PFISTERER

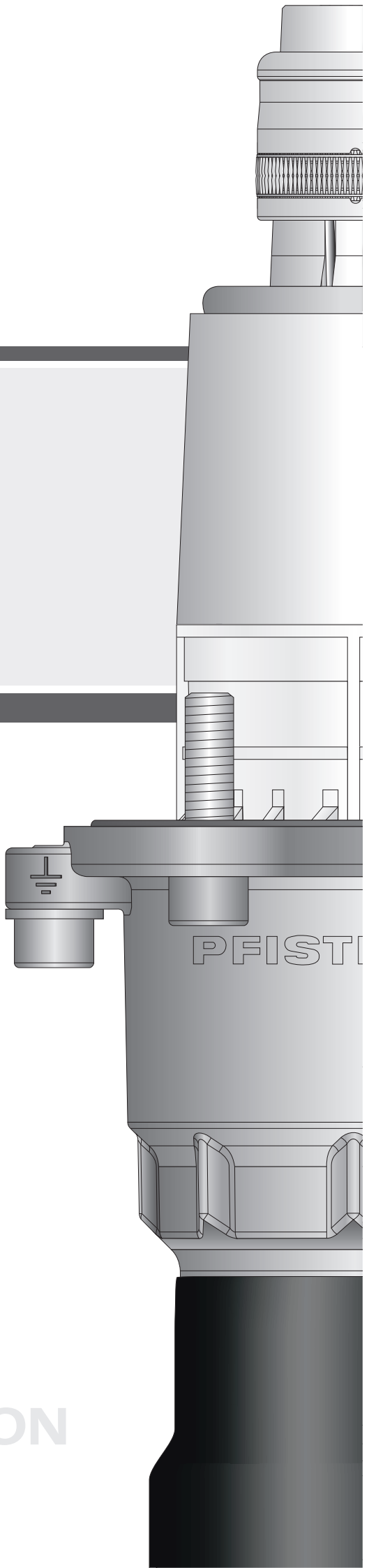
MV-CONNEX size 3 + 3-S wire screen

040 370 003

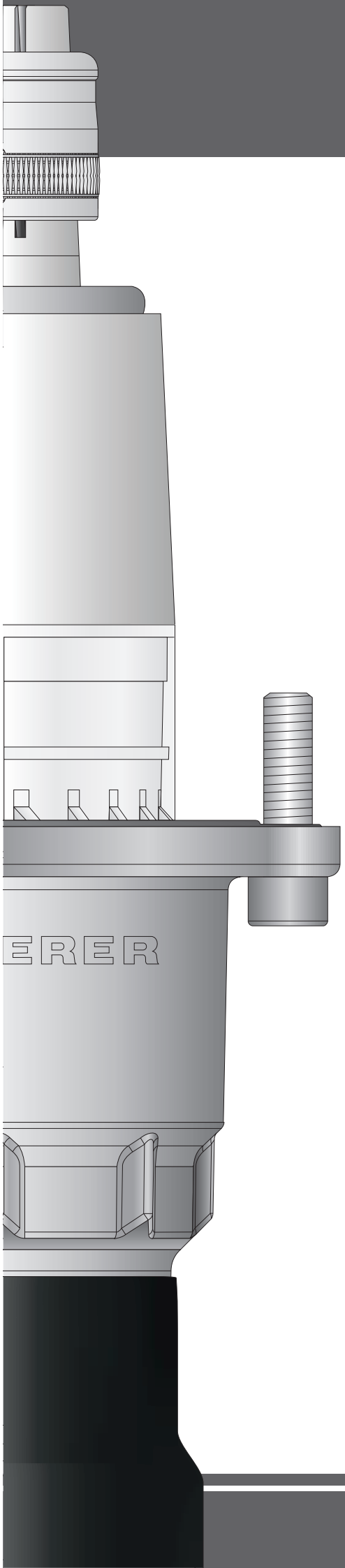
ASSEMBLY INSTRUCTIONS

Separable Connector

Take note of any additional instructions prior to assembly!!!



THE POWER CONNECTION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I

1 Introduction

MV-CONNEX. The dry pluggable cable connector system for medium voltage networks.

CONNEX satisfies all requirements you may have for a universal connection system: Full insulation, metal encapsulation and touch safety. It is maintenance-free, suitable for outdoor use and submersible. In other words, MV-CONNEX can be used under even the harshest conditions.

MV-CONNEX for medium voltage networks comes in a wide range of variants. In addition to the classic plug/socket combination, the selection also includes multiple sockets, busbar coupling systems, surge arresters, variants for the creation of above-ground or underground branch points, motor connections and test adapters.

The factory tested MV-CONNEX components impress with their simple assembly. Complicated oil and gas work during the installation and start-up of transformers and switchgear is now entirely a thing of the past.

Silicone rubber – a key material in medium voltage technology.

Water-, dirt-, grease- and oil-repellent, absolutely maintenance-free, impact-resistant and indestructible: Silicone rubber is the ideal material for cable terminations and is far superior to typical materials. When used as a field stress cone in enclosed applications, silicone rubber evens out temperature fluctuations and unevenness on the cable surface much better than harder materials, such as EPDM. This reliably prevents hazardous partial discharges due to air gap formation. PFISTERER manufactures silicone rubber elements primarily in the advanced LSR design (liquid silicone rubber), special variants are produced with the RTV (room-temperature vulcanizing) method.

2 General Information

The MV-CONNEX is a modern cable connection system. The socket is already integrated into the switchgear. In the following instructions, the step-by-step installation of the plug-in connection is described and shown. Please follow the sequence shown in the assembly steps. The installation should be carried out by technicians who have been trained by PFISTERER.

2.1 Information on the assembly instructions

This assembly instructions describes the safe and proper use of the described product. The safety information and instructions must be observed in addition to the locally applicable accident prevention regulations and general safety rules for the area of application.
Read through the assembly instructions carefully, especially the section on safety and the relevant safety information, before starting any work on the product. It is vital that what is read has also been understood. The assembly instructions is a constituent part of the product. It must be kept accessible at all times in the immediate vicinity of the product (e.g. control room, etc.).

2.2 Contents of the assembly instructions

Every person who is tasked to perform work on or with the product must have read and understood the assembly instructions before working on/with the product. This applies even if the person has already worked with such a product or a similar product or has been trained by the manufacturer. Knowledge of the contents of the assembly instructions is one of the prerequisites for protecting personnel from hazards as well as for preventing errors, thus ensuring the product is used in a safe and trouble-free manner. The operator is advised to have the staff confirm that they have familiarized themselves with the contents of this assembly instructions.

2.3 Additional assembly instructions

Depending on the scope of delivery (e.g. special designs, ordering options), this assembly instructions can be supplemented by an additional assembly instructions which is to be observed and applied in the same way.

2.4 Copyright Protection

This assembly instructions must be kept confidential. It is intended solely for staff who work on and with the product.
All contents, text, drawings, images and other representations are protected under copyright law and are subject to other intellectual property rights. Any misuse is punishable by law.
Disclosure to third parties, including making copies of any type or form - even of extracts - as well as the use and/or communication of the contents without written permission from the manufacturer is prohibited. Any infringements shall be subject to claims for compensation. We reserve the right to assert further claims.
We reserve the right to exercise any of our intellectual property rights.

2.5 Liability and Warranty

All of the information and data contained in this assembly instructions were compiled under consideration of the applicable regulations, the technological state-of-the-art and our many years of expertise and experience.
The assembly instructions are to be kept in the immediate vicinity of the product (e.g. control room), accessible to all persons who work on or with the product at all times.
The assembly instructions is to be read carefully before starting work on and with the product! The manufacturer accepts no liability for any damage or malfunctions resulting from failure to observe the assembly instructions.
The text and images contained in the assembly instructions do not necessarily correspond to the scope of supply. The illustrations are not to scale. Due to fact that special versions or additional options may have been ordered or innovative technical modifications may have been made, the actual scope of delivery can differ from the explanations and illustrations described in these instructions. Please direct any queries to the manufacturer.
We reserve the right to make technical modifications to the product within the framework of improving performance characteristics and further development.

2.6 Warranty

The terms and conditions of warranty are defined in the purchase agreement and the general terms and conditions of the manufacturer.
On return of defective parts or inspection on site, the manufacturer shall ultimately make a decision on the validity of a warranty claim.

2.7 Spare Parts

Only use genuine spare parts of the manufacturer.
The use of unapproved spare parts voids all claims concerning warranty, service, compensation for damages and liability against the manufacturer or its agents, dealers or representatives.

3 Safety

At the time of its development and manufacture, the product was constructed according to currently applicable, accepted codes of engineering practice and is safe to operate.
Nevertheless, the product can pose dangers if it is not used by professionally trained personnel or is used improperly or in a manner deemed not for its intended purpose.

3.1 Intended Use

Any use other than the intended use of the product is prohibited and is deemed as not for its intended purpose.
Any claims against the manufacturer and/or his authorized representatives for damage resulting from use of the product not for its intended purpose shall not be accepted.
The operator shall be solely liable for any damage resulting from use of the product other than its intended purpose.

Operational reliability/safety can only be ensured if the product is used as intended.
The product may only be assembled when the environment temperature is within the limits from **0 °C to 45 °C / 32 °F to 113 °F**. This refers to the preparation, laying or moving of the cable.

3.2 Changes and Modifications to the Product

To avoid hazards and to ensure optimum performance, no changes, additions or modifications may be made to the product that have not been expressly approved by the manufacturer.

3.3 Responsibility of the Operating Company

The product may only be used in a technically perfect and operationally reliable condition. The information given in the assembly instructions must be followed in its entirety and without restrictions!
In addition to the specified safety precautions and instructions in this assembly instructions, you are to observe and comply with the relevant local accident prevention regulations and general safety regulations for the area of application of the product and the applicable environmental protection regulations.
The operator and the staff authorized by him are responsible for the trouble-free operation of the product, as well as for clear definitions of the responsibilities for assembly and repair of the product.

3.4 Hazards Posed by the Product

The product has been subjected to a risk analysis. The state-of-the-art design and configuration of the product based on this analysis correspond to latest technological developments.
The product is safe when used for its intended purpose. Nevertheless, a certain degree of residual risk remains! The product operates at high electrical voltage.

Danger from electrical current!
Electrical power can cause very serious injury.
If the insulating part or components are damaged, there is a risk of fatal injury from the electrical current.

Before starting work on electrical systems, note the following:

1. Disconnect completely.
2. Secure against re-connection.
3. Verify absence of operating voltage.
4. Carry out earthing and short-circuiting.
5. Provide protection against adjacent live parts.

3.5 Work Safety

During work on and with the product, the locally applicable work safety rules must always be complied with.

Following the warnings and instructions given in this assembly instructions can prevent personal injury and damage to property while working with and on the product. Failure to follow these instructions may result in danger to persons and damage to or destruction of the product.
Failure to observe the safety advice and instructions in this assembly instructions, as well as the accident prevention regulations for the area of application and general safety regulations, will void any and all liability and claims for compensation against the manufacturer or its authorized representative.

3.6 Requirements for the Personnel

Only qualified personnel who have been authorised and trained by the manufacturer should work on and with the product. The personnel receive a certificate from the manufacturer attesting to the training. The certificate is valid for 3 years.

Technical personnel are persons who, on the basis of their technical training, knowledge and experience as well as knowledge of the applicable regulations, can assess the tasks assigned to them and recognize potential hazards.
The responsibilities for working on and with the product (assembly, repair) must be clearly defined and complied with to avoid any unambiguous division of responsibilities in terms of safety.

Only persons who can be entrusted to work reliably are permitted to work on and with the product. All working methods that impair the safety of persons, the environment or of the product are prohibited.
Persons under the influence of drugs, alcohol or medication that impedes their reactions must not work on or with the product.
The local age and job-specific regulations applicable at the place of use of the product must be taken into account with regard to personnel selection.
The personnel must immediately report to the operator any changes to the product that impair safety.

3.7 Personal Protective Equipment (PPE)

When working on and with the product, the following must be worn:

Protective clothing, close-fitting working clothes and gloves (low tear resistance, close-fitting sleeves, no rings or other jewellery etc.).

Safety footwear to provide protection from heavy, falling objects and slipping on slippery floors.

Tightly sealing safety goggles to protect the eyes from liquids and dust.

During cleaning and greasing work, the following are to be worn:

Special safety gloves of rubber to prevent the skin coming in contact with harmful substances.

Respirator in poorly and inadequately ventilated areas.

For work in particularly hazardous areas (depending on local conditions):

Safety helmet to provide protection from falling and flung objects and materials.

Secured safety harness for working in elevated and hazardous locations.

3.8 Warning notes

Safety information that refers to potential personal injuries.

Safety information that refers to potential property damage.

The instructions for the product or accessory must be heeded.

3.9 Approved cleaning agents

For the cleaning of insulating parts/control parts made of silicone rubber and the cable insulation made of XLPE, **only** the following cleaning agents are allowed:

The corresponding safety data sheets of the cleaning agents must be observed!

- Acetone (Propanone / Dimethyl ketone) C_3H_6O
- Gasoline used for cleaning purposes
- Ethanol (ethyl alcohol) C_2H_6O
- Isopropanol (2-Propanol / Isopropyl alcohol) C_3H_8O
- PF Solvent (cleaning agent from PT Technologies)

The cleaning agent “PV Solvent” evaporates only very slowly. An appropriate drying time must be allowed to ensure that the cleaning agent has evaporated completely before continued work.

If cleaning of o-ring gaskets is necessary, **only** water and soap or ethanol are allowed for use.

4 Delivery / Storage

4.1 Scope of Supply

Check the scope of supply for completeness based on the packing list. Contact the manufacturer immediately if parts are missing. Reference is made to the terms and conditions of purchase and delivery.
On delivery of the product, any damage as a result of defective packaging or that has been incurred during transportation must be reported immediately to the shipping company, the insurer and the supplier. Ensure that damage is reduced and that further damage is avoided.

The scope of supply includes only installation material for a single installation and a single plug-in procedure. For additional plug-in procedures, the necessary installation material (special grease) must be ordered separately.

If the separable connector is installed again on the same cable, it must be ensured that the cable dimensions are exactly identical.
In addition, the tension cone, insulating part and consumables (heat-shrink tubes, special grease, ...) must be reordered.

The tension cone and insulating part generally may not be reused.

4.2 Packaging

The most often used packaging materials are wood, cardboard and plastic (foils, foam materials). Packaging also consists of materials that are added to the parcels as protection against moisture (e.g. desiccants).
If no corresponding agreement has been made with regard to its return, the packaging material will remain with the customer.
Environmentally acceptable disposal in accordance with the applicable waste disposal regulations must be ensured. If necessary have a waste disposal company dispose of the packaging material.

4.3 Storage

After delivery, the packed items must be placed into storage till required for assembly. The product must not be unpacked!

The product must be stored under the following storage conditions:

- Store in dry conditions. Maximum relative humidity: 60 %. Ensure that the packages are not stored outdoors. In addition, ensure that the floor of the storage area is dry during the storage period.
- Protect from direct sunlight. Storage temperature -5 to 50 °C.
- Store free of dust.
- Avoid mechanical vibrations and damage.

4.4 Storage Time

When storing for longer than around three months, the preservation measures must be checked. In aggressive weather conditions, the preservation may need to be renewed.
The storage time is generally not limited; however, consumables such as tape, special grease and silver for reforming a semi-conductive layer should be replaced 2 years after the production date.

4.5 Disposal

If no agreements have been made for return or disposal, have the dismantled components recycled after proper disassembly:

- Scrap the metallic materials.
- Send plastic elements to plastic recycling.
- Sort and dispose of remaining components according to material type.

Grease and other additives are subject to special waste treatment and may only be disposed of by specialist waste disposal companies!

5 Assembly Accessories

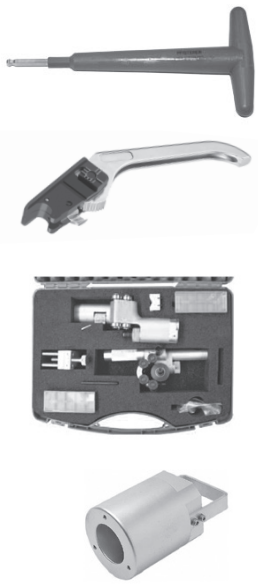
Special tools are required for assembly and disassembly.

5.1 Tools required

Name	Article no.	Description
Hydraulic hand-operated compression tool	827 017 002	For axial pressing-on or pulling-off the contact ring.
Compression head Size 3	305 675 013	Including pull-off die for hand-operated compression tool.
Impact device Size 3	559 214 003	For preassembly of the contact ring.

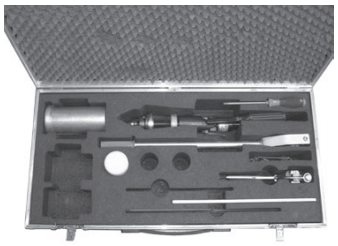
5.2 Recommended tools and accessories

Name	Article no.	Description
T-handle screwdriver SW 6	563 376 002	For tightening or removing the screws of the CONNEX separable connector.
Cable Stripper	305 051 051	For lengthwise and radial cuts into insulation to expose the conductor Ø 15 – 45 mm.
Spare blade	305 063 063	
Peeling tool and cable sheath cutter set XLPE area 15 – 49 mm	827 951 001	For peeling the outer sheath, for peeling off the firmly welded semi-conducting layer and for chamfering the conductor insulation.
Plug-in type assembly socket Size 3	827 174 004	For preassembly of CONNEX separable connectors (e.g. at the workshop).



Name	Article no.	Description
Protection cap Size 3 (metal)	827 134 003	For protection of the withdrawn CONNEX separable connector against damage and soiling (not voltage proof).
Blind cap Size 3	827 131 003	Protection against electric-shock hazard for live CONNEX separable connectors.
Transport case (without tools)	305 768 001	For holding the tools.
Pull-off tool	827 229 001	For easy disconnecting of CONNEX separable connectors.

5.3 Recommended tools and accessories as a complete set



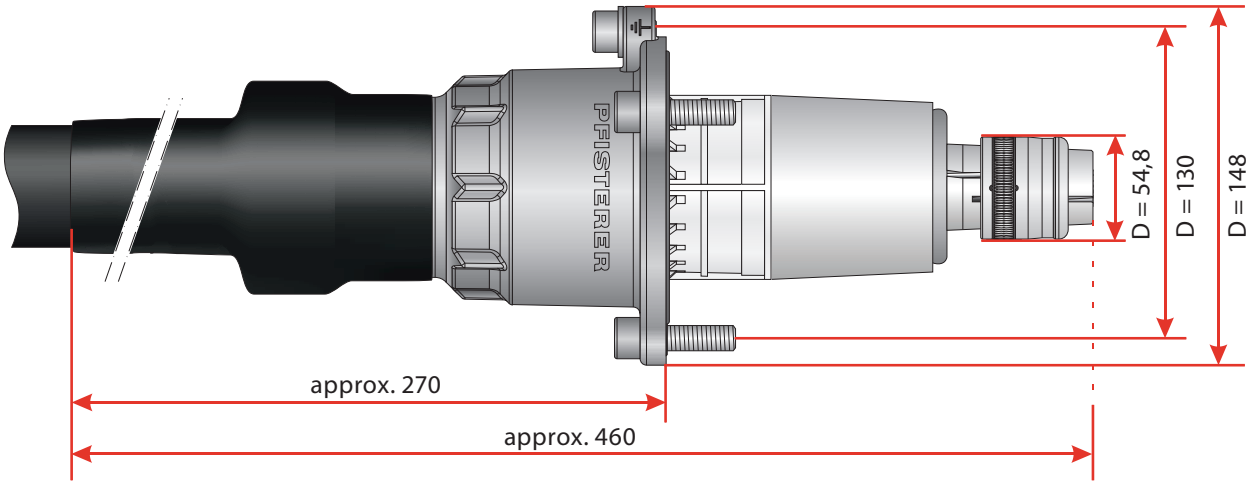
Name	Article no.	Description
Assembly tools for CONNEX separable connectors in the case Size 3 Size 2, 3 Size 1, 2, 3*	 305 768 007 305 768 005 305 768 004	Consisting of hydraulic hand-operated compression tool, compression head, impact device, T-handle screwdriver, cable stripper, spare blade, chain*, assembly lever*, hole bar*.

