damaged or not securely seated.	Replace connecting cables.
	Screw connections and/or plug-socket connections have come loose.	Tighten screw connections and/or plug-socket connection.
	Currents or voltages are too low.	Increase current or voltage.
	The welded strand on the slip ring has come loose.	Replace slip ring. ➔ <i>Chapter 12.3 "Replace slip rings" on page 41</i>
	Heavy dust, soiling or other particles have accumulated inside the housing.	Check sealing and replace it if necessary. ➔ <i>Chapter 12.5 "Replace hood and sealing" on page 50</i> Clean slip ring assembly. ➔ <i>Chapter 12.6 "Clean slip ring assembly" on page 52</i>
	Water or other liquids have entered housing.	Check sealing and replace it if necessary. ➔ <i>Chapter 12.5 "Replace hood and sealing" on page 50</i> Clean slip ring assembly. ➔ <i>Chapter 12.6 "Clean slip ring assembly" on page 52</i>

Fault description	Cause	Remedy
No data transmission and/or signal transmission and/or interruption in data transmission and/or signal transmission	Corrosion on the slip rings.	Clean slip rings. ➔ <i>Chapter 12.6 "Clean slip ring assembly" on page 52</i>
	EMC+ interference from the surrounding environment.	Check for EMC+ emissions from other devices and remove them if necessary.
	Inappropriate data cables are being used.	Use cables with braided shielding.
	Heavy dust, soiling or other particles have accumulated in the interior.	Check sealing and replace it if necessary. ➔ <i>Chapter 12.5 "Replace hood and sealing" on page 50</i> Clean slip ring assembly.
	Water or other liquids have entered the interior.	Check sealing and replace it if necessary. ➔ <i>Chapter 12.5 "Replace hood and sealing" on page 50</i> Clean slip ring assembly.
Noises such as rattling, grinding or clattering occur during operation	Bearing is worn.	Replace bearing. ➔ <i>Chapter 12.4 "Replace bearing" on page 45</i>
Vibration occurs during operation.	Bearing is worn.	Replace bearing. ➔ <i>Chapter 12.4 "Replace bearing" on page 45</i>

After completing the troubleshooting activities, carry out the work steps for restarting.

➔ *Instruction on page 30*

11.2 Handling unknown faults

Conductix-Wampfler must be contacted if unknown faults occur.

Conductix-Wampfler GmbH
Rheinstrasse 27 + 33
D – 79576 Weil am Rhein – Markt
Phone: +49 (0) 7621 662 – 0
Fax: +49 (0) 7621 662 – 144
Email: info.de@conductix.com
➔ <i>www.conductix.de</i>
Country of origin: Germany

Worldwide sales and service location addresses:

➔ *www.conductix.contact*

12 Service and Maintenance

12.1 Maintenance schedule



Ordering spare parts

When ordering spare parts, refer to the spare parts list for the specific slip ring housing type.

When reordering spare parts, specify the type and order number.

Both pieces of information can be found on the slip ring assembly's type plate.

Preparation

Personnel:

- Qualified electricians
- Specialist personnel

Protective equipment:

- Protective eyewear
- FFP3 protective mask
- Protective footwear
- Protective gloves (mechanical)

Tool:

- Sandpaper grain size 240

Material:

- Vacuum cleaner with a Class H fine filter

Requirement

- The system has been disconnected from the power supply in accordance with the Five Safety Rules.

➔ *Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9*

Chap.	Task to perform	Every 1,500 operating hours or every 6 months	Every 20,000 operating hours or every 6 years	Page
12.1.1	General functionality test	X		34
12.1.2	Functionality test of insulating components	X		34
12.1.3	Functionality test of slip ring	X		35
12.1.4	Current collector functional check	X		35
12.1.5	Visual inspection of cables	X		36
12.1.6	General overhaul		X	36

12.1.1 General functionality test

1. Check that all screws and nuts are tight.
 - ➔ Tighten loose screws and nuts.
2. Check sealing(s) for damage.
 - ➔ Replace damaged sealing(s).
 - ➔ *Chapter 12.5 "Replace hood and sealing" on page 50*
3. Check hood for damage.
 - ➔ Replace damaged hood.
 - ➔ *Chapter 12.5 "Replace hood and sealing" on page 50*

12.1.2 Functionality test of insulating components

 **WARNING:** Health hazards due to dust. Wear an FFP3 protective mask when performing this work.

1. Remove debris and dust with a Filter Class H vacuum cleaner.
2. Check the insulating components – such as insulating bodies, insulators and insulating tubes – for damage.
 - ➔ Replace damaged components.

12.1.3 Functionality test of slip ring

⚠ WARNING: Health hazards due to dust. Wear an FFP3 protective mask when performing this work.

1. Check the surface of the slip rings for melt beads and scorch marks.
 - ➔ Clean slip rings with sandpaper grain size 240.
 - ➔ *Chapter 12.6 "Clean slip ring assembly" on page 52*
2. After extended periods of standstill, check the slip rings for corrosion.
 - ➔ Clean slip rings with sandpaper grain size 240.
 - ➔ *Chapter 12.6 "Clean slip ring assembly" on page 52*
3. Check slip rings for wear.
 - ➔ Replace all slip rings if wear is detected.
 - ➔ *Chapter 12.3 "Replace slip rings" on page 41*

12.1.4 Current collector functional check

⚠ WARNING: Health hazards due to dust. Wear an FFP3 protective mask when performing this work.

1. Remove deposits and dust from the current collector using a Filter Class H vacuum cleaner.
2. Check current collectors for wear:

The sliding contact height is at least 7 mm.

 - ➔ Replace all current collectors if wear is detected.
 - ➔ *Chapter 12.2 "Replacing the current collector" on page 37*

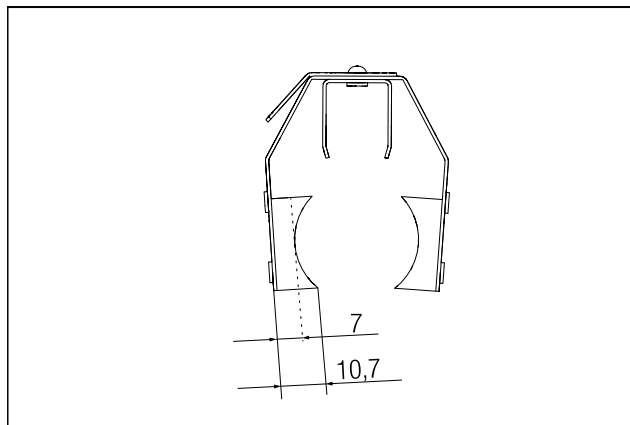


Fig. 7: Sliding contact wear limits for Types 45/1, 45/2 and 45/3

3. Check all current collector connecting cables for damage.
4. Check current collector cable connections for damage.
5. Check position of the current collectors relative to the slip rings.
 - ➔ The current collectors must be seated symmetrical to the slip rings.

