

DURESCA®



# DTOX(S) Condenser bushings 72.5 – 550kV

Transformer to SF6
with Dry-Type insulation RIP and RIS
IEC standard 60137:2017 & IEC62271-211:2014

MOSER GLASER

Current and voltage – our passion

# Swiss quality combined with global experience





## Features

### Dry-type RIP Insulation

Moser Glaser researched a way to increase the dielectric characteristics of its High Voltage equipment. As a result Moser Glaser invented the Epoxy Resin Impregnated Paper (RIP) technology in 1958.

With more than 50 years of experience in development of the ERIP technology, Moser Glaser offers transformer bushings DURESCA® DTOX(S) from 72.5 to 550kV.

The insulation lays directly on the conductor or tube and consists of crepe paper dried under vacuum and impregnated with epoxy resin. Conductive grading layers are embedded during the winding of the insulation for the best field control. This guarantees the highest operational and human safety.



- A strong moisture barrier prevents any contamination or moisture ingress.
- Moser Glaser design does not use any oil; DTOX(S) are completely dry and free of partial discharge.
- DTOX(S) bushings can be applied at any position from 0° to 90° from vertical and allow for safe horizontal transport and storage.

### Replacement bushings

- In addition to the standard range, our design, combined with our production process, allows a wide flexibility and adaptability to provide tailor-made solutions.

Moser Glaser can interchange a wide variety of bushings designs. This allows the customer to replace existing OIP bushings with the RIP technology. The supply chain is simplified as the silicone molding operation is done in-house, Moser Glaser can offer short lead-times for its standard range of product.



## DTOX bushings are also available with RIS (Resin Impregnated Synthetic) insulation.

The main performance and life expectancy restraint in RIP condenser bushings was found to be the paper itself. Paper is an organic material with inconsistent material parameters, namely the moisture content. Too much moisture will cause high loss values, degrade the insulation system of the bushing, and possibly cause a premature failure. In order to compensate this, modern RIP bushings utilize drying systems during the manufacturing process.

For shipment and storage, plastic bags with a dessicate bag or oil containers are used to protect the bushing. Finding an alternative material to paper was not an easy task, though, due to the fact that paper provides good insulation characteristics and has been used in bushing and transformer manufacturing processes for many years with continual optimization.

Several experimentations were needed to find optimal successor.

Moser Glaser undertook this task by performing tests on many materials in order to find a successor to the paper. After research, Moser Glaser found a special polyester structural material which is an excellent alternative to paper. Moser Glaser performed a sequence of tests to qualify this solution:





Routine and type tests according to IEC 60137:2017 and IEC62271-211:2014 Specifications for the type tests were beyond the requirements of the standard.

In addition several special tests have been developed to challenge this solution.

- Adhesion test of direct moulded silicone on the RIS insulation
- Special humidity test
- Dynamic cantilever load tests
- Temperature cycle test
- Accelerated ageing test under high voltage

The new Resin Impregnated Synthetic RIS is now developed and part of Moser Glaser products portfolio.

An all-inclusive solution!

The result of this development is an ideal association of existing epoxy resin technology and its appreciated characteristics:

- Partial discharge free
- Installation at any angle

enhanced with new features:

- Shorter production cycle
- Easier handling for long transportation and storage
- Reduced power factor and capacitance
- Not affected by humidity

For outdoor application Moser Glaser standardized a direct-moulded silicone insulator to provide an even more safer solution.

Moser Glaser could maintain its strength by providing a high level of customization.

Therefore RIS technology can be applied to the standard range and also can interchange all existing designs. There are no limitation as for the diameter and length.

What you get today with RIP technology can be offered with RIS.

With this important new milestone, Moser Glaser is ready to offer the bushing of the future.



