www.yashhv.com

YASH HIGHVOLTAGE

# Wall Through Bushing

**Insulation**: OIP Condenser-graded Wall Bushings

**Type**: Air to Air

**Rated Voltage**: 36 kV – 245 kV

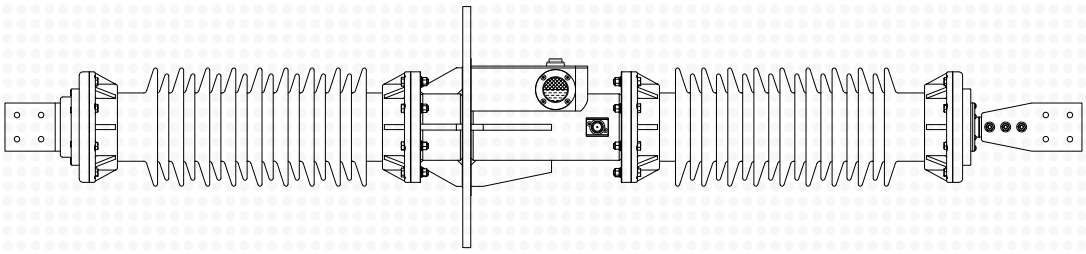
**Rated Current**: Upto 3150 A*

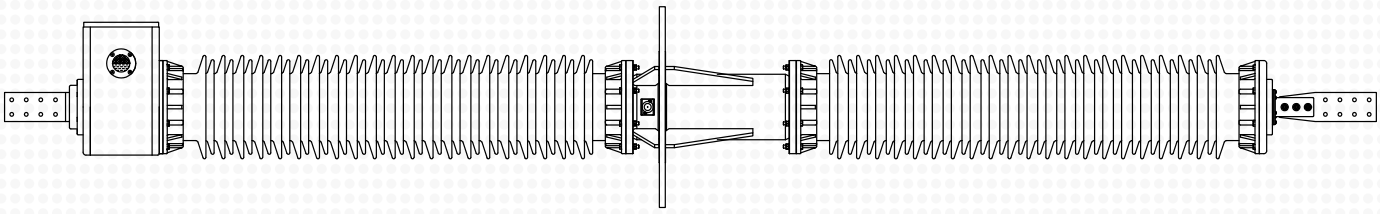
**Standard**: IEC 60137

**Housing**: Porcelain / Silicone / Polymer composite

*Customized Rated Current >3150A are available upon request

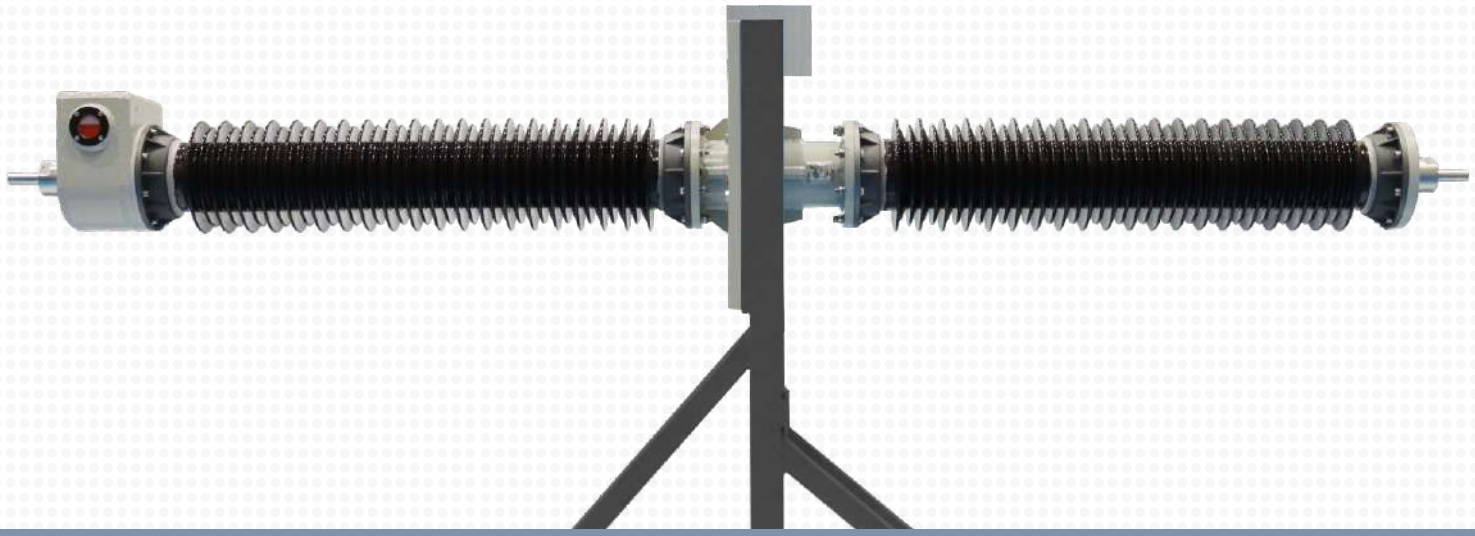
OIP W BUSHINGS





## Features and Highlights

- Finely graded computer aided design of condenser core for optimum electric field distribution
- Partial discharge free and low dissipation factor attributes to stable long-term performance
- High short circuit load withstand capacity
- Available with porcelain or composite insulator housing
- Excellent thermal performance
- Large-size prismatic oil level indicator for better visibility from distance and angles
- Viton material for O-ring / gaskets for sealing
- Special HV terminals available upon on request
- Tan delta / power factor and PD-values better than limits specified by standard
- Wide band DFR used to assess in-process quality
- Particle count analysis carried out on regular basis to control in-process oil quality