5.4 Round crimp tool and compression sleeves

Article no. Compression tool	**Identification number** Compression tool	**Ø (mm)** Outer Ø of the compression sleeve	Description
300 632 632	HR 11	13.0	For round-pressing of the sleeves onto the fine stranded conductor of the highly flexible cable.
300 632 635	HR 16	18.5	
300 632 637	HR 20	22.5	
300 632 639	HR 22	25.0	
300 632 640	HR 25	28.5	
300 641 641	HR 28	32	
300 641 001	HR 32	36.5	
300 641 002	HR 34	38.5	

6 Technical Data / Configuration

6.1 Dimensions and weight(s)



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		Size 3 | 3-S
Length, including heat-shrink tube	[mm]	approx. 460
Outer diameter, max.	[mm]	148
Hole circle	[mm]	130
Weight / part	[kg]	approx. 3.3
Contact ring	[mm]	54.8

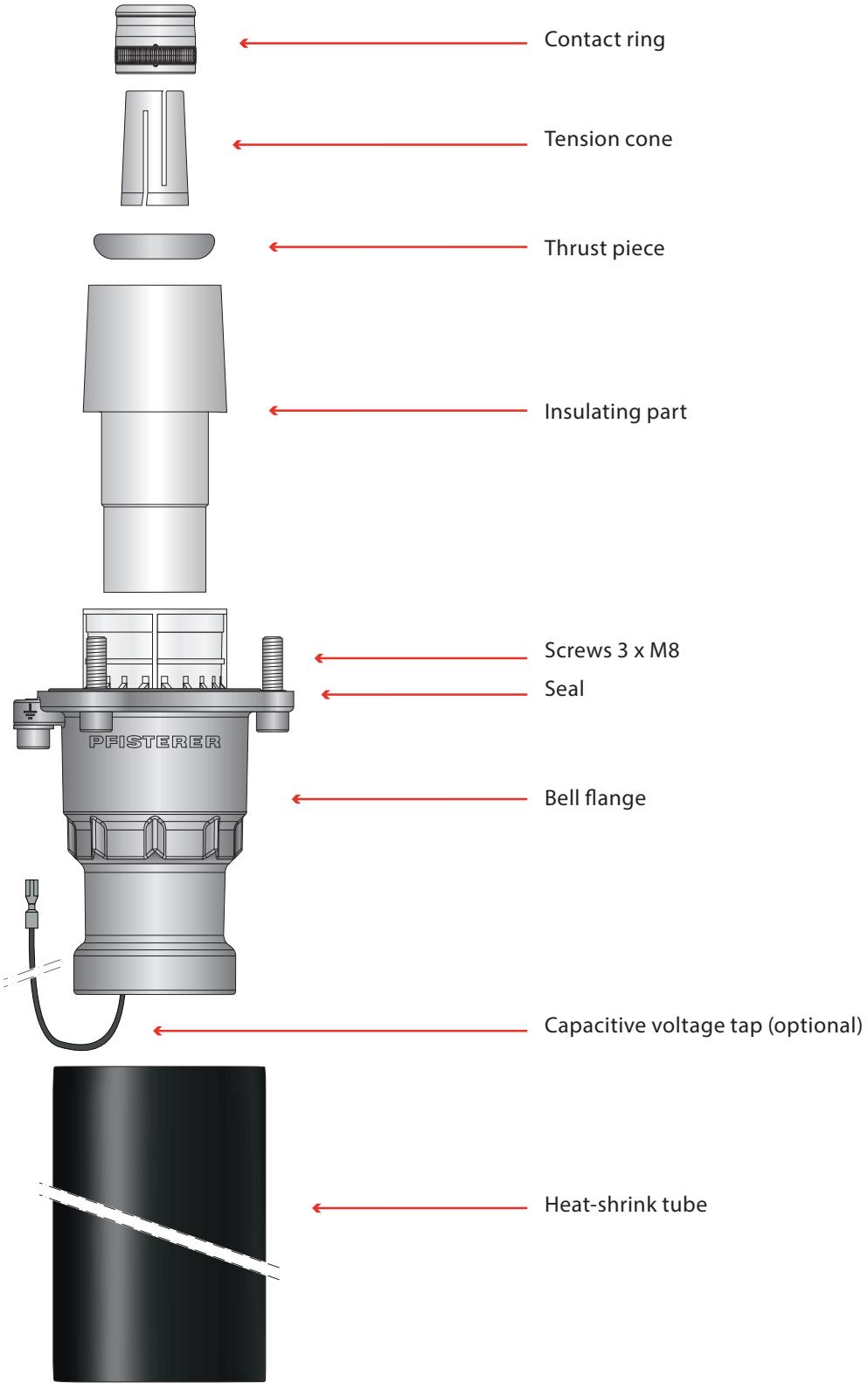
6.2 Cable data

		Size 3 | 3-S
Conductor diameter* min. / max.	[mm]	6.1 / 36.0
Cross section, min. / max.	[mm²]	35 / 800
Ø over insulation, min. / max.	[mm]	15.5 / 46.0

6.3 Characteristics

		Size 3	Size 3-S
Nominal current	I_n [A]	1250	1250
Max. operating voltage	U_m [kV]	42	52
Rated power frequency withstand voltage	50 Hz/5 min [kV]	95	117
Rated lightning impulse withstand voltage	1.2/50 µs [kV]	200	250
Partial discharge	2 x U_0 [pC]	≤ 10	≤ 10
Direct voltage testing	15 min 6 x U_0 [kV]	125	156
Rated short-time withstand current	0.5 sec [kA] 1 sec [kA]	63 50	63 50
Rated impulse current	[kA]	150	150

6.4 Configuration



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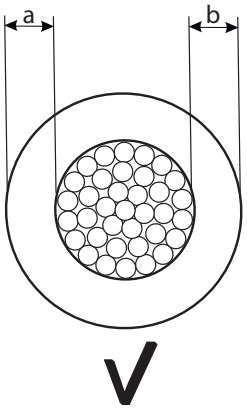
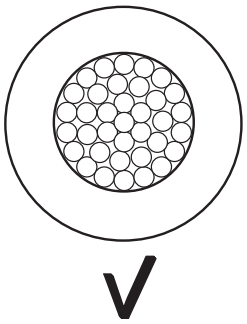
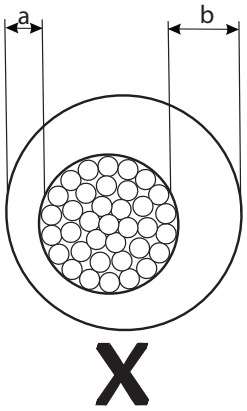
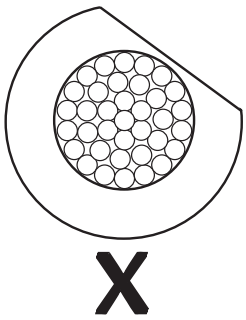
Drawings not to scale – for information purposes only

7 Cable Quality

Check the eccentricity and any flattening of the cable using the following table.

Eccentricity	Flattening
	
Maximum 15 % difference between thickest and thinnest point. $0.85 \leq \frac{a}{b} \leq 1.15$ The result must be within the following limits: Minimum: 0.85 Maximum: 1.15	No tolerance. No flattening allowed, the cable must be round.
	

Installation of the product in violation of the specified limits values can result in damage.
If the limit values are exceeded, the cable must be worked until it complies with the specified tolerances. If this is not possible, the product may not be installed. In this case, contact the company “PFISTERER Kontaktsysteme GmbH”.

8 Assembly / Installation

Danger! Before starting the work on electrical systems, the five safety rules must be observed, see chapter 3.4, page 8.

During work on and with the product, the locally applicable work safety rules must always be complied with and personal protective equipment must be worn, see chapter 3.7, page 9.

The assembly is to be carried out in a clean and dry conditions.

All dimensions in mm.

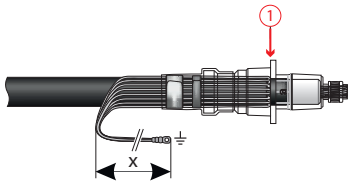
The cable must be straightened 500 mm in front and behind the sheath cut (1).

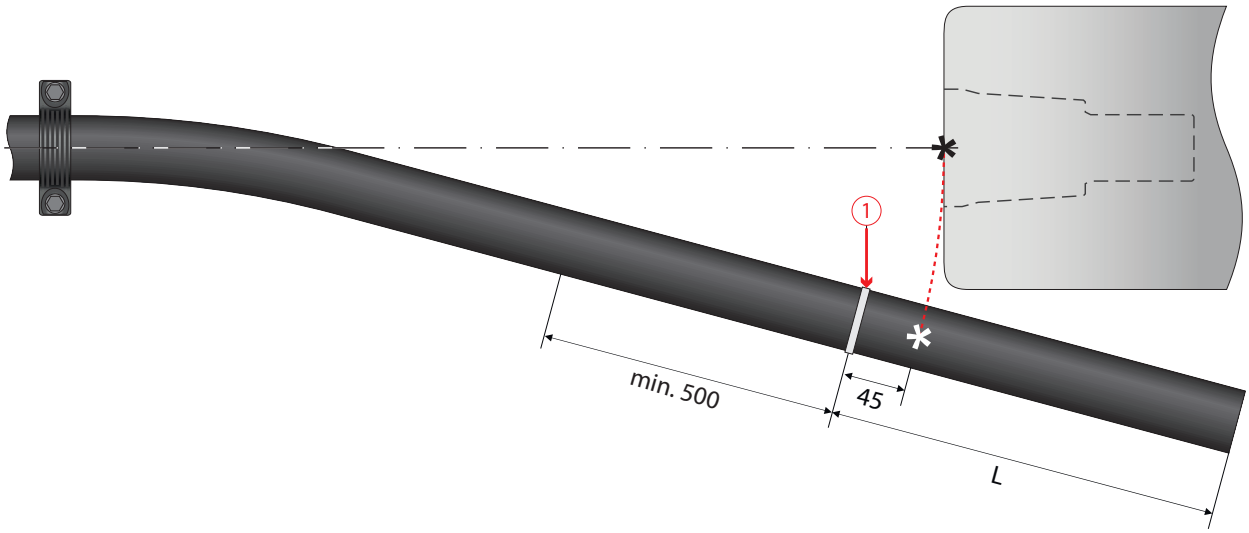
Only peel the cable when it is straight.

8.1 Positioning

1 Mark the sheath cut (1) on the cable 45 mm below the socket.

In the case of cable with wire earth screen:
L = min. 400 mm to extend the wire screen with a connector.
x = the required length of the earth screen to the system earth (e.g. 400 mm + x mm)





After plug-in the connector, the cable needs to be arranged in a way that it comes out of the flange centrically and runs straight until the first cable clamp. The first cable clamp fixes the cable in a distance of approx. 600 mm.

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8.2 Cable preparation

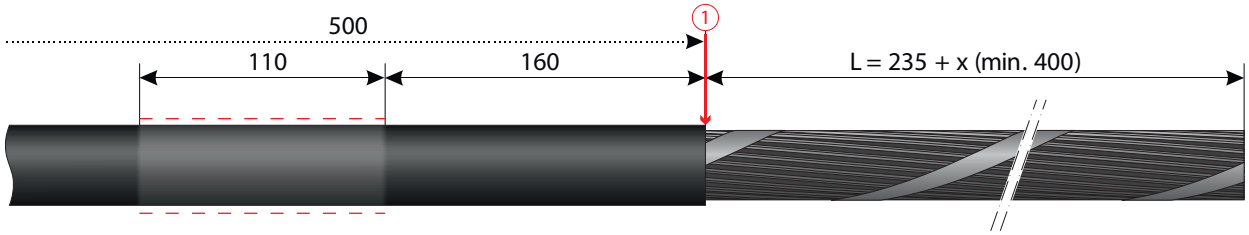
1 Remove outer sheath to sheath cut (1).

Recommended tools (see chapter 5.2, page 13):
▪ Peeling tool and cable sheath cutter set

Do not damage the underlying cable screen!

2 Roughen outer sheath over 110 mm in the heat-shrink area with emery grit 60. – – –

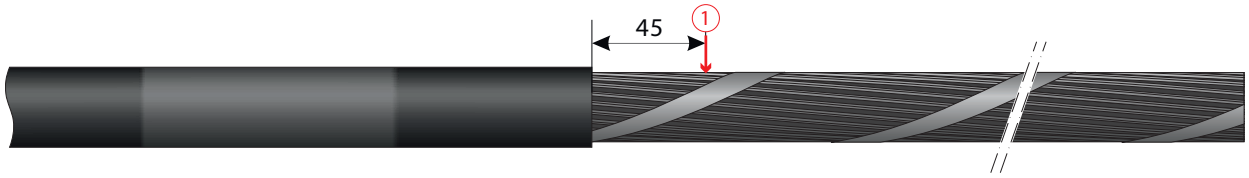
If the outer sheath is conductive, the conductive layer must be completely removed up to 500 mm behind the sheath cut (1) (e.g. by peeling, grinding, washing, ...). .....



Only for cable > 58 mm outer diameter

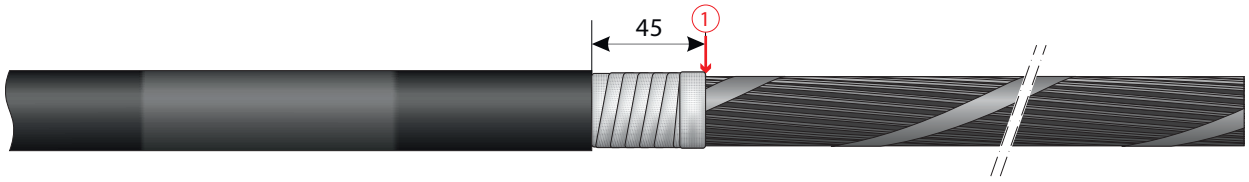
3 Remove outer sheath a further 45 mm behind the sheath cut (1).

Do not damage the underlying cable screen!



4 Apply woven insulating tape from the outer sheath for 45 mm to the sheath cut (1) with a 50% overlap.

5 At the sheath cut (1), apply 2 – 3 more layers one on top of the other.



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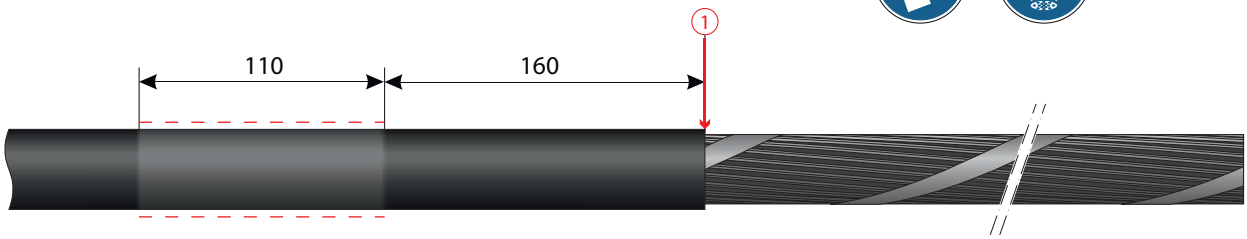
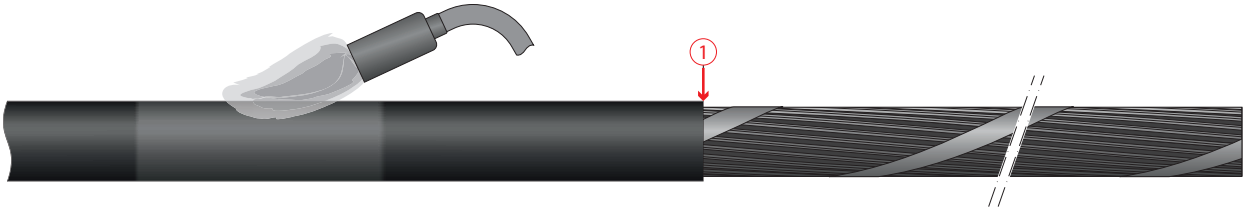
6 Clean the roughened area.



7 Flame the roughened area.

Not necessary for PVC and EPR outer sheath.

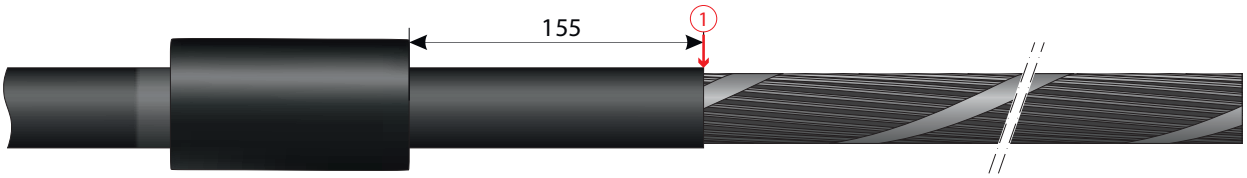
Warning! Aim only at the area of the cable to be flamed!



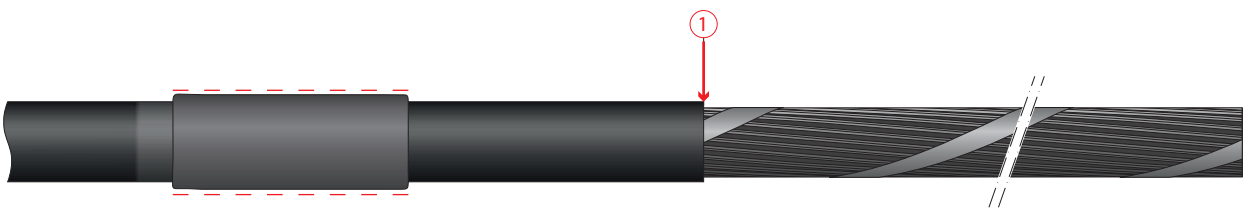
Only with cable < 38 mm outer diameter

8 Slide the smaller heat-shrink tube over the cable to line it and shrink it on in the roughened area.

Warning! Use a soft flame to shrink the tube, and direct it only at the heat-shrink tube.



9 Then roughen the heat-shrink tube again with grit 60 emery.



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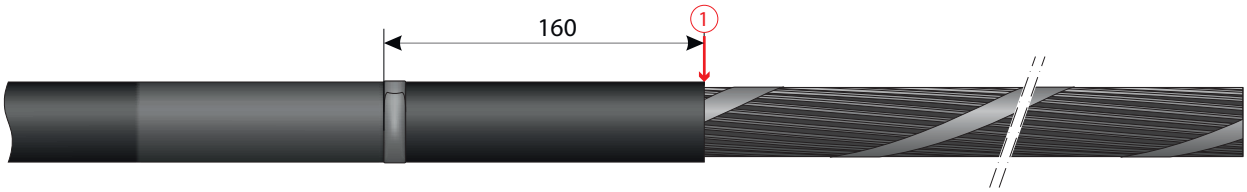
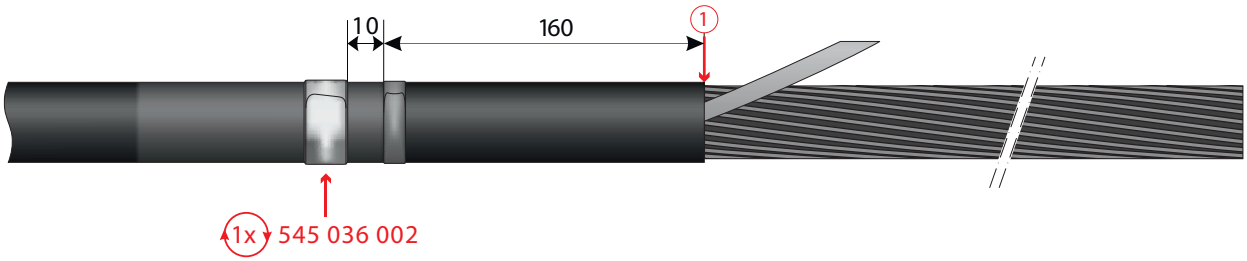
Drawings not to scale – for information purposes only

10 Apply the control mark 160 mm from the sheath cut (1).



11 Apply one layer of sealing tape 10 mm after the control mark.

12 Cut the balancing tape at the sheath cut (1).



13 Fold back the screen wires and fix them with insulating tape.

For one-sided earth connection, see chapter 8.7, page 39 - 40.