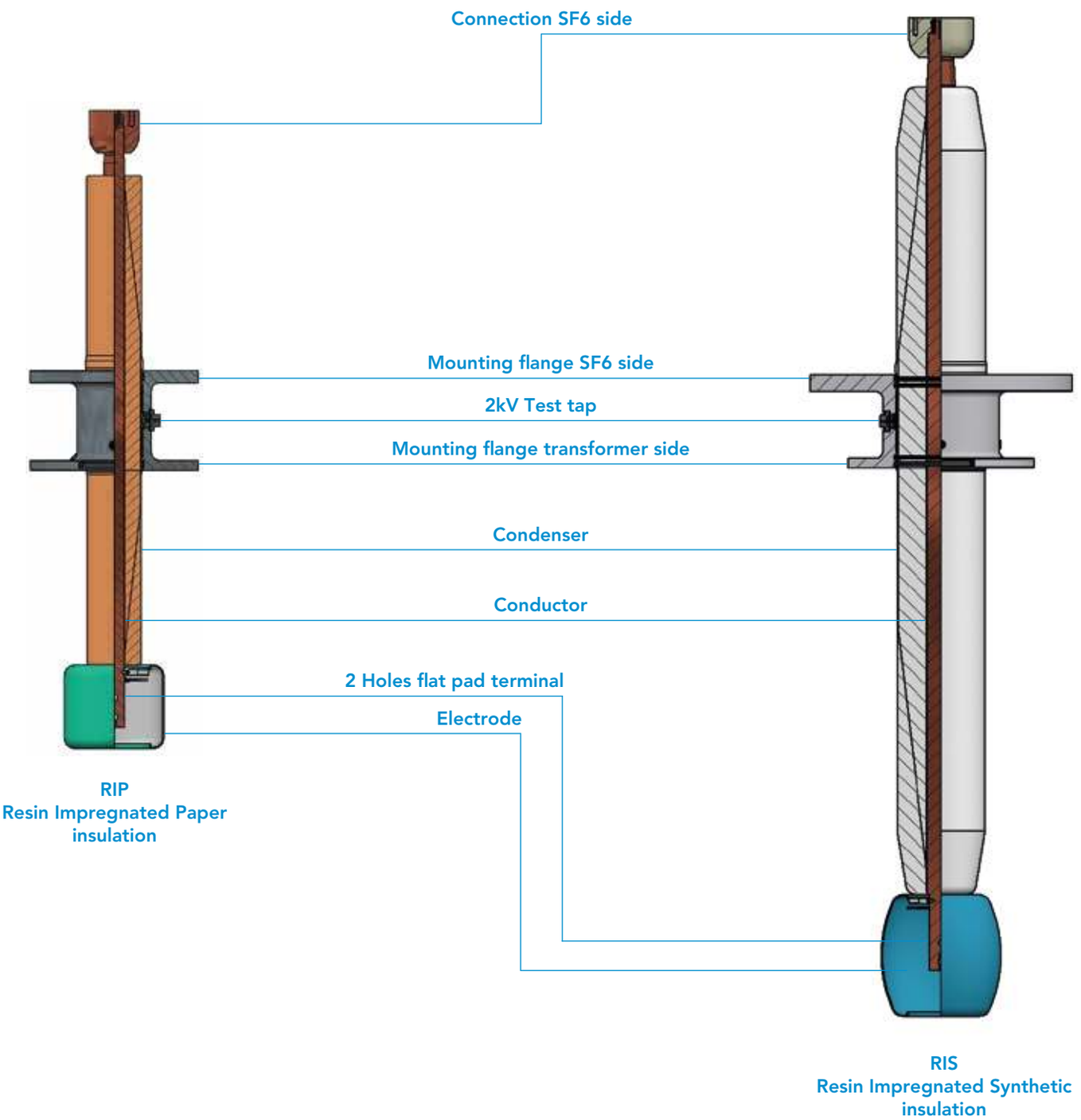


Cut from a RIS active part



Cut from an RIP active part

## Design




All technical data (electrical and dimensions) from this catalogue are applicable for RIP as well as RIS insulation.

- Bushings with RIP insulation are denominated as DTOX
- Bushings with RIS insulation as DTOXS

# Common characteristics

## Top terminal

DTOX(S) bushings are delivered with specific top terminal designed as per the IEC62271-211:2014.
Material is in copper and silver plated.

