DURESCA®

Installation Instructions
Transformer Bushings Oil-Air

MOSER GLASER
Current and voltage – our passion

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	GBI 03.02.2021	SMU 10.03.2021	C	

Transformer Bushing Oil / Air application

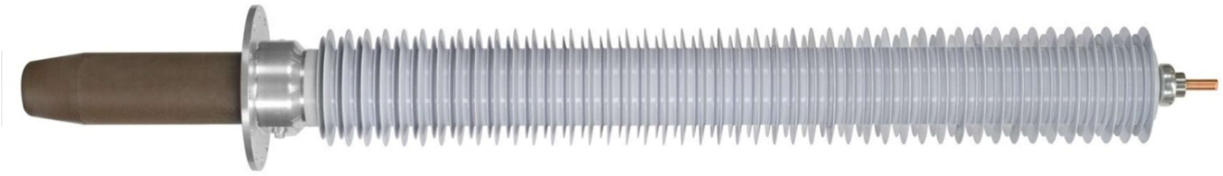

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Table of Contents

1 General

Read this manual carefully and follow all safety regulations at work.

1.1 Safety

Work on bushings may only be performed by qualified people.

Follow the safety instructions of the operating company.

For your safety, before any manipulation inform the responsible person about your action in the field.

Do not energize the bushing without a closed measuring tap.

Caution - Do not work on systems that might be under tension!

Follow below safety rules in the given order.

1 Verify that the system is off-line

2 Disconnect from the mains Secure against reconnection

3 Secure against reconnection

4 Carry out earthing and short circuiting

5 Provide protection from adjacent live parts

Not following these rules could cause death!

Caution Strong electromagnetic fields can occur along the bushings. People with pacemakers may not stand near!

Sensitive technical devices must be protected by appropriate measures.

Only materials provided by MGC must be used (terminals, seals, shields, arcing horns…).
The sealing between the transformer and the bushing is out of Moser Glaser scope of supply.

1.2 Transport and Storage

The bushings are packed in wooden crates (Figure 1). Each bushing is packed individually in a plastic bag sealed with desiccant material and protected from moisture.
The crate should be free off any damage after delivery.

- On request, a shock indicator label can be fixed on the crate in order to check if the crate experienced a mechanical shock.

Transport **damage**

1. Visible damage must be reported on the counter signed delivery note at the reception of the goods.
2. Moser Glaser shall be informed with no delay if a damage is reported.

Bushings must always be protected from moisture.
Keep the protective foil until the installation.

Storage
The bushing must always be protected from moisture and permanently stored in a dry room.

Storage up to 6 months
Packed in protective foil with desiccant bag (Fig. 2)

Storage longer than 6 months
Oil-side protected in a tank with desiccant bag (Fig. 3)

Storage longer than 24 months
Oil-side protected in a tank filled with dry transformer oil (Fig. 4)

Figure 1: wooden crate

Figure 2: protective foil

Figure 3: Protective tank

Figure 4: oil tank (long term storage)

2 Product description

The DURESCA transformer bushing type Oil-Air is used for oil to air application.
The DURESCA transformer bushing conducts the electrical current by a solid conductor or by a drawn cable to outdoor terminal. It is characterised by a compact design and is partial discharge-free during service. The DURESCA transformer bushing is maintenance-free.
The DURESCA transformer bushing has a dry insulation of RIP (Resin Impregnated Paper). The insulation lies directly on the conductor or tube and consists of wrapped paper impregnated with special epoxy resin under vacuum. Conductive grading layers are embedded during the wrapping of the paper for an optimal distribution of the electrical field. This structure ensures the longest operational reliability and the highest human safety.
A dry insulation of RIS (Resin Impregnated Synthetic) is also available.
Silicone rubber sheds are over molded on the air side of the bushing. A silicone hollow insulator is also available on request.
The silicone rubber insulator with alternating sheds has an uniform creepage distance of min. 31 mm/kV SCD or 53.7mm/kV USCD. This corresponds to a class 4 according to IEC 60815 for very high pollution level.

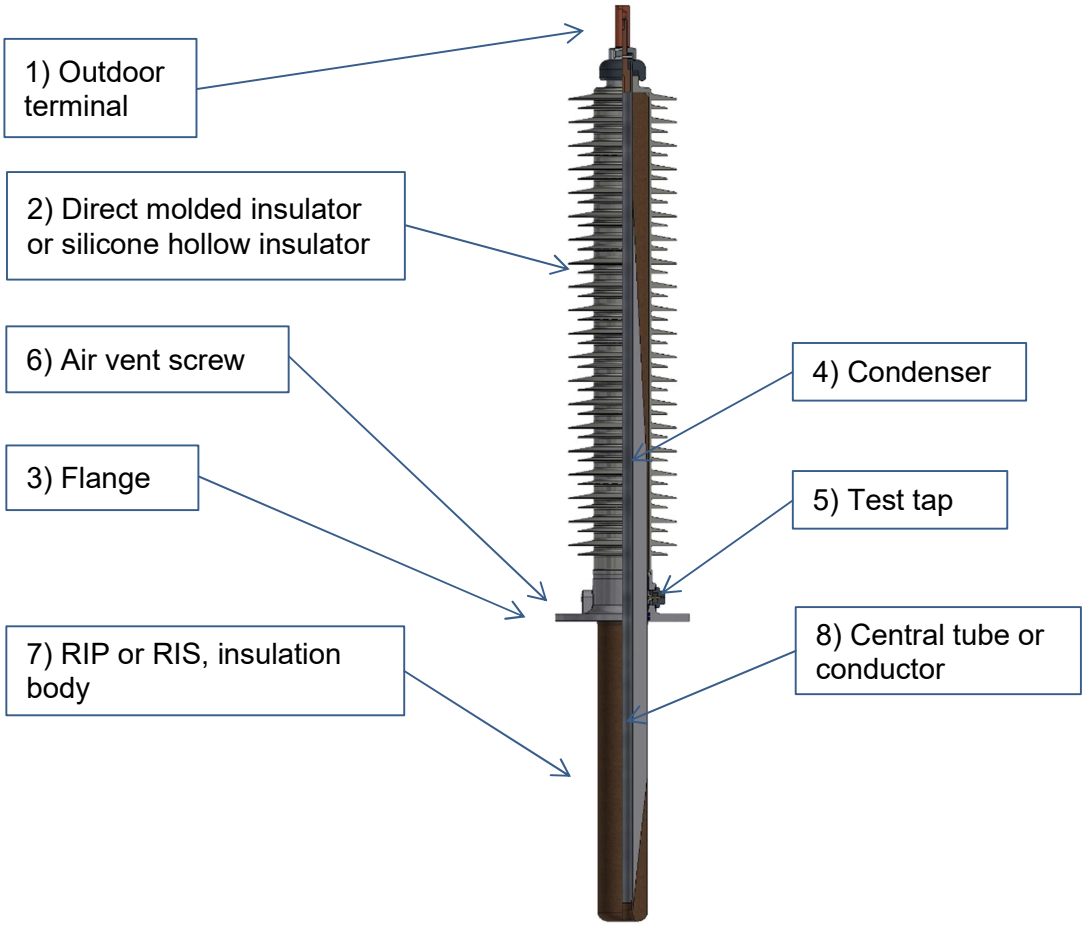


Figure 5: Transformer-Outdoor bushing

3 Specifications

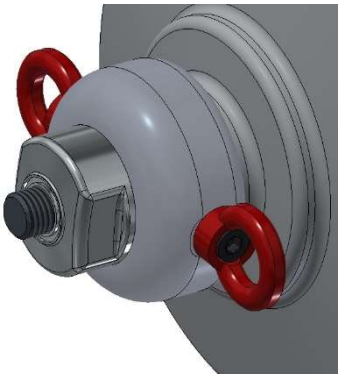
	Standard	Comments
Electrically		
Rated voltage U_m	-	see order confirmation
Max. current I_r (with 1.2 overload)	-	see order confirmation
Standard	IEC 60137/IEEE C57.19.00	see order confirmation
Mechanically		
Bushing type	Dry fine graded condenser type	
Material of conductor	Aluminium EN AW-6101B T7 (AC041) or Electrolyte copper (Cu-ETP)	see order confirmation
Insulation	RIP Resin Impregnated Paper RIS Resin Impregnated Synthetic	
Material of bushing's head	corrosion free aluminium alloy	
Material flange	corrosion free aluminium alloy	
Material outdoor insulation	Silicone (LSR)	
Dimension	-	see layout drawing
Weight	-	see layout drawing
Wooden transport boxes	according ISPM 15 Standard (standard packaging, seaworth)	(ISPM: International Standards for Phytosanitary Measures)
Application		
Permissible ambient temperature	-40 up to +40° C	other values on request see layout drawing
Altitude	up to 1000 masl	other values on request
Application	Oil insulated transformers	Oil / Air
Oil temperature	Daily mean value 90°C, maximum value 100°C	
Mounting angle	0 to 90°	
Pollution degree	Min. 31mm/kV SCD Min. 53.7 mm/kV USCD	According IEC 60815

4 Installation of the bushings

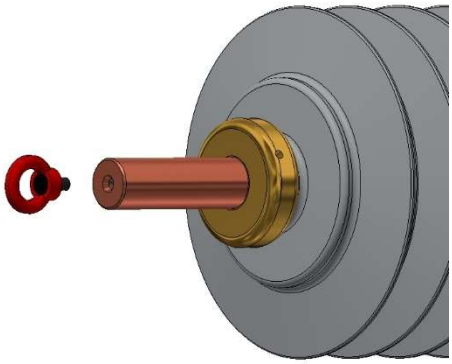
Caution
Do not work on installations that might be under tension!

4.1 Unpacking and lifting

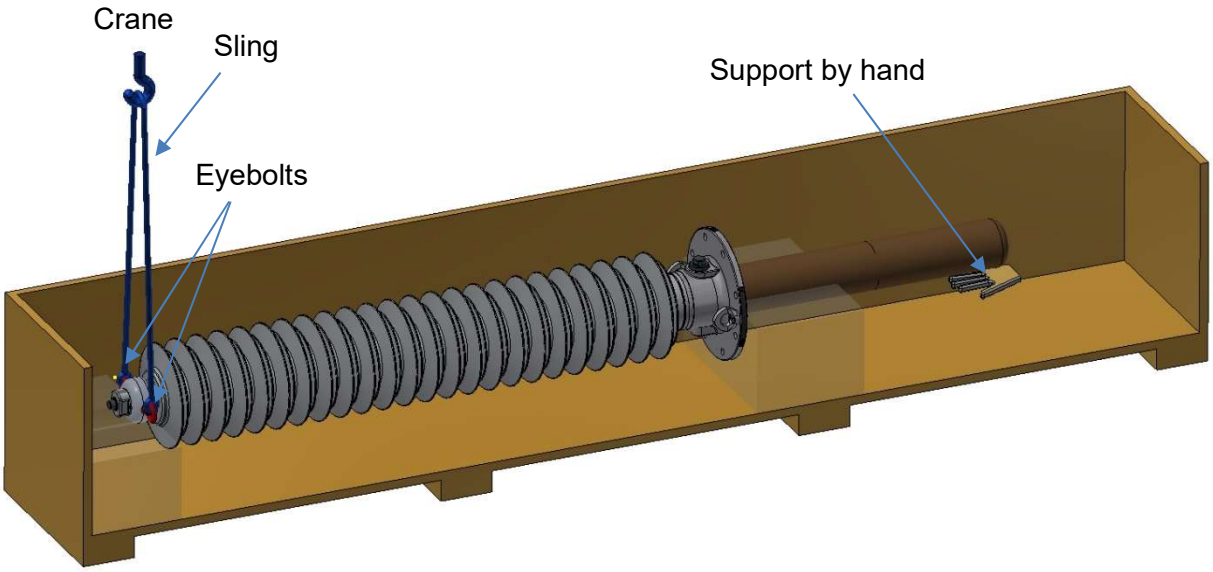
Small bushing could be taken out of the crate by hand (for the weight, consult layout drawing).
For bushing with medium weight, you can use a sling fixed on an eyebolt (Fig.7, not included) on the top of the bushing and support the second side of the bushing by hand.



For draw lead bushing, screw the eyebolts directly on the head.

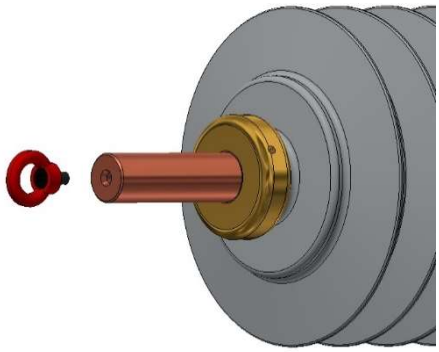


For bushing with fix conductor, screw the eyebolt directly on the conductor. (Dimension indicated on the customer drawing)

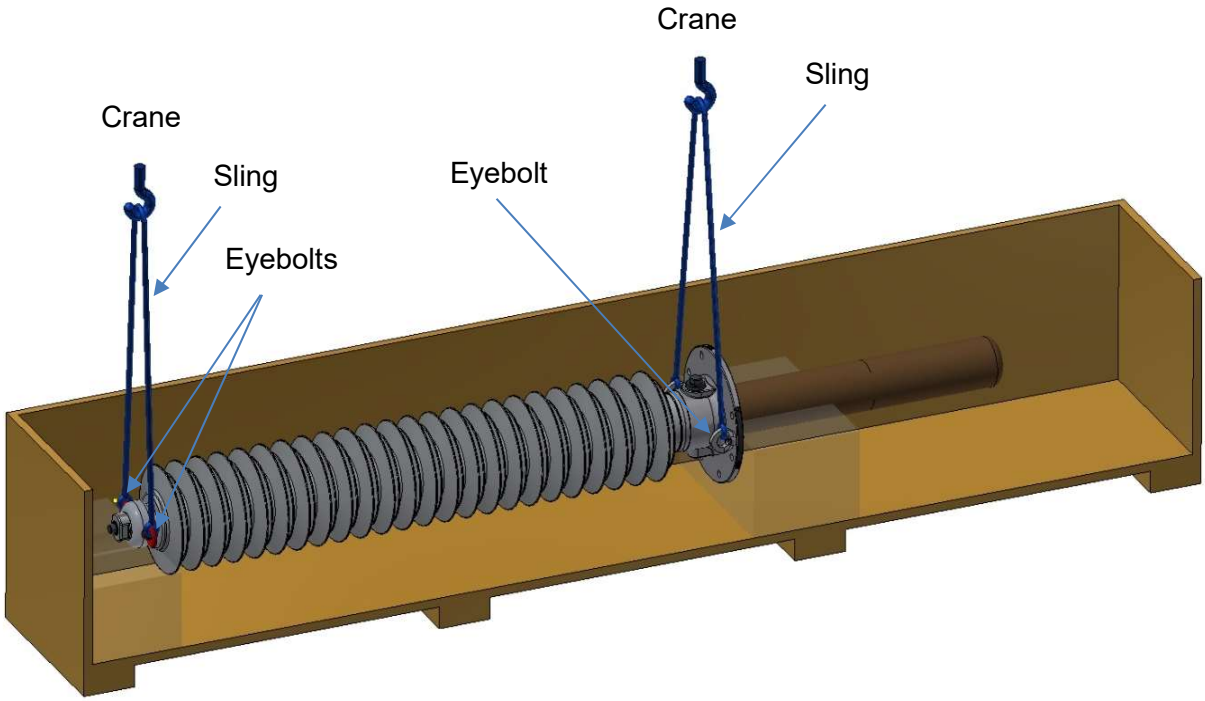


For heavier bushings, the best way to lift them is to fix eyebolts on the top and on the flange and use slings and two cranes.

