

Oil to Oil OIP Bushing

Insulation: Oil Impregnated Paper (OIP)

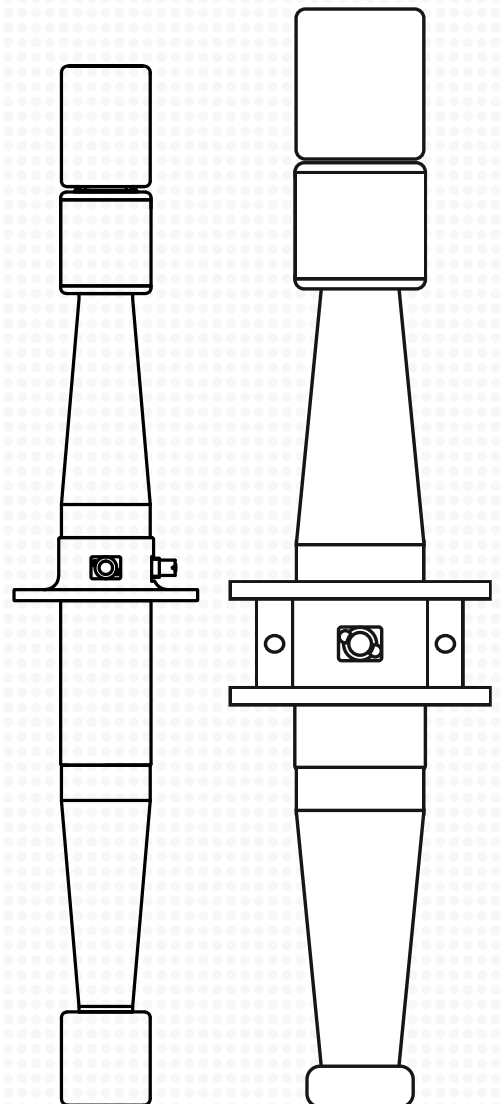
Type: Oil to Oil

Rated Voltage: 36 kV – 245 kV

Rated Current: Upto 3150 A*

Standard: IEC-60137:2017 / IEEE C57.19.00/01 / CLC/TS
50458:2006 / Other equivalent

*Customized Rated Current >3150A are available upon request



Features and Highlights



- More than 20 years of experience in manufacturing world-class bushings
- Finely graded computer aided design of condenser core for optimum electric field distribution
- Fully type tested product range at accredited laboratories
- Partial discharge free and low dissipation factor assures long term reliability
- Shatter-proof epoxy insulator
- Viton material for O-ring/Gaskets for sealing
- Special HV terminals available upon request
- Potential for customization of BCT, transformer end length, mounting flange
- Shortest lead times
- Possibility of horizontal transport and storage
- Availability of single flange and double flange options for assembly in cable box
- Remote test tap connection assembly for bushing test tap access outside of the cable box for single flange design
- Fixed conductor design to avoid possibility of oil communication from transformer to cable box

Bushing Styles and Ratings

Table-1 explains model numbering of bushings

<u>V</u>	<u>C</u>	<u>S</u> <u>O</u> [#]	<u>73</u>	<u>01</u>
Bushing type designation	Insulation type	Connection type	Voltage rating	Current rating
V= 36 kV upto 245 kV and current range upto 3150 Amp	C=OIP	S=Fixed conductor	36=36 kV	02=2000 A
			52=52 kV	03=3150 A
			72.5=73 kV	
			123=123 kV	
			145=145 kV	
			170=170 kV	
			245=245 kV	