## Bushing Styles and Ratings

**Table-1 explains model numbering of bushings**

| V | C | S W# | 73 | 01 |
|---|---|---|---|---|
| Bushing type designation | Insulation type | Connection type | Voltage rating | Current rating |
| V= 36 kV upto 245 kV and current range from 1250 Amp upto 3150 Amp | C=OIP | S=Fixed Conductor | 36=36 kV | 01=1250 A |
| | | | 52=52 kV | 02=2000 A |
| | | | 72.5=73 kV | 03=3150 A |
| | | | 123=123 kV | |
| | | | 145=145 kV | |
| | | | 170=170 kV | |
| | | | 245=245 kV | |

# W=Refers to Wall bushing.
VCSW.7301 → Indicates 72.5 kV 1250 Amp
OIP Wall Bushing.

## Applicable Standard

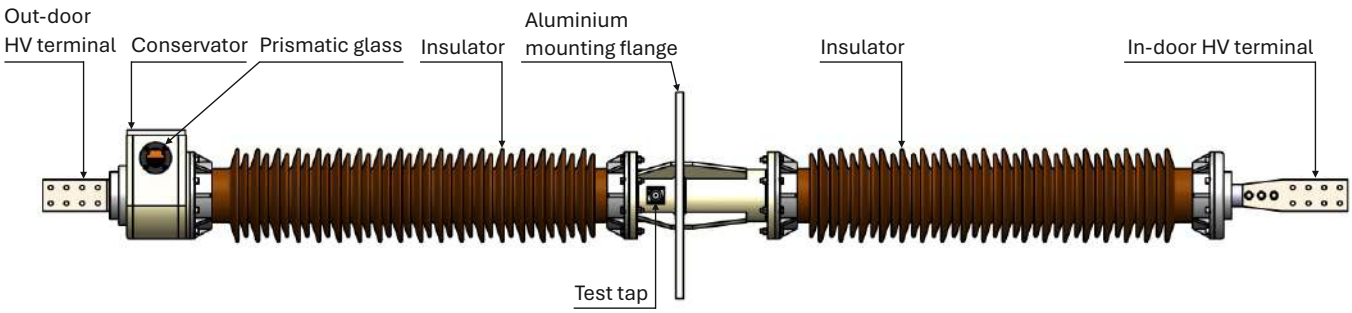
Yash® bushings, type VCSW, are designed to meet the requirements of the following standards and operating conditions.

- IEC 60137:2017 insulated bushings for alternating voltages above 1000 V

## Application

Type VCSW bushings are designed for Air to Air application to pass the electrical current at rated voltage through the wall of a room. Connection to the transmission/distribution system is achieved via fixed conductor with an industry standard HV terminal.

## Bushing Design, Construction and Characteristics




*Oil indicator (Prismatic glass) and conservator locations vary depending on the voltage rating and design requirements.