## Conductor

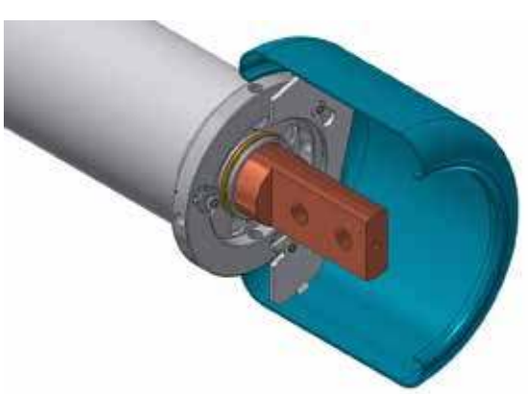
All DTOX(S) bushings are designed with a fix-conductor.

## Short-time current level

The bushings withstand a short-time current of 25x rated continuous current for a maximum of 2 seconds.
For draw-lead the short-time current is defined according to the cable cross section S in mm²: Ith 2sec (kA) = 0.06 x S
Others values are possible after validation by Moser Glaser.

## Current

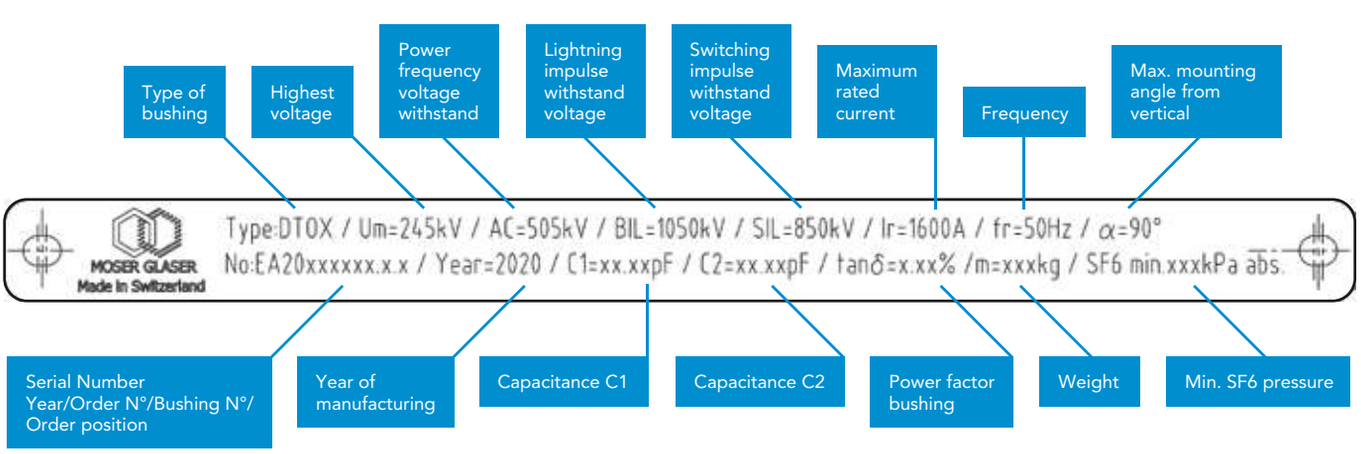
The current rating gives the maximum continuous rating with no effect on the bushing life time.
Bushing rating as well as cable size has to be chosen at least 20% above transformer rating.



## Corona shield

The bushings are all equipped with a removable corona shield at the transformer side.
A manhole on the transformer is required to access the connection.

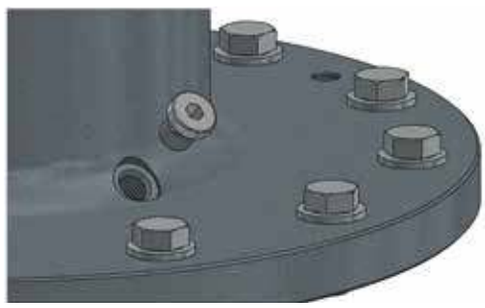
# Example of Nameplate marking



## Mounting flange

Made of corrosion free aluminium, equipped with:

- Test tap (all ratings), the grounding is done through the cap.
- Test voltage is 2kV / 60sec for 50Hz network or 72sec for 60Hz network.
- Self-earthed test tap available on request.
- Air vent screw at flange.