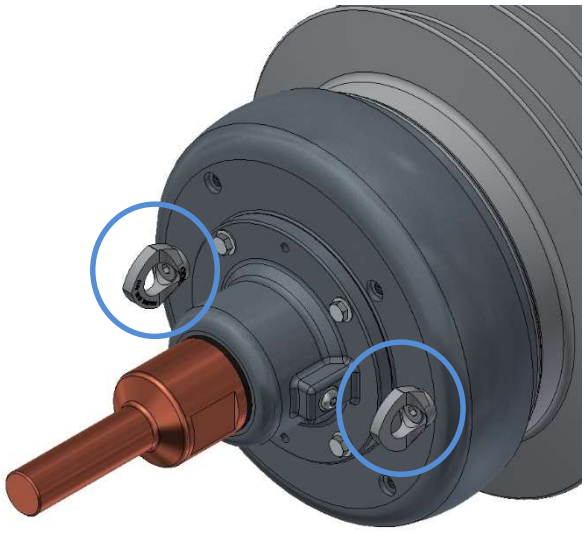
For draw lead bushing, screw the eyebolts directly on the head

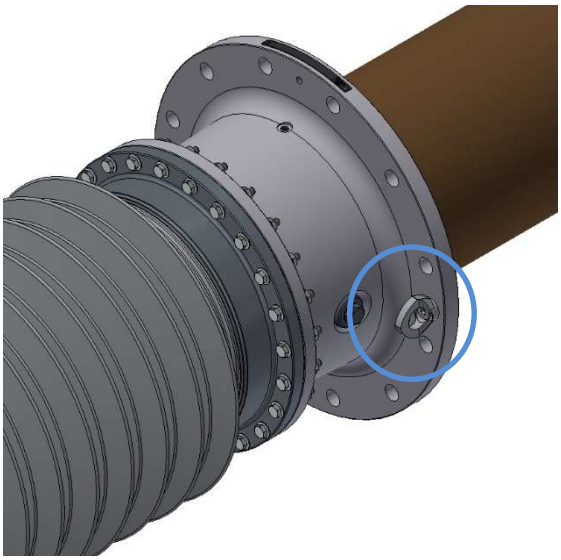


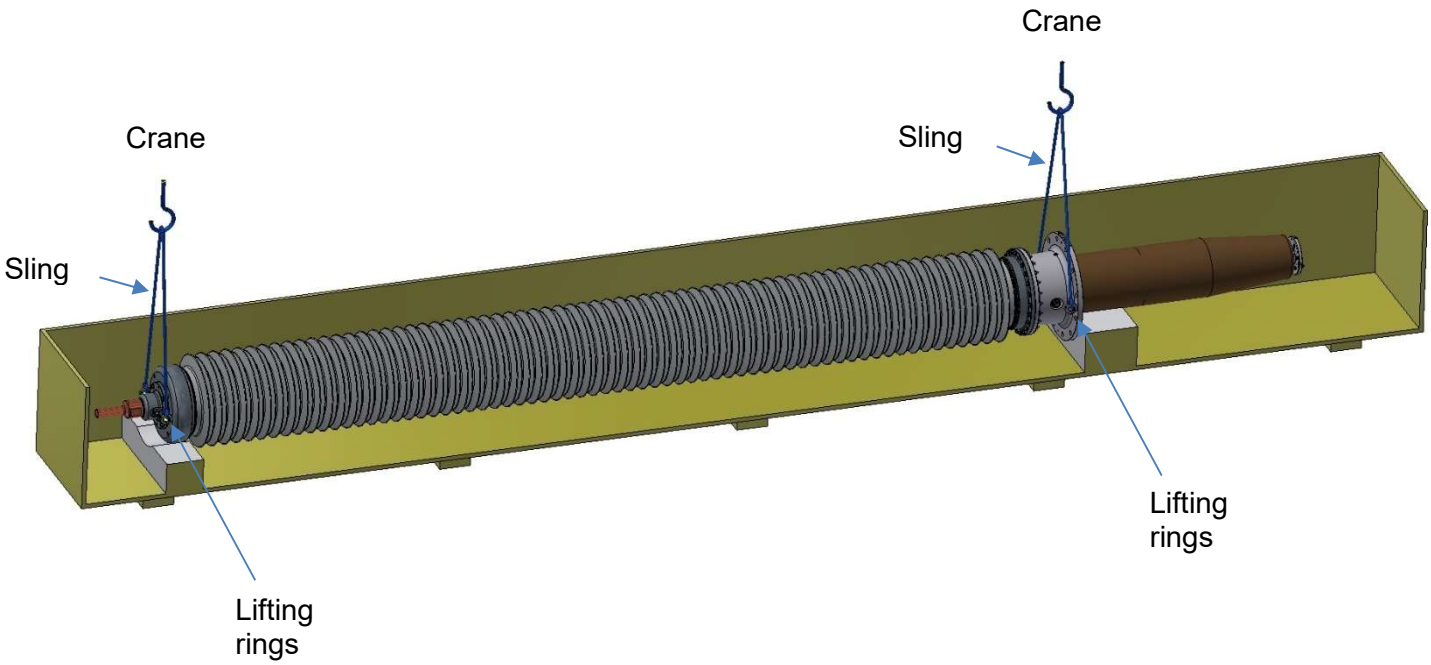
For bushing with fix conductor, screw the eyebolt directly on the conductor. (Dimension indicated on the customer drawing)



For heavier bushings with silicone hollow core insulator, the best way to lift them is to fix eyebolts on the top of the hollow core insulator and on the flange and use slings and two cranes.







Attention
Bushings must be handled with care. Bumps and shocks should be avoided and reported.
Damage on the bushings must be reported immediately to Moser Glaser.
Attention
Do not use cutting tools to remove the protection foil as they might damage the silicone sheds.

4.2 Handling the bushing

The bushing could be handled in several ways.
By using eyebolts installed on the flange (on the M12 holes) and on the top terminal or top of hollow core insulator.
The bushing could be installed on the transformer with the correct angle. For this, you can use two cranes, or one crane with a hand winch to give the correct angle (Fig.6).

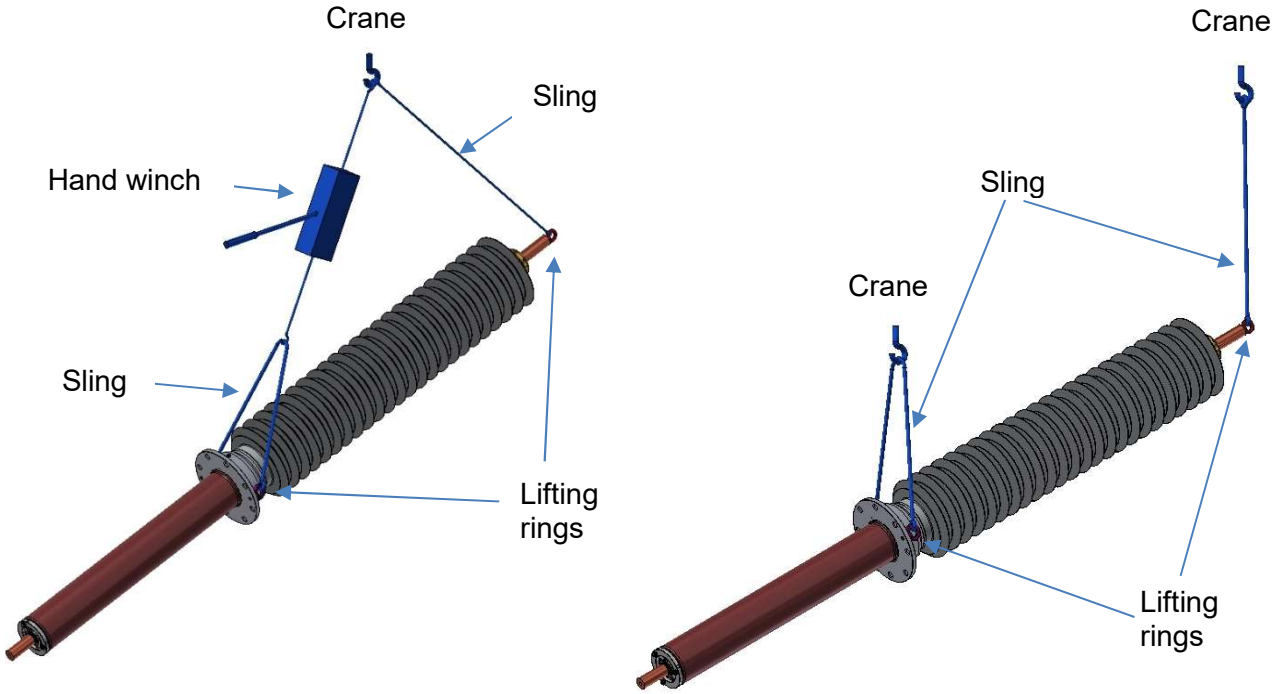
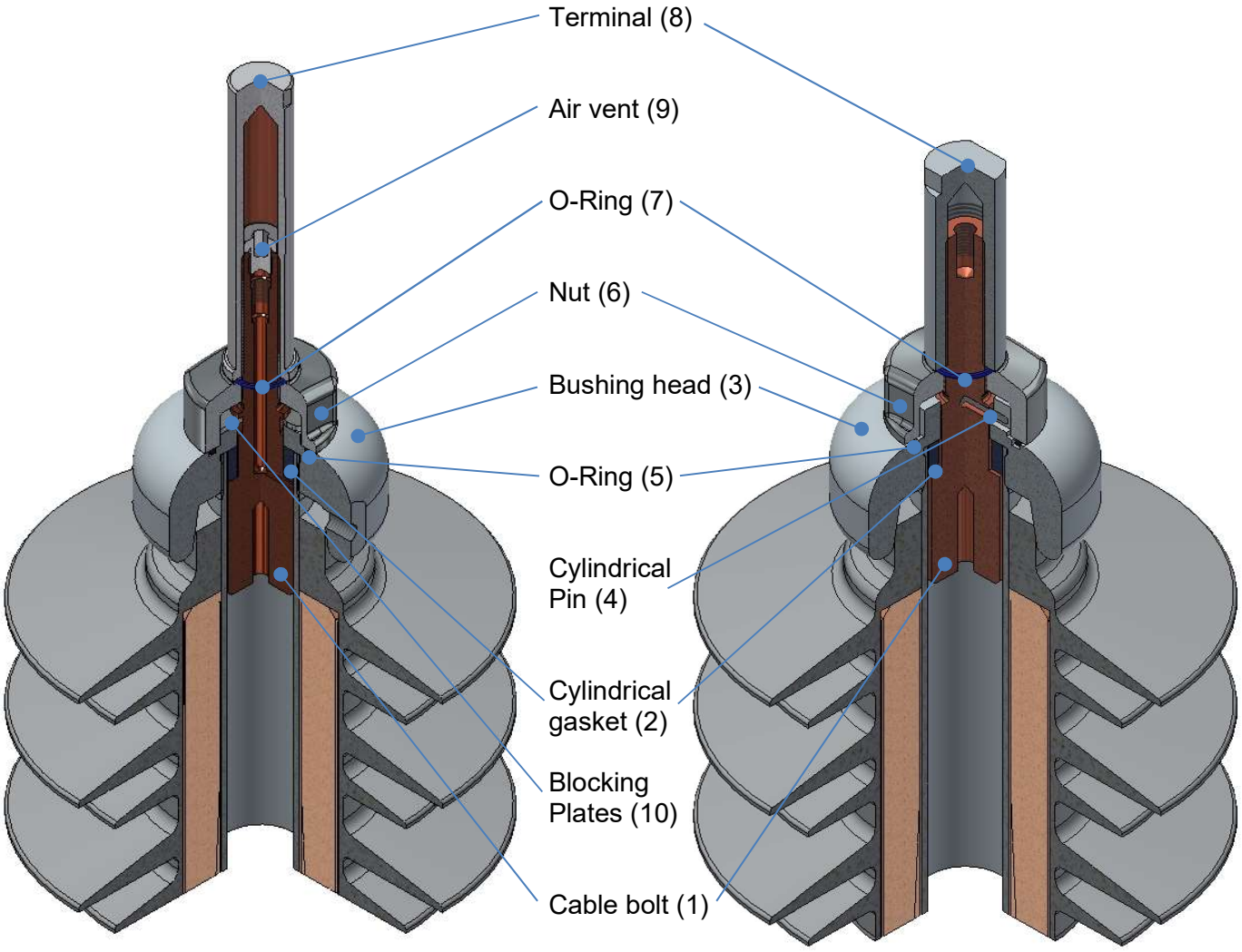


Figure 6: Example of lifting a bushing with fix conductor (up to 245kV)

Figure 7: Example of an eyebolt
(not in the scope of supply)

Attention
Do not attach the sling or other equipment onto the silicone insulator.
Avoid contact of the slings with the silicone insulator.