### Oil Impregnated Paper (OIP) Condenser Core

The bushing is self-contained with OIP condenser core. The OIP insulation is formed by winding high purity insulating kraft paper on the tube / rod. Aluminium foils are inserted at specific locations during the winding of the paper to form capacitive grading for an optimal axial and radial distribution of electrical field. The wound condenser core is then dried under vacuum to reduce its moisture content below 0.5% and subsequently impregnated with special napthene based mineral oil.

The OIP condenser core is then assembled with indoor and outdoor porcelain insulator, mounting flange, conservator, O-Rings / gaskets and then leak tested.

### Bushing Conservator and Oil Level Indicator

The Conservator is made of aluminium alloy and accommodates prismatic type oil level indicator and serves as oil expansion chamber. The bushing should be shipped and stored horizontally and mounted in a horizontal position. The prismatic type of oil level indicator with orange colour background allows easy check of the oil level in bushing even from a distance. The oil level indicator is made of UV grade polycarbonate material.

### Current Path

The bushing carries current through fixed solid conductor.

#### Fixed Current Carrying Conductor

The fixed conductor is either made from a solid rod or is made from a tube (either of copper or aluminium), based on specific bushing rating and customer requirement. The connection to transmission / distribution system is made to the HV terminal of the outdoor end of bushing, through a terminal connector. The HV terminal size and design depends on current rating and customer requirements.

### Air End Terminal

The air end terminal (either of copper or aluminium), is integral part of bushing's fixed conductor and cannot be removed. Fig. 3 shows the connection of HV terminal.

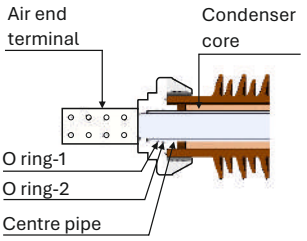
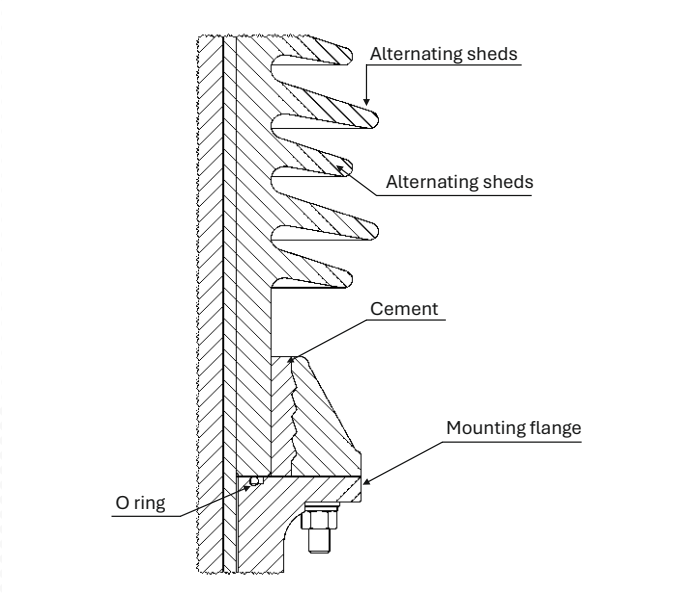



Fig.3

## Outdoor and Indoor Porcelain Insulator

The porcelain insulator is a one-piece (upto 145 kV), high quality brown glazed porcelain with a self-cleaning 'alternating type' shed profile complying to IEC 60815-2. The porcelain insulator has sturdy sheds suitable for high pressure hotline washing and to provide the standard creepage distance of 25 or 31mm / kV (Ph-Ph).

Porcelain insulator is cemented with the cast-aluminum alloy flange for the increased cantilever withstand capability.




Higher creepage versions or composite insulator (polymer insulator) with silicon sheds are also available upon request.

## Insulating Oil

The annular space inside the bushing housing is first evacuated and then filled with dried, degassed high grade transformer insulating oil. The oil is dried, degassed and is filled up to half level in oil level indicator at an ambient temperature of approx. 30°C. This oil is part of the insulating and cooling system of the bushing and evacuated space above oil level is purged with dry nitrogen ($N_2$) gas, which works as cushion to oil volume variations due to temperature variation due to site ambient variations and also due to temperature rised due to passage of current during service.

## Mounting Flange

The mounting flange is made of aluminum alloy and houses:

- Eye bolts
- Oil sampling plug
- Test tap
- Conservator with prismatic type oil level indicator

The mounting flange includes provisions for accommodating a wall thickness and CT space. Bushings suitable for different wall thickness also can be supplied.