12.1.5 Visual inspection of cables

1. Check all cables for damage.
➔ Replace damaged cables.
2. Check routing of the cables.
3. Check all cable fittings for damage.
➔ Replace damaged cable fittings.
4. Check cable insulation for damage.
➔ Replace damaged cable insulation.



NOTICE

Current collector connecting cables

- Lay connecting cables to stationary component in a collision-free manner.
 - Connecting cables must not be subjected to tensile forces and/or directional forces and/or compressive forces.
 - Do not compress or kink connecting cables.
 - Do not twist the connecting cables.
-

12.1.6 General overhaul

Perform a general overhaul after six years at the latest.

- ➔ Replace bearing.
- ➔ Replace sealings.

➔ *Chapter 12.5 "Replace hood and sealing" on page 50*

➔ *Chapter 12.4 "Replace bearing" on page 45*

12.2 Replacing the current collector

Preparation

Personnel:

- Qualified electricians

Protective equipment:

- Protective gloves (mechanical)
- Protective footwear
- Protective eyewear
- FFP3 protective mask

Tool:

- Wrench, AF10
- Wrench, AF13

Requirements:

- The system is switched off according to the Five Safety Rules.
➔ *Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9*
- The cover has been removed.
➔ *Chapter 12.5 "Replace hood and sealing" on page 50*

Work steps



If one current collector has reached its wear limit, it is likely that the other current collectors will also be worn out soon. Therefore, it is recommended to always replace all current collectors to ensure consistent operation.

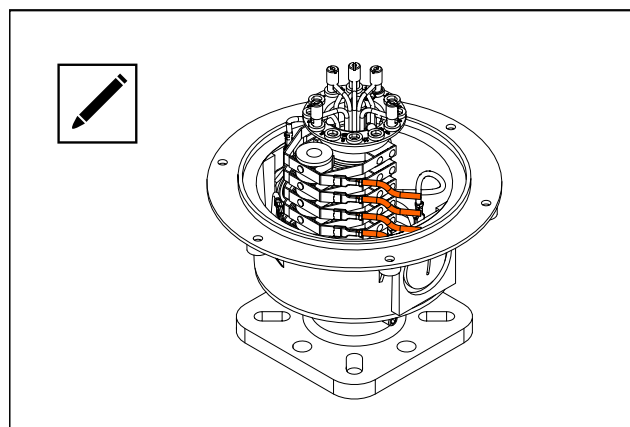


Fig. 8: Label connecting cables.

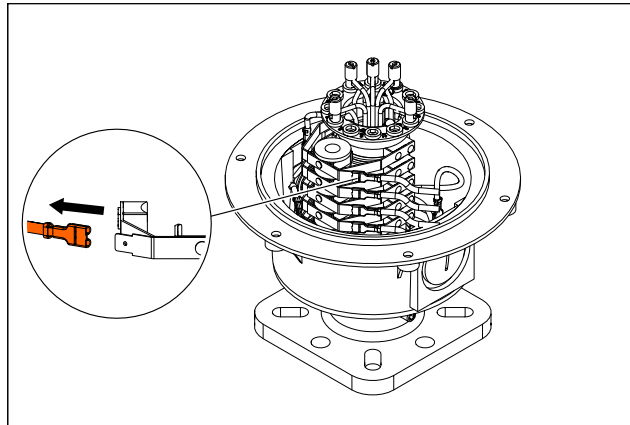


Fig. 9: Disconnect connecting cables from the current collector.

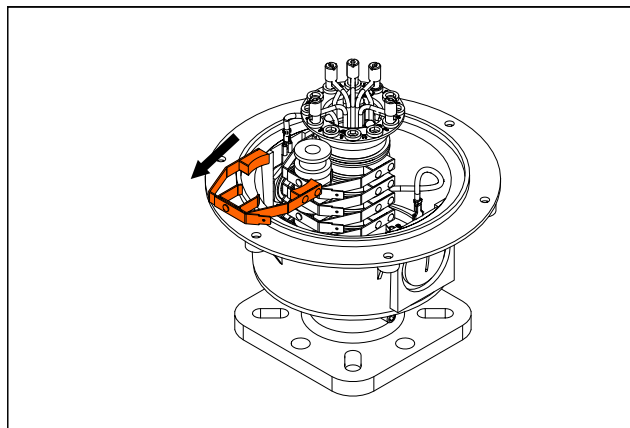


Fig. 10: Pull PH+ current collector from the insulator. Disassemble all PH+ current collectors in the same way.

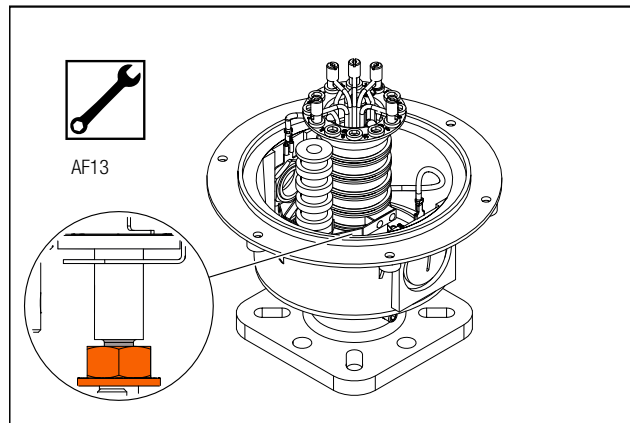


Fig. 11: Loosen the brush bolt to disassemble the PH+ current collector with the insulator, brush bolt and nut.

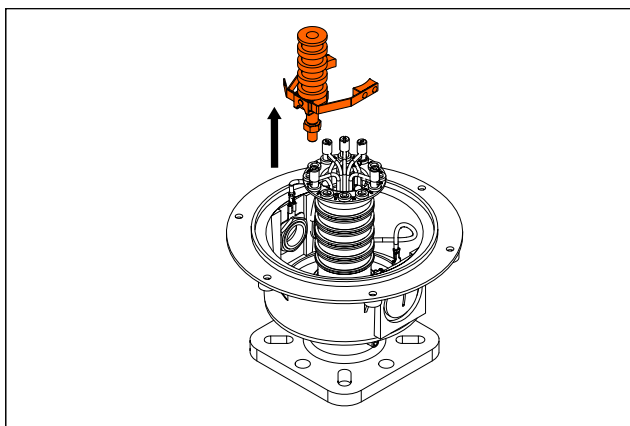


Fig. 12: Remove PH+ current collector with the insulator, brush bolt and nut from the housing lower part.