### Standard 2kV test tap





### Self-earthed test tap available as accessory

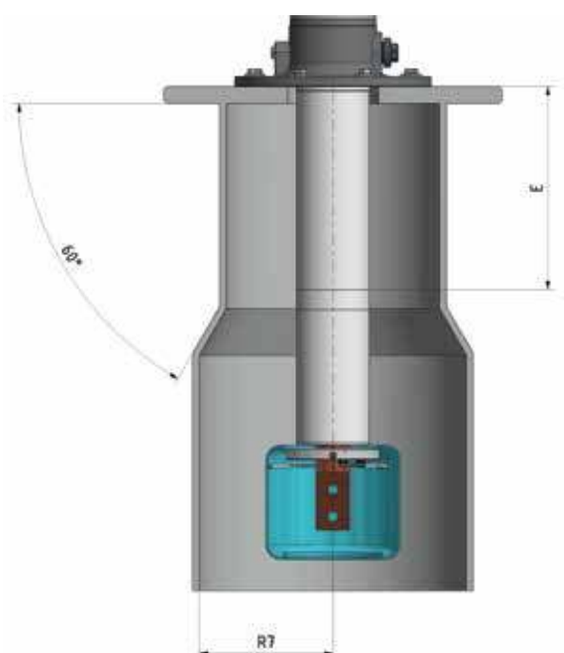





## Minimum distance to earthed parts

The distance to the earthed parts is depending of voltage, transformer tank design as well as oil condition and quality. This distance is according to the recommendation of the standard CLC / TS 50458, lower distance can be covered after approval from Moser Glaser.

R7 distance is given in the dimensions table.



# Accessories

## Long term storage RIP bushings

Protective tank is used to protect parts of RIP bushing which are used under service in transformer oil against damages or humidity.

They are used for long term storage as well as for protection during long transports.

The protection tank is delivered mounted on the bushing and filled with dry insulating oil.

After the sealing an air cushion remains in the protection tank which is necessary for compensation purposes due to temperature-sensitive volume variations.






## Shock indicator

On request, a shock indicator label can be fixed on the crate to check if it has experienced a mechanical shock.

## Offshore application (C5-M)

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.

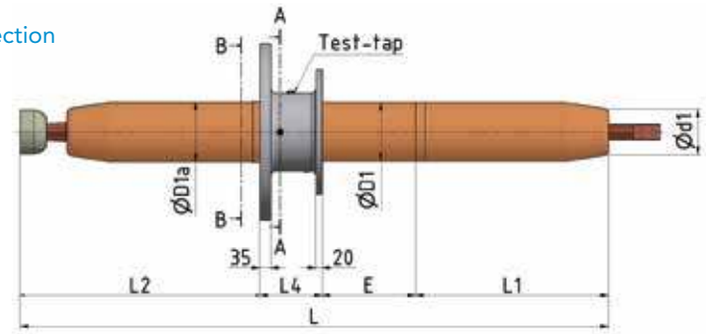
If you ordered a bushing for offshore application, the flange and the head of the bushing will be anodized, and the top terminal will be tin-plated.

Additional mounting advices are given in our online instruction manual www.mgc.ch.

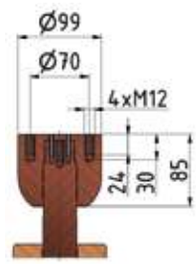


## Dimensions and technical characteristics

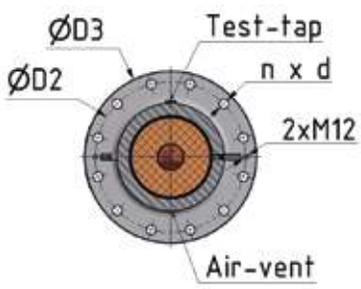
SF6 connection



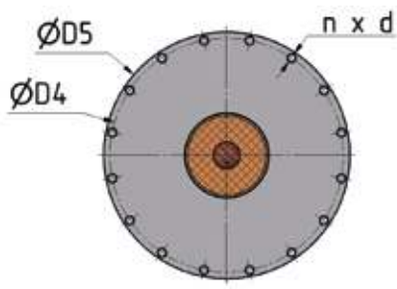

Type 1



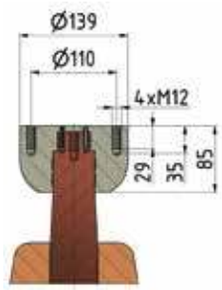

Flange A-A (transformer side)