## Test tap

For bushings with test tap (Fig.5), during assembly a cable is soldered on to the outermost layer of conducting foil of condenser and is crimped to the test tap stem, to assess dielectric properties (tan delta / power factor) of insulating condenser core and monitor health of bushing.

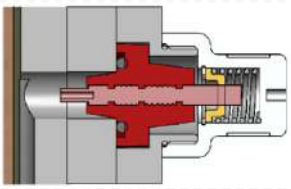


Fig.5

## Nameplate Data

The Fig.6 shows the OIP wall bushing nameplate, fixed on bushing mounting flange has photographic layer which is ultraviolet radiation proof for longevity of the printed data. name plate is engraved with details of bushing serial number, year of manufacture and capacitance and tan delta / power factor test results during factory measurement data.

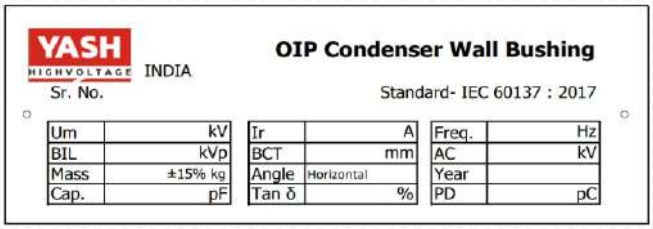



Fig.6

## O-rings and Gaskets

All O-rings used in bushing are made of Viton (suitable for higher temperature withstand). These O-rings are compatible with oil used in the bushing. For special requirements, such as low ambient temperatures (down to -60°C), special O-rings and special insulating oil are used.

## Fasteners

All fasters used in bushing are made of stainless steel material.

## Metal Surface Treatment

Test tap cap are electro-plated and avoids corrosion throughout lifetime and allows for easy screwing and unscrewing during service.

Though all exposed metal components are made of corrosion-resistant aluminum alloy. Upon request all metal components can be painted / powder coated for special applications like severe polluted environments specified in ISO 12944.

## Standard Features

| | |
|---|---|
| Ambient temperature | -20 to + 40 °C |
| Oil temperature rise | ≤ 60 °C above ambient of 40 °C |
| Altitude of operation | ≤ 1000 m |
| Mounting angle | Horizontal |
| Supply frequency | 50/60 Hz |
| Tan delta / power factor at room temperature | 0.15% ~ 0.40% (≤0.7% IEC limit) |

Special requirements are guaranteed in GA drawing and supersedes above data. Bushings with special requirements are supplied against specific customer requirements.

## Tests

### Type test

- Dry and wet power-frequency voltage withstand test
- Long duration power-frequency voltage withstand test (For ≥ 170 kV)
- Dry lightning impulse voltage withstand test
- Dry switching impulse voltage withstand test (For ≥ 170 kV)
- Electromagnetic compatibility test (For ≥ 123 kV)
- Temperature rise test
- Verification of thermal short-time current withstand by calculation method
- Cantilever load withstand test
- Leak proofness / tightness test
- Verification of dimensions

### Routine test

- Measurement of tan delta / power factor and capacitance at ambient temperature
- Dry lightning impulse voltage withstand test (for >72.5 kV bushings)
- Dry power-frequency voltage withstand test
- Measurement of partial discharge
- Tests of tap insulation
- Leak proofness / tightness test
- Visual inspection and dimensional check

## Packing and Transportation

After tests and before packing, the bushing is cleaned to remove any dust. Each bushing is packed and shipped in horizontal position. All fittings used in boxes are seaworthy steel material. Each bushing's packing case is provided with appropriate shock watch labels to register any undue jerks / impacts during transportation and handling.

## Installation Instructions

When installing the bushings, detailed installation instructions listed in operation and maintenance manual of Yash® should be followed.

## Ordering Details

**When ordering please specify the following:**

- Bushing type and model number
- Current rating
- Voltage class and BIL
- Any non-standard requirement such as impulse tests or high / low temperature application and different creepage distance.