4.3 Installation of the bushing – Version with draw lead or split conductor



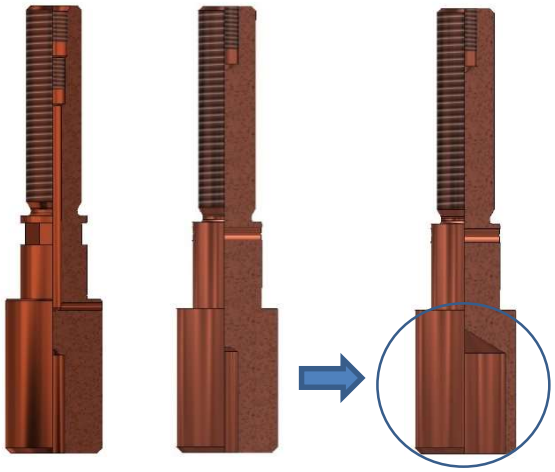
Version with air vent

Version without air vent

Recommendation

Moser Glaser recommends to insulate the cable coming from the transformer winding connected to the draw lead or conductor of the bushing.

Procedure on DTOI / DTOIS / DTOIH / DTOISH / DTOIA / DTOIAS



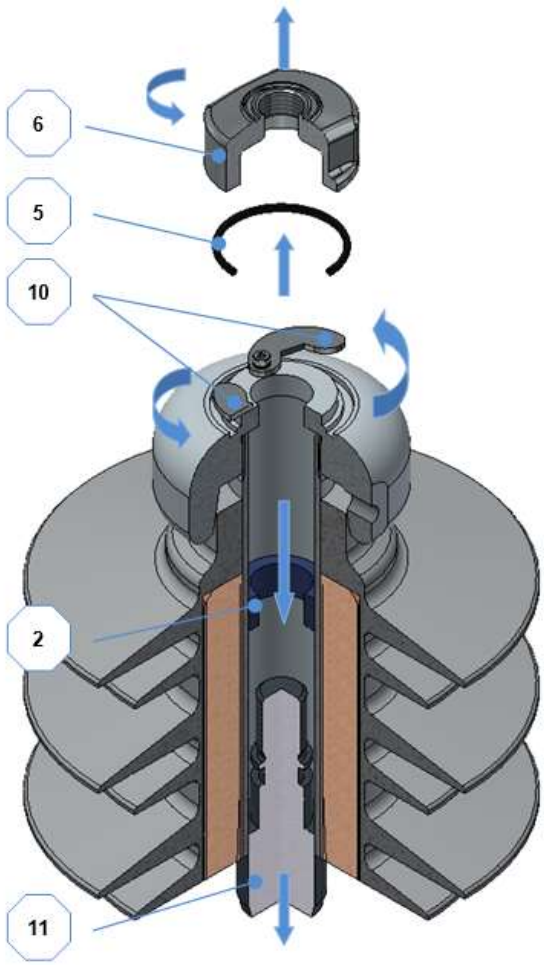
1

Bore the cable bolt (1) or split base (packed separately in the crate) to fit to the transformer cable and connect them together (e.g. brazing).

For maximum boring dimension, see customer drawing.

We recommend to braze the connection.

In case of DTOIA / DTOIAS, the cable can also be crimped into the cable bolt.

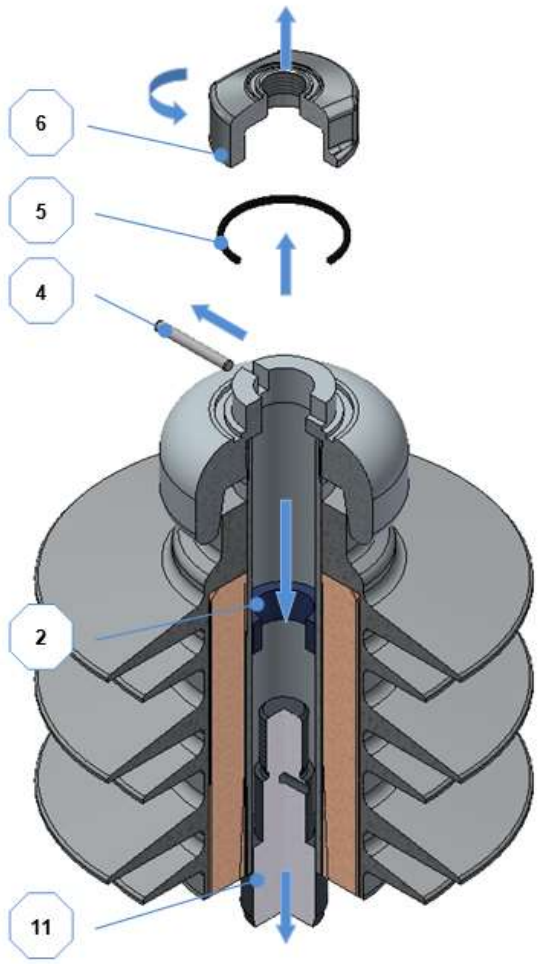


2

Version with air vent:

Remove the transport bolt:

- Unscrew the nut (6)
- Remove the O-Ring (5)
- Rotate both blocking plates (10) to release the transport bolt (11)
- Take the transport bolt (11) and the cylindrical gasket (2) out of the bushing.

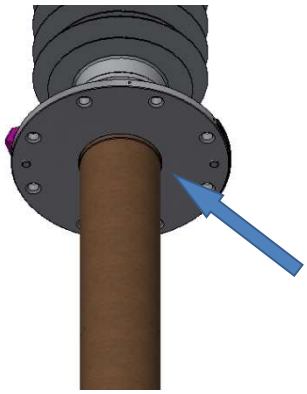


2

Version without air vent:

Remove the transport bolt:

- Unscrew the nut (6)
- Remove the O-Ring (5)
- Remove the cylindrical pin (4) to release the transport bolt (11)
- Take the transport bolt (11) and the cylindrical gasket (2) out of the bushing.



3

Remove flange protection.

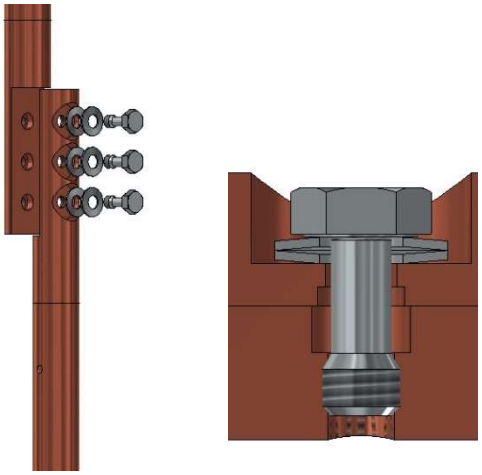
Clean the sealing surfaces of the bushing and transformer.

Clean the draw lead and make sure that everything is completely dry.

4

Lift the bushing using eyebolts and place it in the correct angle above the transformer (as described Fig.6)

Prepare the sealing surface and the sealing components on the transformer.

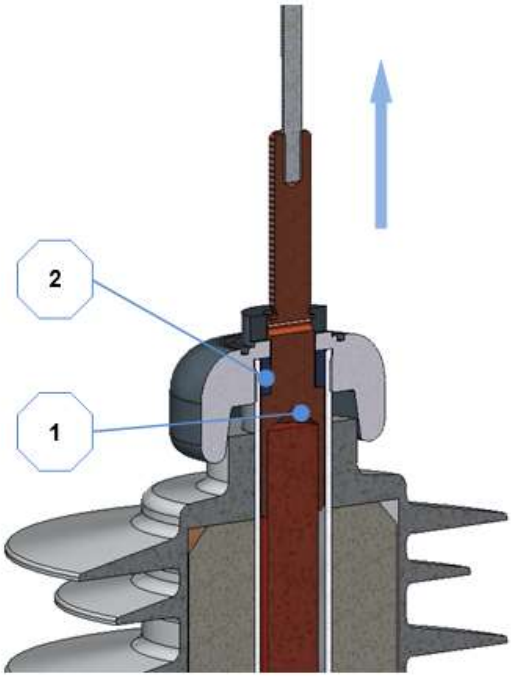


5

For split conductor: connect the split base with the delivered 3x M10 screws and 2 spring washers, torque 20 Nm.

Pay attention to the position of the spring washer.

The spring washers have to be properly centered inside the hole.



6

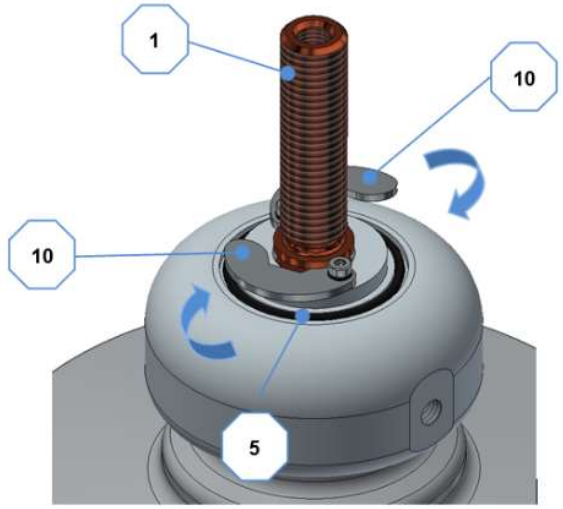
Both versions:

Remove the transport bolt:

Put the cylindrical gasket (2) on the cable bolt or split conductor (1).

Pull the cable bolt or split conductor through the bushing (using a M10 threaded rod – not in scope of supply) and lower the bushing into the transformer.

Note: for the version with air vent, unscrew the air vent screw to put the M10 threaded rod.

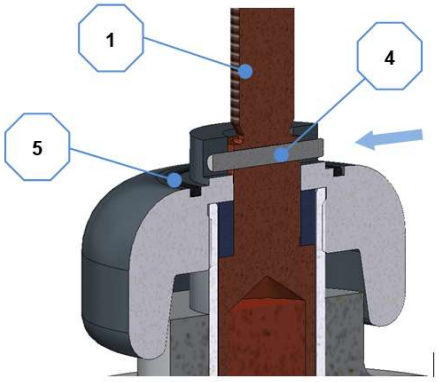


7

Version with air vent:

Rotate both blocking plates (10) to secure the cable bolt (1) and remove the threaded rod.

Insert the O-Ring (5)

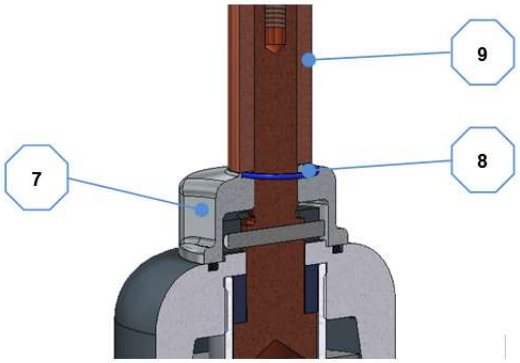


7

Version without air vent:

Insert the cylindrical pin (4) to secure the cable bolt (1) and remove the threaded rod.

Insert the O-Ring (5)

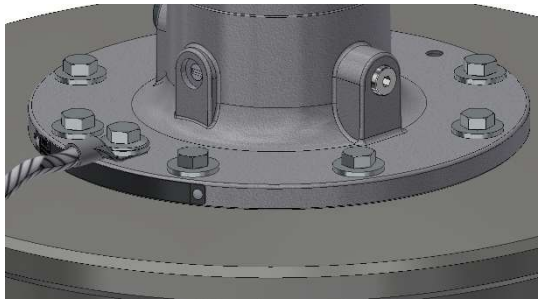
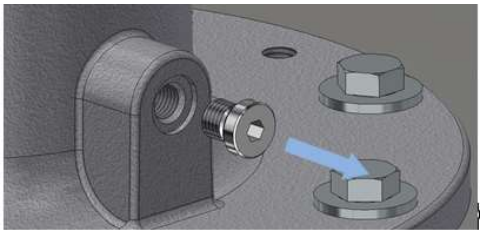
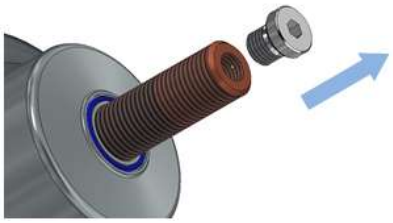


8

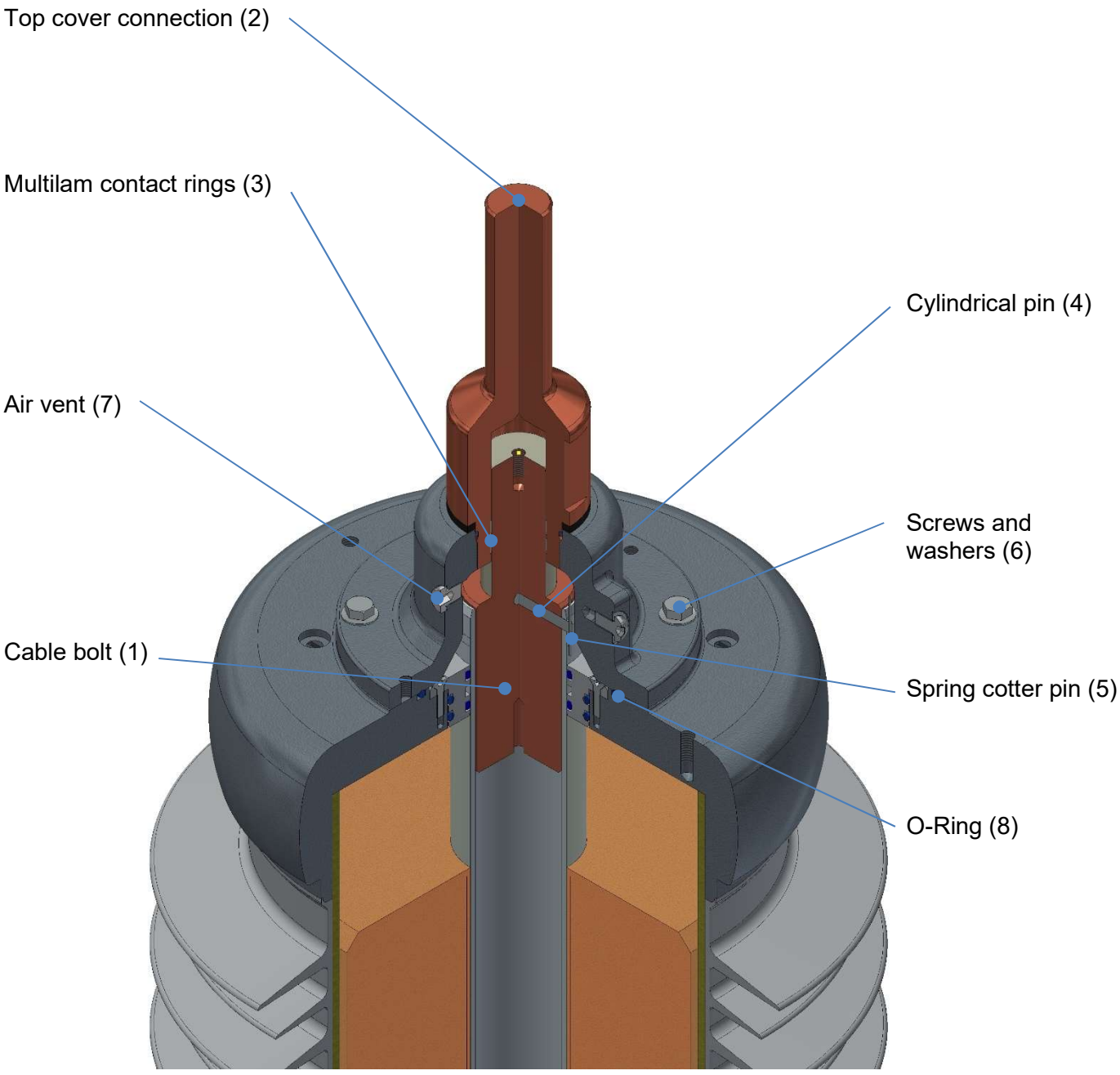
Both versions:

Tighten the nut (7) by hand, then further ¼ to ½ turns.
Use a pin wrench or N50 flat spanner.