Flange B-B (SF6 side)




Type 2




| | | | | | SF6 connection | SF6 side dimensions | | Flange SF6 side | | | | Flange transformer side | | | Oil side dimensions without terminal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Highest voltage (Um) | Dry power frequency withstand voltage (Up) | Lightning impulse withstand voltage (UBIL) | Rated current Fix-conductor (Ir) | Cantilever test load (min) Class II IEC 60137 | Diameter x Length | Active part diameter (D1a) | Length above flange (L2) | No. of bolts x diameter nxd | Bolt circle diameter (D4) | Outside diameter (D5) | Height (L4) | No. of bolts x diameter nxd | Bolt circle diameter (D2) | Outside diameter (D3) | Overal length (L) | Oil end length (L1) | Overal length (L) | Oil end length (L1) |
| | | | | | | | | | | | | | | | CT extension (E) 0mm | | CT extension (E) 300mm | |
| kV | kV | kV | A | N | | mm | mm | | mm | mm | mm | | mm | mm | mm | mm | mm | mm |
| 72.5 | 160 | 350 | 1250-2500 | 3150 | Type 1 (99x30) | 115 | 330 | 8x16 | 285 | 315 | 200 | 8x15 | 250 | 290 | 705 | 175 | 1005 | 475 |
| 100 | 205 | 450 | 1250-1600 | 2000 | Type 1 (99x30) | 115 | 330 | 8x16 | 285 | 315 | 200 | 8x15 | 290 | 335 | 760 | 230 | 1060 | 530 |
| | | | 2000 | 3150 | | 145 | 330 | 8x16 | 285 | 315 | 200 | 8x15 | 290 | 335 | 760 | 230 | 1060 | 530 |
| | | | 2500 | 3150 | | 145 | 330 | 8x16 | 285 | 315 | 200 | 8x15 | 290 | 335 | 760 | 230 | 1060 | 530 |
| 123 | 260 | 550 | 1250-1600 | 3150 | Type 1 (99x30) | 112 | 520 | 8x16 | 305 | 335 | 200 | 8x15 | 290 | 335 | 1060 | 340 | 1360 | 640 |
| | | | 2000 | 4000 | | 145 | 520 | 8x16 | 305 | 335 | 200 | 8x15 | 290 | 335 | 1060 | 340 | 1360 | 640 |
| | | | 2500 | 4000 | | 145 | 520 | 8x16 | 305 | 335 | 200 | 8x15 | 290 | 335 | 1060 | 340 | 1360 | 640 |
| 145 | 310 | 650 | 1250-2000 | 4000 | Type 1 (99x30) | 145 | 520 | 8x16 | 305 | 335 | 200 | 8x15 | 290 | 335 | 1080 | 360 | 1380 | 660 |
| | | | 2500 | 4000 | | 195 | 520 | 8x16 | 305 | 335 | 200 | 8x15 | 290 | 335 | 1080 | 360 | 1380 | 660 |
| 170 | 365 | 750 | 1250-1600 | 4000 | Type 1 (99x30) | 145 | 520 | 8x16 | 305 | 335 | 200 | 8x15 | 290 | 335 | 1220 | 500 | 1470 | 750 |
| | | | 2000 | 5000 | | 195 | 520 | 8x16 | 305 | 335 | 200 | 8x15 | 290 | 335 | 1170 | 450 | 1470 | 750 |
| | | | 2500 | 5000 | | 195 | 520 | 8x16 | 305 | 335 | 200 | 8x15 | 290 | 335 | 1170 | 450 | 1470 | 750 |
| 300 | 505 | 1050 | 1250-2000 | 5000 | Type 2 (139x30) | 195 | 770 | 16x16 | 535 | 565 | 200 | 12x23 | 400 | 450 | 1590 | 620 | 1890 | 920 |
| | | | 2500 | 5000 | | 250 | 770 | 16x16 | 535 | 565 | 200 | 12x23 | 400 | 450 | 1590 | 620 | 1890 | 920 |
| 362 | 950 | 1175 | 1250-2000 | 5000 | Type 2 (139x30) | 252 | 1050 | 16x20 | 640 | 690 | 200 | 12x23 | 400 | 450 | 1935 | 685 | 2235 | 985 |
| | | | 2500 | 5000 | | 252 | 1050 | 16x20 | 640 | 690 | 200 | 12x23 | 400 | 450 | 1935 | 685 | 2235 | 985 |
| 420 | 1175 | 1550 | 1250-1600 | 4000 | Type 2 (139x30) | 286 | 1050 | 16x20 | 640 | 690 | 200 | 12x23 | 450 | 500 | 2040 | 790 | 2340 | 1090 |
| | | | 2000 | 5000 | | 286 | 1050 | 16x20 | 640 | 690 | 200 | 12x23 | 450 | 500 | 2140 | 890 | 2340 | 1090 |
| | | | 2500 | 5000 | | 286 | 1050 | 16x20 | 640 | 690 | 200 | 12x23 | 450 | 500 | | | 2340 | 1090 |
| 550 | 1175 | 1675 | 1250-1600 | 4000 | Type 2 (139x30) | 286 | 1050 | 16x20 | 640 | 690 | 200 | 16x23 | 550 | 600 | | | 2440 | 1190 |
| | | | 2000 | 5000 | | 286 | 1050 | 16x20 | 640 | 690 | 200 | 16x23 | 550 | 600 | | | 2440 | 1190 |
| | | | 2500 | 5000 | | 286 | 1050 | 16x20 | 640 | 690 | 200 | 16x23 | 550 | 600 | | | 2440 | 1190 |