For water tightness, fold back the screen wires in parallel, without crossing over!

With a capacitive voltage tap, the distance from the wire screen to the test lead must be observed, see step 31, page 35.

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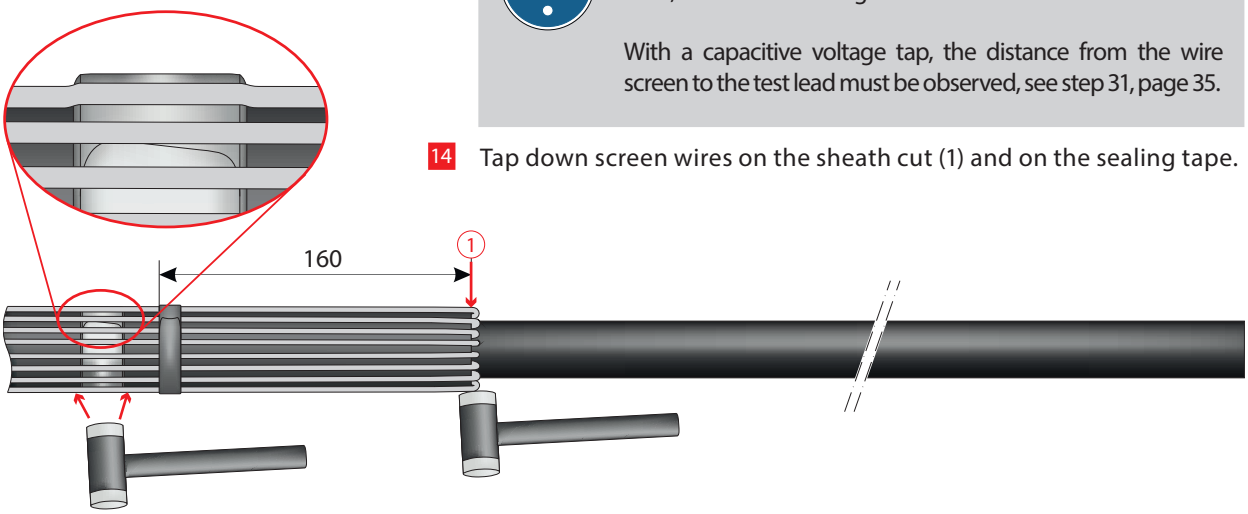
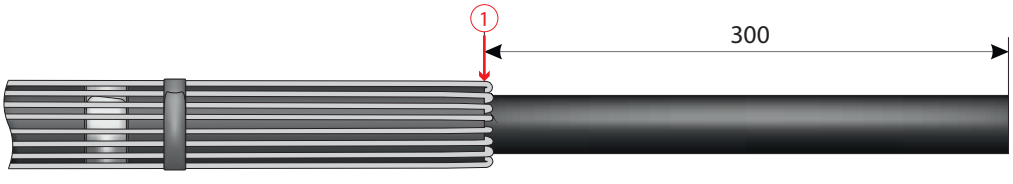
14 Tap down screen wires on the sheath cut (1) and on the sealing tape.



15 Mark the end of the cable 300 mm from the sheath cut (1) for a provisional cut and shorten.



Drawings not to scale – for information purposes only

Only with peelable semi-conductive layer

16 In the section between 250 mm and 300 mm in front of the sheath cut (1), peel off sections of the semi-conductive layer on a test basis (follow operating instructions for the peeling tool). Then determine the difference between the semi-conductive layer and the peeled insulation layer using the enclosed measuring tape or a calliper.

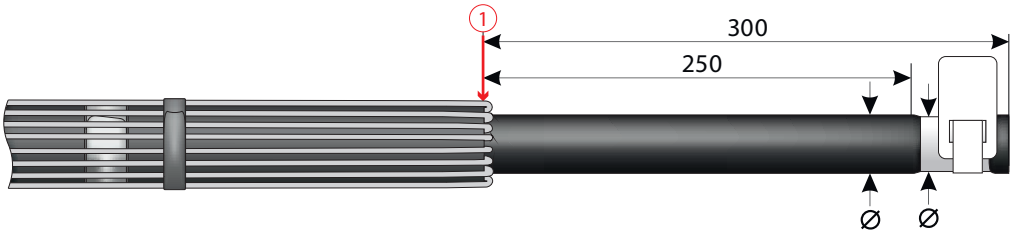
During the peeling process it is important to ensure that the semi-conductive layer is completely removed and as little of the insulation as necessary is removed.

Measurement:

Ø semi-conductive layer - Ø insulation = Ø difference

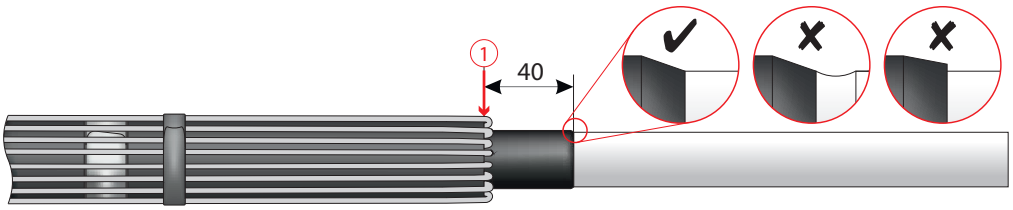
Difference **< 2 mm** is considered a **normal** semi-conductive layer. For additional instructions, see step 17, page 23.

Difference **≥ 2 mm** is considered a **thick** semi-conductive layer. For additional instructions, see chapter 8.8, page 40 - 41.



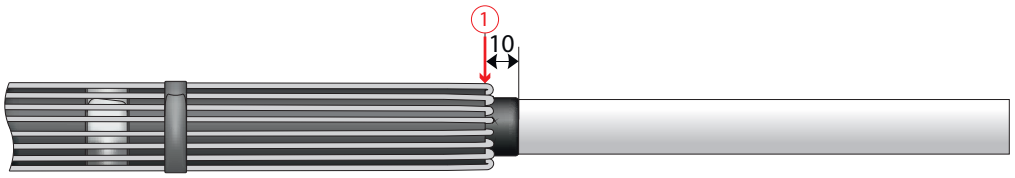
Only with a normal (Ø < 2 mm) peelable semi-conductive layer

17 Peel off semi-conductive layer up to 40 mm before the sheath cut (1) using a peeling tool (follow operating instructions for the peeling tool).



Only with strippable semi-conductive layer

18 Remove strippable semi-conductive layer 10 mm before sheath cut (1).

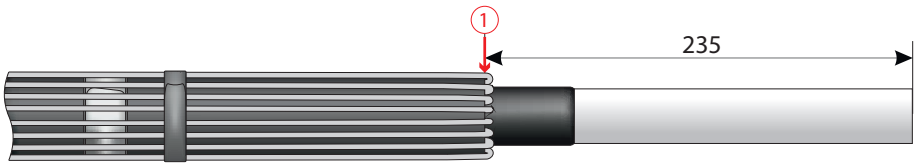


VIII

Drawings not to scale – for information purposes only

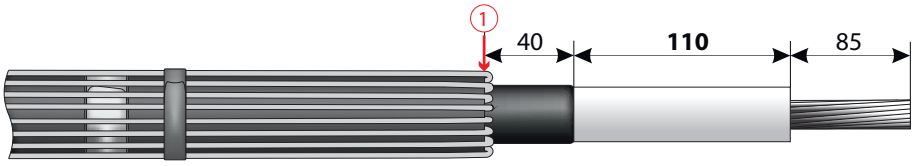
19 Mark the cable 235 mm in front of the sheath cut (1) and saw off straight with a hacksaw – **do not clip**!

To avoid crushing of the conductor, the cable must not be clipped!!!

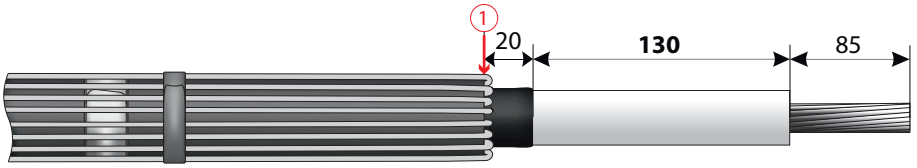


20 Strip the insulation from the conductor to 85 mm. The specified **insulation length** must be complied with.

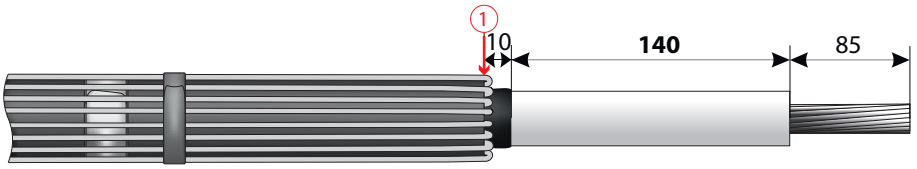
Only with a normal (Ø < 2 mm) peelable semi-conductive layer



Only with a thick (Ø ≥ 2 mm) peelable semi-conductive layer

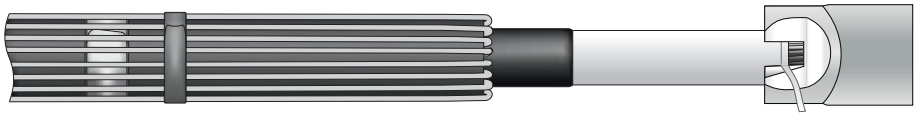


Only for strippable semi-conductive layer



VIII

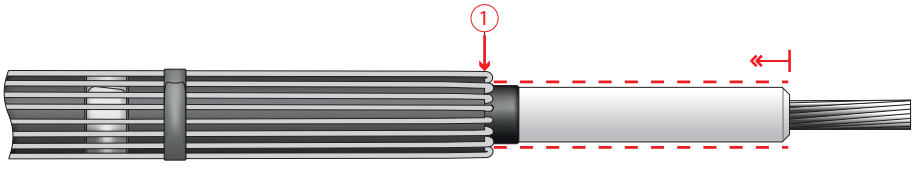
21 Chamfer the insulation edge.



Only with a thick (Ø ≥ 2 mm) peelable semi-conductive layer

Or for strippable semi-conductive layer

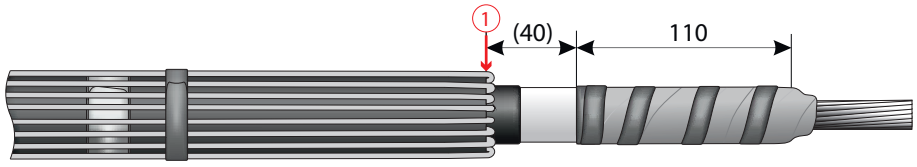
22 Clean the area – – – towards the sheath cut (1) and wait until the cleaning agent has fully evaporated. The recommended cleaning agent is white gasoline or acetone, see chapter 3.9, page 10.



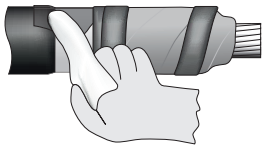
Drawings not to scale – for information purposes only

23 Apply adhesive tape 110 mm from the beginning of the insulation. Ensure the edge is straight and clean. Provide insulation in the direction of the conductor with protective wrapping.

Do not roughen the surface!



24 Apply an additional conductive layer of dry graphite that forms a good covering over 40 mm on the semi-conductive layer and insulation. Take care to ensure insulation length of 110 mm is achieved.



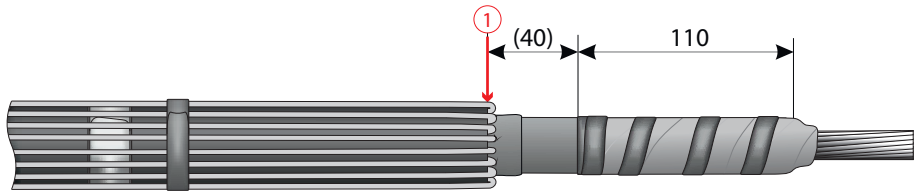
Remove excess graphite!

For round, fine stranded conductors (RF) OR customer-specific conductors, use silver for reformation of a semi-conductive layer instead of dry graphite:

- When using silver for reformation of a semi-conductive layer, first roughen the insulation and then the semi-conducting layer from 40 mm with 120 grit electrical emery (enclosed).
- Apply one layer of silver for reproduction of a semi-conductive layer with the enclosed brush.

Shake the bottle well before use. After application, allow to completely dry (approx. 10 minutes).

Warning! Before using the silver for reformation of a semi-conductive layer, observe the safety data sheet!

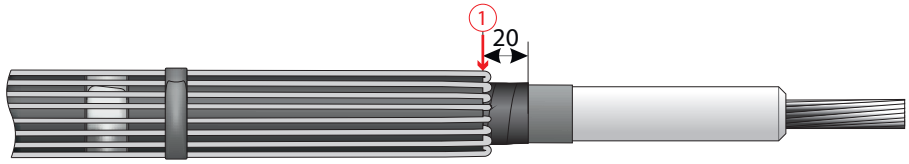


25 After drying remove the protective wrap from the insulation.

Only for strippable semi-conductive layer

26 Stretch self-amalgamating semi-conductive tape lengthwise over approximately half the length and cut off one end. Apply the semi-conductive tape in a single layer with a 50% overlap over 20 mm before the sheath cut (1).

Wrap semi-conductive tape tightly, a straight edge is required at the front. Tear off the remainder of the semi-conductive tape. The edge of the strippable semi-conductive layer must be sealed.

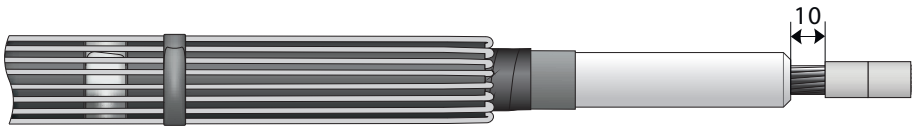


Only for fine stranded conductor (class 5 according to DIN VDE-0295 / IEC 60228)

27 Slide the first compression sleeve onto the conductor with a 10 mm spacing from the insulation. Perform a round crimping operation with suitable tools.

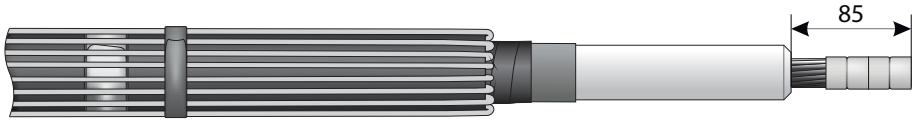
28 Slide the second compression sleeve onto the conductor, and perform a round crimping operation with suitable tools.

If the wrong tool is used, the sleeve and the conductor may be compressed too much or too little. For the appropriate tool, see chapter 5.4, page 14.



29 Saw off the conductor with the crimped-on sleeve at 85 mm and then deburr the sleeve.

To avoid crushing of the conductor, the cable must not be clipped!!!



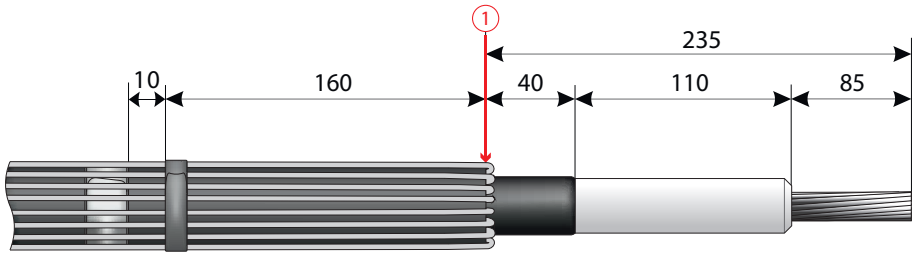
VIII

Drawings not to scale – for information purposes only

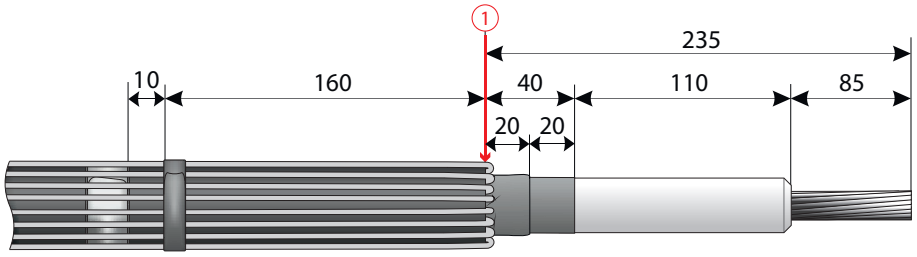
8.3 Checking

Reference illustration for dimensions

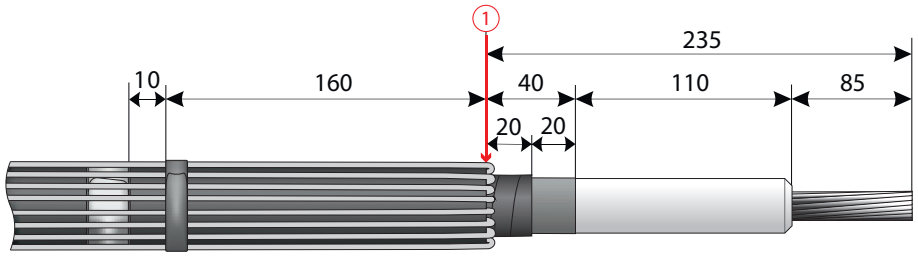
Only with a normal (Ø < 2 mm) peelable semi-conductive layer



Only with a thick (Ø ≥ 2 mm) peelable semi-conductive layer



Only for strippable semi-conductive layer



Comparing the insulation diameter with the scope of application of the insulating part

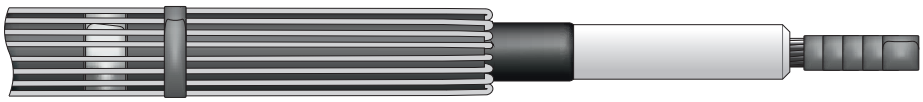
Check if the diameter of the prepared insulation is within the working range of the insulating part (for range, see label / parts list / insulating part). If the diameter is not within these values, **THE INSULATING PART MAY NOT BE INSTALLED.**

Comparing the conductor diameter with the scope of application of the tension cone

Check whether the diameter of the conductor lies within the working range of the tension cone (for area, see label / parts list / tension cone). If the diameter is not within these values, **THE TENSION CONE MAY NOT BE INSTALLED.**

8.4 Assembly

1 Apply a protective wrap to the conductor using insulating tape.



2 Apply self-adhesive tape, with the sticky side facing outwards, to form a protective wrapping over the semi-conducting layer.

When using an overvoltage limiter, observe the instructions in chapter 8.7, page 39 - 40!

