



## BHARAT HEAVY ELECTRICAL LIMITED, BHOPAL

### SPECIFICATION CUM COMPLIANCE CERTIFICATE OF 245 kV OIL-SF6 CONDENSER BUSHING

**NAME & ADDRESS OF THE SUPPLIER :**

**SCOPE: SUPPLY OF 245 kV, 2000A OIL-SF6 CONDENSER BUSHINGS COMPLYING WITH THE SPECIFICATIONS AS BELOW :**

**Spec No. : BCE/PS/245/51, Rev00**  
**Date : 13-01-2023**

S.NO.	DESCRIPTION OF BHEL REQUIREMENT	SPECIFIED / TO BE CONFIRMED BY	REMARKS
1.0	WORKPIECE MATERIAL		
1.1	Item : 245KV Oil-SF6 RIP (Resin Impregnated Paper) condenser type bushing.	Vendor to confirm	
2.0	SPECIFICATION :		
2.1	The electrical and mechanical characteristics of bushings shall be in accordance with latest revisions of IEC: 60137:2017 & IEC 62271-211.	Vendor to confirm	
2.1	The bushing shall be suitable for connection with GIS SF6/ Oil Interface as per IEC 62271-211.	Vendor to confirm	
2.2	Valid type test reports as per IEC:60137 (2017) for similar 245 kV Oil-SF6 RIP bushings , conducted within last 7(seven) years prior to the date of bid opening shall be submitted alongwith the bid.	Vendor to confirm and submit the test reports alongwith the bid	



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2.2.1	The type tests conducted should have either been conducted in accredited laboratory (accredited based on ISO/ IEC Guide 25/ 17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by client / third party.	Vendor to confirm	
2.2.2	In case valid type test report as mentioned under Sr. Nos. 2.2 & 2.2.1 above is not available, then vendor has to conduct type test in presence of BHEL / Customer representative before delivery of first lot , at no extra cost.	Vendor to confirm	
2.3	When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action.	Vendor to confirm	
2.4	No radio interference shall be caused by the bushings when operating at the normal rated voltage. All surfaces of the metal parts shall be perfectly smooth with the projecting points or irregularities which may cause corona.	Vendor to confirm	
2.5	End fittings shall be free from cracks, seams, shrinks, air holes and rough edges.	Vendor to confirm	
2.6	End fittings should be effectively, sealed to prevent moisture ingress, effectiveness of sealing system must be supported by test documents.	Vendor to confirm	
2.7	All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.	Vendor to confirm	

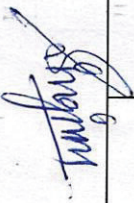




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2.8	Clamps and fittings shall be of hot dip galvanised/stainless steel.	Vendor to confirm	
2.9	Spare Bushing shall be specially packed suitable for long storage with non-returnable.	Vendor to confirm	
2.10	Bushings of identical current and voltage ratings must be interchangeable.	Vendor to confirm	
2.11	Supplier to submit their Quality Plan for review by BHEL.	Vendor to confirm	
2.12	Bottom stress shield insulated with 5mm pressboard is preferable. It shall be duly packed in moisture proof condition and supplied alongwith bushing.	Vendor to confirm	
2.13	Bushing shall be specially packed to avoid any damage during transit and suitable for long storage, with non-returnable packing wooden boxes with hinged type cover. Without any gap between wooden planks. Packing Box opening cover with nails/screws type packing arrangement shall not be acceptable.	Vendor to Confirm	
2.14	Both bushing oil end & SF6 end shall be fitted with metal housing with positive dry air pressure and a suitable pressure monitoring device shall be fitted on the metal housing during storage to avoid direct contact with moisture with epoxy. Alternatively, oil filled metal housing / tank with suitable arrangement for taking care oil expansion due to temperature variations shall also be acceptable. Tank shall have necessary provision for oil filling, level gauge etc. Manufacturer shall submit drawing/ documents of packing for approval during detail engineering.	Vendor to Confirm	

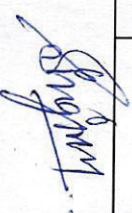




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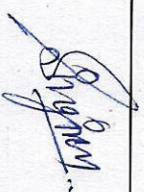
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2.15	Detail method for storage of bushing including accessories shall be brought out in the instruction manual.	Vendor to Confirm	
2.16	Tan delta measurement at variable frequency (in the range of 20 Hz to 350 Hz) shall be carried out on each condenser type bushing (RIP) at manufacturing works as routine test before despatch and the result shall be compared at site during commissioning to verify the healthiness of the bushing.	Vendor to Confirm	
2.17	Tan delta value of RIP condenser bushing at site shall be 0.005 (max) in temperature range of 20 deg C to 90 deg C. The measured tan delta value at site of in-service bushing should not exceed by 0.001 w.r.t factory results (measured at approx. similar temperature conditions) during warranty period.	Vendor to Confirm	
2.18	If the bushing does not fulfill the criteria under Cl. No. 2.17 mentioned above, the supplier shall arrange to replace the defective bushing by a new one, within the warrantee period.	Vendor to Confirm	
3.0	<b>Technical Parameters</b>		
3.1	Rated Voltage	245 kV	Vendor to Confirm
3.2	Rated Current (Mfin.)	2000 A	Vendor to Confirm
3.3	Lightning impulse withstand voltage	1050 kVp	Vendor to Confirm
3.4	Switching impulse withstand voltage	850 kVp	Vendor to Confirm
3.5	One minute power frequency withstand voltage	505 kVrms	Vendor to Confirm
3.6	Tan delta of bushings	$\leq 0.005$	Vendor to Confirm