## OIP Wall bushing Up to 72.5 kV

| Model | Highest System Voltage, kV | Phase to earth voltage, kV | Rated continuous current, Ir Amp | Lightning impulse insulation level, kVp | Switching lightening impulse, kVp | AC test level, kV | Connection to the Transmission / Distribution system | Cantilever test load, N | Altitude of operation, m | L1, mm | L2, mm | L-Total length of bushing, mm | L3- Distance of Bushing live part from flange on outdoor side, mm | L4- Distance of Bushing live part from flange on indoor side, mm | AD- Arcing distance, mm | L5- Length for mounting CT and Wall thickness, mm | Terminal details on indoor and outdoor side | Flange details | t- Flange thickness, mm | Minimum wall opening in round shape, mm | øD1 – Maximum porcelain insulator OD, mm | Creepage distance, mm | Approx. weight (+/-15%), kg | Approx. oil quantity, ltr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VCSW.3601 | 36 | 21 | 1250 | 170 | NA | 70 | SS | 1250 | 1000 | 895 | 1260 | 2155 | 620 | 870 | 400 | 400 | Fig.8 | Fig.10 | 20 | 380 | 310 | 900 | 135 | 12.0 |
| | | | | | | | | | | | | | | | | | | | | | 320 | 1116 | 145 | 12.0 |
| VCSW.3602 | 36 | 21 | 2000 | 170 | NA | 70 | SS | 2000 | 1000 | 895 | 1260 | 2155 | 620 | 870 | 400 | 400 | Fig.8 | Fig.10 | 20 | 380 | 310 | 900 | 140 | 11.5 |
| | | | | | | | | | | | | | | | | | | | | | 320 | 1116 | 150 | 11.5 |
| VCSW.3603 | 36 | 21 | 3150 | 170 | NA | 70 | SS | 3150 | 1000 | 980 | 1335 | 2315 | 620 | 870 | 400 | 400 | Fig.9 | Fig.10 | 20 | 380 | 310 | 900 | 145 | 10.0 |
| | | | | | | | | | | | | | | | | | | | | | 320 | 1116 | 155 | 10.0 |
| VCSW.5201 | 52 | 30 | 1250 | 250 | NA | 95 | SS | 1250 | 1000 | 995 | 1360 | 2355 | 720 | 970 | 500 | 400 | Fig.8 | Fig.10 | 20 | 380 | 310 | 1300 | 145 | 13.0 |
| | | | | | | | | | | | | | | | | | | | | | 320 | 1612 | 160 | 13.0 |
| VCSW.5202 | 52 | 30 | 2000 | 250 | NA | 95 | SS | 2000 | 1000 | 995 | 1360 | 2355 | 720 | 970 | 500 | 400 | Fig.8 | Fig.10 | 20 | 380 | 310 | 1300 | 155 | 12.5 |
| | | | | | | | | | | | | | | | | | | | | | 320 | 1612 | 170 | 12.5 |
| VCSW.5203 | 52 | 30 | 3150 | 250 | NA | 95 | SS | 3150 | 1000 | 1080 | 1435 | 2515 | 720 | 970 | 500 | 400 | Fig.9 | Fig.10 | 20 | 380 | 310 | 1300 | 160 | 11.0 |
| | | | | | | | | | | | | | | | | | | | | | 320 | 1612 | 175 | 11.0 |
| VCSW.7301 | 72.5 | 42 | 1250 | 325 | NA | 140 | SS | 1250 | 1000 | 1155 | 1520 | 2675 | 880 | 1130 | 660 | 400 | Fig.8 | Fig.10 | 20 | 380 | 310 | 1813 | 150 | 14.0 |
| | | | | | | | | | | | | | | | | | | | | | 320 | 2248 | 170 | 14.0 |
| VCSW.7302 | 72.5 | 42 | 2000 | 325 | NA | 140 | SS | 2000 | 1000 | 1155 | 1520 | 2675 | 880 | 1130 | 660 | 400 | Fig.8 | Fig.10 | 20 | 380 | 310 | 1813 | 160 | 13.5 |
| | | | | | | | | | | | | | | | | | | | | | 320 | 2248 | 180 | 13.5 |
| VCSW.7303 | 72.5 | 42 | 3150 | 325 | NA | 140 | SS | 4000 | 1000 | 1240 | 1595 | 2835 | 880 | 1130 | 660 | 400 | Fig.9 | Fig.10 | 20 | 380 | 310 | 1813 | 165 | 11.5 |
| | | | | | | | | | | | | | | | | | | | | | 320 | 2248 | 185 | 11.5 |