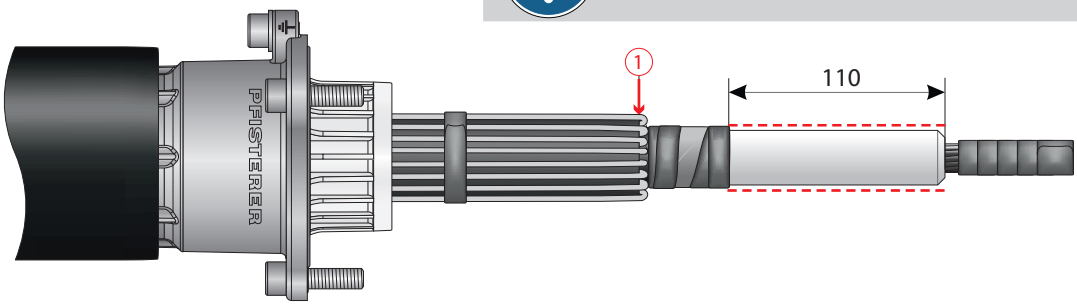
3 Slide the heat-shrink tube and bell flange over the cable.

4 Clean the conductor insulation and wait until the cleaning agent has fully evaporated. The recommended cleaning agent is white gasoline or acetone, see chapter 3.9, page 10.

5 Grease the conductor insulation thinly and evenly with PFISTERER MV special grease.

Warning! Before using the MV special grease, observe the safety data sheet!

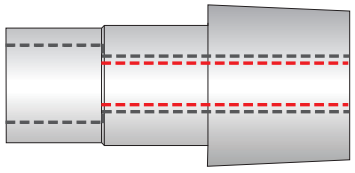
Wear clean gloves.



6 Remove the protective wrap from the semi-conducting layer.

7 Check the insulating part for cleanliness, clean if necessary, and then grease the inside thinly and evenly with PFISTERER MV special grease.

Warning! Before using the MV special grease, observe the safety data sheet!

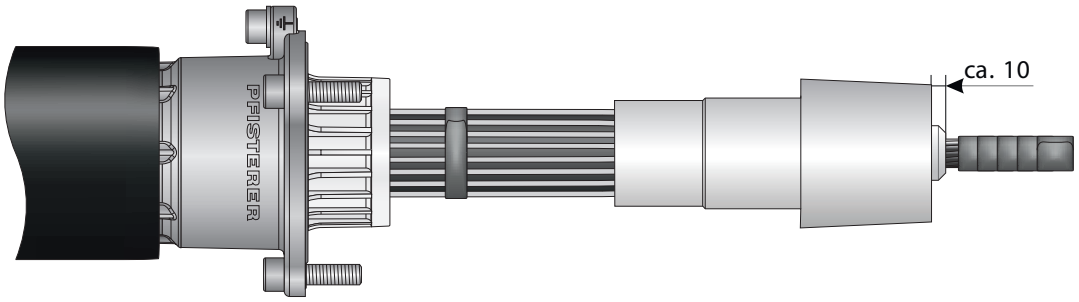


VIII

Drawings not to scale – for information purposes only

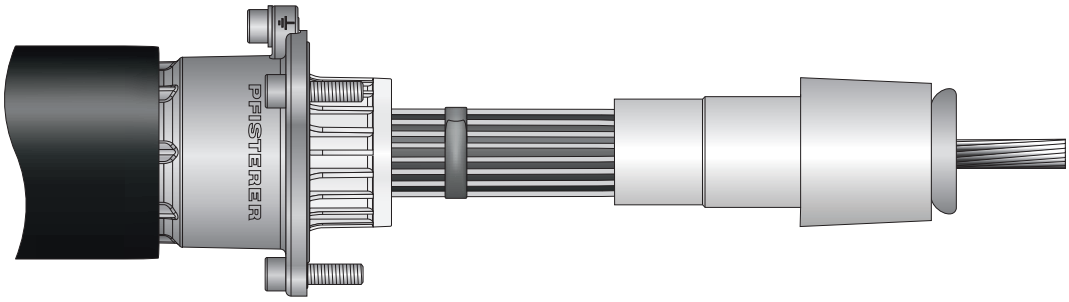
Size 3 | 3-S / Standard instructions for wire screen / No. 040 370 003 (2019-08-13) i-02

8 Slide the insulating part onto the conductor insulation until 10 mm of the insulation is exposed. Remove excess grease.

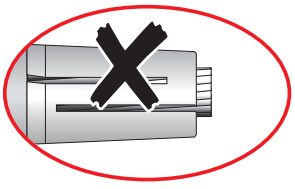


9 Remove the protective wrap from the conductor.

10 Slide the thrust piece onto the conductor with the rounded side towards the insulating part.



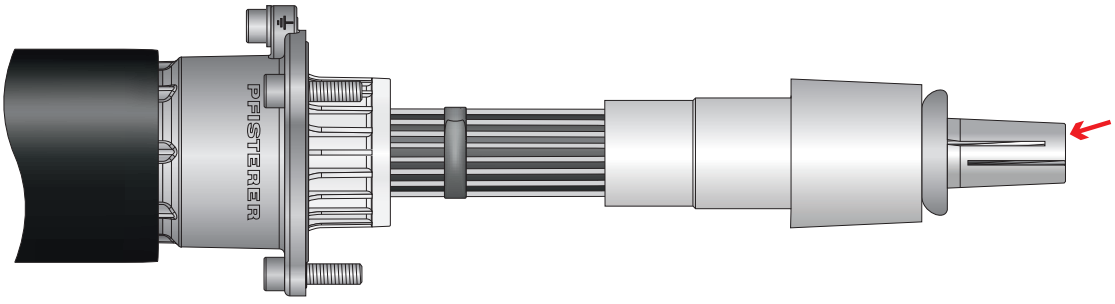
11 Slide the tension cone onto the conductor up to the thrust piece.



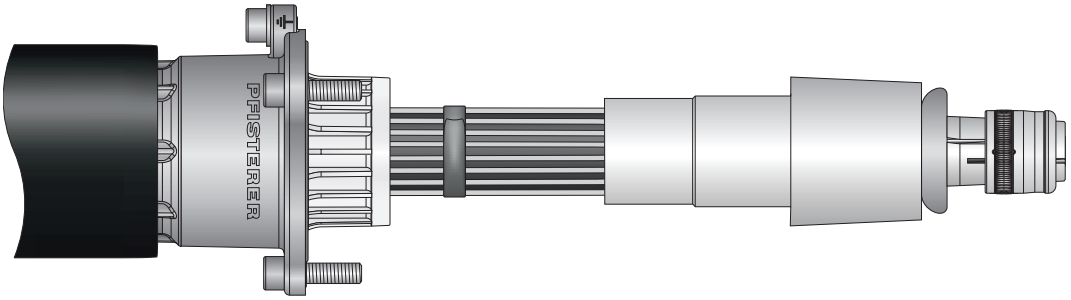
The conductor must not protrude past the tension cone!

The conductor and tension cone must be free of grease!

The tension cone and insulating part can only be used once!



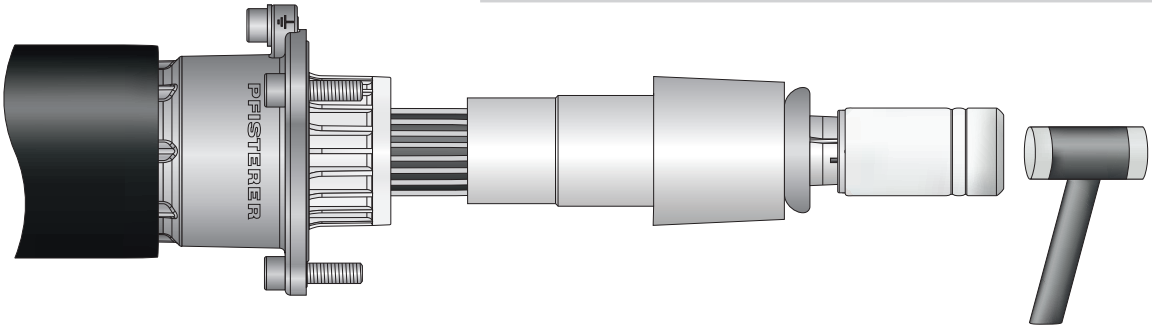
12 Slide the contact ring onto the tension cone.



13 Fix the contact ring onto the tension cone with the impact device.

The contact ring must no longer be able to rotate. The lamellas must not be damaged.

For required tools, see chapter 5.1, page 13:
- Impact device



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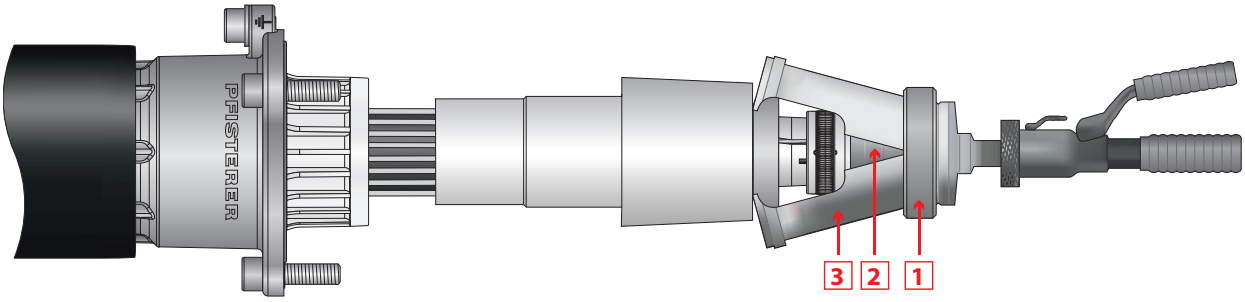
14 Slide the retaining ring [1] of the compression head back. Turn back the thrust piece of the compression head [2] until the half-shells [3] can be positioned behind the thrust piece of the separable connector.

Do not damage the insulating part.

For required tools, see chapter 5.1, page 13:
- Hydraulic hand-operated compression tool

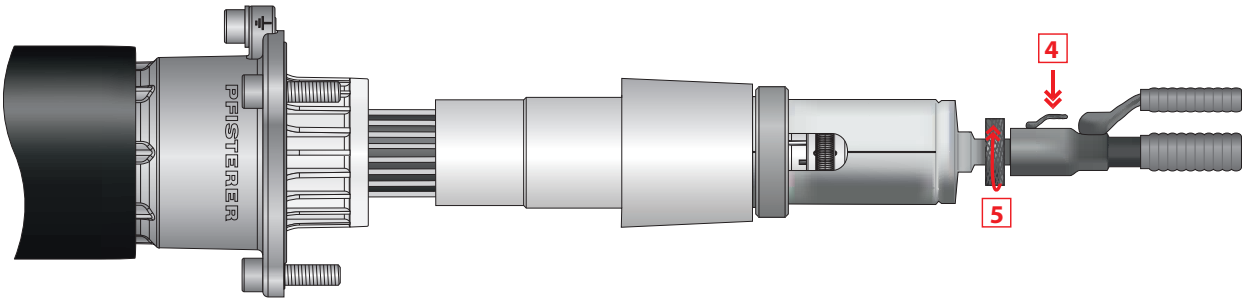


Drawings not to scale – for information purposes only

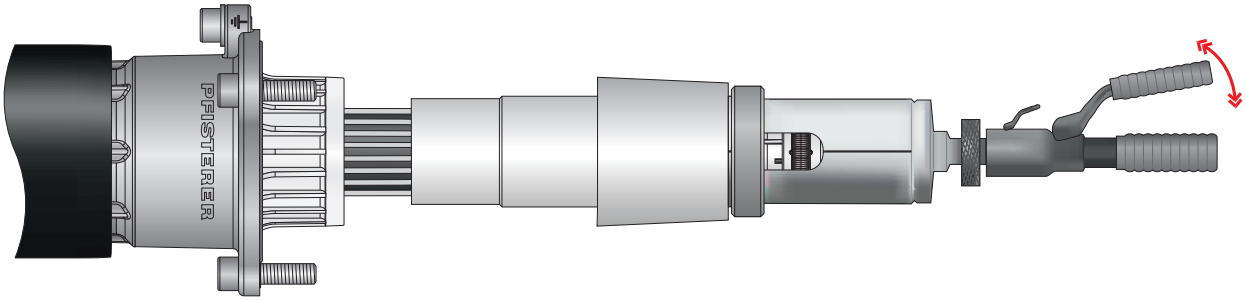
15 Squeeze the half-shells together and slide the retaining ring forward.

Release the hydraulic hand-operated compression tool before operating [4].

16 Turn the knurled wheel [5] of the hydraulic hand-operated compression tool to the right until the thrust piece of the compression head makes contact with the contact ring.



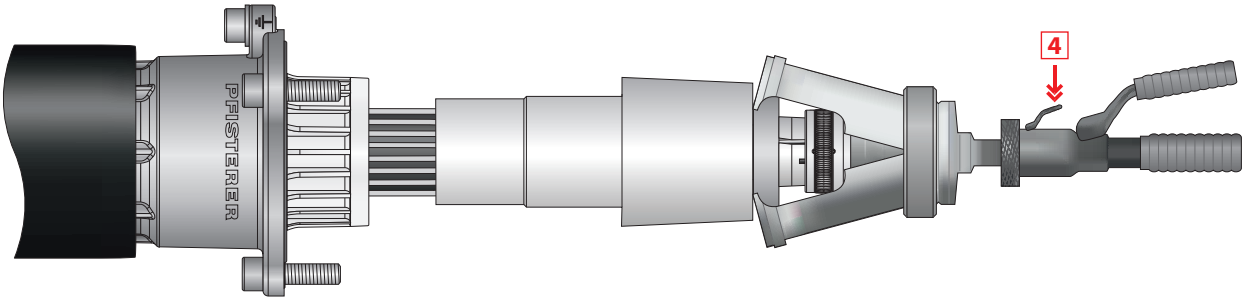
17 Press the contact ring onto the tension cone with the hydraulic hand-operated compression tool until it reaches pressure.



18 Release the hydraulic hand-operated compression tool [4].

19 Slide the retaining ring of the compression head back and open the half-shells.

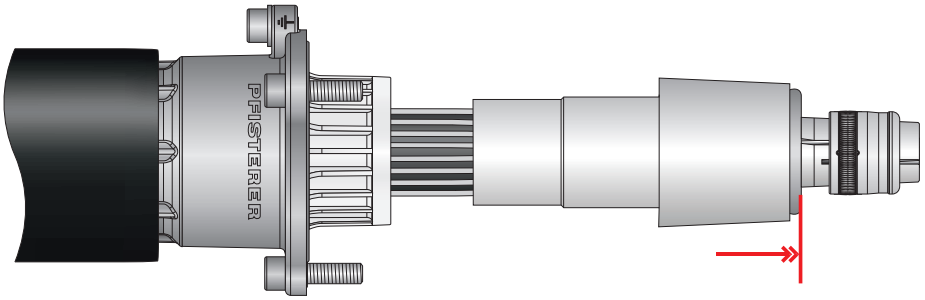
20 Remove the hydraulic hand-operated compression tool.



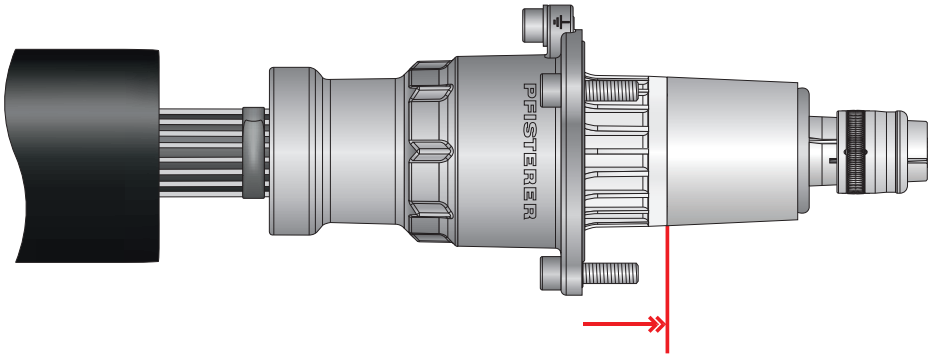
VIII

Drawings not to scale – for information purposes only

21 Pull the insulating part flush against the thrust piece.



22 Slide the bell flange onto the insulating part.

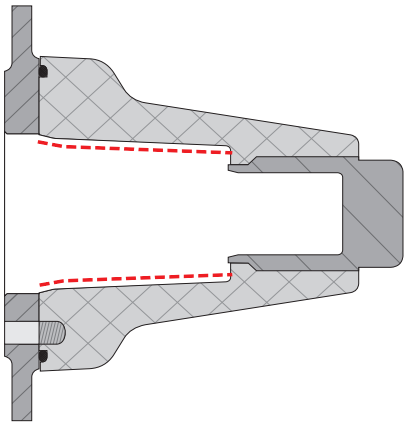


For installation outdoors vertically from above (for transformer applications), an extra set of seals must be used. Note the additional steps, see chapter 8.9, page 42.

23 Clean the inside of the socket and wait until the cleaning agent has fully evaporated. The recommended cleaning agent is white gasoline or acetone, see chapter 3.9, page 10. – – –

24 Grease the area – – – thinly and evenly with PFISTERER MV special grease. Wear clean protective gloves (e.g. latex or plastic). **Do not apply grease to the contact area!**

Warning! Before using the MV special grease, observe the safety data sheet!

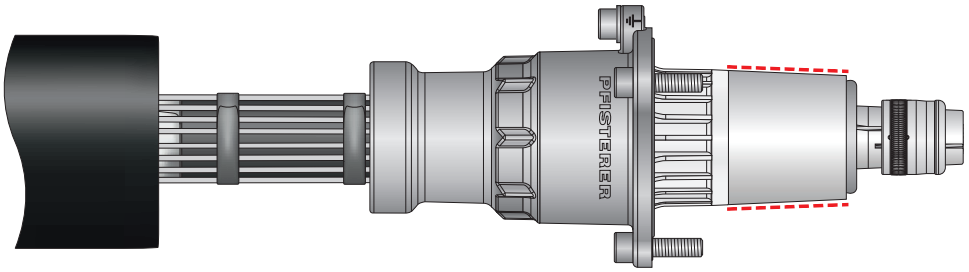


VIII

25 Clean the surface of the insulating part and wait until the cleaning agent has fully evaporated. The recommended cleaning agent is white gasoline or acetone, see chapter 3.9, page 10.

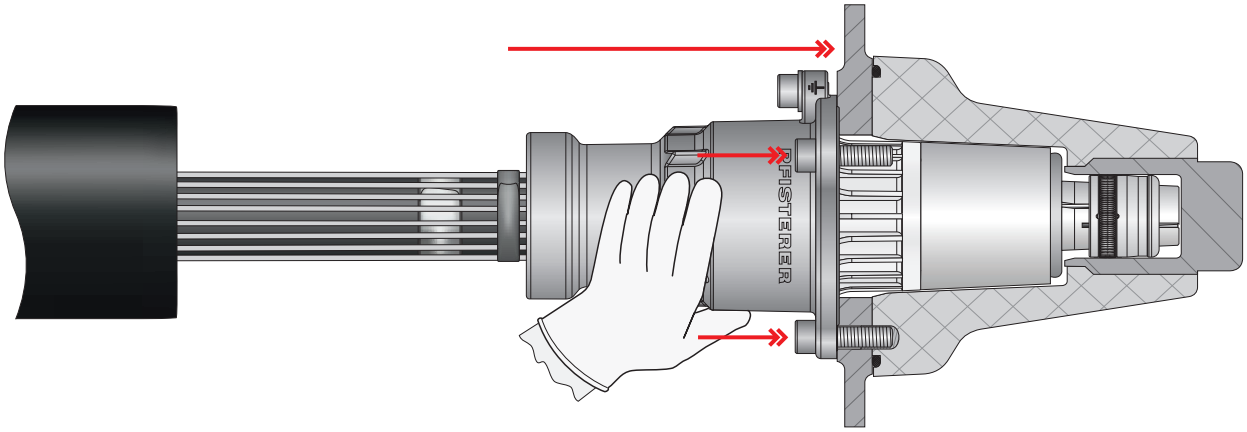
26 Grease the area – – – thinly and evenly with PFISTERER MV special grease. Wear clean protective gloves (e.g. latex or plastic). **Do not apply grease to the contact area!**

Warning! Before using the MV special grease, observe the safety data sheet!