If damage is found on the insulating components, they must be replaced.

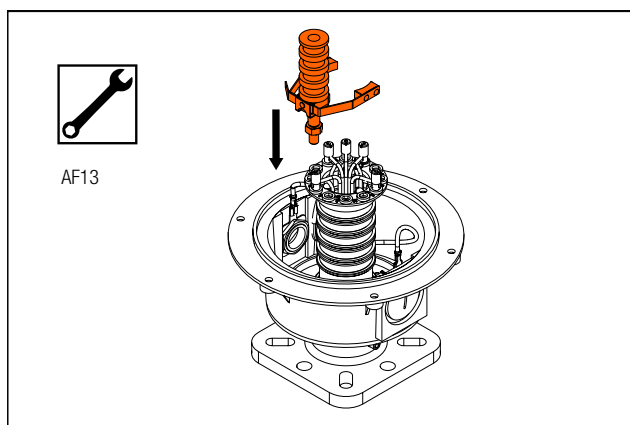


Fig. 13: Place new PH+ current collector with the insulator, brush bolt and nut onto the housing lower part. Check the alignment of the current collectors with the slip rings and tighten the nut.

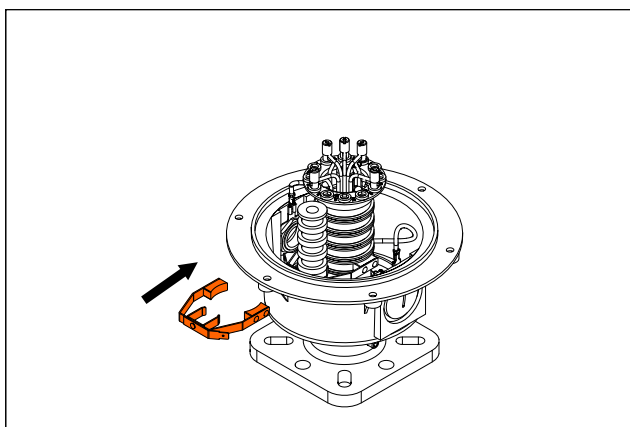


Fig. 14: Mount PH+ current collector over the insulator onto the PH+ slip ring. Mount all PH+ current collectors in the same way.

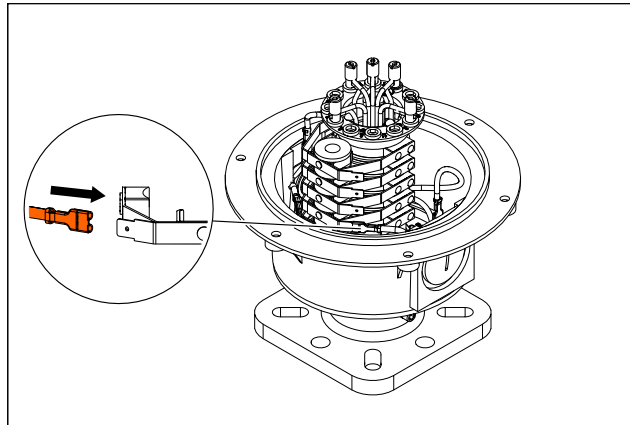


Fig. 15: Connect current collector connecting cables according to the connection diagram.



NOTICE

Current collector connecting cables

- Lay connecting cables to stationary component in a collision-free manner.
- Connecting cables must not be subjected to tensile forces and/or directional forces and/or compressive forces.
- Do not compress or kink connecting cables.
- Do not twist the connecting cables.

Next steps:

1. Mount hood

➔ Chapter 12.5 "Replace hood and sealing" on page 50

2. Perform mechanical and electrical functionality tests for the slip ring assembly.

➔ Chapter 9.1 "Check list" on page 28

12.3 Replace slip rings

Preparation

Personnel:

- Qualified electricians

Protective equipment:

- Protective gloves (mechanical)
- Protective footwear
- Protective eyewear
- FFP3 protective mask

Tool:

- Screwdriver for slotted screw
- Wrench, AF7
- Wrench, AF10

Requirements:

- The system is switched off according to the 5 Safety Rules.
➔ *Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9*
- The cover has been removed.
➔ *Chapter 12.5 "Replace hood and sealing" on page 50*
- The current collectors have been removed.
➔ *Chapter 12.2 "Replacing the current collector" on page 37*

Work steps



If one slip ring is worn, it is likely that the other slip rings will also be worn out soon. For this reason, it is recommended that all slip rings be replaced to ensure consistent functionality.

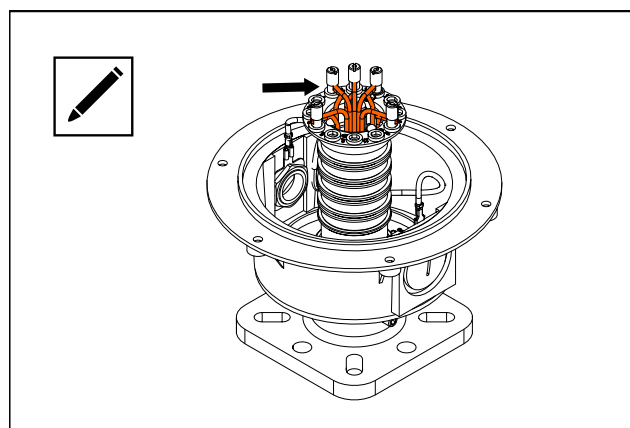


Fig. 16: Label slip ring connecting cables.

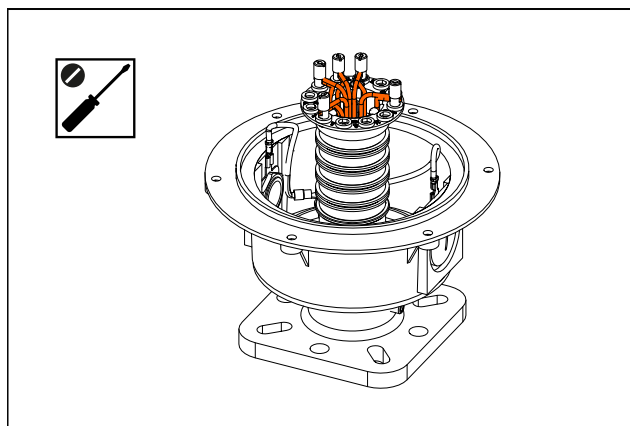


Fig. 17: Loosen connecting cables ends from the mantle clamps.