Assemble O-ring (8) and terminal (9)
Torque 40Nm.

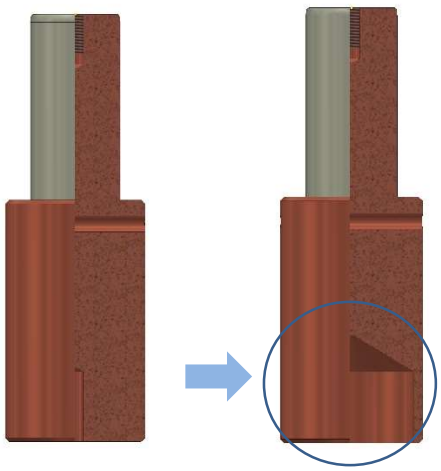
	**9** Tighten the bolts on the flange to the transformer. Make the earthing between the flange and the transformer, use the marked M12 threads.
 	**8** Ventilation: On flange and, if any, on cable bolt or split conductor. Open the air vent screw to release the air during transformer oil filling process. After 24 hours vent again to make sure that no air is trapped. Lubricate the threads of the air vent screw with transformer oil and tighten the screw with 30Nm torque.

Procedure on DTOIH / DTOISH with top cover connection, valid only for draw lead version.



Recommendation

Moser Glaser recommends to insulate the cable coming from the transformer winding connected to the draw lead or conductor of the bushing.



1

Bore the cable bolt (1) to fit to the transformer cable and connect them together (e.g. brazing).

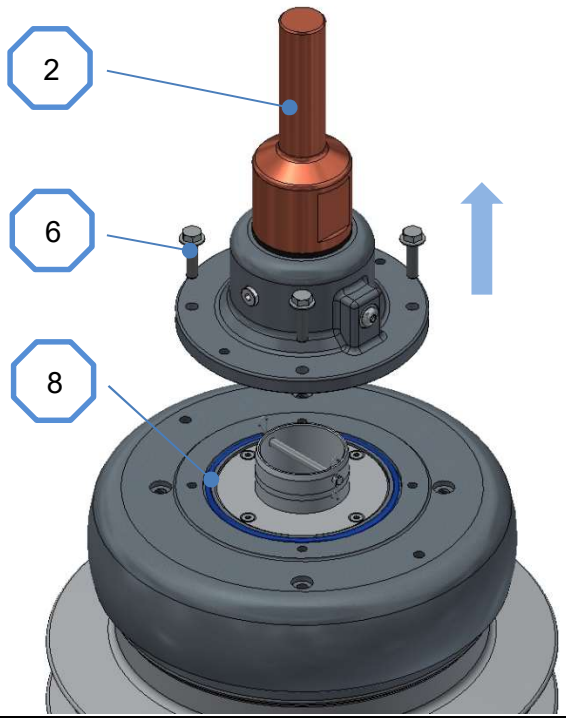
For maximum boring dimension, see customer drawing.

We recommend to braze the connection.

Take care about the silver-plated surface to avoid any shocks or scratches.

After brazing:

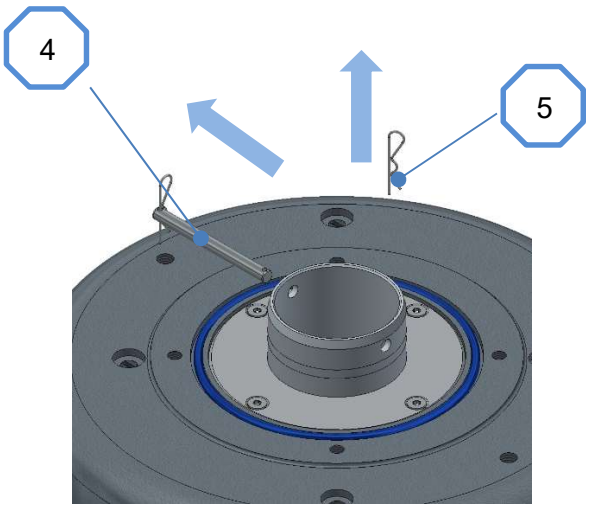
Clean the silverplated with a scotch-brite



2

Remove the top cover connection:

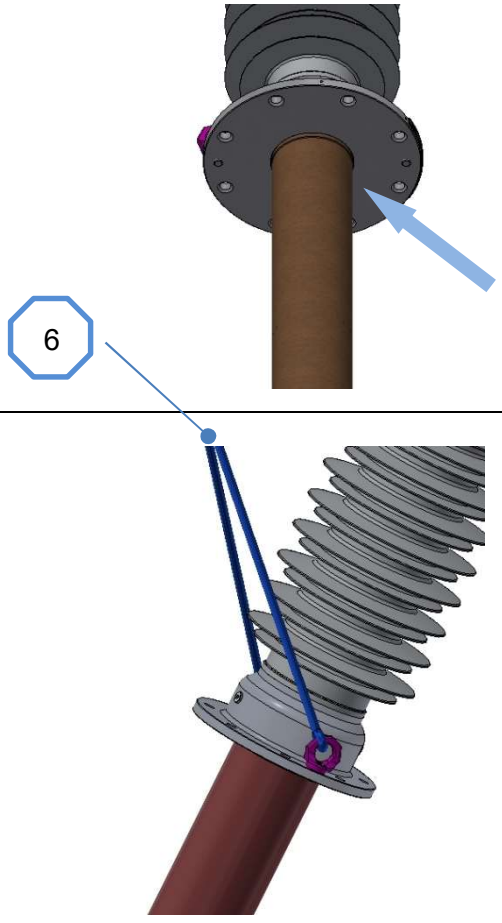
- Unscrew the 4 screws and washers (6)
- Remove the top cover connection (2)
- Take care not to lose the O-ring (8)



3

Remove one spring cotter pin (5)

Remove the pin (4) (let the other spring cotter fixed on it).



4

Remove flange protection.

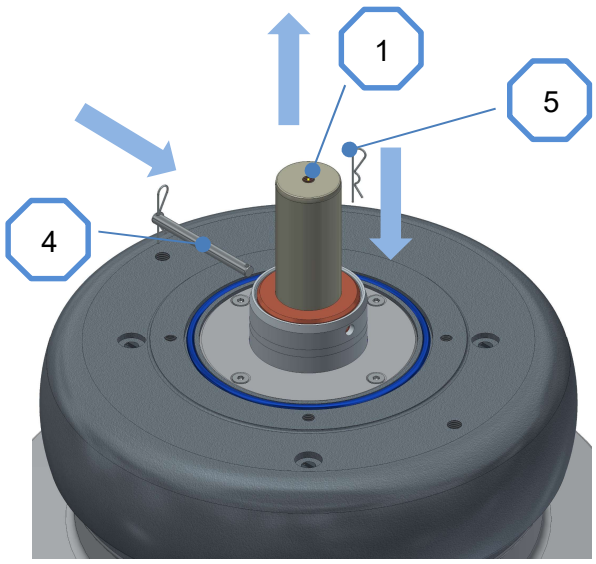
Clean the sealing surfaces of the bushing and transformer.

Clean the draw lead and make sure that everything is completely dry.

5

Lift the bushing using eyebolts and place it in the correct angle above the transformer (as described Fig.6)

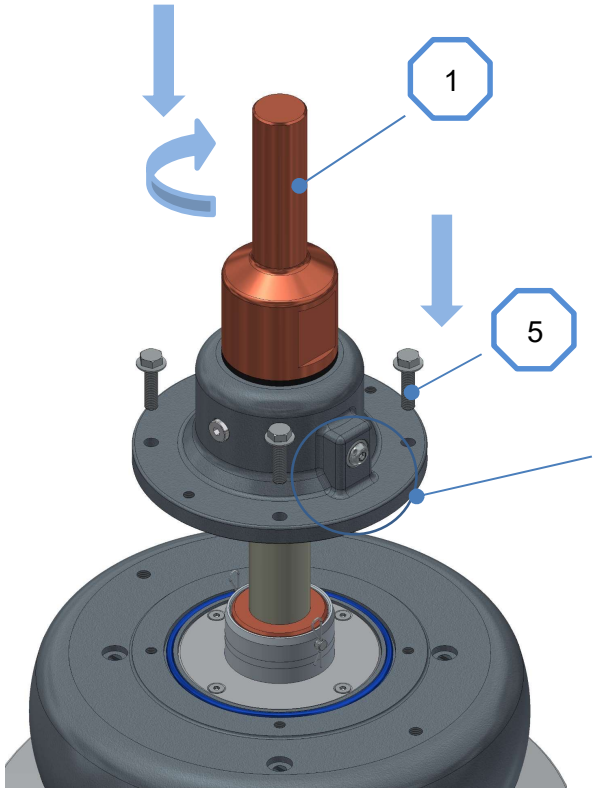
Prepare the sealing surface and the sealing components on the transformer.



6

Pull the cable bolt (1) though the bushing (using a M10 threaded rod – not in scope of supply) and lower the bushing into the transformer.

Put the pin (4) (with the other spring cotter fixed on it) through the hole of the central tube and of the cable bolt.



7

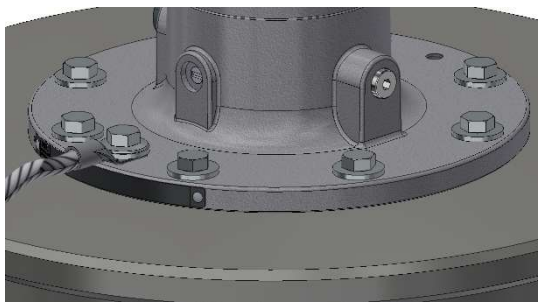
Re assemble the top cover terminal (1) carefully.

As it will be guided on the cable bolt, make sure not to damage the multilam contact rings (3).

To make the assembly easier, rotate clockwise the top cover terminal (1).

If an arcing horn should be mounted, make the orientation of the top cover terminal regarding the flange (see blue circle).

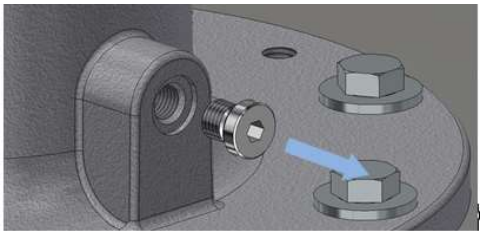
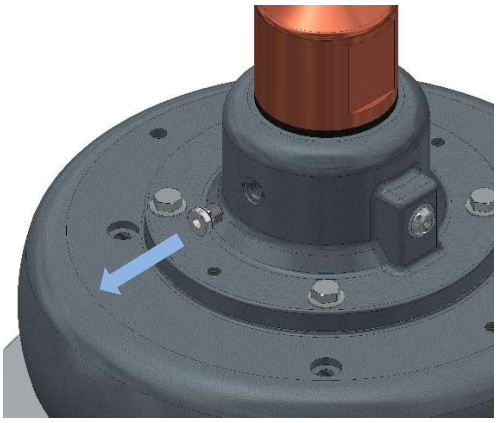
Tighten the screws and washers (5), torque 25Nm.



8

Tighten the bolts on the flange to the transformer.

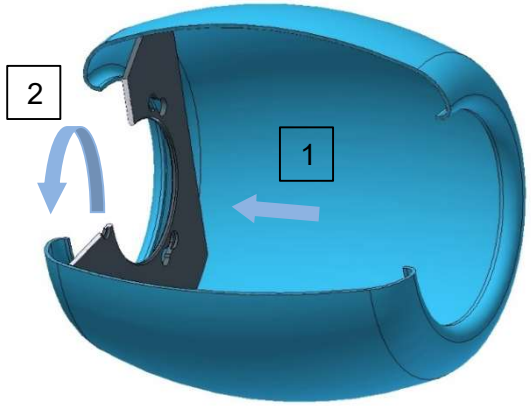
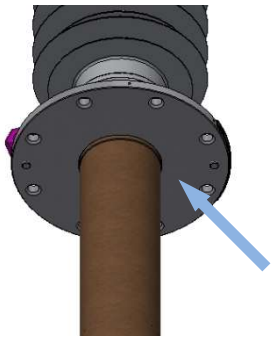
Make the earthing between the flange and the transformer, use the marked M12 threads.

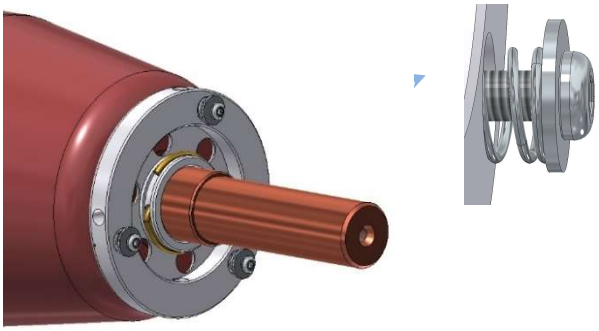
 	**9** Ventilation: On flange and on the top cover connection. Open the air vent screw to release the air during transformer oil filling process. After 24 hours vent again to make sure that no air is trapped. Lubricate the threads of the air vent screw with transformer oil and tighten the screw with 25Nm torque.