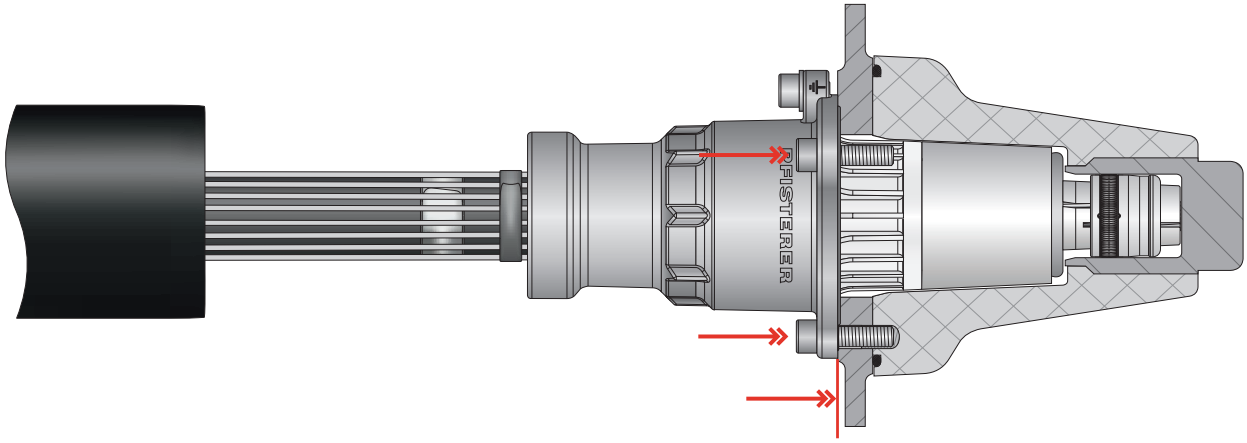
27 Introduce the CONNEX separable connector into socket and tighten the screws.

The bell flange must be held with pressure on the insulating part until the screws grip.



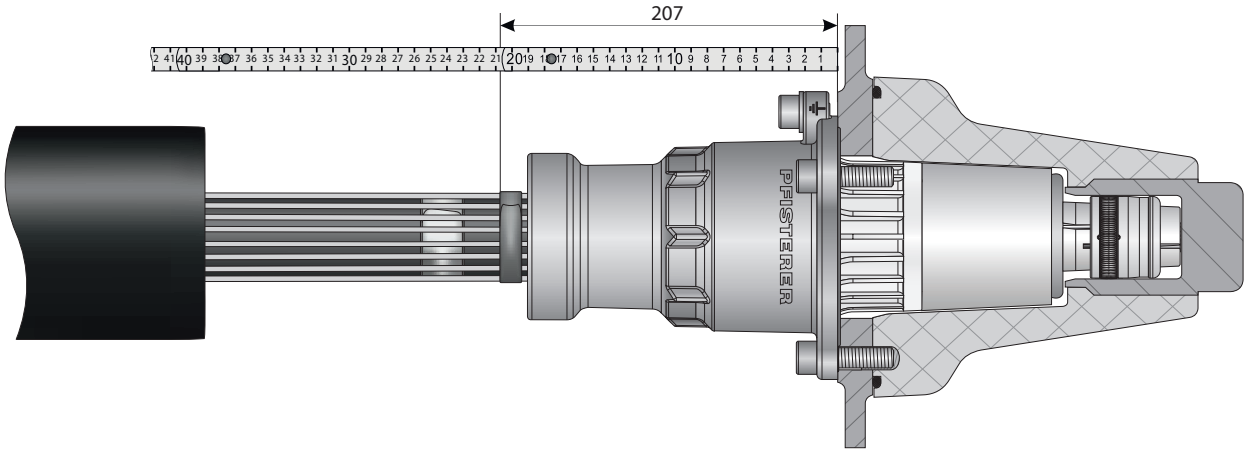
VIII

28 Tighten the screws going around on alternating sides to a torque of 15 Nm.



29 Using the ruler, check the position of the contact to confirm the dimension 207 mm; otherwise press the cable again.

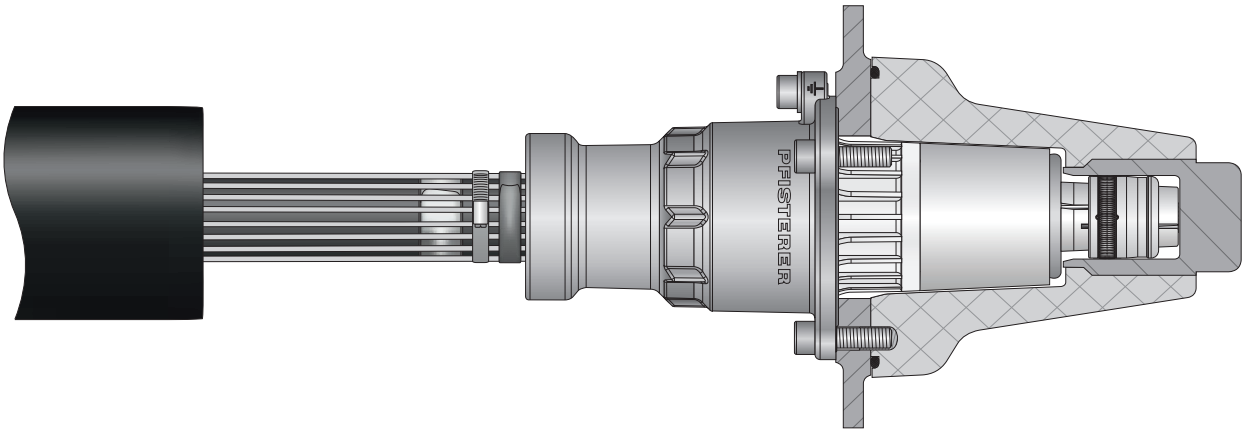
Do not remove the control mark!



VIII

Only with a super-flexible cable

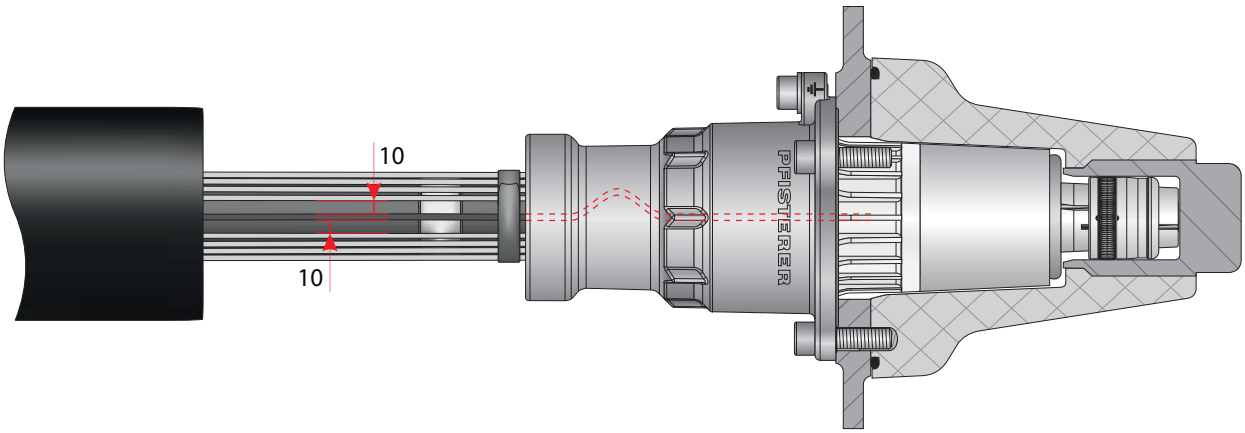
30 For better adhesion of the heat-shrink tube, introduce a clamping collar between the sealing tape and the control mark on the outer sheath.



Only for a separable connector with capacitive voltage tap

31 Slide back the test lead from the capacitive voltage tap approx. 15 mm into the bell flange and fix it approx. 10 mm from the screen wires.

The test lead from the capacitive voltage tap may **not** be taut in the bell flange.
The test lead may **not** be crossed with the screen wires in the heat-shrink area.



VIII

Drawings not to scale – for information purposes only

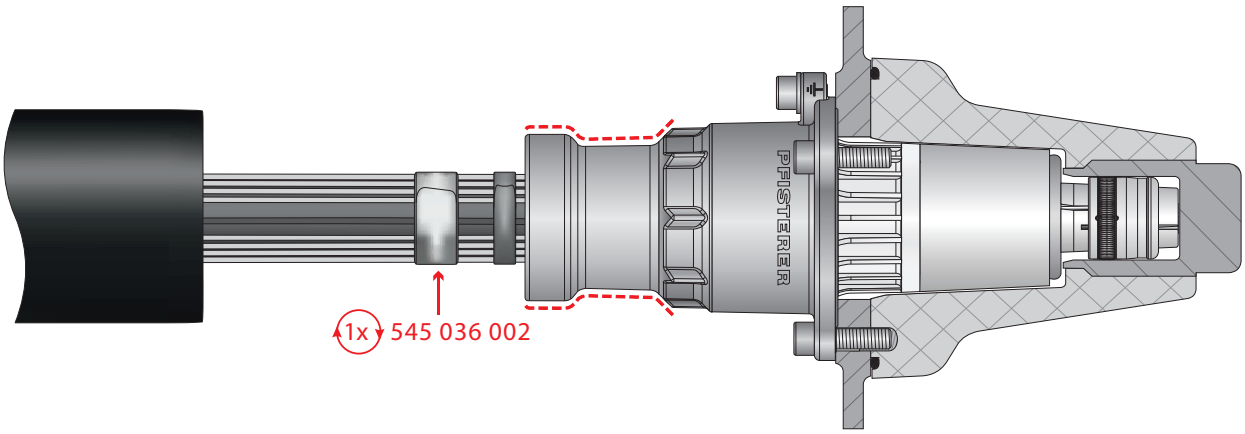
For one-sided earth connection / use with an overvoltage limiter, see chapter 8.7, page 39 – 40.

For installation outdoors vertically from above or offshore/ underground applications, see chapter 8.9/8.10, page 42 –44.

Align cable centred and in a straight way in the bell flange.

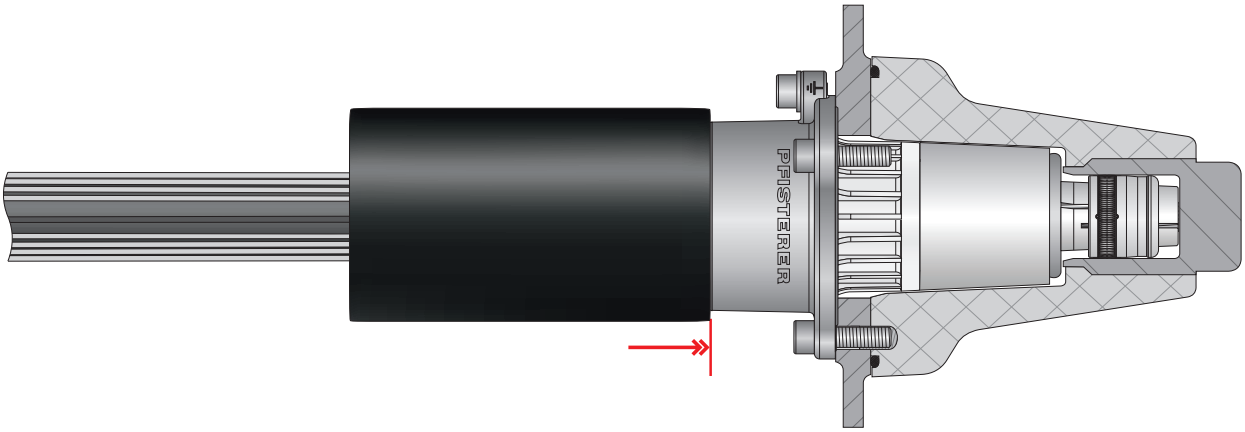
32 Clean the outside of the bell flange and wait until the cleaning agent has fully evaporated. The recommended cleaning agent is white gasoline or acetone, see chapter 3.9, page 10.

33 Apply a further layer of sealing tape directly on top of the first layer.



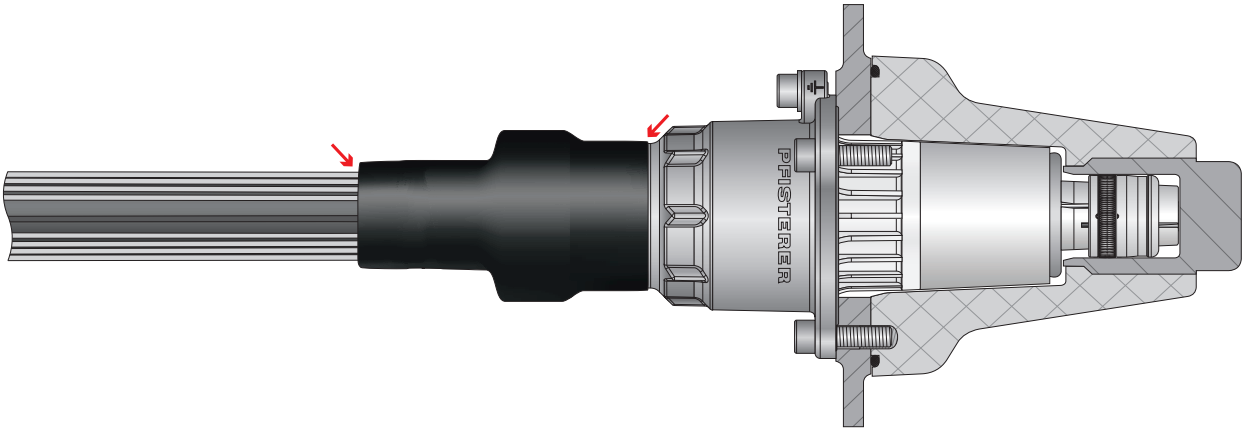
VIII

34 Fix the heat-shrink tube over bell flange on the ribbing.



35 Evenly heat the heat-shrink tube starting from the bell flange until the heat-shrink tube fits evenly all round (below the ribbing) and the inner adhesive is exposed from both sides (see arrows).

Warning! Use a soft flame to shrink the tube, and direct it only at the heat-shrink tube.



A "setting time" of 1 hour is needed before starting up the system.

8.5 Earth connection

1 Cut the screen wires (not the test lead) to the required length and connect it to the earth connection of the system.

If the test lead of the voltage tap is not needed and is not connected to the continuous voltage indication system, it **must** be earthed separately.

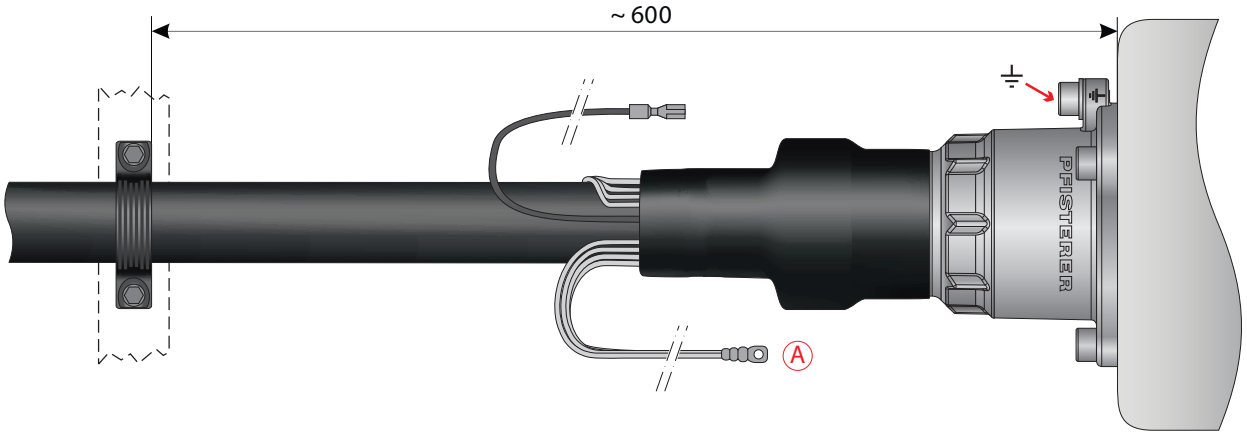
2 The bell flange with rotatable bell flange ring provides an earth connection point, see arrow. The earth connection point serves as a potential equalization and can be optionally connected with the earth connection of the system if there is no ground potential at the bell flange.

The earth connection point of the bell flange is not suitable for earthing the cable screen and may not be connected with the cable screen.

3 The cable must be fixed with a clamp. The first clamp must be placed approx. 600 mm from the flange of the unit.

After plug-in the connector, the cable needs to be arranged in a way that it comes out of the flange centrically and runs straight until the first cable clamp. The first cable clamp fixes the cable in a distance of approx. 600 mm.

4 The product can now be operated within the plant and it complies with all safety regulations.



Ⓐ System earth

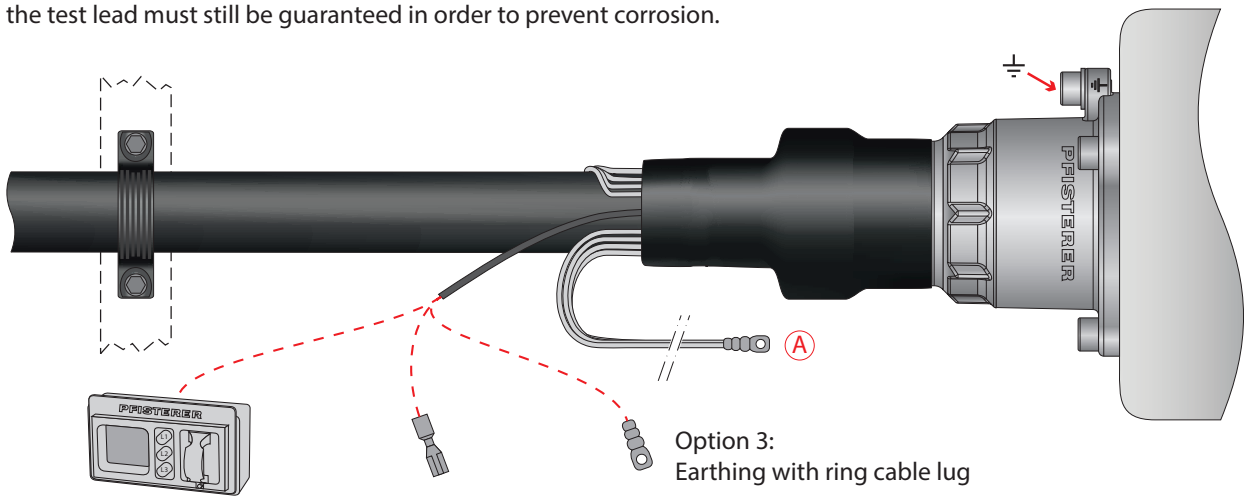
8.6 Capacitive voltage tap

Voltage detecting systems are used for determination of the absence of voltage on encapsulated systems (such as cable systems). The capacitive voltage tap is a connection for a continuous voltage indicator (CVI).

Optionally, a capacitive voltage tap can be integrated into the CONNEX separable connector. If present, the capacitive voltage tap is run out of the separable connector with a (blue) test lead.

If no continuous voltage indicator is connected, the (blue) test lead must be earthed separately. The test lead may not be removed or allowed to hang loose!

The earthing of the voltage tap takes place at a separate earth connection point of the system earth. For earthing, the plug connection can be slid onto an opposing contact (5x10 mm) or replaced by a ring cable lug. The sealing of the test lead must still be guaranteed in order to prevent corrosion.