[#]O refers to Oil to Oil bushings

VCSO.7302 indicates 72.5 kV 2000 Amp OIP Oil to Oil bushing

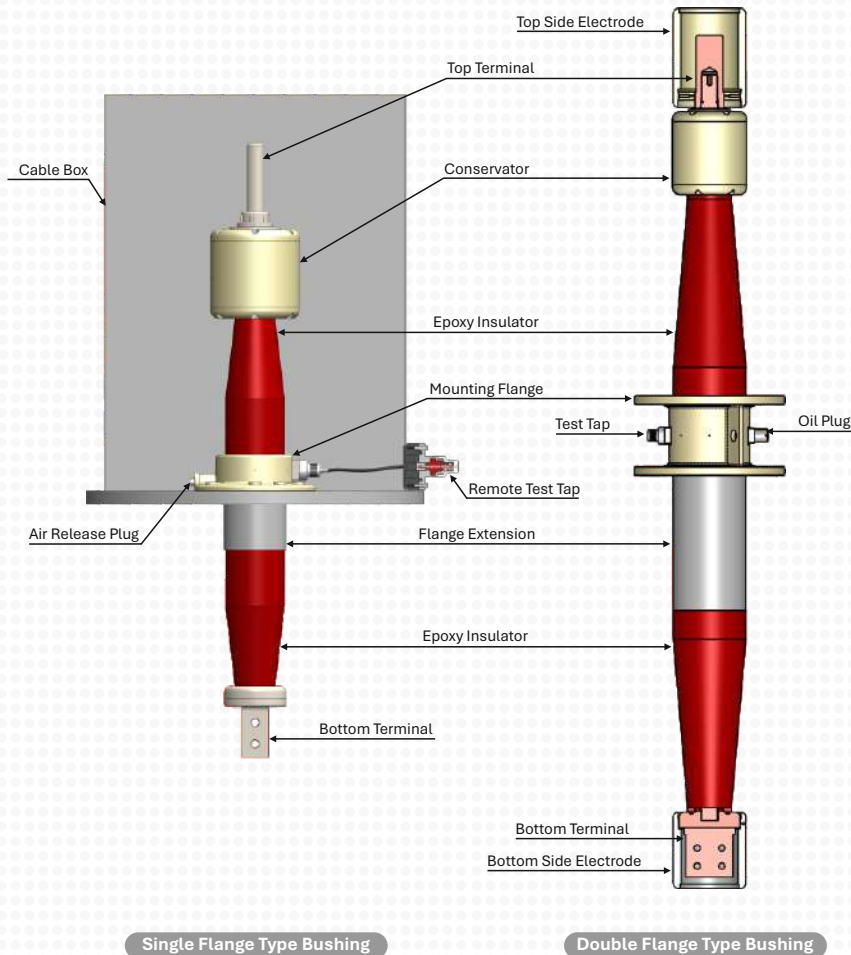
Applicable Standard

Yash® bushings of type VCSO are designed to meet the requirements and operating condition of IEC 60137:2017 insulated bushing for alternating voltage above 1000 V.

Application

Type VCSO bushings are designed for Oil to Oil applications in mineral oil-filled power transformers, with parts above the mounting flange located in the cable box and parts below the mounting flange connected to the transformer winding. These bushings are used to connect the HV power cable termination to the power transformer in an oil-filled cable box. The connection to the transformer winding leads is made at the bottom through a fixed conductor.

Bushing Design, Construction and Characteristics



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 centre conductor. 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 moisture content in paper to below 0.5% and subsequently impregnated with special naphthene based mineral oil.

The OIP condenser core is then assembled with top and bottom epoxy insulator, mounting flange, conservator, O-rings/ Gaskets.

The entire bushing assembly is held together by coil spring assembly, housed inside the bushing conservator and then leak tested. Coil springs always maintains required pressure on sealing rings, over the entire range of operating temperature.

Bushing Conservator

The conservator is made of aluminum alloy and serves as oil expansion chamber.

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 from a tube, based on specific bushing ratings. The connection to the transformer winding leads is connected at the bottom end of the bushings. The terminal size and design depends on current ratings and customer requirements.

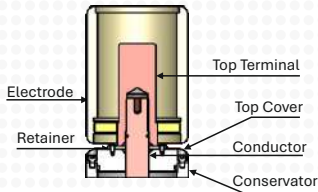
Electrode/Shield

High voltage bushings of and above 72.5 kV require an oil end electrode/shield to control the electrical field strength at the transformer end of the bushings and to shield the bolted connection between the transformer lead and fixed-conductor.