4.4 Installation of the bushing – Version with fix conductor

Attention: Any shield damage (coating, geometry) must be reported to Moser Glaser with no delay. Bottom connected bushing requires a man-hole in the transformer turret.

Procedure with bayonet shield on DTOI / DTOIS / DTOIH / DTOISH

	**1** Remove the electrode (if present) by unlocking the bayonet Push and turn counterclockwise. 
	**2** Remove the flange protection. Clean the sealing surfaces of the bushing and transformer. Make sure that everything is completely dry.



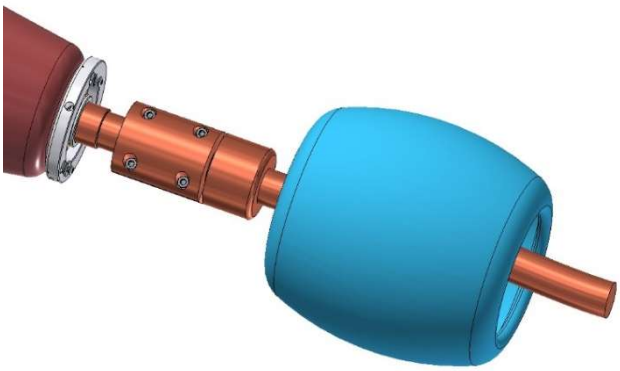
3

Clean the oil side of the bushing, be sure that the connection is not damaged.

4

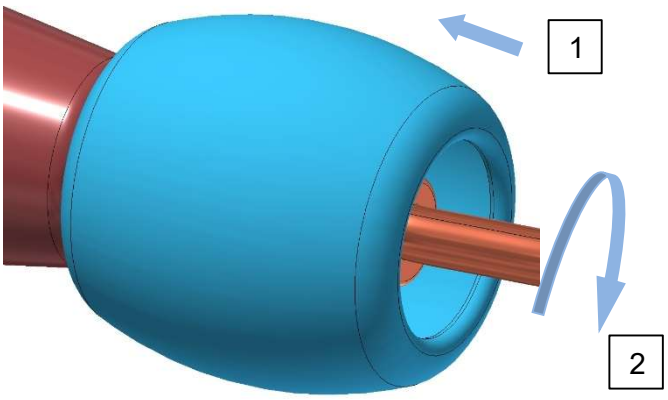
Lift the bushing using eyebolts and place it in the correct angle above the transformer (as described Fig.6)

Prepare the sealing surface and the sealing components on the transformer.



5

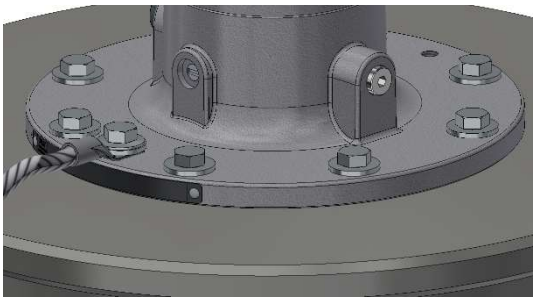
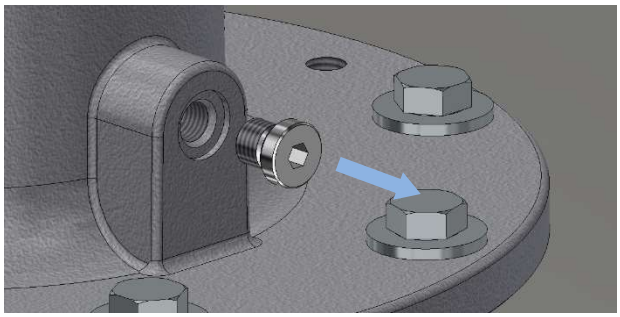
Via manhole: Pull the transformer cable through the electrode and connect it to the fixed conductor bolt



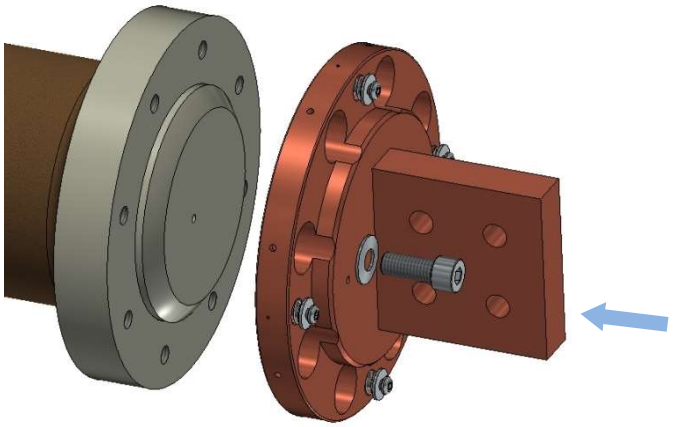
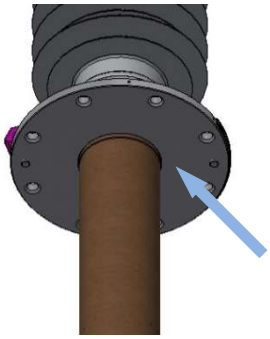
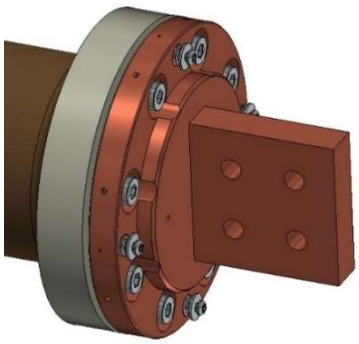
6

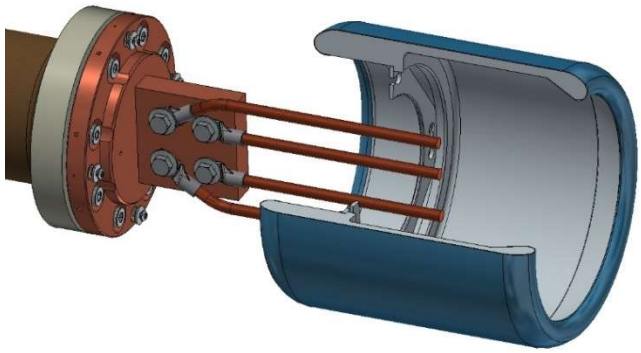
Install the shield

Block the shield with the bayonet fitting
Push and turn clockwise.

	**7** Tighten the bolts on the flange to the transformer. Make the earthing between the flange and the transformer, use the marked M12 threads.
	**8** Ventilation: Open the air vent screw to release the air during transformer oil filling process. After 24 hours vent again to make sure that no air is trapped. Lubricate the threads of the air vent screw with transformer oil and tighten the screw with 30Nm torque.

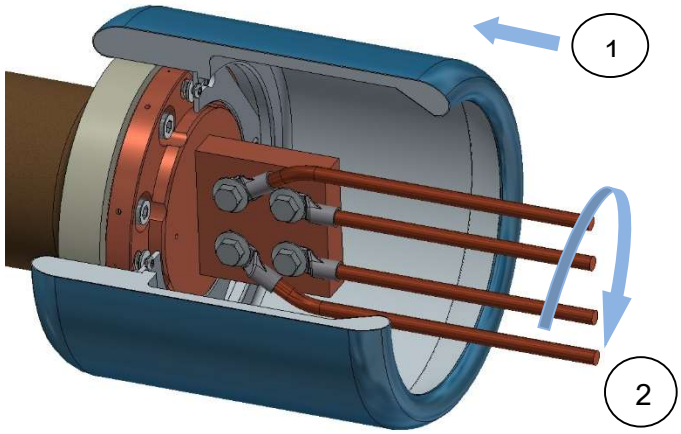
Procedure with bayonet shield on DTOIA / DTOIAS

	**1** Mount the oil side terminal on the bushing (if not mounted). Make the orientation regarding the flange fixing holes and/or the potential tap and fix the terminal with the screws and washers furnished. Torque 45Nm. 
	**2** Remove the flange protection. Clean the sealing surfaces of the bushing and transformer. Make sure that everything is completely dry.
	**3** Clean the oil side of the bushing, be sure that the connection is not damaged.
	**4** Lift the bushing using eyebolts and place it in the correct angle above the transformer. Prepare the sealing surface and the sealing components on the transformer.



5

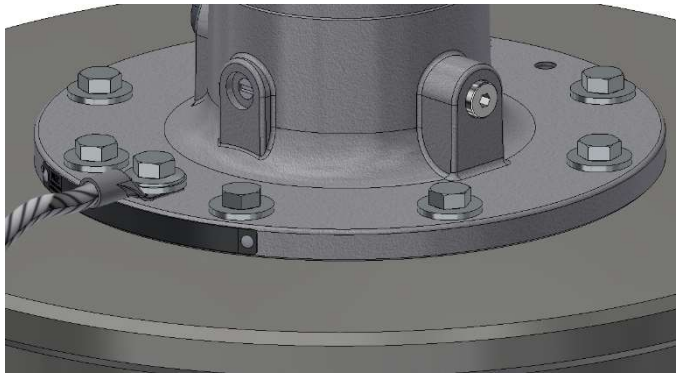
Via manhole: Pull the transformer cables through the electrode and connect to oil side terminal



6

Install the shield

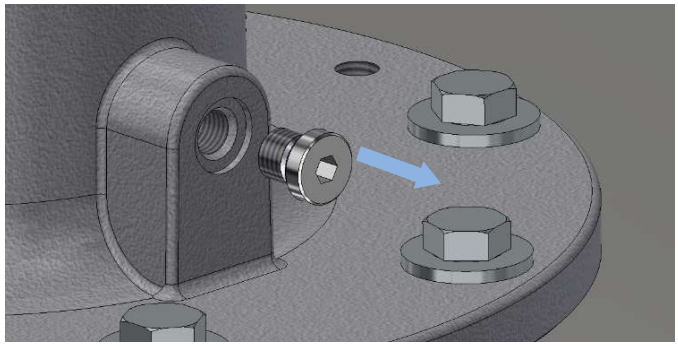
Block the shield with the bayonet fitting
Push and turn clockwise.



7

Tighten the bolts on the flange to the transformer.

Make the earthing between the flange and the transformer, use the marked M12 threads.



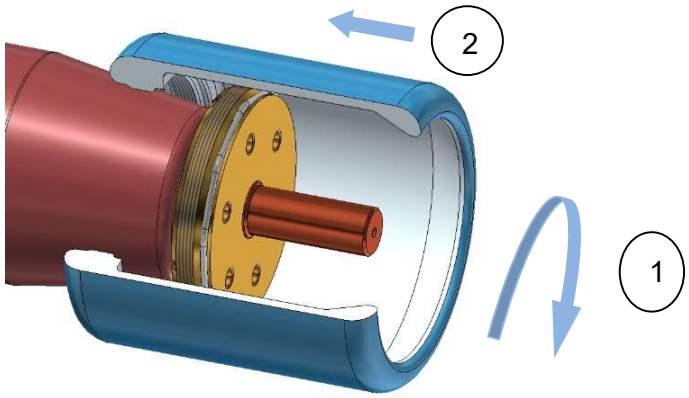
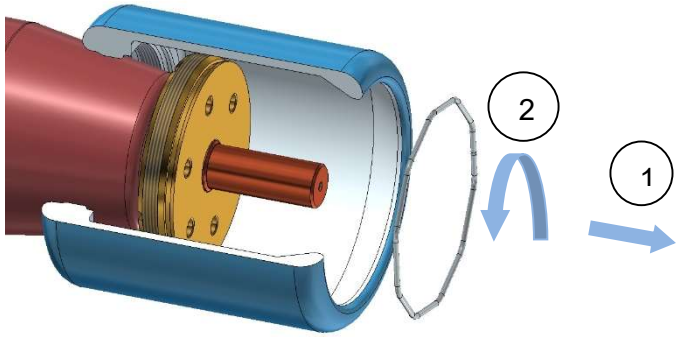
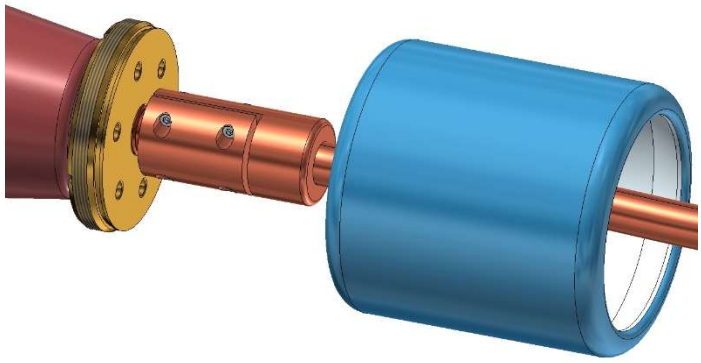
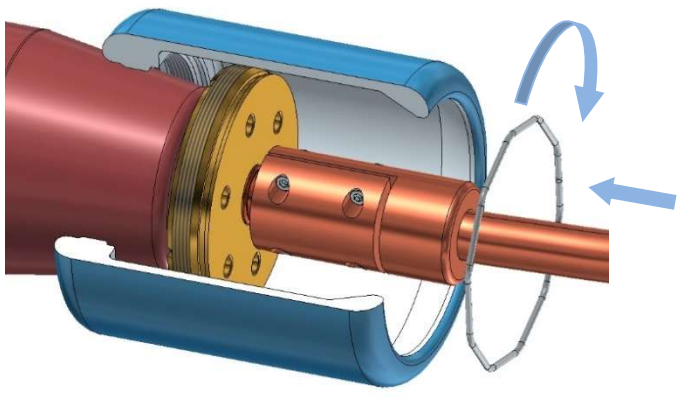
8