Option 1:
Continuous voltage indicator

Option 2:
Earthing with plug connection 5x10 mm

Option 3:
Earthing with ring cable lug

8.7 One-sided earth connection / use with overvoltage limiter

The voltage at the cable screen may not exceed 5 kV AC! The earthing principle depends on the network. The design of the cable, the earthing principle, the location, the use of the screen overvoltage limiter must be specified by the customer / project management.

1 Apply a heat-shrink tube over the blue test lead within the bell flange until the middle of the sealing tape.

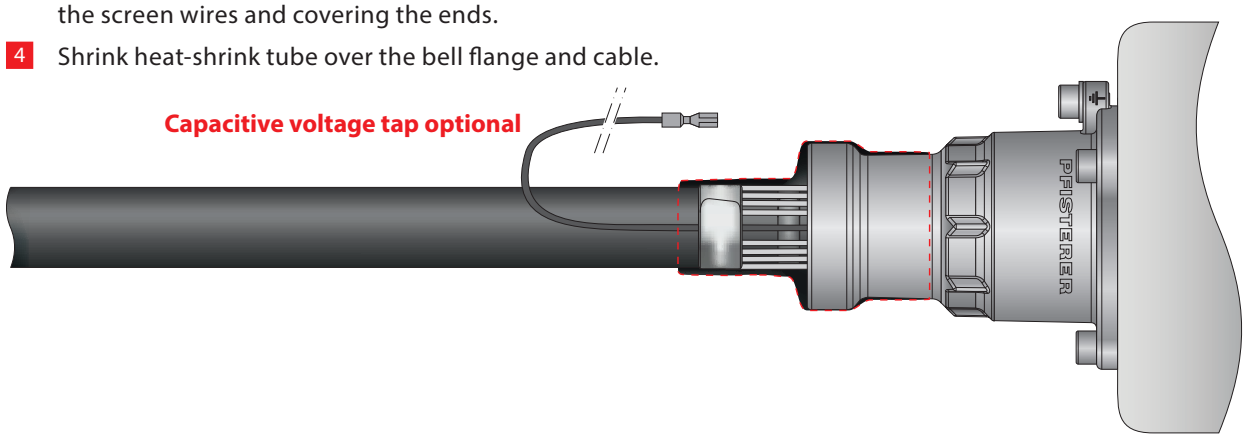
Option 1 (perform before step 35, chapter 8.4)

2 Cut off screen wires at the height of the sealing tape.

3 Apply a second layer of sealing tape directly on the first, thus fixing the screen wires and covering the ends.

4 Shrink heat-shrink tube over the bell flange and cable.

Capacitive voltage tap optional



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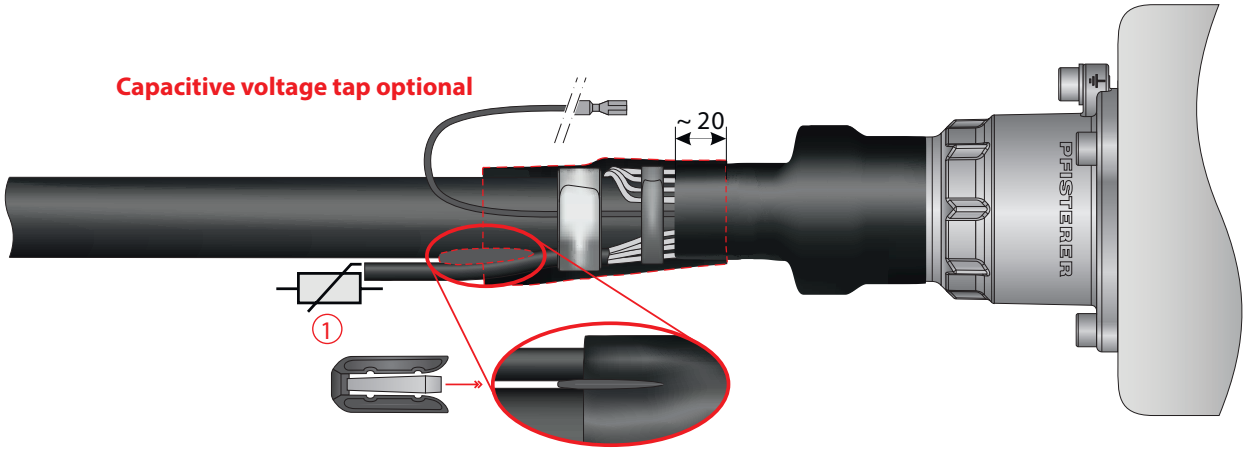
Option 2 (perform after step 36, chapter 8.4)

1. Affix the screen wires with cotton insulating tape after the heat-shrink tube.

> The additional material shown here must be ordered separately.

2. Bundle the screen wires and connect them to the insulated strand using a press connector.
3. Place one layer of sealing tape above and one below the press connector.
4. Position a tapping bracket on the additional heat-shrink tube between the cable and the insulated strand.
5. Shrink the additional heat-shrink tube over the press connector, the cable and approximately 20 mm over the standard heat-shrink tube.
6. Connect screen overvoltage limiter. (1)

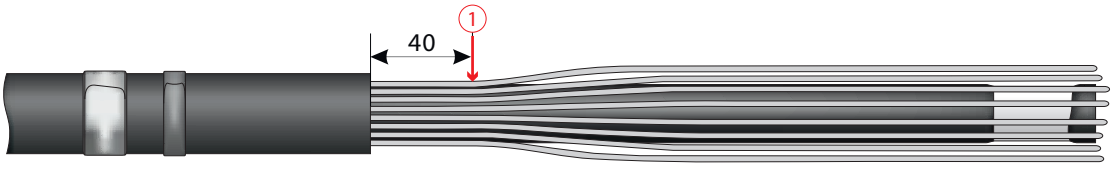


VIII

8.8 Thick semi-conducting layer (diameter ≥ 2 mm)

1. Remove the insulating tape and bend the screen wires back.
2. Remove the outer sheath to 40 mm behind the sheath cut (1).

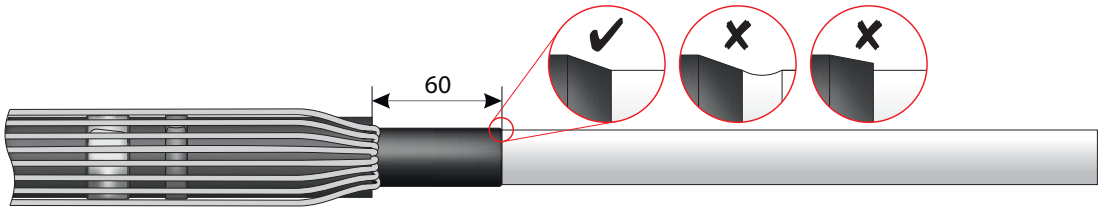
> Do not damage the underlying cable screen!



Drawings not to scale – for information purposes only

3 Bend back the screen wires for peeling.

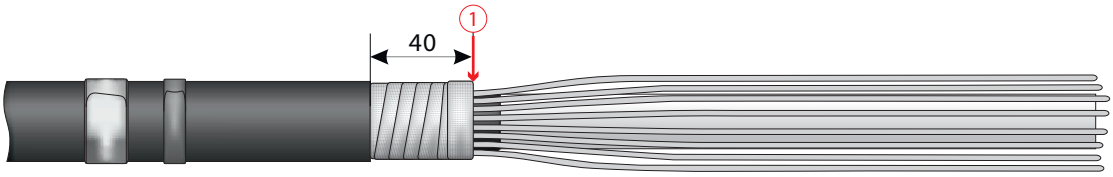
4 Peel off semi-conductive layer up to 60 mm before the outer sheath using a peeling tool (follow operating instructions for the peeling tool).



5 Bend the screen wires back toward the front.

6 Apply woven insulating tape from the outer sheath for 40 mm to the sheath cut (1) with a 50% overlap.

7 Apply 2–3 more layers at the sheath cut (1).

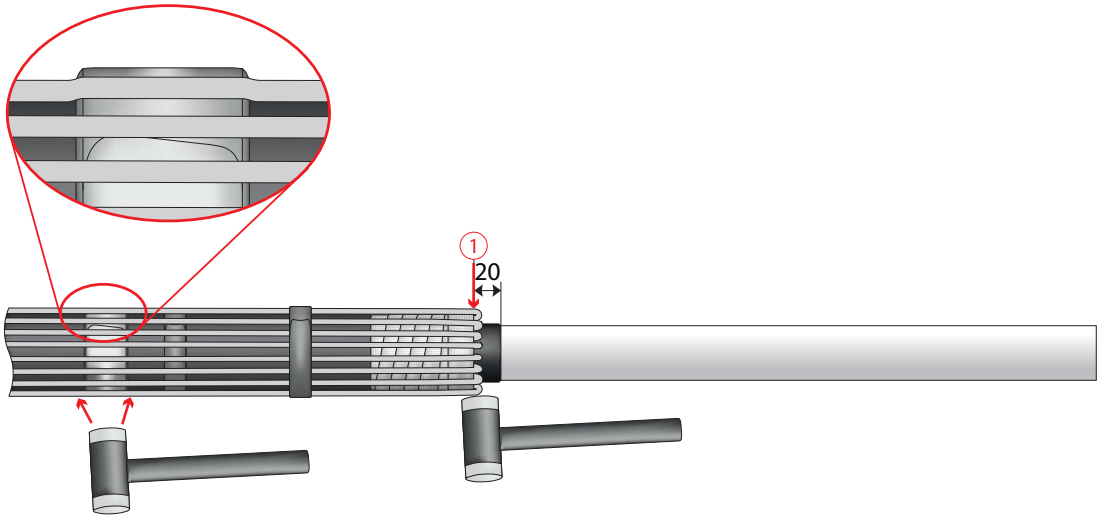


8 Fold back the screen wires and fix them with insulating tape.

For water tightness, fold back the screen wires in parallel, without crossing over!

With a capacitive voltage tap, the distance from the wire screen to the test lead must be observed, see step 31, page 35.

9 Tap down screen wires on the sheath cut (1) and on the sealing tape.



10 **Go to step 19 in chapter 8.2, page 24.**

VIII

8.9 Outdoor applications vertically from above

Additional sealing is required when installing onto the transformer vertically from above.

Prepare system flange and separable connector before the separable connector is plugged in.

Only for interior sockets.
Not relevant for multiple sockets and joints.

Preparation of the separable connector:

1 Place the Usit rings [A] under the three mounting screws.

Preparation of the system flange:

The sealing set is only to be used in combination with the Usit rings, the sealing washer and the universal sealing compound.

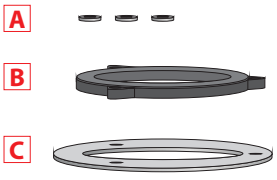
2 Completely fill the countersinks in the socket mounting with the universal sealing compound [D]. – · – ·

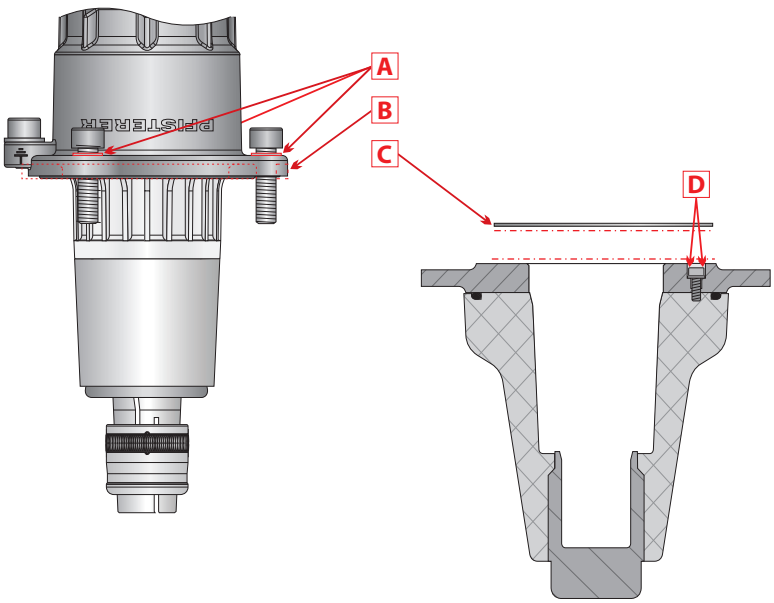
3 Coat the sealing surface of the system flange with the universal sealing compound. – · – ·

4 Coat the underside of the washer [C] with the universal sealing compound and press it down with this side towards the sealing surface of the system flange.

Warning! Before using the universal sealing compound, observe the safety data sheet!

If not included in the variant, the sealing set must be ordered separately:
559 218 001 (3x)
559 218 011 (1x)





VIII

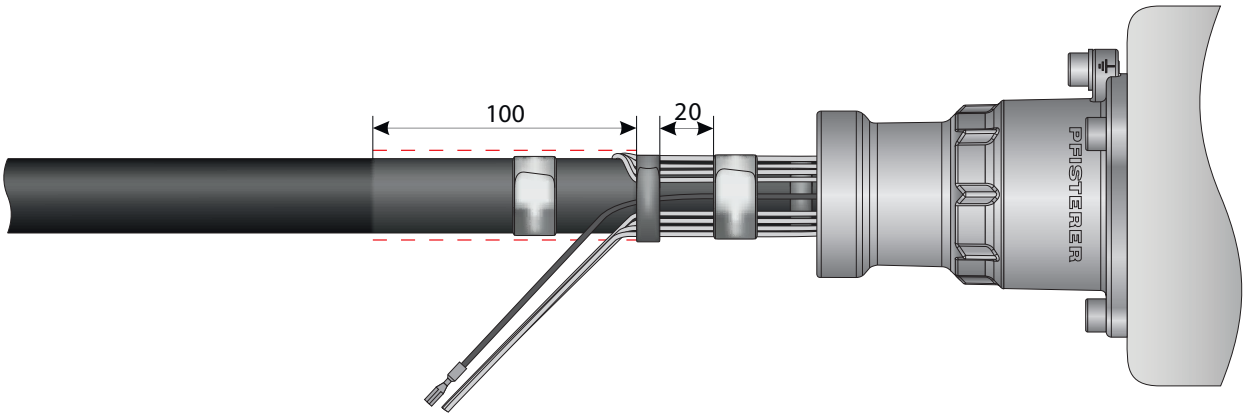
Drawings not to scale – for information purposes only

8.10 Sealing kit for offshore/ ground/ outdoor vertically from above applications

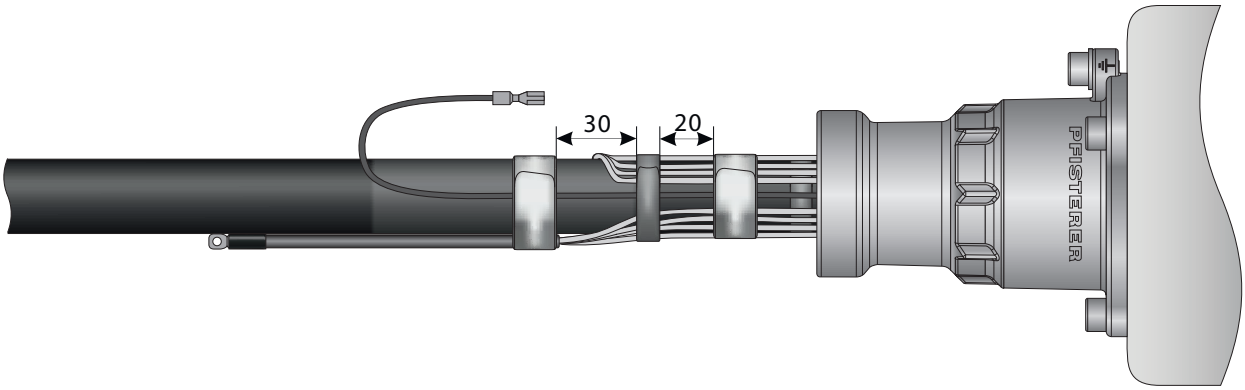
Prepare the screen wires for earthing before the large heat-shrink tube is shrunk onto the bell flange.

1. Fix the screen wires 20 mm after the sealing tape with cotton insulating tape and roughen the outer sheath with emery grit 60.
2. Bundle the screen wires.
3. Shrink the long slim heat-shrink tube over the bundled screen wires.

Warning! Use a soft flame to shrink the tube, and direct it only at the heat-shrink tube.



4. Press on the compression cable lug.
5. Place one layer of sealing tape under and one over the bundled screen wires.



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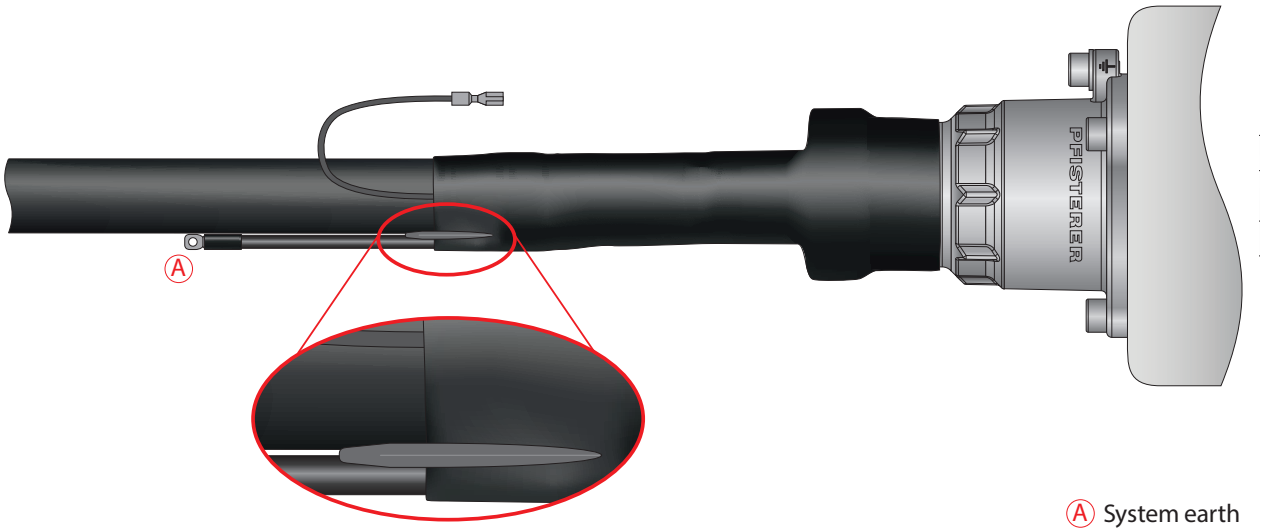
6 Shrink the short heat-shrink tube onto the compression cable lug and the long slim heat-shrink tube.

Warning! Use a soft flame to shrink the tube, and direct it only at the heat-shrink tube.

7 Position the tapping bracket on the large heat-shrink tube between the cable and the heat-shrink covered screen wires.

8 Evenly heat the heat-shrink tube starting from the bell flange until the heat-shrink tube fits evenly all round (below the ribbing) and the inner adhesive is exposed from both sides.

Warning! Use a soft flame to shrink the tube, and direct it only at the heat-shrink tube.



Ⓐ System earth

VIII

9 Testing

Danger! Before starting the work on electrical systems, the five safety rules must be observed, see chapter 3.4, page 8.

During work on and with the product, the locally applicable work safety rules must always be complied with and personal protective equipment must be worn, see chapter 3.7, page 9.

9.1 Accessories required

Blind cap

- Size 3 / 3-S, No. 827 131-003

Protection against electric-shock hazard for CONNEX separable connectors under tension.