Fix-conductor 2 holes
72.5 – 170kV

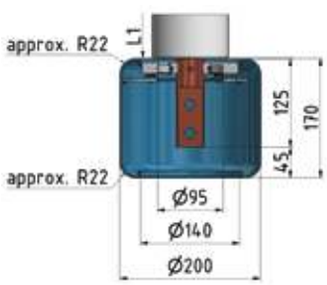



Fig. 2

Fix-conductor 2 holes
245 – 300kV

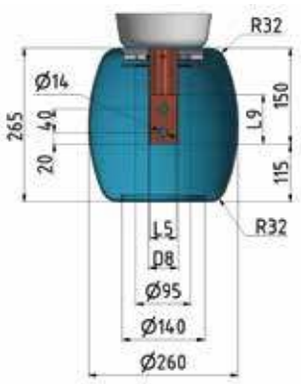



Fig. 2a

Fix-conductor 2 holes
362 – 550kV

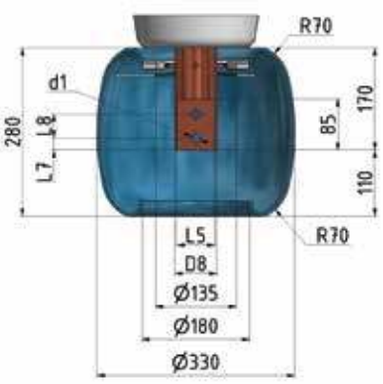



Fig. 2b

Fix-conductor 4 holes
362 – 550kV

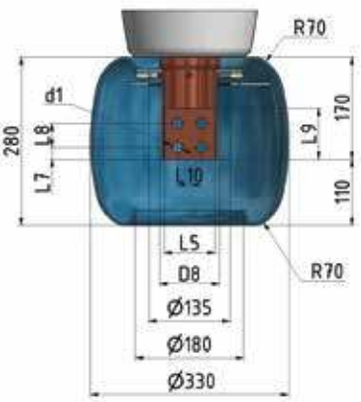



Fig. 2c

| Oil side dimensions without terminal | | | Bottom terminal | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Overal length (L) CT extension (E) 500mm | Oil end length (L1) | Active part diameter (D1) | Type of connection | Diametre (D8) | Usable width (L5) | Usable Length (L9) | Thickness (t) | Hole size (d1) | Distance between holes (L8) | Distance between holes (L10) | Distance bottom to the first hole (L7) | Distance HV to earth (R7) | Bushing type | Drawings references for RIP version On request for RIS | | |
| | | | | | | | | | | | | | | CT extension (E) 0mm | CT extension (E) 300mm | CT extension (E) 500mm |
| mm | mm | mm | | mm | mm | mm | mm | mm | mm | mm | mm | mm | | | | |
| 1205 | 675 | 111 | 2 | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 130 | DTOX 72.5kV 1250-2500A | 600.20.0009 | 600.20.0010 | 600.20.0011 |
| 1260 | 730 | 111 | 2 | 45 | 37 | 85 | 20 | 18 | 40 | | 20 | 145 | DTOX 100kV 1250-1600A | 600.20.0012 | 600.20.0013 | 600.20.0014 |
| 1260 | 730 | 141 | 2 | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 145 | DTOX 100kV 2000A | 600.20.0015 | 600.20.0016 | 600.20.0017 |
| 1260 | 730 | 141 | 2 | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 145 | DTOX 100kV 2500A | 600.20.0018 | 600.20.0019 | 600.20.0020 |
| 1560 | 840 | 111 | 2 | 45 | 37 | 85 | 20 | 18 | 40 | | 20 | 160 | DTOX 123kV 1250-1600A | 600.20.0021 | 600.20.0022 | 600.20.0023 |
| 1560 | 840 | 141 | 2 | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 160 | DTOX 123kV 2000A | 600.20.0024 | 600.20.0025 | 600.20.0026 |
| 1560 | 840 | 141 | 2 | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 160 | DTOX 123kV 2500A | 600.20.0027 | 600.20.0028 | 600.20.0029 |