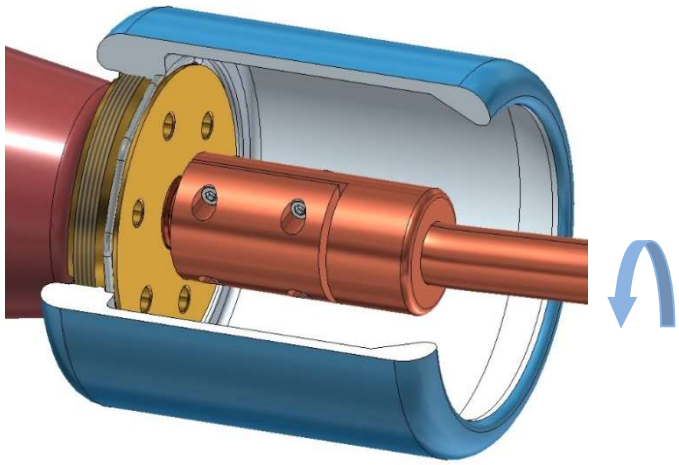
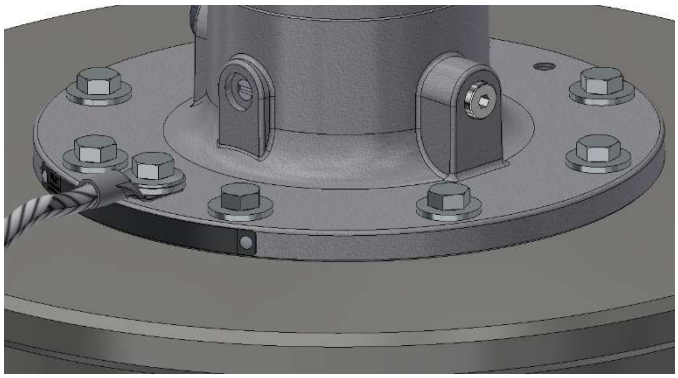
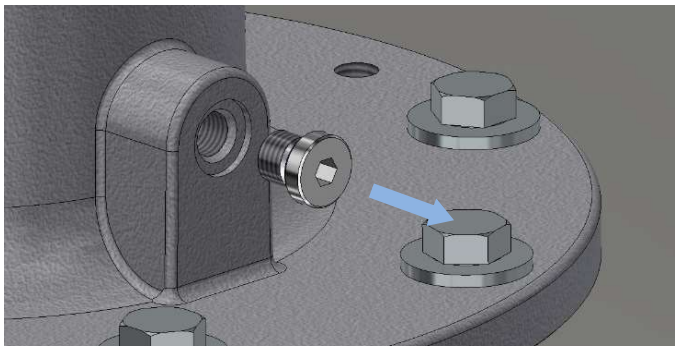
Ventilation:

Open the air vent screw to release the air during the transformer oil filling process.
After 24 hours vent again to make sure that no air is trapped.

Lubricate the threads of the air vent screw with transformer oil and tighten the screw with 30Nm torque.

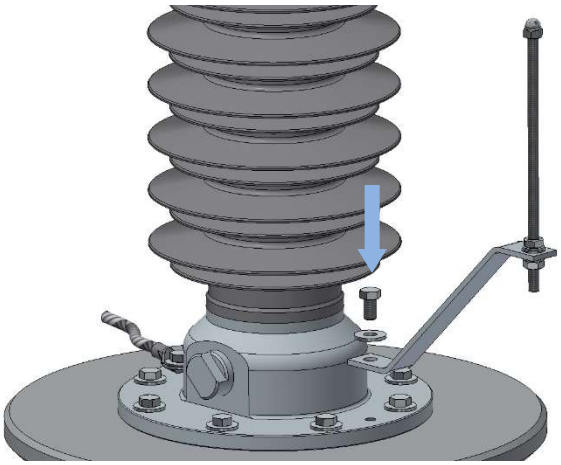
Procedure with screwed shield on DTOI / DTOIS / DTOIH / DTOISH

	**1** Screw the shield clockwise in order to remove the spring ring. The thread of the shield must be located after the bottom plate.
	**2** Remove the spring ring and unscrew the shield counterclockwise on the bottom plate.
	**3** Via manhole: Pull the transformer cable through the electrode and connect it to the fixed conductor bolt.
	**4** Screw clockwise the shield on the bottom plate and after the bottom plate in order to facilitate the mounting of the spring ring.

	**5** Put the spring ring in the groove and unscrew counterclockwise the shield. **The shield must be in contact with the spring ring.**
	**7** Tighten the bolts on the flange to the transformer. Make the earthing between the flange and the transformer, use the marked M12 threads.
	**8** Ventilation: Open the air vent screw to release the air during the transformer oil filling process. After 24 hours vent again to make sure that no air is trapped. Lubricate the threads of the air vent screw with transformer oil and tighten the screw with 30Nm torque.

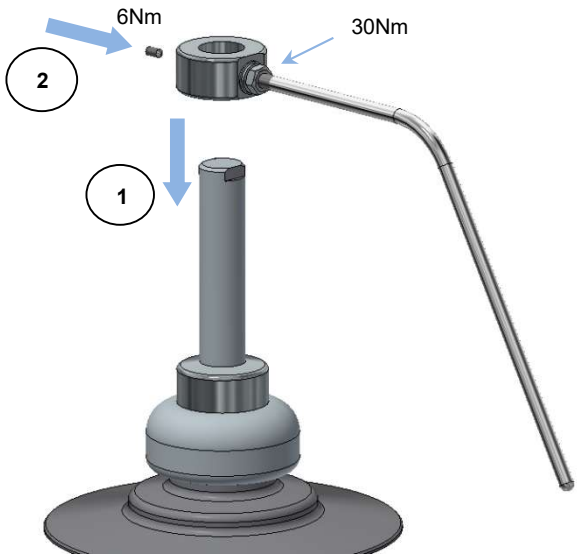
4.5 Accessories mounting

Arcing horn



1

Assemble the lower part of the arcing horn on the flange using one of the two earthing threads (M12) or by using a fixing bolt on the flange.

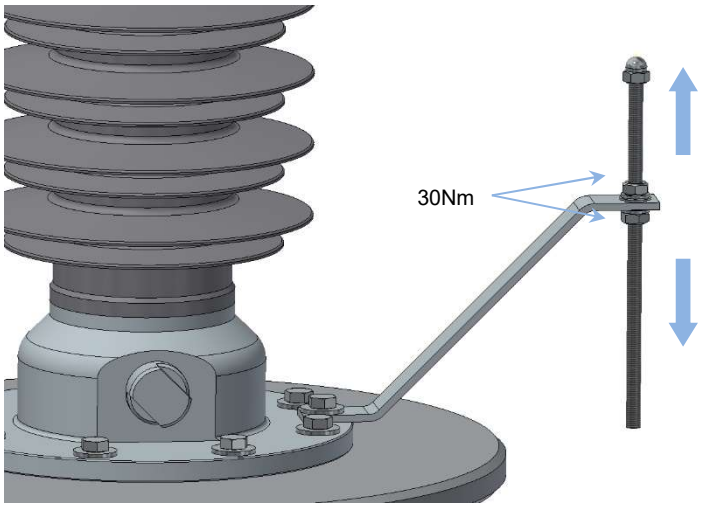


2

Assemble the upper part of the arcing horn.

Put the ring on the top terminal

Adjust the position regarding the lower part of the arcing horn and tighten the headless screw in order to secure it.



3

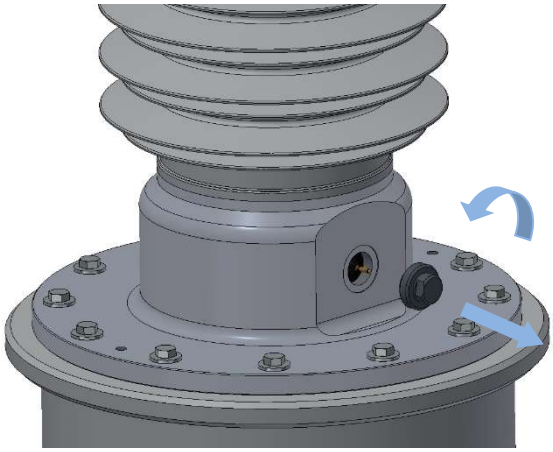
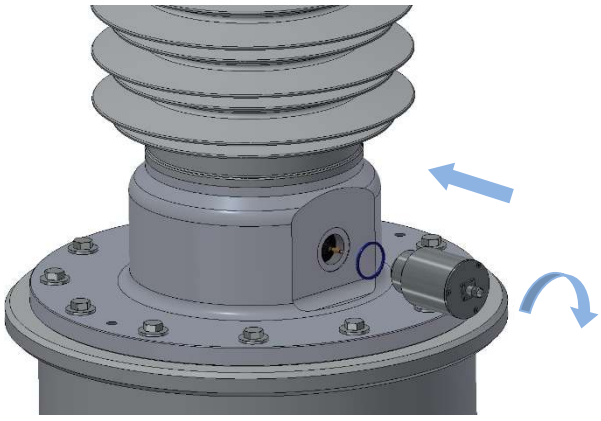
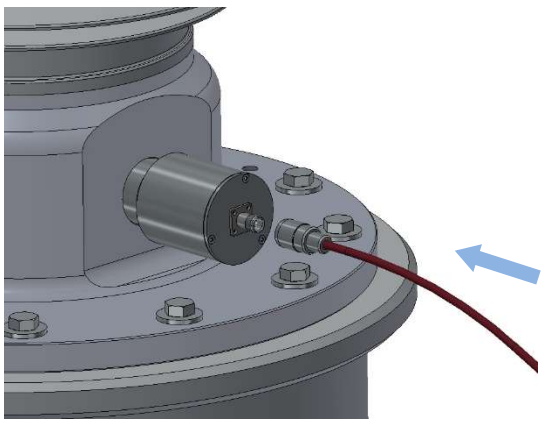
Adjust the distance between both parts of the arcing horn by unscrewing the nut.

Until the distance indicated on the arcing horn customer drawing is reached, tighten the nuts.

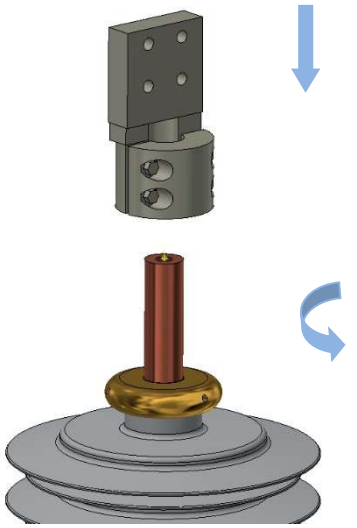
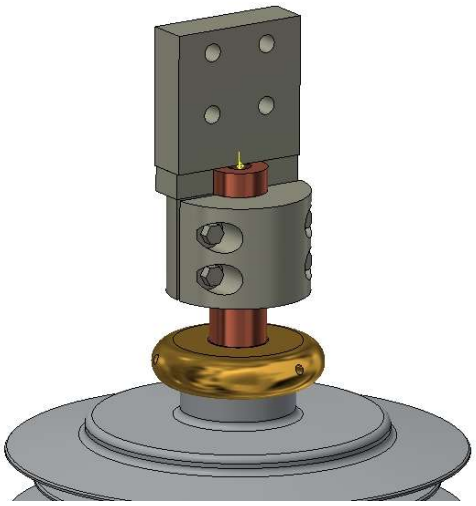
Voltage divider

Voltage divider is a linear circuit that produce an output voltage (V out) which is a fraction of the phase to earth voltage (V).

Voltage ratio refers to the partitioning of a voltage among the components of the divider.

	**1** Unscrew the test tap cap. Remove the O-ring from the cap.
	**2** Put the O-ring in the groove located on the top of the voltage divider. Screw it on the flange in place of the test tap cap.
	**3** Connect the coaxial cable on the TNC connector. Connect the other side of the cable on your monitoring device.

Flat pad terminal

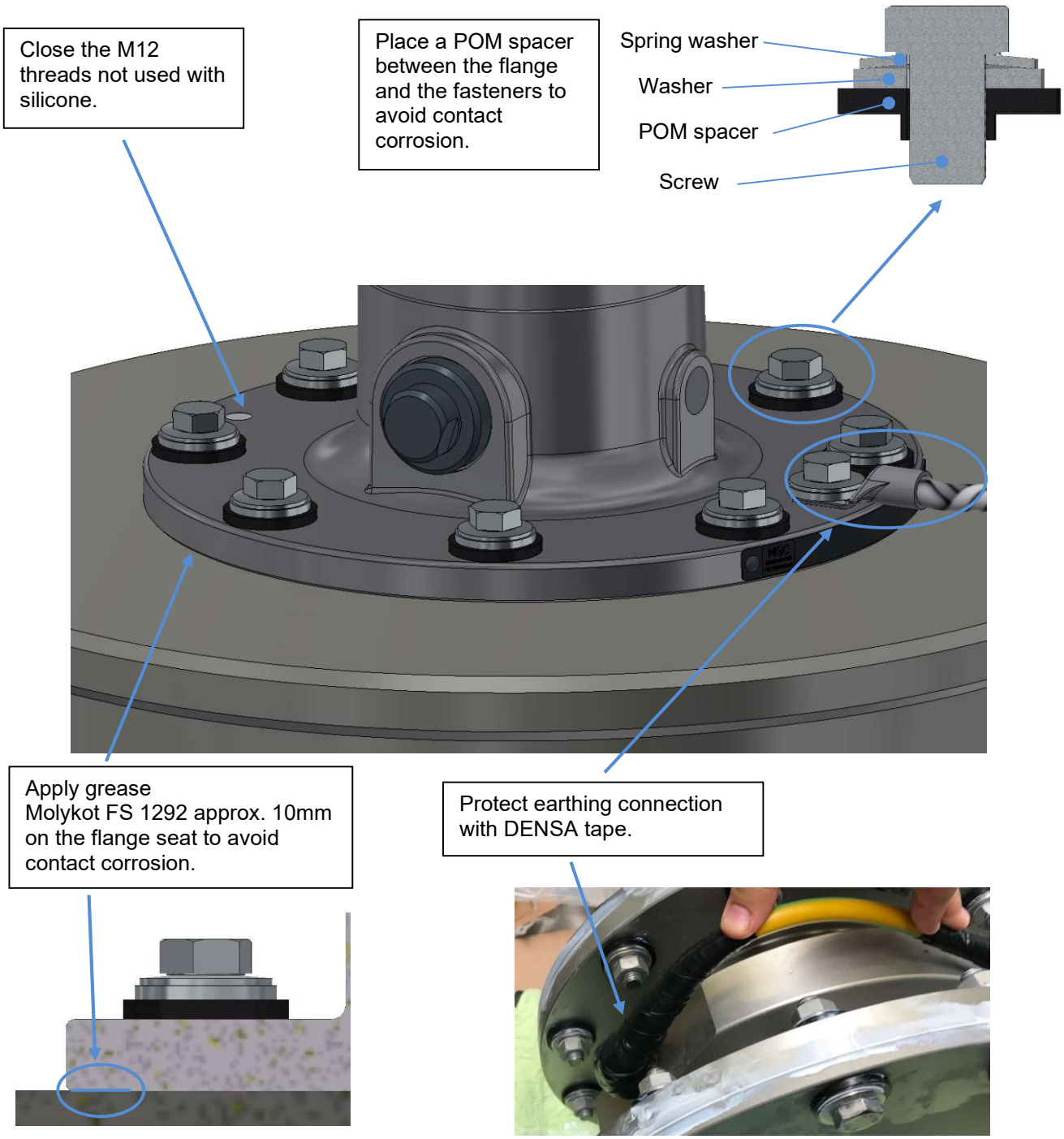
	**1** Put the flat pad terminal on the top terminal. Adjust the orientation.
	**2** Tighten the bolts to the adequate torque moment in order to have a good electrical contact between the parts (see on the clamp).