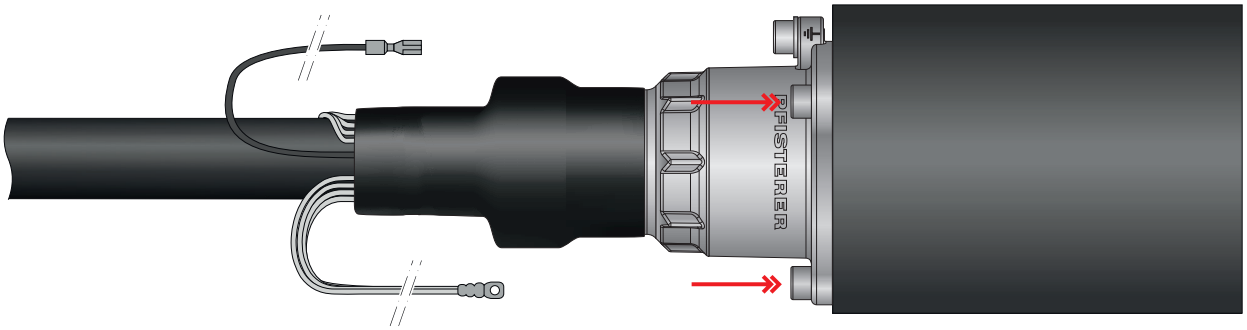
9.2 Mounting blind cap

If the CONNEX separable connector is pulled out for test purposes, the CONNEX separable connector must be closed with a voltage-proof blind cap.

1 Position blind cap and tighten screws.

The socket and insulating part of the separable connector must be cleaned and greased with MV special grease, which can be ordered separately under 558 228 008.

Warning! Before using the MV special grease, observe the safety data sheet!



Keep bell flange, cable screen and if appropriate test lead line separate.

Drawings not to scale – for information purposes only

9.3 Setup for final test

max. operating voltage

Size 3-S, $U_0/U_N(U_M)$: 26/45(52) kV
Size 3, $U_0/U_N(U_M)$: 20.8/36(42) kV

max. test voltages

Size 3-S, VLF $3xU_0$ = 78 kV, 60 min
PD $2xU_0$ = 52 kV ≤ 10 pC

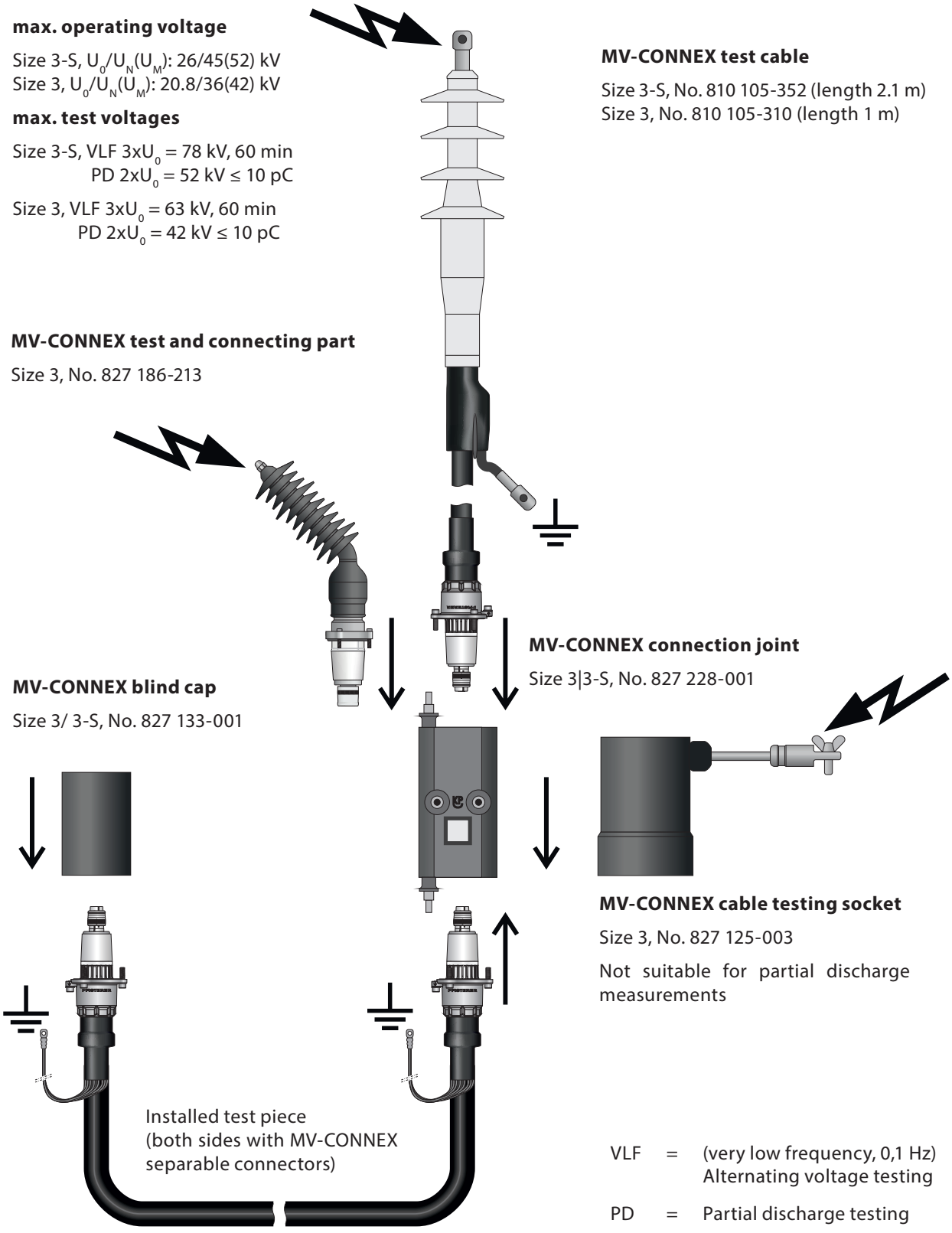
Size 3, VLF $3xU_0$ = 63 kV, 60 min
PD $2xU_0$ = 42 kV ≤ 10 pC

MV-CONNEX test cable

Size 3-S, No. 810 105-352 (length 2.1 m)
Size 3, No. 810 105-310 (length 1 m)

MV-CONNEX test and connecting part

Size 3, No. 827 186-213



MV-CONNEX connection joint

Size 3|3-S, No. 827 228-001

MV-CONNEX blind cap

Size 3/ 3-S, No. 827 133-001

MV-CONNEX cable testing socket

Size 3, No. 827 125-003

Not suitable for partial discharge measurements

Installed test piece
(both sides with MV-CONNEX separable connectors)

VLF = (very low frequency, 0,1 Hz) Alternating voltage testing

PD = Partial discharge testing

IX

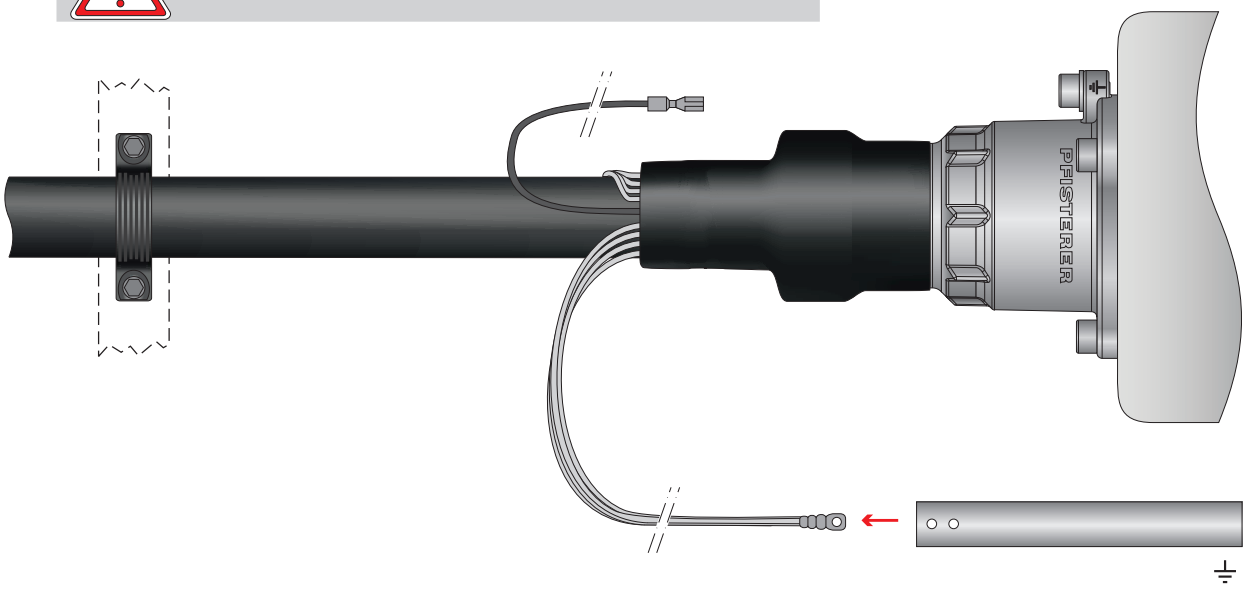
Drawings not to scale – for information purposes only

9.4 Sheath testing

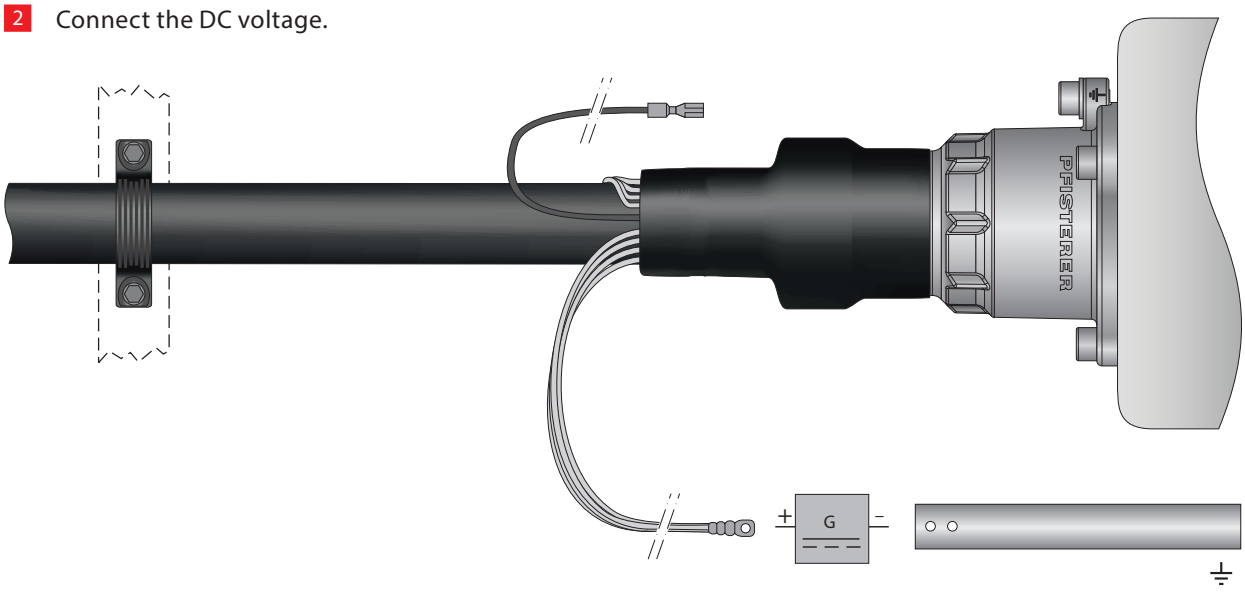
Carry out the sheath testing at max. 5 kV (DC voltage).

1 Disconnect the earth screen and test lead from system earth.

Danger! Beware of induced voltages on the cable screen!



2 Connect the DC voltage.



IX

Drawings not to scale – for information purposes only

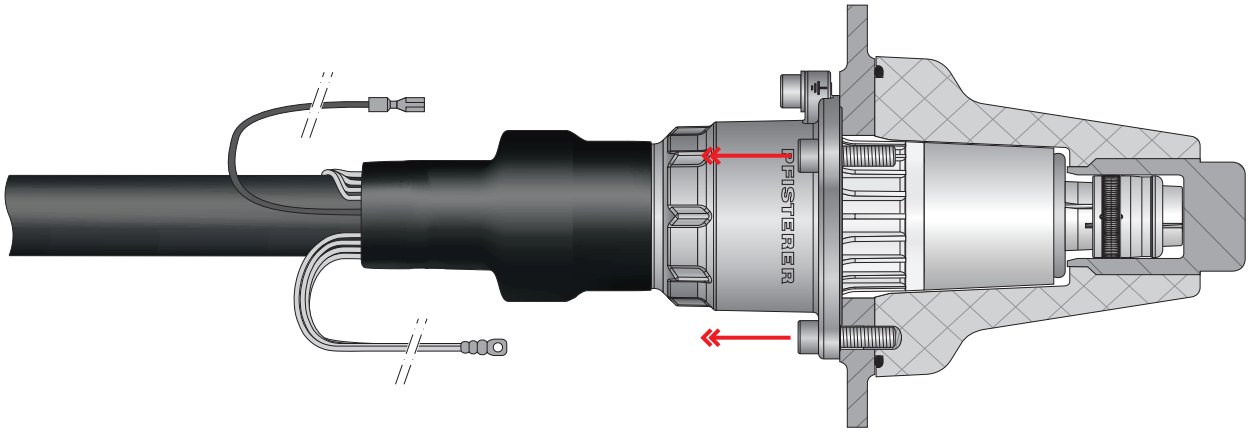
10 Unplugging / Plugging in

Danger! Before starting the work on electrical systems, the five safety rules must be observed, see chapter 3.4, page 8.

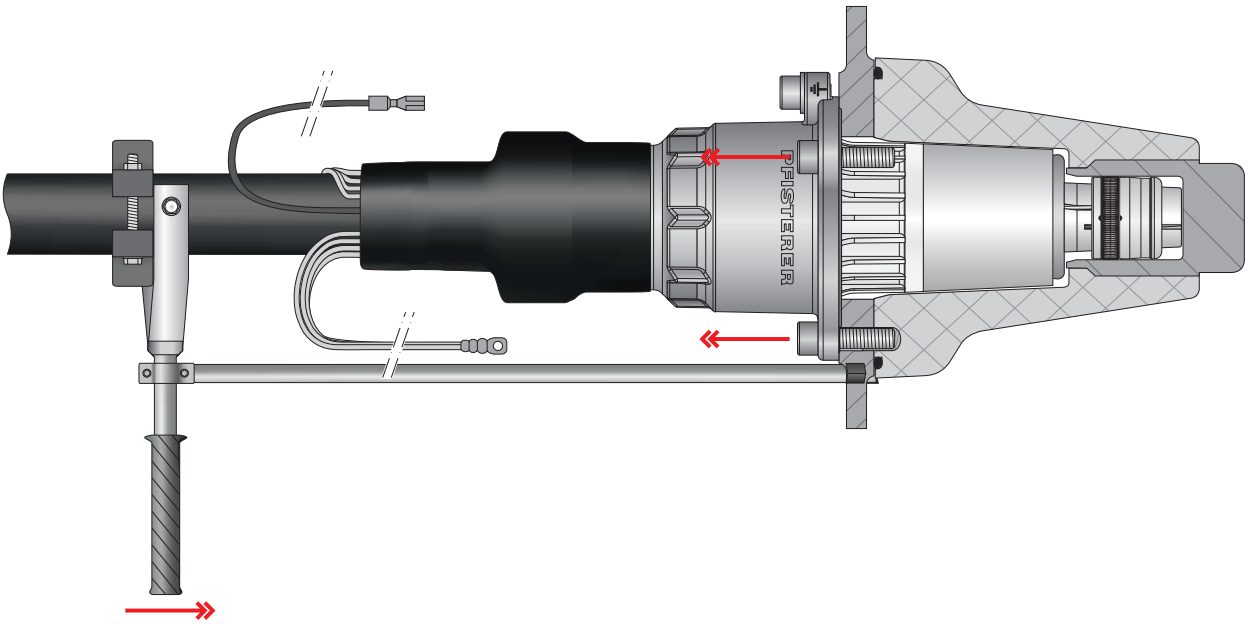
During work on and with the product, the locally applicable work safety rules must always be complied with and personal protective equipment must be worn, see chapter 3.7, page 9.

10.1 Unplugging

1. Disconnect the cable screen, the test lead and the bell flange earth connection (if present).
2. Loosen the mounting screws and carefully unplug.



Optional removal device

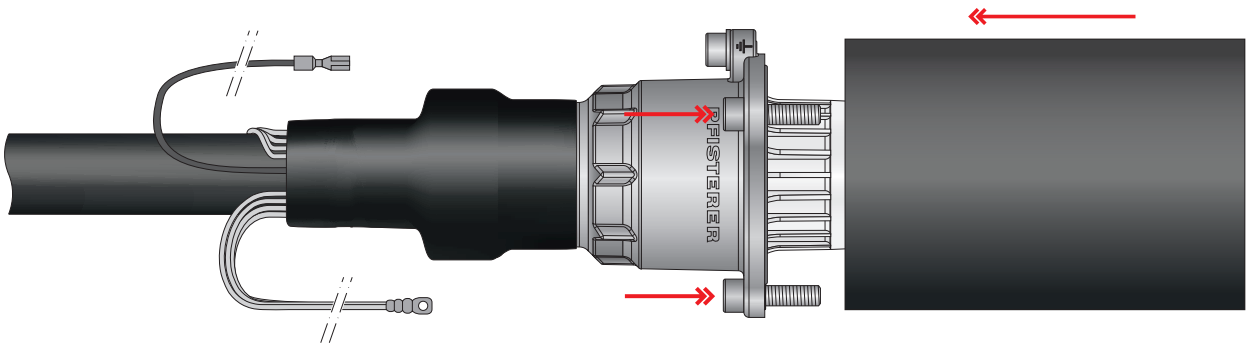


Drawings not to scale – for information purposes only

3 Clean the insulating part and wait until the cleaning agent has fully evaporated. The recommended cleaning agent is white gasoline or acetone, see chapter 3.9, page 10. – – –

4 Mount the protection cap (not voltage-proof) or blind cap (voltage-proof).

When using the blind cap, grease is required!



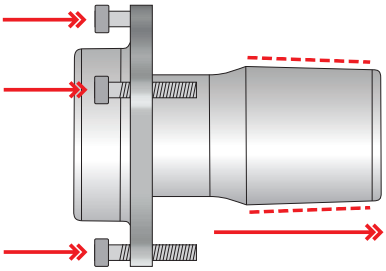
5 Clean the inside of the socket and wait until the cleaning agent has fully evaporated. The recommended cleaning agent is white gasoline or acetone, see chapter 3.9, page 10. – – –

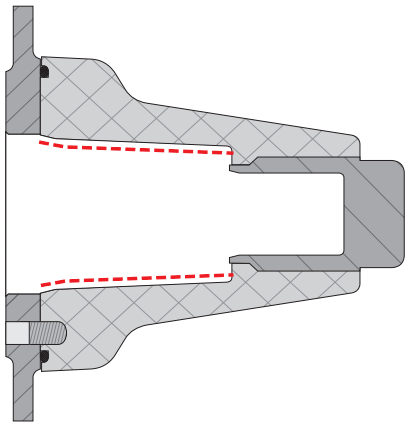
6 Grease the area – – – thinly and evenly with PFISTERER MV special grease. Wear clean protective gloves (e.g. latex or plastic). **Do not apply grease to the contact area!**

Warning! Before using the MV special grease, observe the safety data sheet!

7 Mount the cover (not voltage-proof) or dummy plug (voltage-proof).

When using the dummy plug, grease is required!