Fixed-conductor bushings are provided with externally mountable electrode/shield.

The electrode/shield made of aluminum alloy is provided with insulation coating.

HV Terminal



In bottom connected bushings, which are stem type, the HV terminal is integral part of bushing's fixed conductor and need not be removed.

Insulating Oil

The annular space inside the bushing housing is first evacuated and then filled with dried, degassed high grade transformer insulating oil. This oil is part of the insulating and cooling system of the bushings. The evacuated space above oil level is purged with Dry Nitrogen (N₂) gas, which works as cushion to oil volume variations due to temperature changes on account of ambient temperature variations and also temperature rise due to current flow.

Epoxy Insulator

The insulator are made of cast epoxy resin. The cast epoxy resin insulator is shatter-resistant and less susceptible to damage from handling.

Epoxy insulator can achieve accurate shapes, thickness and very low dimensional tolerances.

Mounting Flange and Bushing Current Transformer (BCT) Mounting

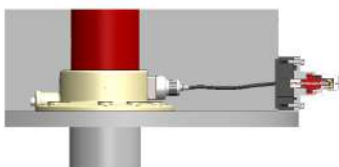
The mounting flange is made of aluminum alloy casting and houses:

- Air release plug: 1/4" air release plug
- Oil plug
- Test tap (power factor tap)

Below the mounting flange, a ground sleeve for current transformer mounting is provided. The ground sleeve is made of aluminum alloy. Specific length for BCT mounting is available upon request.

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 monitoring health of the bushings.



Bushings with single flange design can be delivered with a remote-test-tap connection (coaxial cable and connector assembly) for the test tap extension outside of the cable box.

Nameplate Data

The nameplate, fixed on bushing mounting flange has photographic layer which is ultraviolet radiation proof for longevity of the printed data. Nameplate is engraved with details of bushing serial number, year of manufacture and electrical test results during routine testing in factory.

YASH HIGH VOLTAGE INDIA		OIP Oil-Oil Condenser Bushing			
Sr. No.		Standard- IEC 60137 : 2017			
Um	kV	Ir	A	Freq.	Hz
BIL	kVp	BCT	mm	AC	kV
Mass	±15%kg	Mounting		Year	
Cap.	pF	TAN δ	%	PD	pC

O-rings and Gaskets

All O-rings used in bushing are made of Viton. 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 fasteners used in bushing are made of stainless steel material.

Metal Surface Treatment

Test tap cover is 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, exposed to ambient, can be painted / powder coated for special applications, like harsh environments, specified in ISO12944.



Standard Features

Ambient temperature	-20 to +40 °C
Cable box oil temperature and transformer oil temperature	< 95 °C
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 bushings)
- Dry lightning impulse voltage withstand test
- Dry switching impulse voltage withstand test (For ≥ 245 kV bushings)
- Electromagnetic compatibility test (For ≥ 123 kV bushings)
- Temperature rise test
- Verification of thermal short-time current withstand
- Cantilever load withstand test
- 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
- Tightness test
- Visual inspection and dimensional check

Packing and Transportation

After tests and before packing, the bushings are 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.

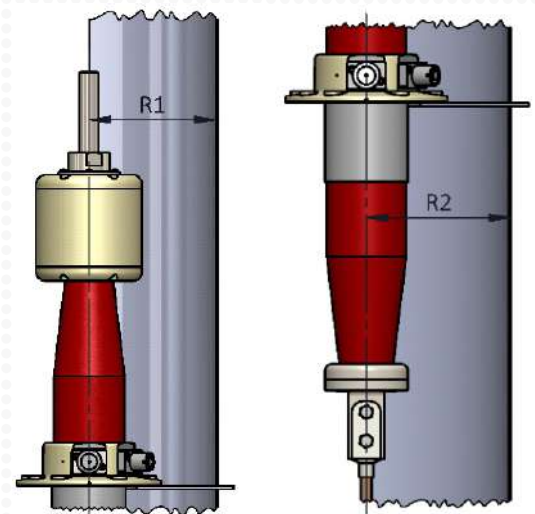
Installation Instructions

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

Distance of Grounded Objects from Live Parts

The following recommendations of dimensions are intended as guidelines for high-quality mineral transformer oil (BDV > 70 kV in 2.5 mm gap, Tan Delta @ 90°C < 0.005 , and water content < 7 PPM). Refer GA drawing for bushing specific design calculations to verify the proper clearances.