| 1580 | 860 | 141 | 2 | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 190 | DTOX 145kV 1250-2000A | 600.20.0030 | 600.20.0031 | 600.20.0032 |
| 1580 | 860 | 190 | 2 | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 190 | DTOX 145kV 2500A | 600.20.0034 | 600.20.0035 | 600.20.0036 |
| 1670 | 950 | 141 | 2 | 50 | 40.3 | 85 | 20 | 18 | 40 | | 20 | 230 | DTOX 170kV 1250-1600A | 600.20.0037 | 600.20.0038 | 600.20.0039 |
| 1670 | 950 | 190 | 2 | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 230 | DTOX 170kV 2000A | 600.20.0040 | 600.20.0041 | 600.20.0042 |
| 1670 | 950 | 190 | 2 | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 230 | DTOX 170kV 2500A | 600.20.0043 | 600.20.0044 | 600.20.0045 |
| 2090 | 1120 | 190 | 2a | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 325 | DTOX 300kV 1250-2000A | 600.20.0046 | 600.20.0047 | 600.20.0048 |
| 2090 | 1120 | 246 | 2a | 60 | 56.7 | 85 | 20 | 18 | 40 | | 20 | 325 | DTOX 300kV 2500A | 600.20.0049 | 600.20.0050 | 600.20.0051 |
| 2235 | 1185 | 246 | 2b | 70 | 67.1 | 85 | 20 | 18 | 40 | | 20 | 370 | DTOX 362kV 1250-2000A | 600.20.0067 | 600.20.0068 | 600.20.0069 |
| 2235 | 1185 | 246 | 2c | 80 | 77.5 | 85 | 20 | 18 | 40 | 40 | 20 | 370 | DTOX 362kV 2500A | 600.20.0070 | 600.20.0071 | 600.20.0072 |
| 2540 | 1290 | 278 | 2b | 60 | 56.6 | 85 | 20 | 18 | 40 | | 20 | 510 | DTOX 420kV 1250-1600A | 600.20.0073 | 600.20.0060 | 600.20.0074 |
| 2540 | 1290 | 278 | 2b | 70 | 67.1 | 85 | 20 | 18 | 40 | | 20 | 510 | DTOX 420kV 2000A | 600.20.0075 | 600.20.0060 | 600.20.0074 |
| 2540 | 1290 | 278 | 2c | 90 | 87.7 | 85 | 20 | 18 | 40 | 50 | 20 | 510 | DTOX 420kV 2500A | | 600.20.0076 | 600.20.0077 |
| 2640 | 1390 | 328 | 2b | 60 | 56.6 | 85 | 20 | 18 | 40 | | 20 | 510 | DTOX 550kV 1250-1600A | | 600.20.0078 | 600.20.0079 |
| 2640 | 1390 | 328 | 2b | 80 | 77.5 | 85 | 20 | 18 | 40 | | 20 | 510 | DTOX 550kV 2000A | | 600.20.0080 | 600.20.0081 |
| 2640 | 1390 | 328 | 2c | 90 | 87.7 | 85 | 20 | 18 | 40 | 50 | 20 | 510 | DTOX 550kV 2500A | | 600.20.0082 | 600.20.0083 |

