

PRE-QUALIFICATION REQUIREMENTS (TECHNICAL) FOR
WATER COOLED TERMINAL BUSHINGS

Introduction: Indented Terminal Bushings are used for current transfer between the generator & the bus duct in large size turbo-generators (500MW & above) and as such are subjected to very high current during normal as well as fault conditions. The bushings are subjected to stringent tests relating to dielectric strength, leak-proofness, bending, mechanical strength, sudden short circuit test, angular deviation, impulse voltage withstand test etc.

1. EXPERIENCE:

The vendor should have the experience of manufacturing and supplying water-cooled HIGH VOLTAGE TERMINAL BUSHINGS made from high quality resin impregnated paper or its equivalent suitable for voltage rating ≥ 27.8 KV of large size Turbo-generators and suitable for continuous operating temperature 120°C , during the last five (5) years from the date of enquiry. In support of which, vendor to submit the following documents: -

- 1.1. Unpriced copy of at least one Purchase Order, with minimum 06 nos. terminal bushings, successfully executed for reputed turbogenerator manufacturers world-wide during the last ten (10) years from the date of enquiry.
- 1.2. Copy of test certificates for the above bushings corresponding to purchase order submitted against clause no. 1.1.
- 1.3. Documentary evidence for acceptance of material for purchase order submitted against clause no. 1.1.

2. TECHNICAL COMPETENCY:

- 2.1. Vendor to submit the outline drawings of the offered bushings for BHEL review and approval.
- 2.2. Vendor to submit details of high quality resin impregnated paper or its equivalent along with its properties including Electrical strength, Flexural Strength, Tensile strength, Glass Transition temperature, etc.
- 2.3. The voltage withstand capability of the bushings shall be in line with that specified in BHEL specification TG60409 for the intended voltage rating of the bushing. Vendor to confirm the same.

3. MANUFACTURING FACILITIES:

- 3.1. The vendor should have facilities for manufacturing high voltage bushings with high quality resin impregnated paper or its equivalent, manufacturing of copper terminal, precision machining, silver plating, stress-grading of insulation, sealing of air side and gas side etc. Vendor to furnish details of the manufacturing facilities available at their works, required for manufacturing the enquired item, along with the photographs.
- 3.2. If the vendor plans to outsource any manufacturing activity, particulars of the same along with details of the sub-vendor to be furnished to BHEL, for review.

4. TESTING FACILITIES:

4.1. The vendor should have facilities for carrying out the following tests and provide details of test equipment available at their works: -

- a) Dielectric strength at a.c. test voltage as specified in BHEL specification TG60409 in line with the rating of the bushing.
- b) Leak testing using Helium at 10 bar test pressure.
- c) Electrical Conductivity, chemical composition and mechanical properties testing for copper conductor.
- d) Dimensional measurement.
- e) Capacitance, partial discharge and tan delta.
- f) Type testing including Bending test, Mechanical Strength test, Sudden Short Circuit test with test surge of 10 KN, Change in length of conductor and angular deviation after sudden short circuit test, Impulse Voltage Withstand test as specified in BHEL specification TG60409.

4.2. Vendor to confirm that the test facilities available at their works are calibrated.

4.3. In case, vendor conducts any test at an outsourced testing agency, the outsourced testing facility should be NABL/ILAC/APLAC lab and vendor to furnish details of the same.

5. Vendor must provide clause wise confirmation of enquiry specification and drawings.

NOTE:

1. BHEL reserves the right to verify the information submitted by vendor. In case the information is found to be false / incorrect, the offer shall be rejected.
2. All correspondence shall be in English Language.
3. If any document provided by vendor is in language other than English, it must be supported with its English translation.

PRE-QUALIFICATION REQUIREMENTS (TECHNICAL) FOR
HYDROGEN COOLED TERMINAL BUSHINGS

Introduction: Indented Terminal Bushings are used for current transfer between the generator & the bus duct in large size turbo-generators (210MW & above) and as such are subjected to very high current during normal as well as fault conditions. The bushings are subjected to stringent tests relating to dielectric strength, leak-proofness, bending, mechanical strength, impulse voltage withstand test etc.

1. EXPERIENCE:

The vendor should have the experience of manufacturing and supplying hydrogen-cooled HIGH VOLTAGE TERMINAL BUSHINGS made from high quality resin impregnated paper or its equivalent suitable for voltage rating ≥ 19.1 KV of large size Turbo-generators and suitable for continuous operating temperature 120°C , during the last five (5) years from the date of enquiry. In support of which vendor to provide the following documents: -

- 1.1. Unpriced copy of at least one Purchase Order, with minimum 06 nos. terminal bushings, successfully executed for reputed turbogenerator manufacturers world-wide during the last ten (10) years from the date of enquiry.
- 1.2. Copy of test certificates for the above bushings corresponding to purchase order submitted against clause no. 1.1.
- 1.3. Documentary evidence for acceptance of material for purchase order submitted against clause no. 1.1.

2. TECHNICAL COMPETENCY:

- 2.1. Vendor to submit the outline drawings of the offered bushings for BHEL review and approval.
- 2.2. Vendor to submit details of high quality resin impregnated paper or its equivalent along with its properties including Electrical strength, Flexural Strength, Tensile strength, Glass Transition temperature, etc.
- 2.3. The voltage withstand capability of the bushings shall be in line with that specified in BHEL specification TG60409 for the intended voltage rating of the bushing. Vendor to confirm the same.

3. MANUFACTURING FACILITIES:

- 3.1. The vendor should have facilities for manufacturing high voltage bushings with high quality resin impregnated paper or its equivalent, manufacturing of copper terminal, precision machining, silver plating, stress-grading of insulation, sealing of air side and gas side etc. Vendor to furnish details of the manufacturing facilities available at their works, required for manufacturing the enquired item, along with the photographs.
- 3.2. If the vendor plans to outsource any manufacturing activity, particulars of the same along with details of the sub-vendor to be furnished to BHEL, for review.

4. TESTING FACILITIES:

4.1 The vendor should have facilities for carrying out the following tests and provide details of test equipment available at their works: -

- a) Dielectric strength at a.c. test voltage as specified in BHEL specification TG60409 in line with the rating of the bushing.
- b) Leak testing using Helium at 7 bar test pressure.
- c) Electrical Conductivity, chemical composition and mechanical properties testing for copper conductor.
- d) Dimensional measurement.
- e) Capacitance, partial discharge and tan delta test.
- f) Type testing including Bending test, Mechanical Strength test & Impulse Voltage Withstand test as specified in BHEL specification TG60409.

4.2 Vendor to confirm that the test facilities available at their works are calibrated.

4.3 In case, vendor conducts any test at an outsourced testing agency, the outsourced testing facility should be NABL/ILAC/APLAC lab and vendor to furnish details of the same.

5. Vendor must provide clause wise confirmation of enquiry specification and drawings.

NOTE:

- 1. BHEL reserves the right to verify the information submitted by vendor. In case the information is found to be false / incorrect, the offer shall be rejected.
- 2. All correspondence shall be in English Language.
- 3. If any document provided by vendor is in language other than English, it must be supported with its English translation.