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3.7	Max partial discharge level at Um	< 10 pC	Vendor to Confirm	
3.8	Test tap voltage withstand level	2 kVrms	Vendor to Confirm	
3.9	SF6 end Terminal details	As per drg. at Annexure-I	Vendor to Confirm	
3.10	Height of mounting flange (between SF6 side and oil side PCD areas)	220 mm	Vendor to Confirm	
3.11	Oil End Terminal details	Flat rectangular shaped with 4 nos. 14mm dia holes Horizontal pitch = 45mm Vertical pitch = 40mm	Vendor to Confirm	
3.12	Oil end side bushing dia. (max.)	210 mm	Vendor to Confirm	
3.13	Flange Fixing details - SF6 side	16 holes, dia. 16 mm equally spaced on PCD 535 mm	Vendor to Confirm	
3.14	Flange Fixing details - Transformer side	12 holes, dia. 24 mm equally spaced on PCD 400 mm	Vendor to Confirm	
3.15	CT space min.	300 mm	Vendor to Confirm	
3.16	Type of Lead	Bottom connected	Vendor to Confirm	
4.0	<b>DOCUMENTATION :</b> Following documents in English language should be submitted along with the bid for our evaluation.		Vendor to Confirm	
4.1	OGA Drawing		Vendor to submit	





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4.2	Type test reports	Vendor to submit	
4.3	Instruction manual	Vendor to submit	
4.4	Quality Plan	Vendor to submit	
5.0	GUARANTEE :		
5.1	12 months from the date of commissioning of the transformer and 18 months from the date of supply, whichever is later.	Vendor to Confirm	
6.0	ROUTINE TEST INSPECTION:	Vendor to confirm	
6.1	Routine tests to be conducted on all bushings as per IEC 60137:2017. The routine tests may be witnessed by BHEL/customer/TPIA at supplier's works.	Vendor to confirm	

Prepared By:

Singiren.E.Kandulna  
Mgr (CIE)

Checked By:

Kulamani Naik  
SDGM (BCE & CIE)

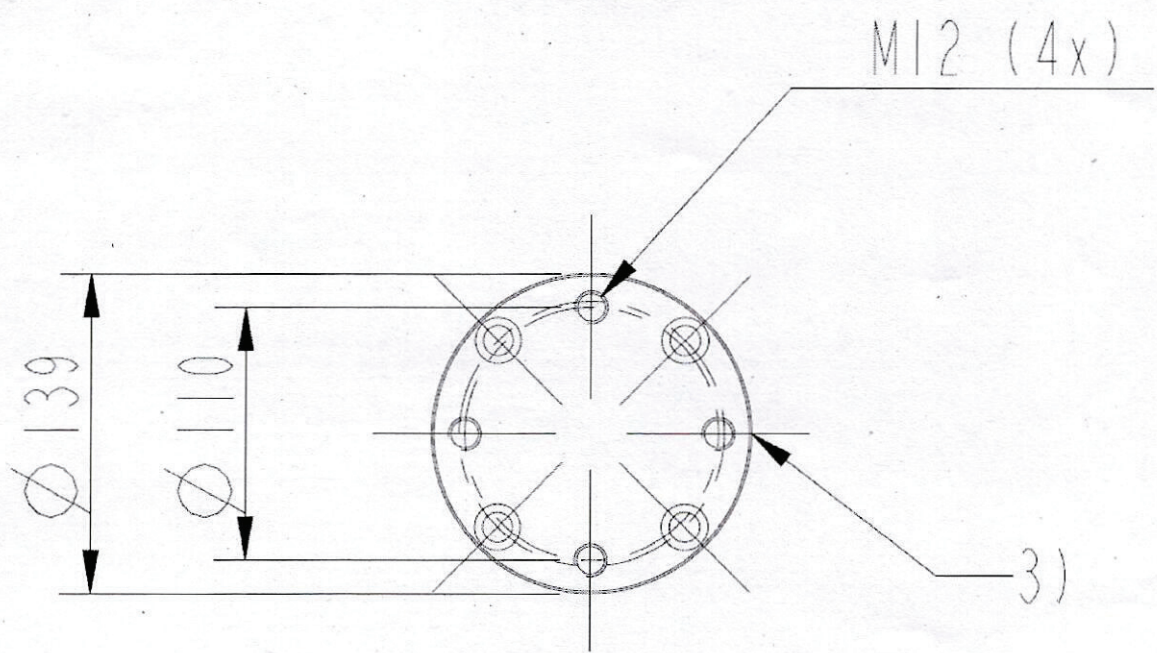
Approved By:

Mahendra Kurre  
AGM (BCE & CIE)



ANNEXURE-I

SF6 SIDE BUSHING TERMINAL DETAILS



*Signature*