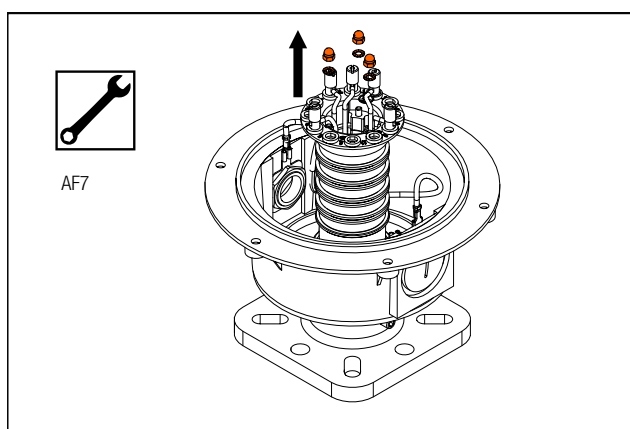


Fig. 18: Loosen inner cap nuts from the terminal block.

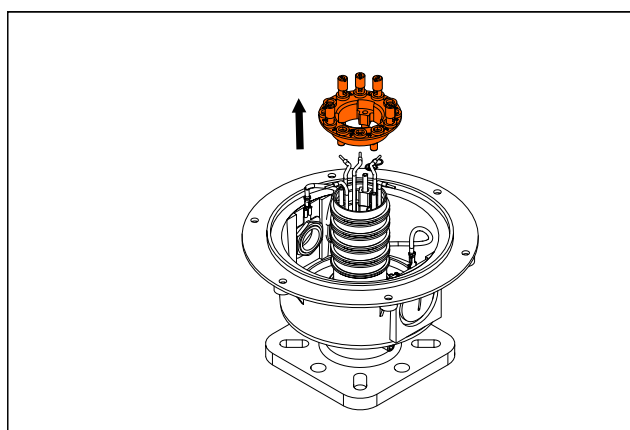


Fig. 19: Remove terminal block.

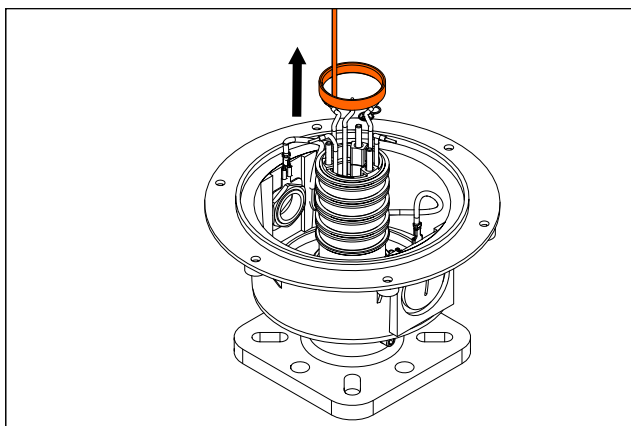


Fig. 20: Remove slip ring with strand.

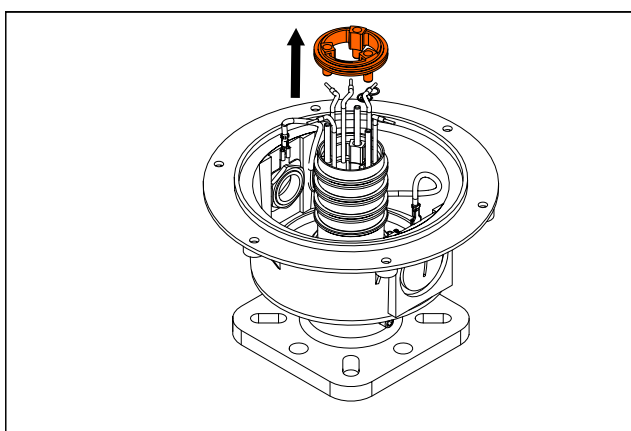


Fig. 21: Remove all remaining slip rings and insulating bodies.



If damage is found on the insulating components, they must be replaced.

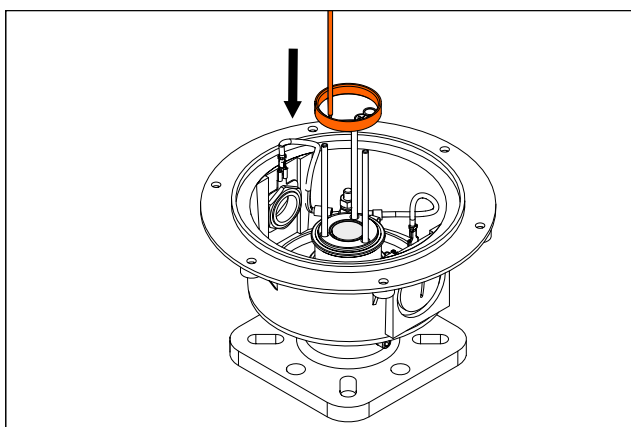


Fig. 22: Insert new PE+ slip ring with strand.

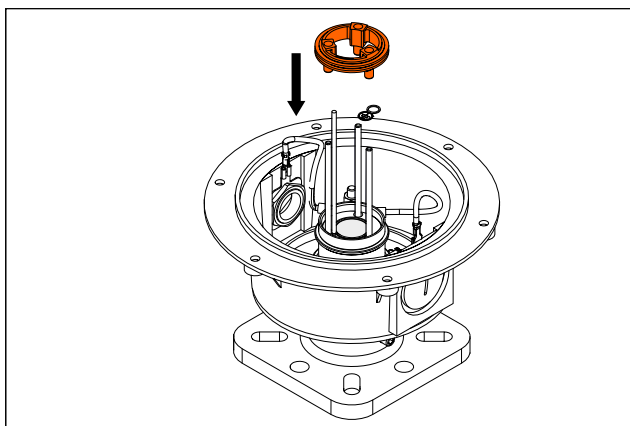


Fig. 23: Place insulating body onto the slip ring studs. Install all slip rings and insulating bodies in the same way.