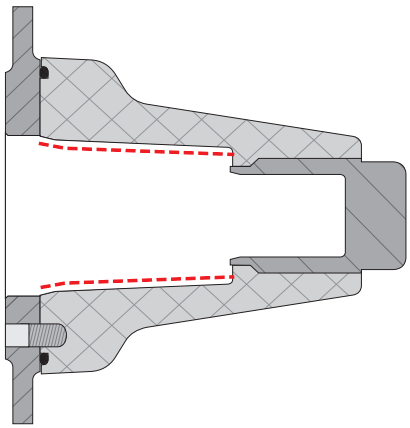
X

10.2 Plugging in

1 Clean the inside of the socket and wait until the cleaning agent has fully evaporated. The recommended cleaning agent is white gasoline or acetone, see chapter 3.9, page 10.

2 Grease the area thinly and evenly with PFISTERER MV special grease. Wear clean protective gloves (e.g. latex or plastic). **Do not apply grease to the contact area!**

Warning! Before using the MV special grease, observe the safety data sheet!

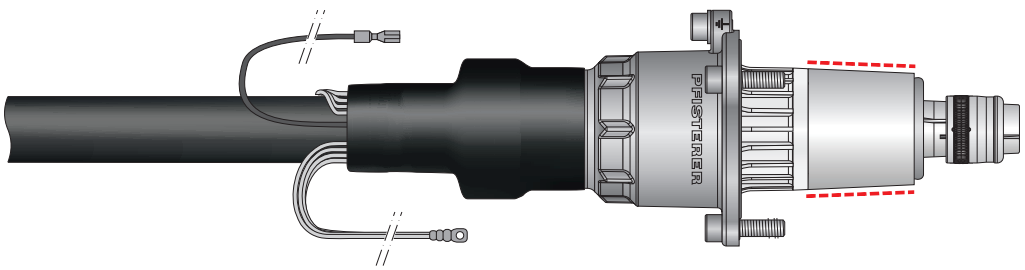


3 Clean the surface of the insulating part and wait until the cleaning agent has fully evaporated. The recommended cleaning agent is white gasoline or acetone, see chapter 3.9, page 10.

4 Grease the area thinly and evenly with PFISTERER MV-special grease. Wear clean protective gloves (e.g. latex or plastic).

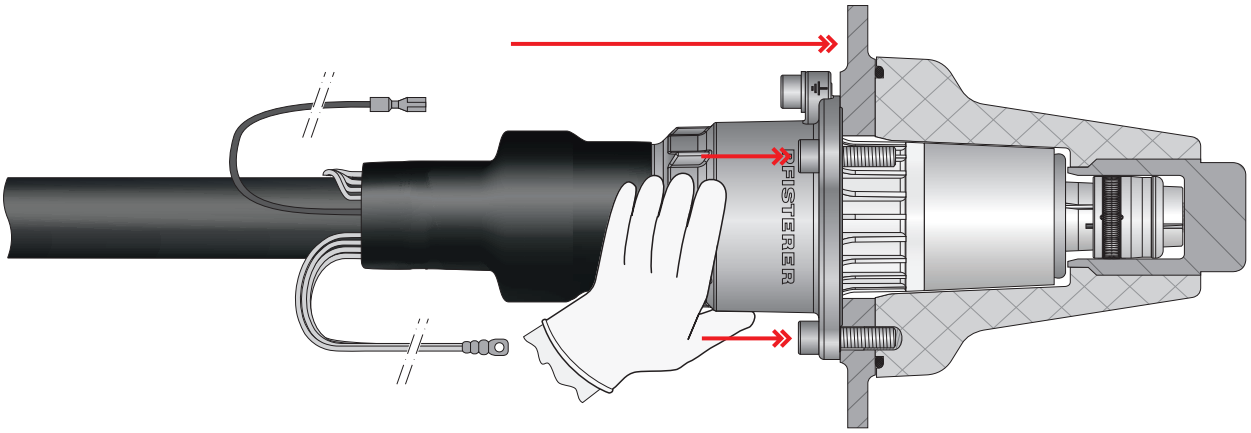
Warning! Before using the MV special grease, observe the safety data sheet!

X

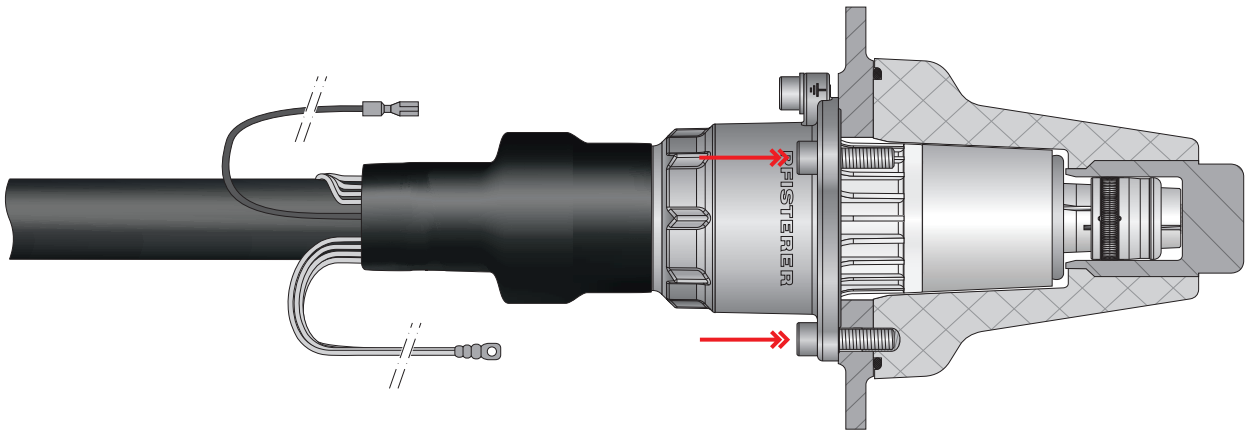


5 Introduce the CONNEX separable connector into socket and tighten the screws.

The bell flange must be held with pressure on the insulating part until the screws grip.



6 Tighten the screws all round with the SW6 T-handle screwdriver (torque 15 Nm).



After plug-in the connector, the cable needs to be arranged in a way that it comes out of the flange centrically and runs straight until the first cable clamp. The first cable clamp fixes the cable in a distance of approx. 600 mm.

A "setting time" of 1 hour is needed before starting up the system.

X

11 Dismantling / Removal

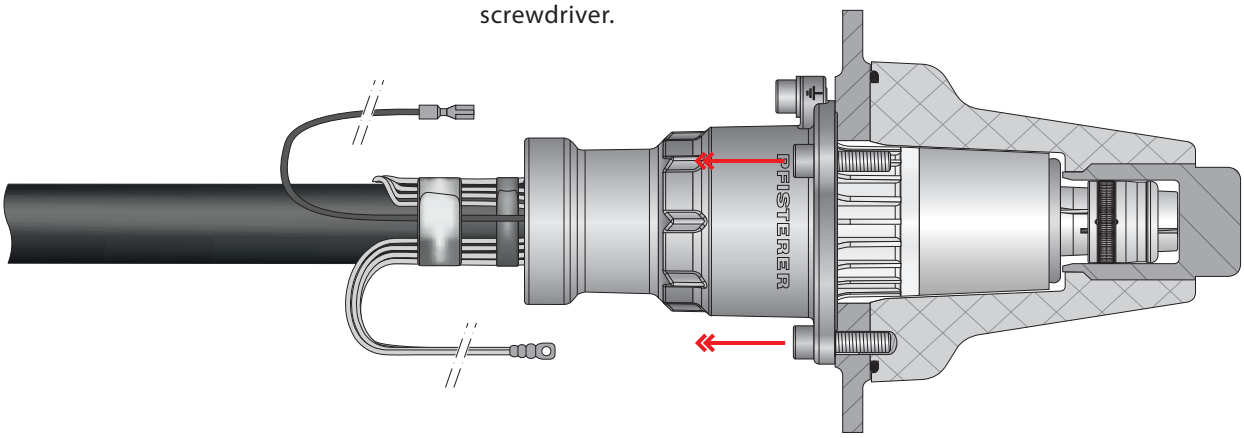
Danger! Before starting the work on electrical systems, the five safety rules must be observed, see chapter 3.4, page 8.

During work on and with the product, the locally applicable work safety rules must always be complied with and personal protective equipment must be worn, see chapter 3.7, page 9.

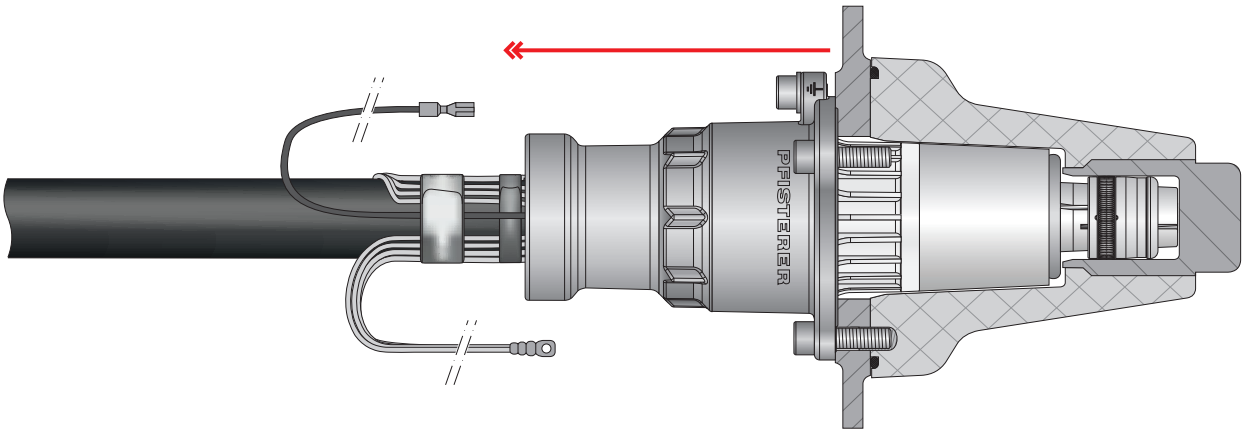
1. Disconnect the cable screen, the test lead and the bell flange earth connection (if present).
2. Remove the heat-shrink tube.

The screen wires underneath the heat-shrink tube and the test lead of the voltage tap must not be damaged.

3. Loosen the screws all round alternating with the SW6 T-handle screwdriver.



4. Pull the CONNEX separable connector out of the socket.

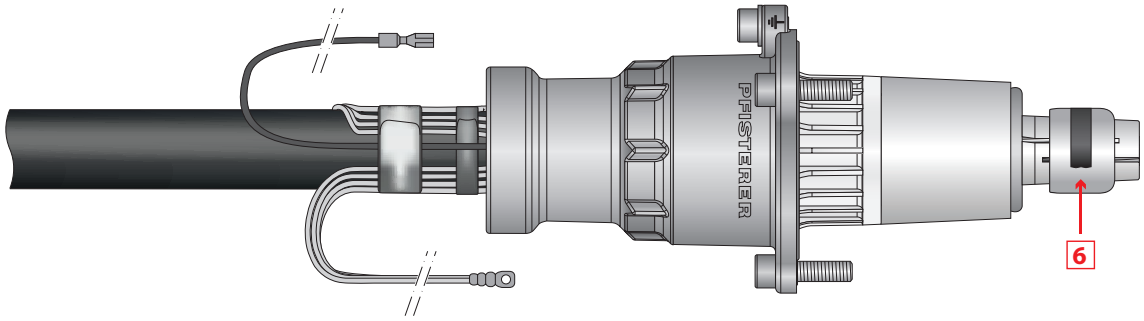


XI

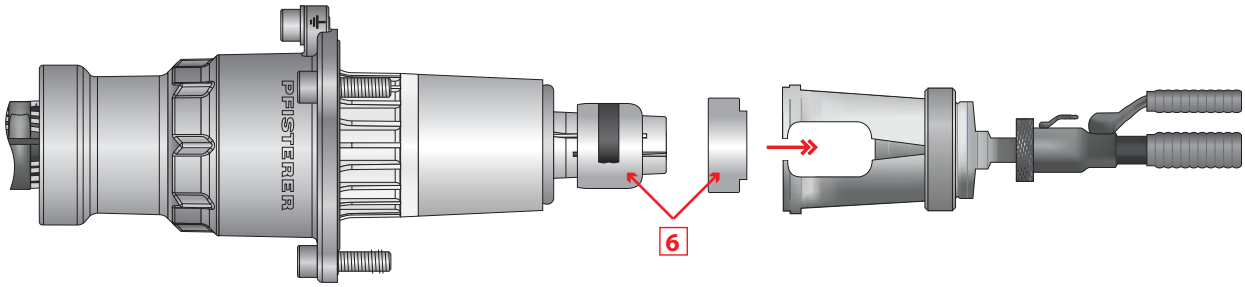
Drawings not to scale – for information purposes only

5 Assemble the two halves of the pull-off die [6] and fix it in place with adhesive tape.

6 Place the pull-off die over the contact ring with its fillet towards the insulating part and squeeze together.

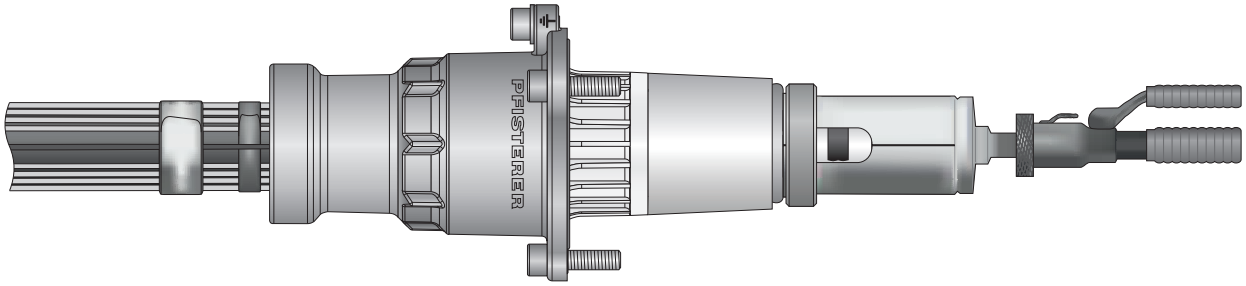


7 Place the pressure plate [6] on the thrust piece of the compression head and slide the retaining ring of the compression head to the back.



8 Place the half-shells of the compression head behind the pull-off die and press together.

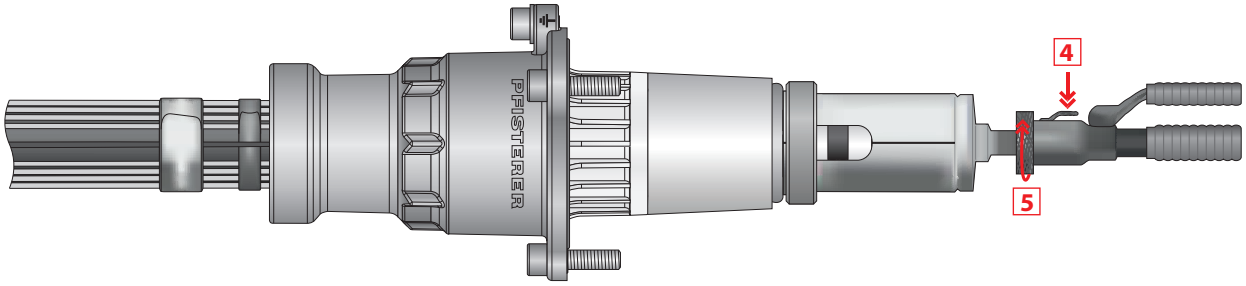
9 Slide the retaining ring forward.



XI

Release the hydraulic hand-operated compression tool before operating [4].

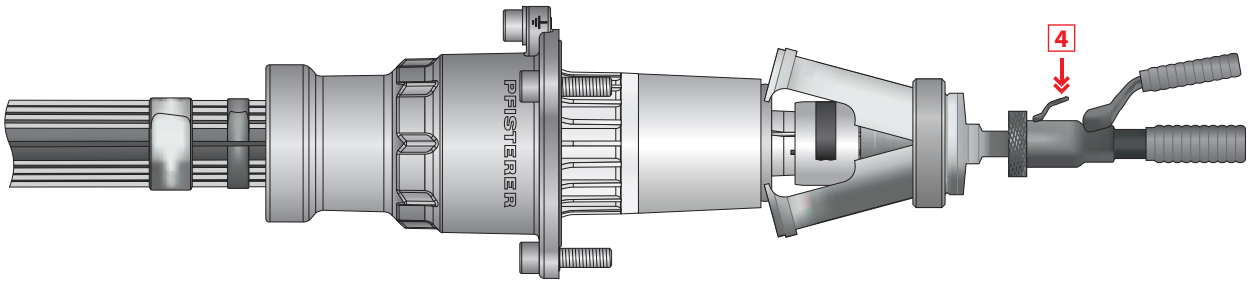
10 Turn the knurled wheel [5] of the hydraulic hand-operated compression tool to the right until the pressure plate of the compression head lies firmly on the tension cone.



11 Pull the contact ring off the tension cone with the hydraulic hand-operated compression tool.

Release the hydraulic hand-operated compression tool [4].

12 Slide the retaining ring of the compression head back and open the half-shells.



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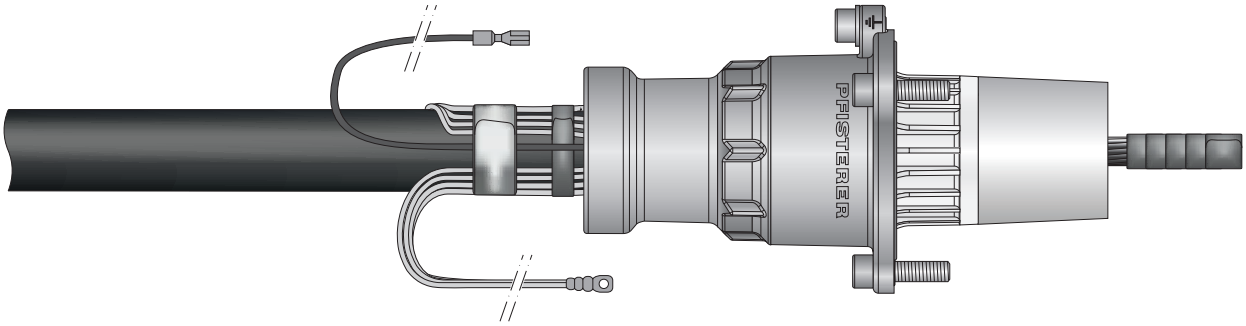
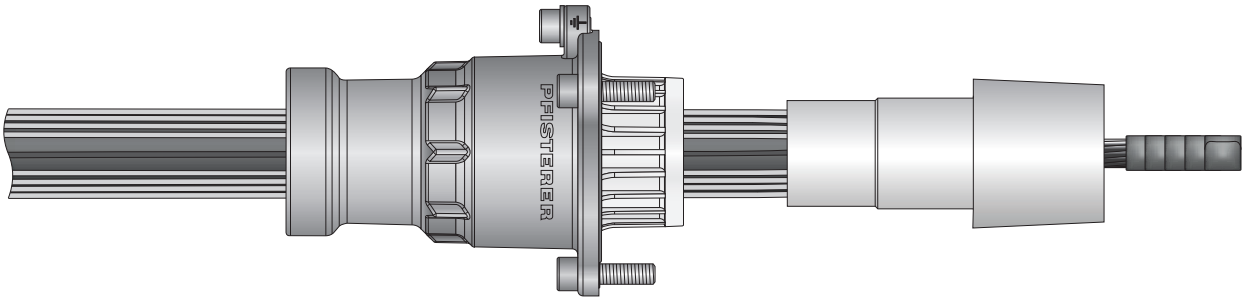
13 Remove the hand-operated compression tool.

14 Remove the tension cone and thrust piece.

15 Cover the conductor with protective wrap.



16 Remove the insulating part and bell flange.



The tension cone and insulating part may **not be reused**.

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