U_m	S, mm	R1, mm	R2, mm
Up to 72.5 kV	10	275	150
145 kV	15	275	250
170 kV	15	275	275
245 kV	20	390	390

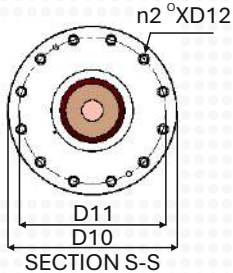
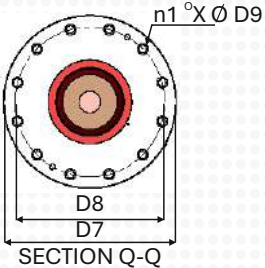


Model	Type of Mounting Arrangement	Highest System Voltage, kV	Phase to Earth Voltage, kV	Rated Continuous Current, Ir Amp	Lightning Impulse Insulation Level, kVp	Switching Lightning Impulse Insulation Level, kVp	AC Test Level, kV	Connection to Transformer	Cantilever Test Load, N
VCSO.3602.100	Single mounted	36	21	Upto 2000	170	NA	77	SS	2000
VCSO.3602.300		36	21	Upto 2000	170	NA	77	SS	2000
VCSO.3602.600		36	21	Upto 2000	170	NA	77	SS	2000
VCSO.3603.100		36	21	3150	170	NA	77	SS	3150
VCSO.3603.300		36	21	3150	170	NA	77	SS	3150
VCSO.3603.600		36	21	3150	170	NA	77	SS	3150
VCSO.5202.100		52	30	Upto 2000	250	NA	105	SS	2000
VCSO.5202.300		52	30	Upto 2000	250	NA	105	SS	2000
VCSO.5202.600		52	30	Upto 2000	250	NA	105	SS	2000
VCSO.5203.100		52	30	3150	250	NA	105	SS	3150
VCSO.5203.300		52	30	3150	250	NA	105	SS	3150
VCSO.5203.600		52	30	3150	250	NA	105	SS	3150
VCSO.7302.100		72.5	42	Upto 2000	325	NA	155	SS	2000
VCSO.7302.300		72.5	42	Upto 2000	325	NA	155	SS	2000
VCSO.7302.600		72.5	42	Upto 2000	325	NA	155	SS	2000
VCSO.7303.100		72.5	42	3150	325	NA	155	SS	4000
VCSO.7303.300		72.5	42	3150	325	NA	155	SS	4000
VCSO.7303.600		72.5	42	3150	325	NA	155	SS	4000
VCSO.3602.100	Double mounted	145	84	Upto 2000	650	NA	305	SS	2500
VCSO.3602.300		145	84	Upto 2000	650	NA	305	SS	2500
VCSO.3602.600		145	84	Upto 2000	650	NA	305	SS	2500
VCSO.3603.100		145	84	3150	650	NA	305	SS	4000
VCSO.3603.300		145	84	3150	650	NA	305	SS	4000
VCSO.3603.600		145	84	3150	650	NA	305	SS	4000
VCSO.5202.100		170	98	Upto 2000	750	NA	355	SS	2500
VCSO.5202.300		170	98	Upto 2000	750	NA	355	SS	2500
VCSO.5202.600		170	98	Upto 2000	750	NA	355	SS	2500
VCSO.5203.100		170	98	3150	750	NA	355	SS	4000
VCSO.5203.300		170	98	3150	750	NA	355	SS	4000
VCSO.5203.600		170	98	3150	750	NA	355	SS	4000
VCSO.7302.100		245	142	Upto 2000	1050	750	505	SS	2500
VCSO.7302.300		245	142	Upto 2000	1050	750	505	SS	2500
VCSO.7302.600		245	142	Upto 2000	1050	750	505	SS	2500
VCSO.7303.100		245	142	3150	1050	750	505	SS	4000
VCSO.7303.300		245	142	3150	1050	750	505	SS	4000
VCSO.7303.600		245	142	3150	1050	750	505	SS	4000