Off Shore application (C5-M)

MGC Moser Glaser has made investigations and performed tests according ISO 12944 and ISO 20340 to find the most efficient combination of products for heavy corrosive environment.

If you ordered a bushing for offshore application, the flange and the head of the bushing will be anodized, and the top terminal will be tin-plated.

Mounting recommendations for optimal lifetime of the bushing:



5 Check before energizing

After installation on the transformer, a waiting time of 24 hours and repeated air bleeding is required to avoid air bubbles on the insulating body which can cause flashovers or partial discharges.
Minimal oil level: up to bushing flange or if the transformer is not equipped with a conservator, minimum 1/3 of the CT extension has to be covered at any temperature, remaining volume being filled with dry nitrogen.

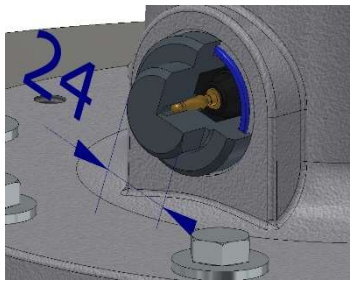
Check earthing
Inadequate earthing may lead to the failure of the installation and damage the bushings!

The test tap may only be used if the power supply is disconnected. After the measurements, the cap must be closed tight (30Nm).

To ensure safe operation, Moser Glaser recommends the following checks:

1. Tightness : between bushing / transformer tank, and the head sealing of the bushing
2. Tan Delta and capacity at the test tap (if possible)

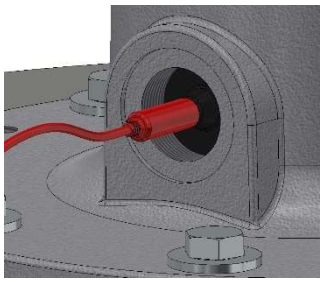
Measurement of the tan δ and capacitance



Use a flat spanner or spanner socket N24 to open the cap.

After the measurement, replace the cap and the o-ring. Torque 30Nm.

In operation, grounded



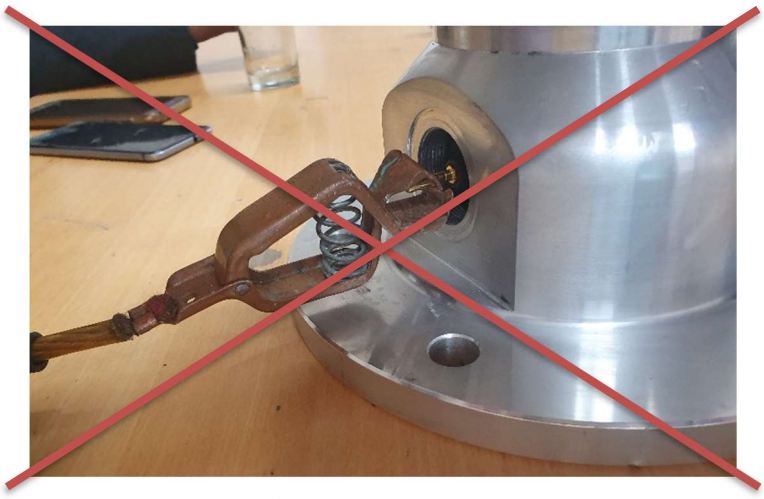
Connection: multilam pin ø4mm

use a banana jack to connect

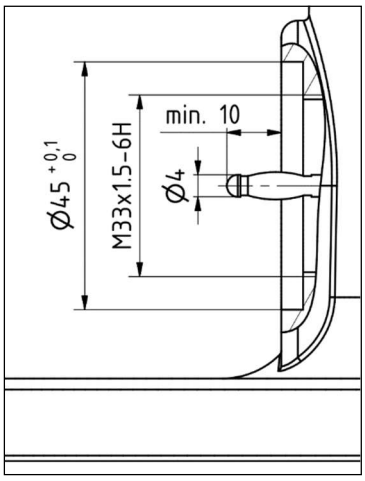
Measurement cable not included

Measurement position, not grounded

Do not use the crocodile clip



Dimension of the test tap



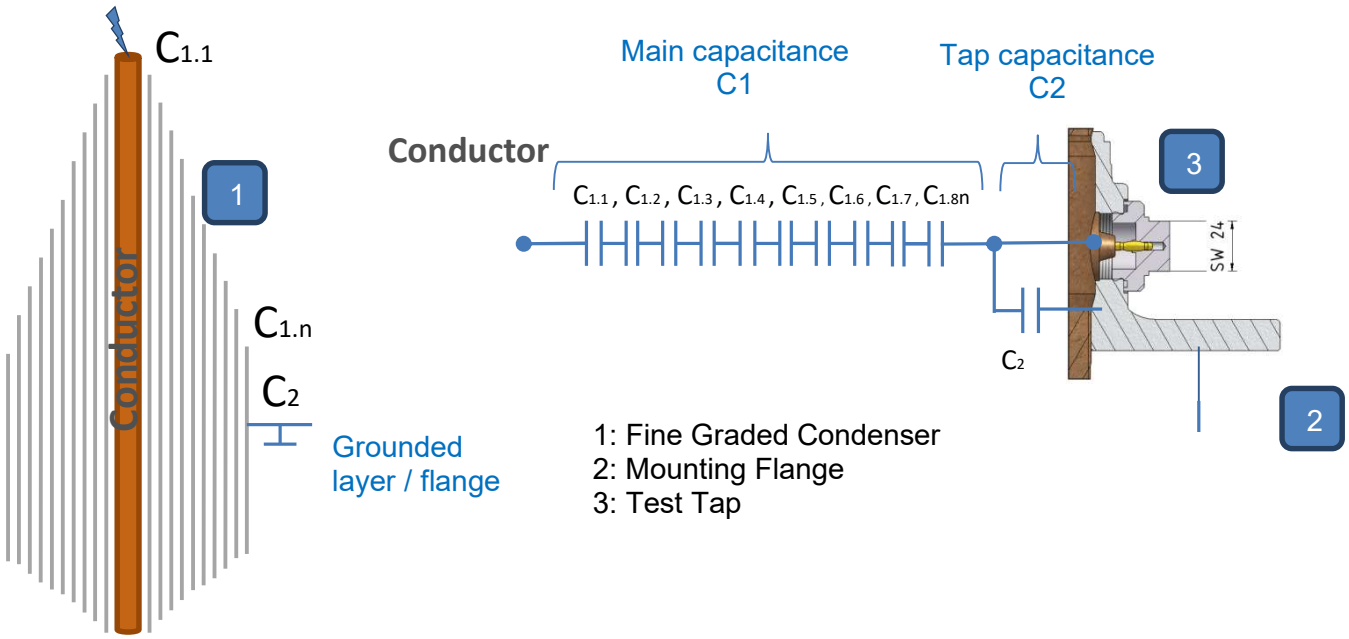


Figure 8: Principle of capacitance and Tan Delta measurement.

Capacitances C1 and C2

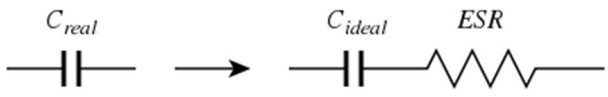
The capacitance is defined by the geometry of the active part (position and length of the capacitive layers, size of the flange, …).

Following parameters can influence the value of capacitance:
- Temperature: permittivity and then capacitance increase with increasing temperature
- Stray capacitances: presence of a current transformer, a transformer turret, an external corona shield, connections, distance to ground…

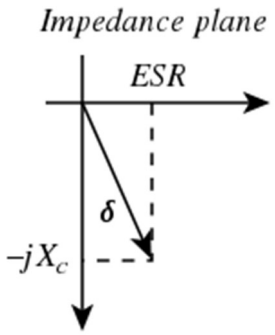
Values can therefore deviate from manufacture values:
- For main insulation C1: up to 10%
- For test tap C2: up to 100%

Power factor / tan δ_1 (Main insulation) and tan δ_2 (Test tap)

The ideal bushing is a pure capacitance, but the real bushing is an ideal capacitance associated with a resistance. The loss factor is defined by the ratio between resistive and capacitive currents of the tested part:



ESR: Equivalent Series Resistance



How to limit tan δ_1

- Avoid moisture and dust to penetrate inside of the test tap (always close test tap with the original cap when not used)
- Pack the bushing in accordance with the expected use (short-term operation, long-term storage, …) → see Re-packing chapter
  - Limit the exposition of the bushing to moisture (indoor storage, sealed packaging, …)
  - Measure in the best conditions:
    - Outside of the wooden crate
    - Flange earthed but insulated from any other material (polystyrene, wood, …)

Importance of tan δ_2

- In operation, the last layer is earthed, so that C2 is shortened:
  - No dielectric losses
  - No dielectric stress
  - No partial discharge activity
- It is not recommended to use tan δ_2 for bushing diagnostic as this parameter is highly volatile especially with temperatures changes.

Following parameters can influence the value of tan δ:

- Moisture: humidity content decreases the resistance and therefore increase the tan δ
- Surface cleanness: any conductive part at the surface may lead to an increase of tan δ.
  By example: dusty silicone sheds, dusty or wet creepage distance (measurement in wooden crate)
- Temperature:
  With increasing temperature:
  - Tan δ_1 decreases (in temperature range 10…60°C)
  - Tan δ_2 increases

  Values can therefore deviate from manufacture values:

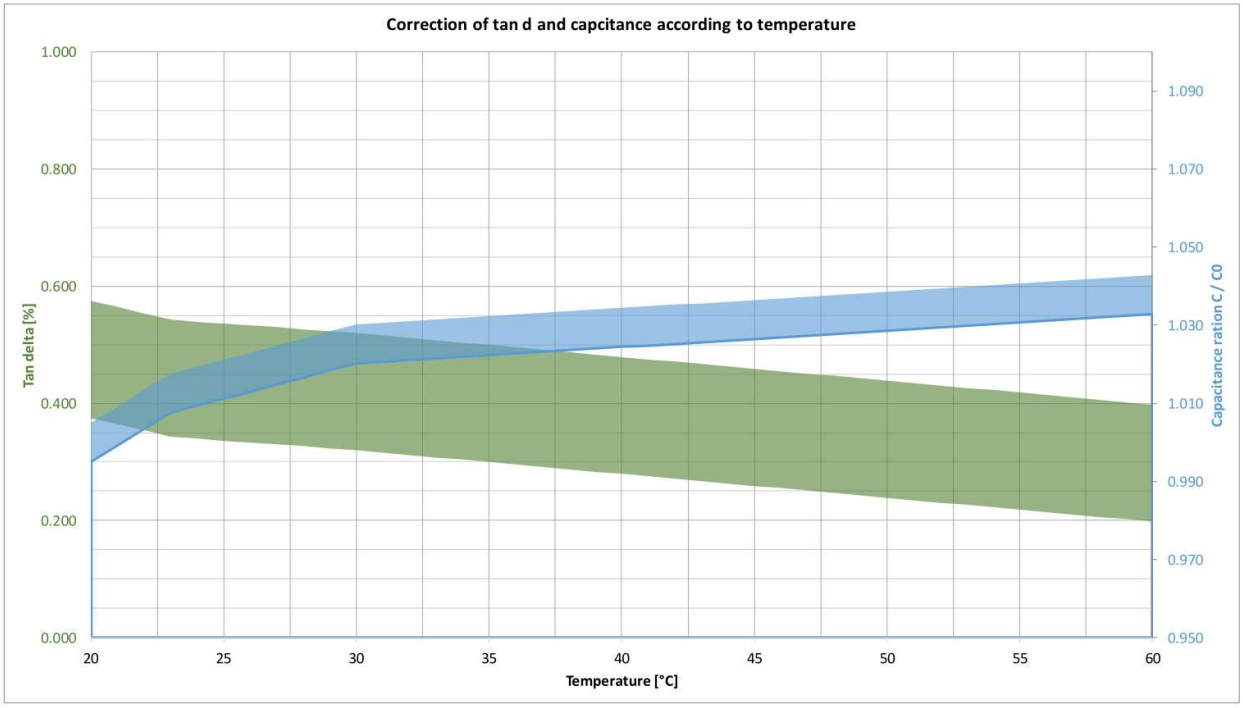
  - For main insulation tan δ_1: -0.5…-1.0 %/K in range 10…60°C
  - For test tap tan δ_2: up to 100%

Acceptance criteria :

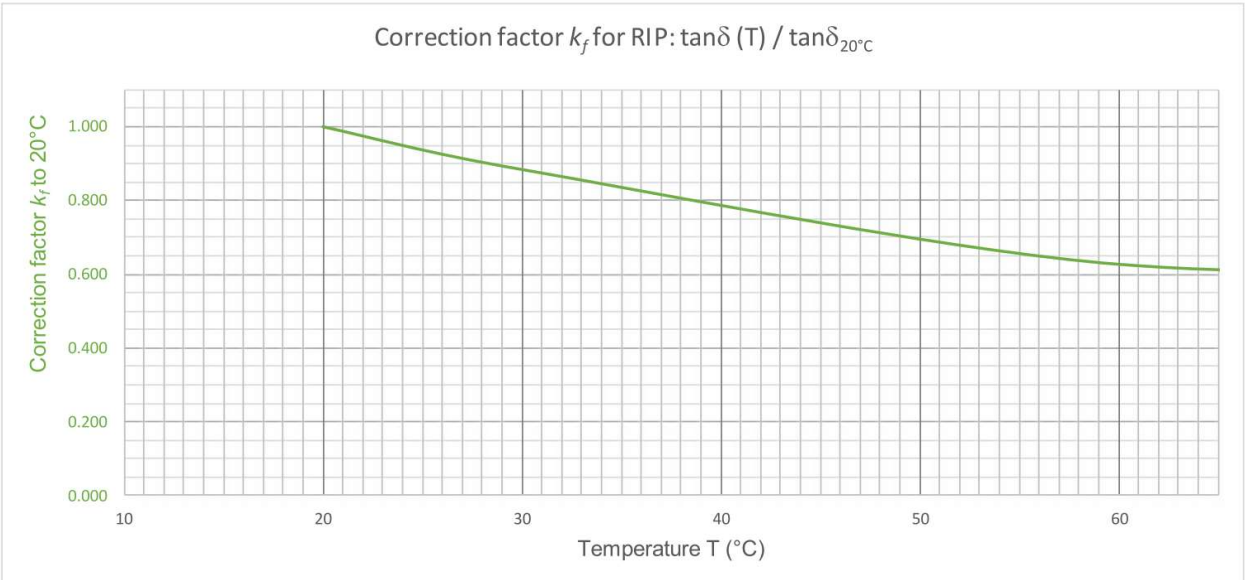
Capacity C1 :	Should not change more than 10% under the same test conditions as performed at Moser Glaser test lab.
Tan δ_1 :	For new bushings, should not exceed 0.7%, and should not change more than 0.10% between 1.05Um/√3 and Um.