## OIP Wall bushing 123 kV to 245 kV

| Model | Highest System Voltage, kV | Phase to earth voltage, kV | Rated continuous current, Ir Amp | Lightning impulse insulation level, kVp | Switching lightening impulse, kVp | AC test level, kV | Connection to the Transmission / Distribution system | Cantilever test load, N | Altitude of operation, m | L1, mm | L2, mm | L-Total length of bushing, mm | L3- Distance of Bushing live part from flange on outdoor side, mm | L4- Distance of Bushing live part from flange on indoor side, mm | AD- Arcing distance, mm | L5- Length for mounting CT and Wall thickness | L6- Width of Conservator, mm | H- Height of conservator, mm | Terminal details on indoor and outdoor side | Flange details | t- Flange thickness, mm | Minimum wall opening in round shape, mm | øD1 – Maximum porcelain insulator OD, mm | Creepage distance, mm | Approx. weight (+/-15%), kg | Approx. oil quantity, ltr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VCSW.12302 | 123 | 71 | 2000 | 550 | NA | 230 | SS | 2500 | 1000 | 1775 | 1810 | 3585 | 1250 | 1420 | 1050 | 300 | 320 | 450 | Fig.8 | Fig.11 | 20 | 420 | 360 | 3075 | 310 | 48 |
| | | | | | | | | | | | | | | | | | | | | | | | 380 | 3813 | 365 | 48 |
| VCSW.12303 | 123 | 71 | 3150 | 550 | NA | 230 | SS | 4000 | 1000 | 1860 | 1890 | 3750 | 1250 | 1420 | 1050 | 300 | 320 | 450 | Fig.9 | Fig.11 | 20 | 420 | 360 | 3075 | 335 | 45 |
| | | | | | | | | | | | | | | | | | | | | | | | 380 | 3813 | 390 | 45 |
| VCSW.14502 | 145 | 84 | 2000 | 650 | NA | 275 | SS | 2500 | 1000 | 1985 | 2020 | 4005 | 1460 | 1630 | 1260 | 300 | 320 | 450 | Fig.8 | Fig.11 | 20 | 420 | 360 | 3625 | 360 | 50 |
| | | | | | | | | | | | | | | | | | | | | | | | 380 | 4495 | 425 | 50 |
| VCSW.14503 | 145 | 84 | 3150 | 650 | NA | 275 | SS | 4000 | 1000 | 2070 | 2100 | 4170 | 1460 | 1630 | 1260 | 300 | 320 | 450 | Fig.9 | Fig.11 | 20 | 420 | 360 | 3625 | 385 | 47 |
| | | | | | | | | | | | | | | | | | | | | | | | 380 | 4495 | 400 | 47 |
| VCSW.17002 | 170 | 98 | 2000 | 750 | NA | 325 | SS | 2500 | 1000 | 2175 | 2210 | 4385 | 1650 | 1820 | 1450 | 300 | 320 | 450 | Fig.8 | Fig.11 | 20 | 420 | 360 | 4250 | 410 | 55 |
| | | | | | | | | | | | | | | | | | | | | | | | 380 | 5270 | 490 | 55 |
| VCSW.17003 | 170 | 98 | 3150 | 750 | NA | 325 | SS | 4000 | 1000 | 2260 | 2290 | 4550 | 1650 | 1820 | 1450 | 300 | 320 | 450 | Fig.9 | Fig.11 | 20 | 420 | 360 | 4250 | 440 | 52 |
| | | | | | | | | | | | | | | | | | | | | | | | 380 | 5270 | 520 | 52 |
| VCSW.24502 | 245 | 142 | 2000 | 1050 | 750 | 460 | SS | 2500 | 1000 | 3045 | 3070 | 6115 | 2505 | 2675 | 2153 | 400 | 340 | 490 | Fig.8 | Fig.12 | 25 | 600 | 380 | 6125 | 785 | 78 |
| | | | | | | | | | | | | | | | | | | | | | | | 390 | 7595 | 825 | 78 |
| VCSW.24503 | 245 | 142 | 3150 | 1050 | 750 | 460 | SS | 4000 | 1000 | 3130 | 3140 | 6270 | 2505 | 2675 | 2153 | 400 | 360 | 500 | Fig.9 | Fig.12 | 25 | 600 | 400 | 6125 | 870 | 82 |
| | | | | | | | | | | | | | | | | | | | | | | | 410 | 7595 | 940 | 82 |