# Production facility

## Winding





## Impregnation







## Machining





# Production facility

## Silicone insulator molding





## Routine / type tests





## Packaging





## Range of transformer bushings

### DTOI(S)H / DTOIA(S)H

- Oil to air bushings
- IEC or IEEE standard
- From 52 to 550kV
- With hollow core insulator



### DTOIA(S)

- Oil to air bushings
- IEEE standard
- From 25 to 500kV



### DTO(S)

- Oil to oil bushings
- IEC standard
- From 72.5 to 550kV



### DTOI(S)

- Oil to Air bushings
- IEC standard
- From 25 to 362kV
- With direct molded silicone insulator



### DTOP RIP or RIS Transformer and Switchgear bushings in porcelain housing - up to 252kV

**ООО МОЗЕР ГЛАЗЕР**

In 2018, Moser Glaser decided to firmly consolidate its position on the high-voltage bushings market in Russia, and the CIS countries, by establishing the company OOO Moser Glaser with its head office, assembly site and testing laboratory, in the city of Kaluga.

OOO Moser Glaser is developing dynamically and continues to strengthen its reputation in the energy sector, while competing with international players and local manufacturers.

For more information: **www.mgc-ru.ch**

Email: **info@mgc-ru.ch**



# Range of transformer bushings







## OIP Condenser Bushing

Voltage rating: up to 145kV
Current rating: up to 3150A
Standards: IEC / IEEE
Connection: Draw-lead / Draw Rod / Stem type
Housing: Porcelain / Polymer

- Hermetically sealed and self contained
- Low dielectric loss and partial discharge free
- Exact interchangeability with global reputed makes
- Short lead time
- Excellent lead time
- Excellent mechanical strength
- Good seismic and short circuit withstand
- Easy clean alternate sheds
- Explosion proof lower end insulator

## High Current Bushing

Rated voltage: 24kV – 36kV
Types: Oil filled / Communicating OIP Condenser
Standard: IEC-60137:2017





- Single solid aluminium / copper conductor
- No welding or brazing below mounting flange
- Integral flat bottom terminal, directly milled on solid conductor
- High thermal stability / Short-circuit withstand capability
- High strength Porcelain
- Corrosion resistant metal parts
- Exact interchanganeability with global reputed makes
- Shortest lead time

For more information: **www.yashhv.com**

Email: **sales@yashhv.com**

DURESCA®
*Busbar system*



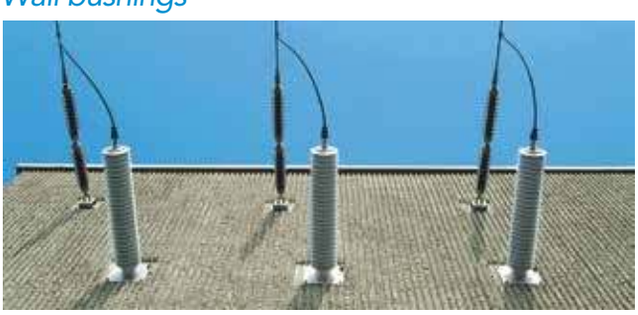
TIRESCA®
*Busbar system*



GASLINK®
*$SF_6$ insulated busbar system*



DURESCA®
*Wall bushings*



DURESCA®
*Transformer bushings*



MOSER GLASER

Current and voltage – our passion

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## Member of PFIFFNER Group

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