The test results depend on the measurement method, temperature, air pressure and moisture. Make measurements at ambient temperature of 20°C for better comparability.

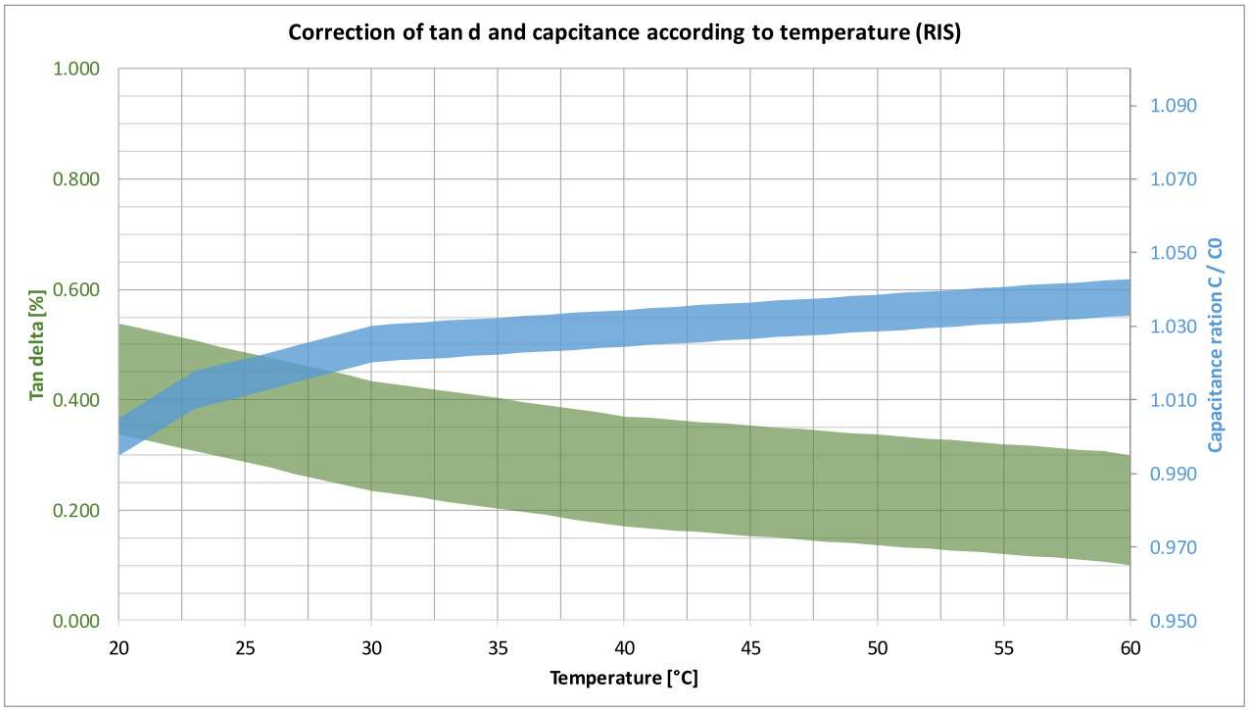
The following graph presents on-site acceptable values of loss factor tan δ and capacitance change at different bushing temperature for **RIP bushings**:



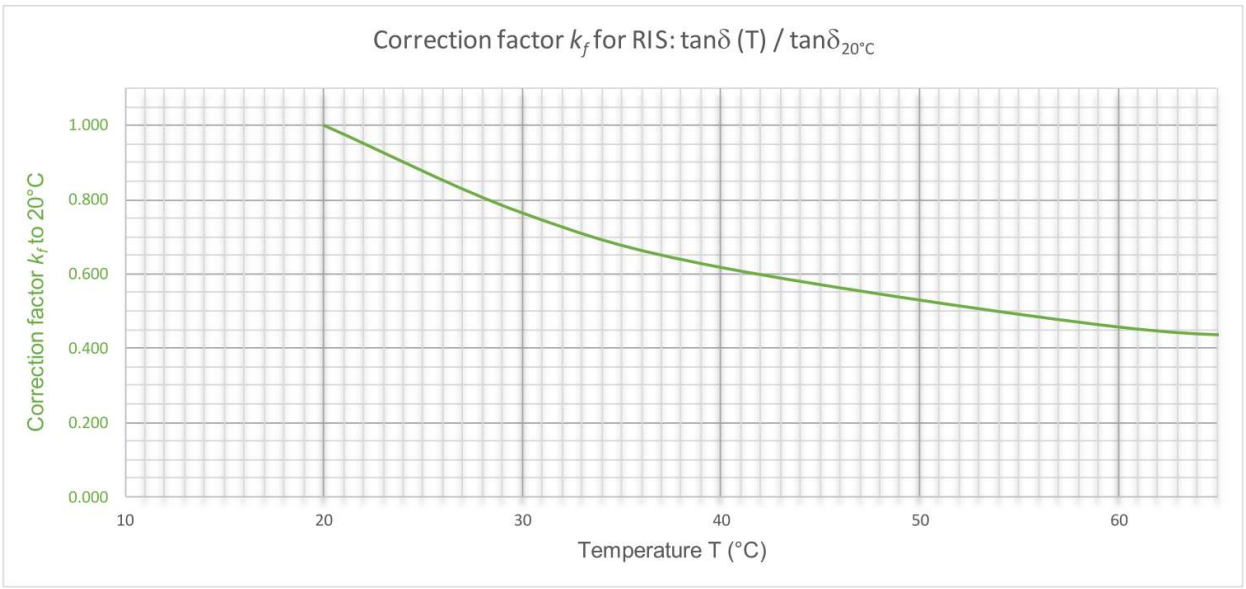
The curve below presents correction factor to calculate the loss factor tan δ at 20°C:
$(T) = kf \cdot \theta_{20°C}$



The following graph presents on-site acceptable values of loss factor tan δ and capacitance change at different bushing temperature for **RIS bushings**:

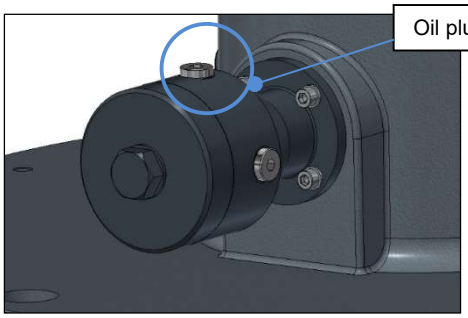


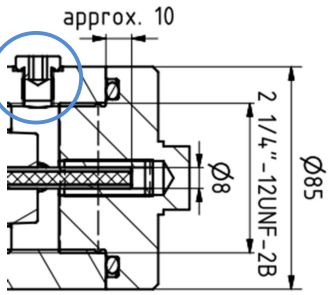
The curve below presents correction factor to calculate the loss factor tan δ at 20°C:
$(T) = kf \cdot \theta_{20°C}$



Contact Moser Glaser for the interpretation of results from measurement took in different conditions.

On request, the bushing could be supplied with a self-earthed test tap



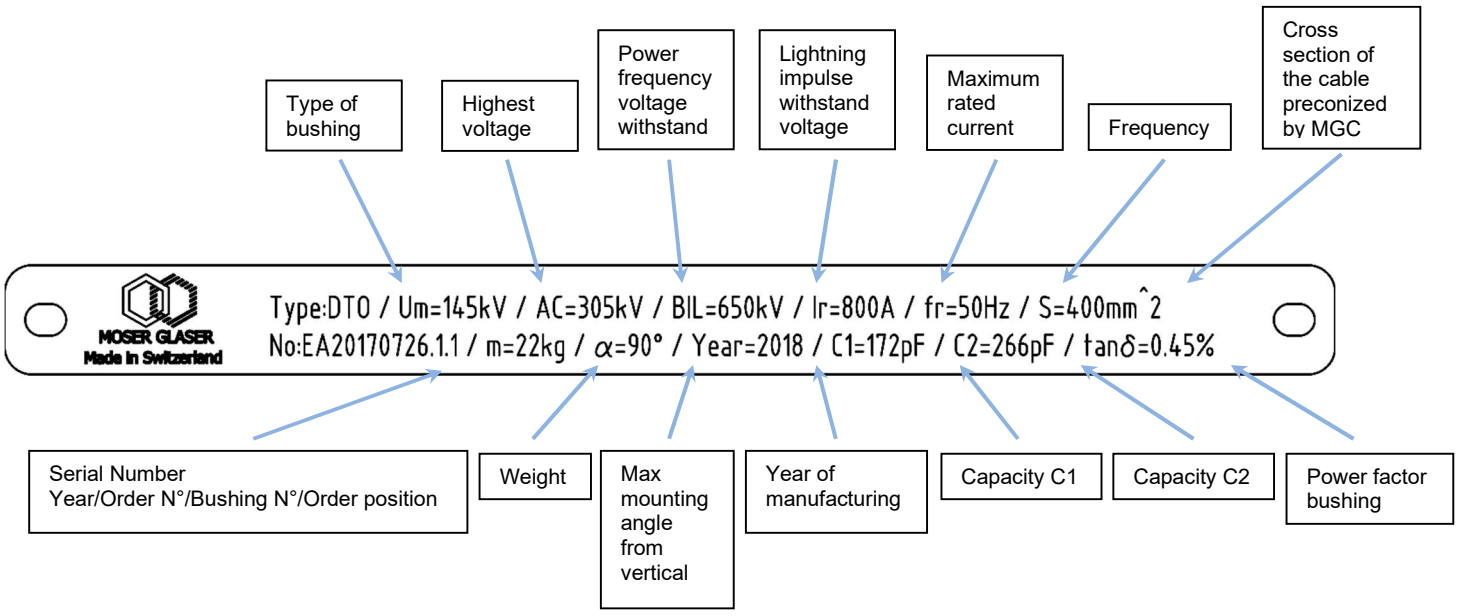


The bushing can also be supplied with a voltage tap

To use the voltage tap (at 20kV), remove the cap and connect the potential device, remove the oil plug and fill the cavity with clean, dry transformer oil.
For the oil expansion, allow a short clearance between the seal and the surface of the oil. Then replace the oil plug (torque 10Nm).
For devices below 10kV, it is not necessary to fill the voltage tap with oil for power factors or capacitance measurement.
After the measurement, screw the cap back and tightened it to 40 Nm in order to earth the bushing.

Note: Residual oil coming from electrical tests at MGC factory can be found in the voltage tap during the first use. This is normal and not a result of a tightness issue of the bushing.

6 Nameplate



7 Maintenance

DURESCA bushings are maintenance free. If however a maintenance inspection is required by the plant operator we recommend the following:

7.1 Capacity and Tan Delta measurements (see chapter 5)

Caution
Do not work on systems that might be under tension!

7.2 Cleaning the silicone sheds

The hydrophobic properties of silicone rubber reduce significantly leakage currents, resulting in an excellent performance in polluted environments. Therefore, there is no need to clean or grease the insulator. Silicone prevents the formation of conductive paths which lead to flashovers, line outages or erosions on the insulator.

In case of exceptional severe site conditions :

The insulator can be cleaned manually with soap/water and soft cloth.
No oil or detergent should be used.
Silicone rubber retains its hydrophobicity after washing.

In case of contamination of silicone by transformer oil:

We recommend using Acetone, Isopropyl alcohol or White spirit. This solvent should be used together with a clean cloth to remove the transformer oil from the surface of the insulator.

If done right after the pollution the Silicone rubber will retrieve its form and properties.

7.3 Recycling the bushing

The bushings are made with following components:

- Central tube or conductor made of aluminium or copper
- Active part made of resin impregnated paper or synthetic with aluminium foils.
- Flange and head made of aluminium
- Insulator made of silicone or silicone/fiber-glass/aluminium (hollow insulator)
- Filling material made of polyurethane elastomere in case of using a hollow insulator
- Cable bolt, split conductor made of copper
- Screws, bolts, pins, washer, covers, shields made of stainless steel or aluminium.

As most of these parts are fixed together, we preconize to cut the bushing in several parts.
None of the bushings contains any liquids.

8 Repacking of bushings

Use clean lifting slings to handle the bushing. Light bushings may be handled by hand.

All packing material originally delivered has to be reused.

	**1** If present, removable copper conductor has to be fastened on the bottom of the box
	**2** Place the protection disc below the flange to protect the flange and especially the sealing surface
	**3** Place the green net around the bottom part of the bushing

4

In case of a bushing with fix-conductor, protect the terminal and especially the contact surface

5

MGC recommend to pack at first in a separate bag the insulator then with a second bag the complete bushing.

Place at least one desiccant bag inside the bag containing the bushing, 6 months after the delivery replace it by a new one. Remove the air from the bag and seal it.

6

The bushing should be blocked against axial and radial movements with wooden rafters.

	**7** Electrode shield has to be protected with bubble wrap and packed in a card box Others accessories have to be packed in a plastic bag fastened in the box

Find our installation instructions on our website

www.mgc.ch

or by flashing the QR Code