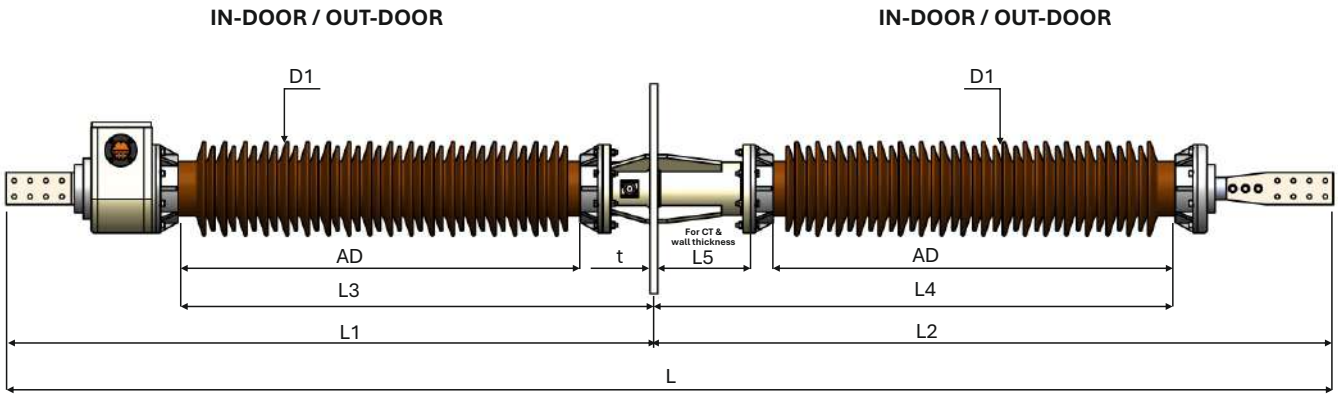
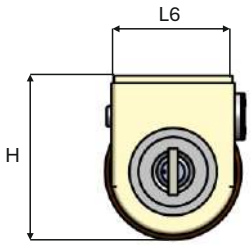