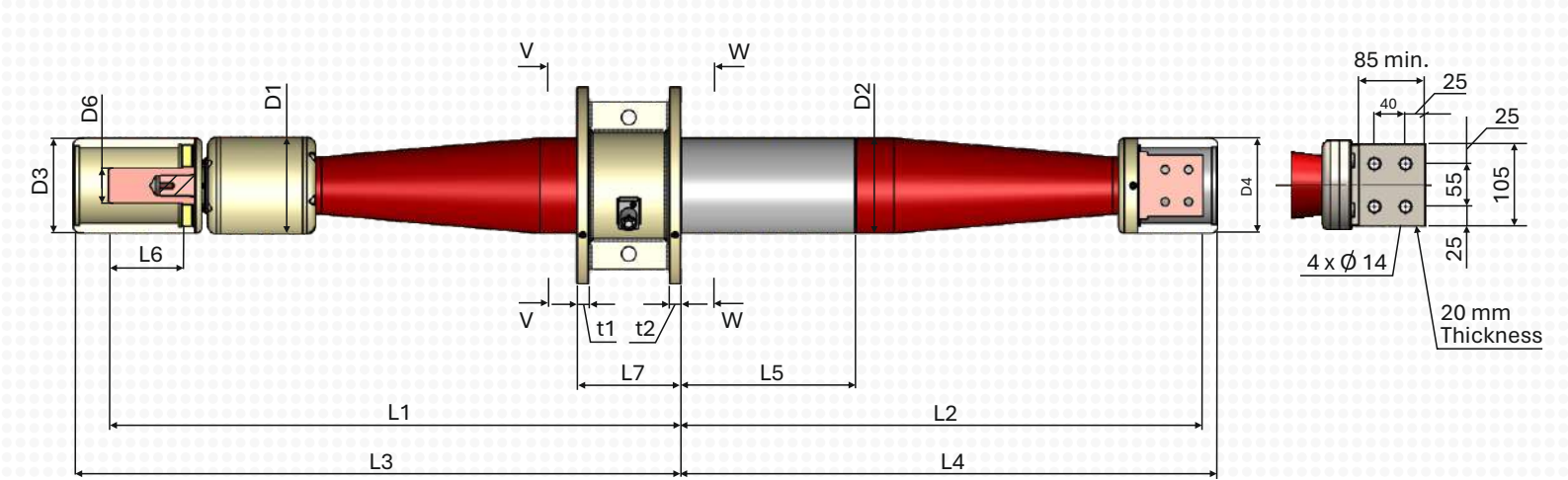
Ordering Details

While ordering, please specify the following:

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



L1- Top end side length upto top terminal, mm	L2- Bottom side length upto bottom terminal, mm	L3- Top end side length with Electrode, mm	L4- Bottom end side length with Electrode, mm	L5- CT space, mm	øD1- Conservator diameter, mm	øD2- Bottom end side max. diameter, mm	øD3- Electrode diameter on top end side, mm	øD4- Electrode diameter on bottom end side, mm	Top Terminal		L7-Flange height, mm	Top End Side Flange					Bottom Side Flange					Approx. weight (+/-15%), kg	Approx. oil quantity, ltr
									L6- Minimum connection length, mm	øD6- Terminal diameter		øD7-Mounting flange OD, mm	øD8-Mounting flange PCD	n1° -No. of holes	øD9- Hole diameter	t1- Mounting flange thickness	øD10-Mounting flange OD, mm	øD11-Mounting flange PCD	n2° -No. of holes	øD12- Hole diameter	t2- Mounting flange thickness		
645	495	NA	NA	100	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	35	1.5
645	695	NA	NA	300	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	42	2.0
645	995	NA	NA	600	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	50	2.5
645	495	NA	NA	100	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	40	1.5
645	695	NA	NA	300	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	50	2.0
645	995	NA	NA	600	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	57	2.5
645	495	NA	NA	100	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	35	1.5
645	695	NA	NA	300	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	42	2.0
645	995	NA	NA	600	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	50	2.5
645	495	NA	NA	100	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	40	1.5
645	695	NA	NA	300	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	50	2.0
645	995	NA	NA	600	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	57	2.5
645	495	NA	NA	100	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	35	1.5
645	695	NA	NA	300	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	42	2.0
645	995	NA	NA	600	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	50	2.5
645	495	NA	NA	100	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	40	1.5
645	695	NA	NA	300	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	50	2.0
645	995	NA	NA	600	165	115	NA	NA	125	60	62	NA	NA	NA	NA	NA	225	185	6	15	16	57	2.5
995	695	1055	720	100	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	88	6.5
995	895	1055	920	300	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	95	7.5
995	1195	1055	1220	600	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	105	9.0
995	695	1055	720	100	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	98	6.5
995	895	1055	920	300	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	105	7.5
995	1195	1055	1220	600	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	115	9.0
995	695	1055	720	100	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	88	6.5
995	895	1055	920	300	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	95	7.5
995	1195	1055	1220	600	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	105	9.0
995	695	1055	720	100	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	98	6.5
995	895	1055	920	300	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	105	7.5
995	1195	1055	1220	600	165	165	162	162	125	60	115	275	245	12	14	15	335	290	12	16	20	115	9.0
1475	980	1535	1030	100	225	230	225	270	125	60	185	450	400	12	20	20	450	400	12	20	23	163	7.0
1475	1180	1535	1230	300	225	230	225	270	125	60	185	450	400	12	20	20	450	400	12	20	23	170	8.5
1475	1480	1535	1530	600	225	230	225	270	125	60	185	450	400	12	20	20	450	400	12	20	23	180	11.0
1475	980	1535	1030	100	225	230	225	270	125	60	185	450	400	12	20	20	450	400	12	20	23	178	7.0
1475	1180	1535	1230	300	225	230	225	270	125	60	185	450	400	12	20	20	450	400	12	20	23	185	8.5
1475	1480	1535	1530	600	225	230	225	270	125	60	185	450	400	12	20	20	450	400	12	20	23	195	11.0



Product Range



OIP CONDENSER BUSHINGS

Rated Voltage:
24 kV – 245 kV

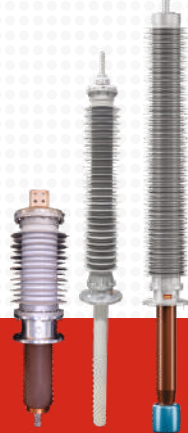
Rated Current:
Upto 3150 A*

Standards:
**IEC-60137:2017 / IEEE
C57.19.00/01 / CLC/TS
50458:2006 / Other
equivalent**

Conductor:
**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:
Upto 3150 A*

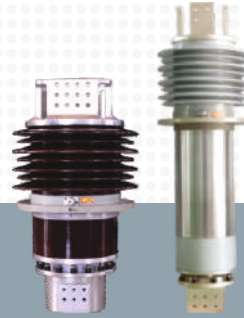
Standard:
IEC-60137:2017

Conductor:
**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*

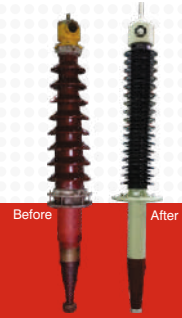
Rated Current:
Upto 25000 A

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

Conductor:
Aluminum / Copper

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

*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 upto
245 kV and 25000 A.



ILAC accredited
EHV lab



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Represented By