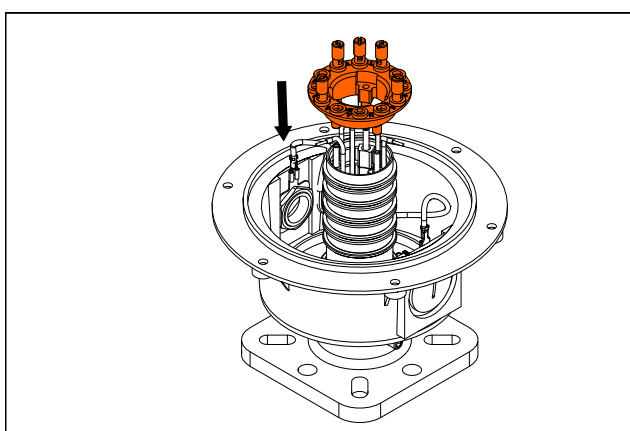


Fig. 24: Place terminal block onto the slip ring studs.

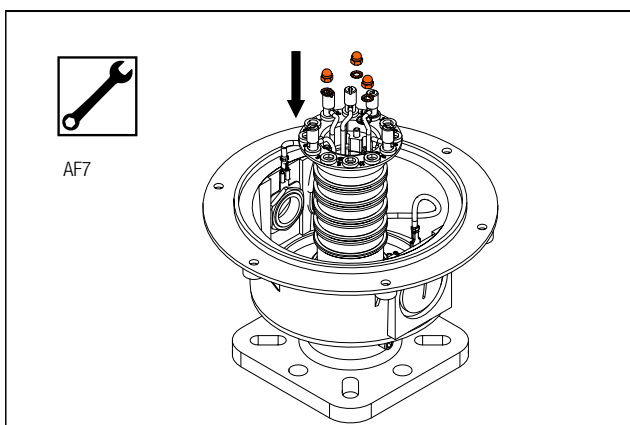


Fig. 25: Tighten inner cap nuts on the terminal block.

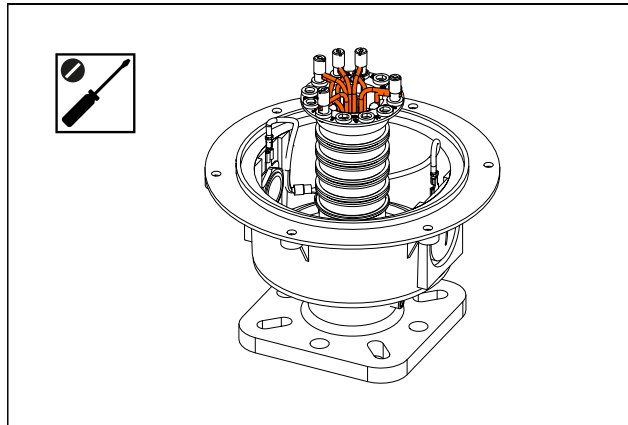


Fig. 26: Trim new cables to correct length for the terminals and strip the cable ends. Secure connecting cable ends in the mantle terminals according to the terminal connection table.

Next steps:

1. Install current collector.
 ➔ Chapter 12.2 "Replacing the current collector" on page 37
2. Mount hood.
 ➔ Chapter 12.5 "Replace hood and sealing" on page 50
3. Perform mechanical and electrical functionality tests for the slip ring assembly.
 ➔ Chapter 9.1 "Check list" on page 28

12.4 Replace bearing

Preparation

Personnel:

- Qualified electricians

Protective equipment:

- Protective gloves (mechanical)
- Protective footwear
- Protective eyewear
- FFP3 protective mask

Tool:

- Hex key AF4
- Hex key AF6
- Wrench, AF10
- Wrench, AF13

Material:

- Loctite 243 (not included in scope of delivery)

Requirements:

- The system is switched off according to the 5 Safety Rules.
→ Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9
- The connections at the cable ends were marked before they were disconnected from the end consumer.
- The slip ring assembly has been electrically and mechanically disconnected from the end consumer.
- The cover has been removed.
→ Chapter 12.5 "Replace hood and sealing" on page 50
- A dry, clean space has been prepared for the replacement.

Work steps



NOTICE

To ensure smooth operation, always replacing all bearings is recommended.

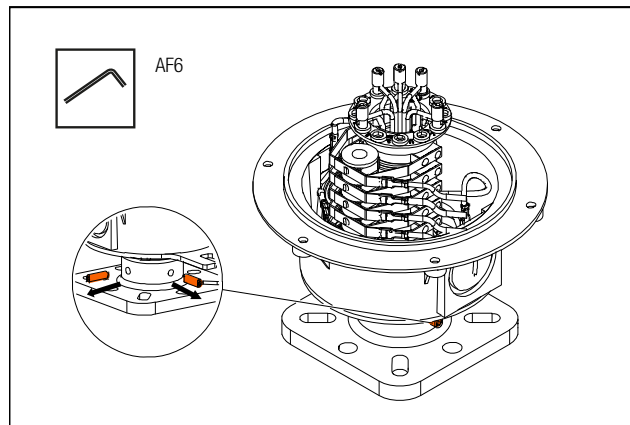


Fig. 27: Loosen set screws on the flange.

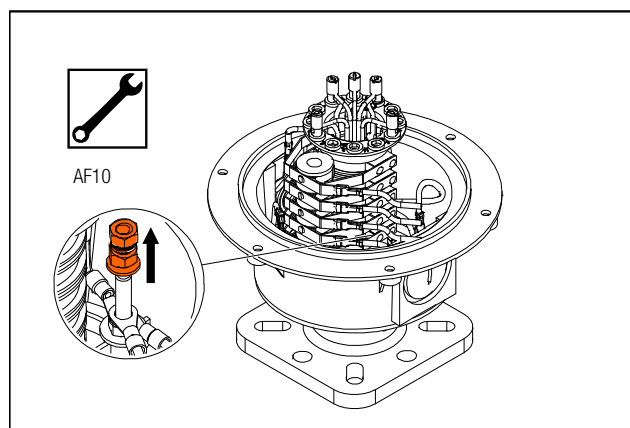


Fig. 28: Loosen PE+ cables from the grounding plates that are screwed to the grounding studs.