Fig.7



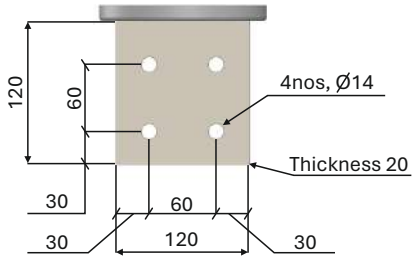




Fig.8

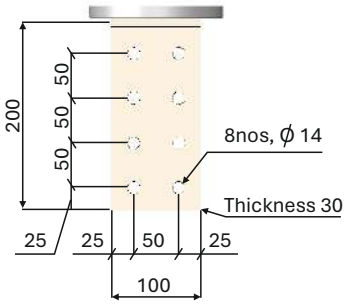



Fig.9

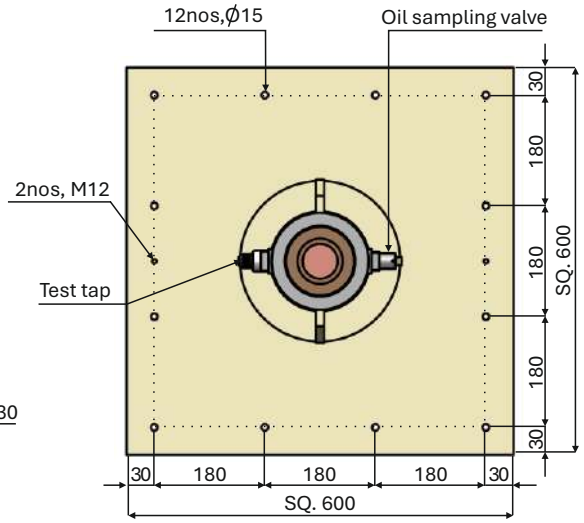



Fig.10
Mounting flange 36 kV to 72.5 kV

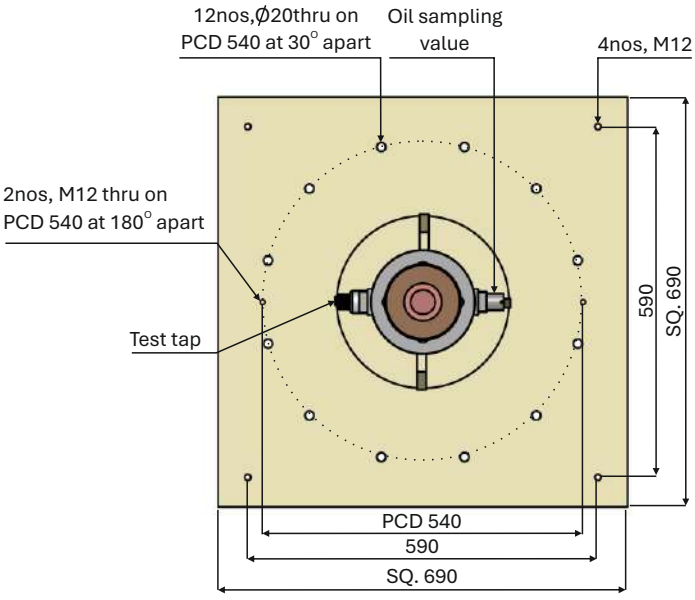



Fig.11
Mounting flange 123 kV to 170 kV

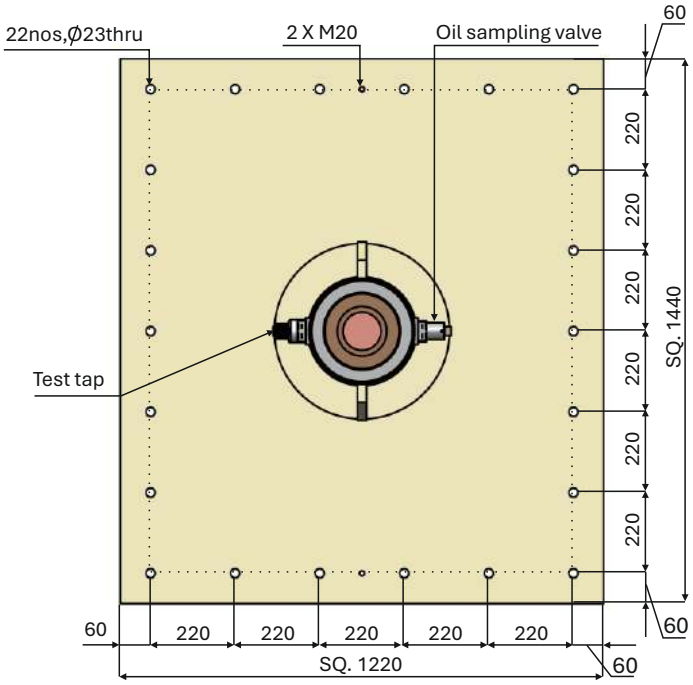



Fig.12
Mounting flange 245 kV

# Product Range

## OIP CONDENSER BUSHINGS

Rated Voltage:
**24 kV – 245 kV**

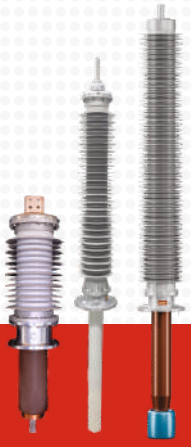
Rated Current:
**Up to 3150 A***

Standards:
**IEC-60137:2017 / IEEE C57.19.00/01 / Others**

Connector:
**Draw lead / Draw rod / Stem type**

Housing:
**Porcelain / Silicone / Polymer composite**

*Customized rated current >3150A are available upon request



## RIP/RIS CONDENSER BUSHINGS

Rated Voltage:
**24 kV – 245 kV**

Rated Current:
**Up to 3150 A***

Standard:
**IEC-60137:2017**

Connector:
**Draw lead / Draw rod / Stem type**

Housing:
**Silicone / Polymer composite**

*Customized rated current >3150A are available upon request

Technology collaboration
MOSER GLASER
[For Indian supplies]

## HIGH CURRENT BUSHINGS

Rated Voltage:
**24 kV – 52 kV***

Rated Current:
**Up to 25000 A**

Standard:
**IEC-60137:2017 / IEEE C57.19.00/01 / Others**

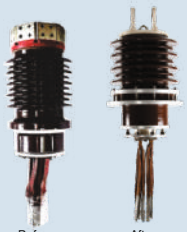
Types:
**Oil filled / Communicating / OIP condenser**

Connector:
**Aluminum / Copper**

*Special / higher voltage ratings available upon request


## RETROFIT SOLUTIONS

Interchangeable solutions possible for OIP-to-OIP, OIP-to-RIP, OIP-to-RIS bushings of global reputed makes for up to 245 kV and 25000 A.




**ILAC accredited EHV lab**

YASH HIGHVOLTAGE

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