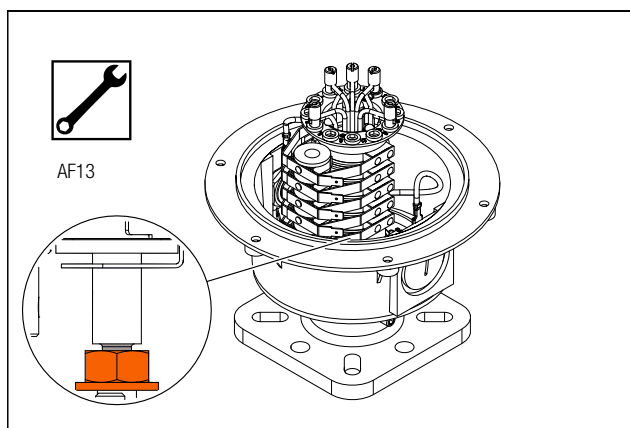


Fig. 29: Loosen hexagon nut on the brush bolt.

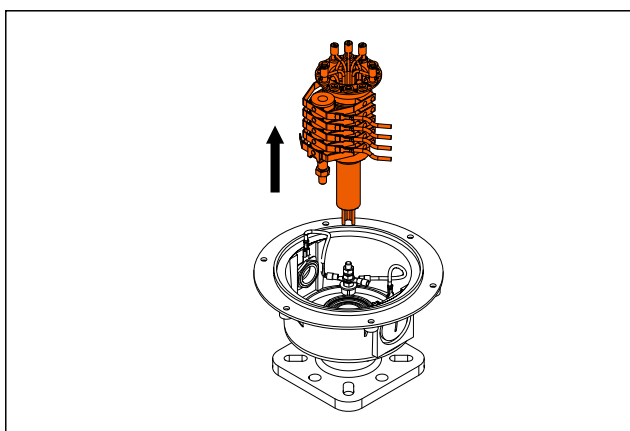


Fig. 30: Remove ring assembly with the current collector, insulator and brush bolt from the flange.

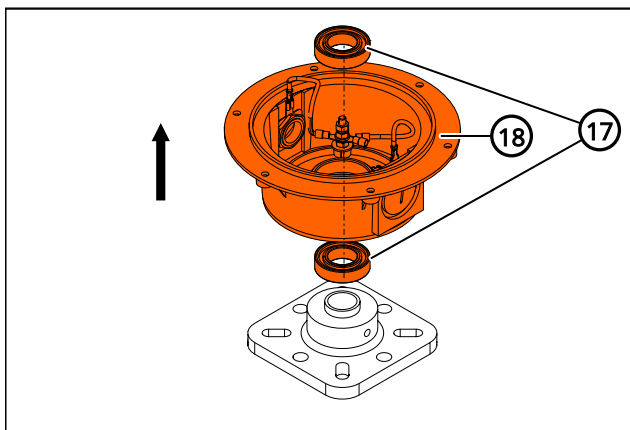


Fig. 31: Remove both bearings and the housing lower part from the flange.

17 Bearing

18 Housing lower part

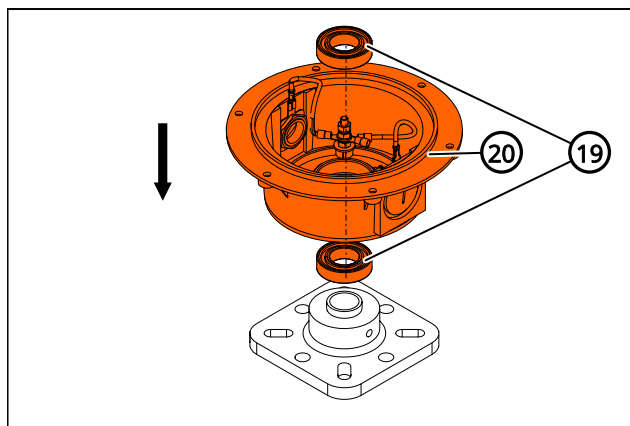


Fig. 32: Ensure that the bearing flange is completely free of dust and grease. Carefully place the two new deep groove ball bearings in their positions.

19 Bearing

20 Housing lower part

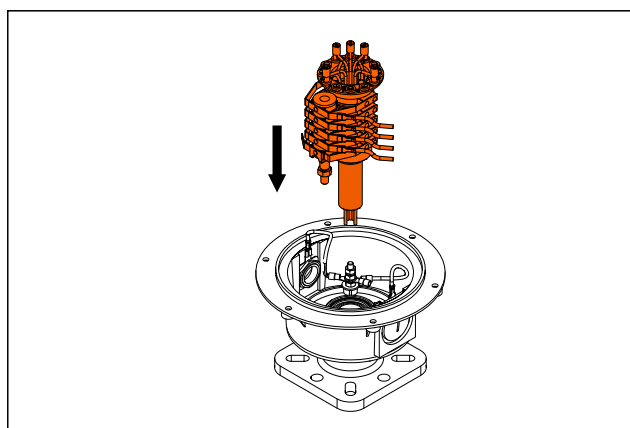


Fig. 33: Place ring assembly with the current collector, insulator and brush bolt into the flange. Check current collector alignment with the slip rings.

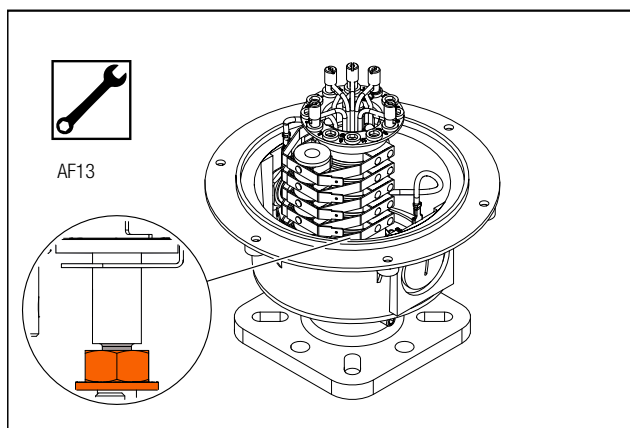


Fig. 34: Tighten hexagon nut on the brush bolt.

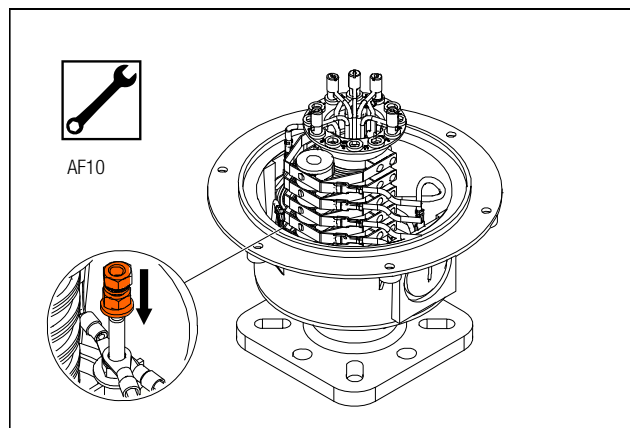


Fig. 35: Connect PE+ cables to the grounding plates that are screwed to the grounding studs.

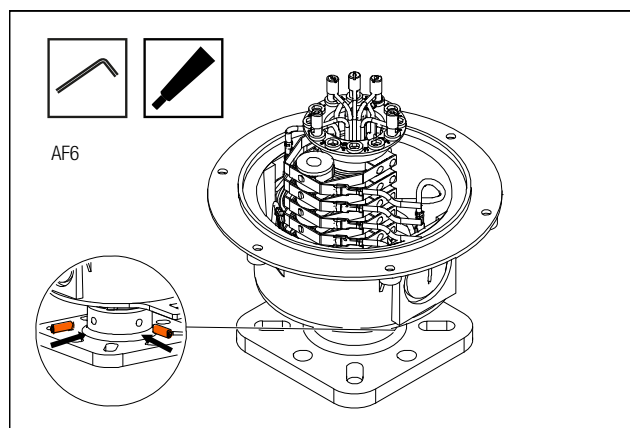


Fig. 36: Clean set screws to remove dust and grease and apply Loctite 243. Align flange so that the countersink in the axle tube is visible. Tighten set screws.

Next steps:

1. Mount cover.
➔ Chapter 12.5 "Replace hood and sealing" on page 50
2. Mount slip ring assembly onto the end consumer.
➔ Chapter 8.1 "Mount slip ring assembly to end consumer" on page 25
3. Electrically connect slip ring assembly to the end consumer.
➔ Chapter 8.2 "Electrically connect slip ring assembly to end consumer" on page 26
4. Perform mechanical and electrical functionality tests for the slip ring assembly.
➔ Chapter 9.1 "Check list" on page 28

12.5 Replace hood and sealing

Preparation

Personnel:

- Qualified electricians

Protective equipment:

- Protective gloves (mechanical)
- Protective footwear

Tool:

- Wrench, AF10

Requirements:

- The system is switched off according to the 5 Safety Rules.
→ Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9

Work steps

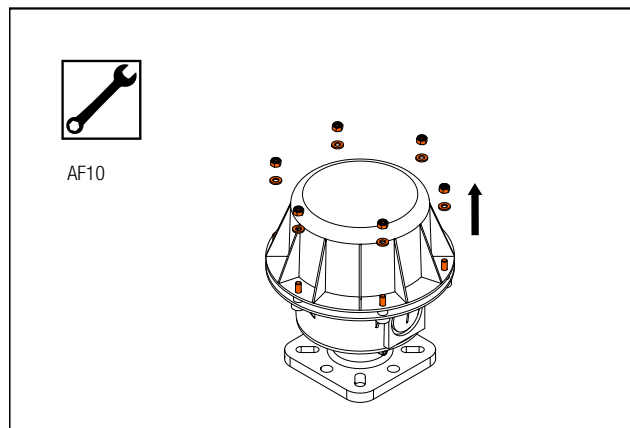


Fig. 37: Loosen hexagon nuts.

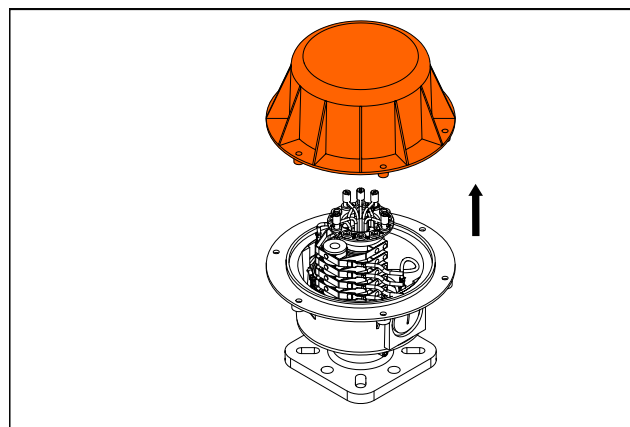


Fig. 38: Remove hood.

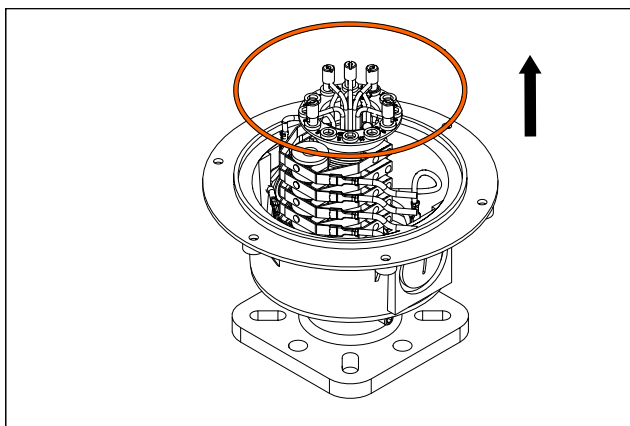


Fig. 39: Remove sealing from the housing lower part.

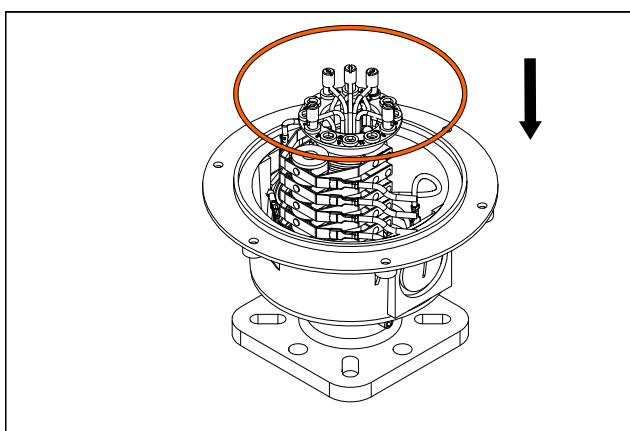


Fig. 40: Place the new sealing onto the housing lower part. The surface must be free of dust and grease.

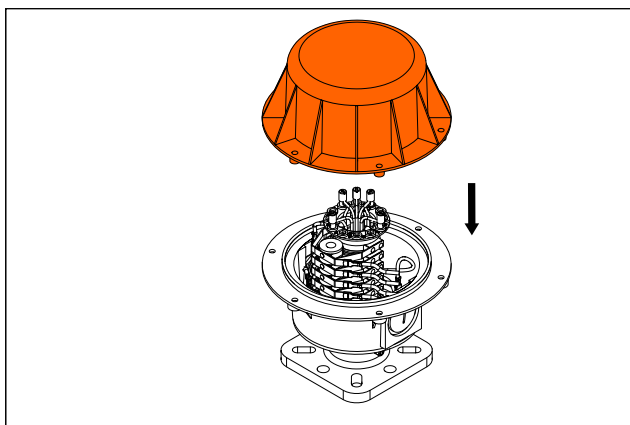


Fig. 41: Replace hood.

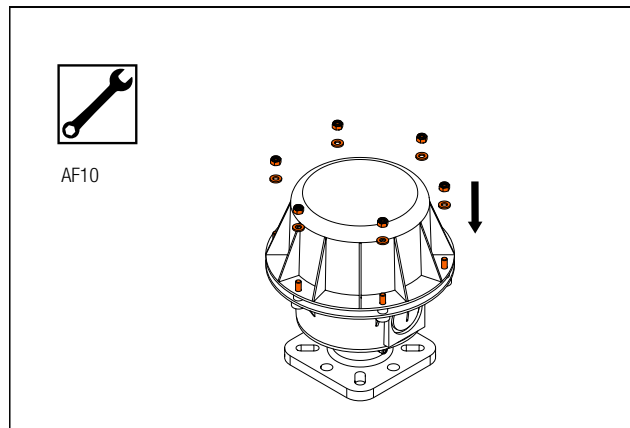


Fig. 42: Tighten hexagon nuts.

Next steps:

1. Electrically connect slip ring assembly to the end consumer.
 ➔ Chapter 8.2 "Electrically connect slip ring assembly to end consumer" on page 26
2. Perform mechanical and electrical functionality tests for the slip ring assembly.
 ➔ Chapter 9.1 "Check list" on page 28

12.6 Clean slip ring assembly

Preparation

Personnel:

- Qualified electricians

Protective equipment:

- FFP3 protective mask
- Protective gloves (mechanical)
- Protective footwear
- Protective eyewear

Tool:

- Wrench, AF10
- Sandpaper grain size 240

Material:

- Vacuum cleaner with a Class H fine filter

Requirements:

- The system is switched off according to the 5 Safety Rules.
 ➔ Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9
- The cover has been removed.
 ➔ Chapter 12.5 "Replace hood and sealing" on page 50

Work steps

 **WARNING:** Health hazards due to dust. Wear an FFP3 protective mask when performing this work.

1. Remove accumulated soiling from the insulating components using a Filter Class H vacuum cleaner.
 - ➔ Do not use chemical agents; they will damage the ring surface.
 - ➔ *“Unsuitable cleaning agents” on page 53*
2. Check and clean slip ring surface.
 - ➔ Remove melt beads and scorched marks with Sandpaper grain size 240.
3. Check and clean current collector.
 - ➔ Remove dust deposits with a Filter Class H vacuum cleaner.
 - ➔ Do not use chemical agents.
4. Mount hood.
 - ➔ *Chapter 12.5 “Replace hood and sealing” on page 50*
5. Perform mechanical and electrical functionality tests for the slip ring assembly.
 - ➔ *Chapter 9.1 “Check list” on page 28*

Unsuitable cleaning agents

These substances wear or damage the product components when applied:

- Contact cleaners
- Contact sprays
- Degreasing sprays
- Engine cleaners
- Moisture-displacing cleaning agents
- Solvents
- Abrasive fabrics with or without polishing agent

13 Disassembly and Disposal

13.1 Disassembly

Preparation

Personnel:

- Qualified electricians

Protective equipment:

- Protective gloves (mechanical)
- Protective footwear
- FFP3 protective mask
- Protective eyewear

Tool:

- Hex key AF4
- Hex key AF6
- Screwdriver for slotted screw
- Wrench, AF7
- Wrench, AF10
- Wrench, AF13

Requirements:

- Switch off the system according to the 5 Safety Rules.
➔ Chapter 1.8 "5 Safety Rules for working on electrical systems" on page 9

Work steps

⚠ WARNING: Health hazards due to dust. Wear an FFP3 protective mask when performing this work.

1. Remove accumulated dirt from the contact surfaces using a Filter Class H vacuum cleaner.
2. Mechanically and electrically disconnect slip ring assembly from the end consumer.
3. Disassemble slip ring assembly into its individual parts.

➔ "Material groups relevant for disposal" on page 55

13.2 Disposal

Preparation

Personnel:

- Specialist personnel

Protective equipment:

- Protective gloves (mechanical)
- Protective headgear
- Protective footwear



ENVIRONMENT

Environmental damage due to improper disposal!

Valuable raw materials can be reused through environmentally friendly disposal.

- Separately dispose of disassembled components in an environmentally friendly manner.
- Observe locally applicable disposal regulations.
- Have a specialized company carry out the disposal if necessary
- Comply with the Hazardous Substances Ordinance, particularly the regulations on handling hazardous substances.
- Dispose of materials marked for recycling using the respective recycling process.

Material groups relevant for disposal

- Insulating body, insulator, housing and terminal block: Fiberglass reinforced polyamide
- Current collector: Mischmetal
- Brush bolt and slip ring stud: Steel
- Slip ring: Copper and brass
- Flange: Aluminum casting alloy
- Cable fitting (screw plug): Fiberglass reinforced polyamide
- Vent screw: PVC
- Sealing: Cellular rubber/rubber
- Bearing and towing device: Steel

14 Approvals and standards

The Declaration of Conformity for this product can be requested from Conductix-Wampfler.

Conductix-Wampfler GmbH
Rheinstrasse 27 + 33
D – 79576 Weil am Rhein – Märkt
Phone: +49 (0) 7621 662 – 0
Fax: +49 (0) 7621 662 – 144
Email: info.de@conductix.com
➔ www.conductix.de
Country of origin: Germany

Worldwide sales and service location addresses:

➔ www.conductix.contact

15 Abbreviations

EMC	Electromagnetic compatibility
GS	Enclosed slip ring assembly
PE	Protective Earth
PH	Phase
SRK	Slip ring assembly

www.conductix.de

Conductix-Wampfler GmbH
Rheinstr. 27 + 33
79576 Weil am Rhein
Telephone: +49 (0) 7621 662-0
Fax: +49 (0) 7621 662-144
E-mail: info.de@conductix.com
Internet: www.conductix.de

