



PRODUCT STANDARD
SWITCHGEAR ENGINEERING DIVISION

SG 10408 Rev: 00

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SPECIFICATION OF COPPER-TUNGSTEN MATERIAL & ITS COMPONENTS

1. GENERAL:

This specification governs the requirements of Copper-Tungsten alloy bars, rods, sections and profiles.

2. APPLICATION:

This material is used in switchgear and tap changer application.

3. COMPLIANCE WITH NATIONAL/INTERNATIONAL STANDARDS :

The material shall comply with the requirements of the B702-93(2010) ASTM International standard and also meet the requirements of this specification. For test methods of Density, Oil content and Interconnected porosity of sintered metal structure part, B328 shall be followed.

4. DIMENSIONS AND TOLERANCES:

As per drawings/Purchase order.

5. FINISH:

- a. Surface finish of the components shall be at least Ra 0.8.
- b. The component shall be free from dirt, grease and loose particles.
- c. Drawn profiles, to size, only shall be used for direct welding. No smithy is allowed for formation/ matching of profiles in view of defect inception.
- d. Any sharp corners shall be removed as per the drawing. Wherever not specified in the drawing, a radius of R1 shall be provided at the sharp corners and edges.

6. MANUFACTURING PROCESS

A sintered matrix of W-Cu (70-30 %) shall be produced by Powder Metallurgy (PM) technique. The sintering shall be carried out in neutral or reducing atmosphere. The ingredient (powders) shall have high purity.

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7. PROPERTIES :

Sl. No	Parameter	Unit	Value	Test Methods
01	Chemical Composition	By wt%	W=70±3 Cu=30±3 Ni=0.2-0.5 Traces=<0.2	ASTM B 328 IS: 1817
02	Density	gm/cc	13.9-14.3	
03	Electrical Conductivity	%IACS min	31.03	ASTM E 1003
04	Vickers Hardness	HV10	160-200	IS1500
05	Tensile Strength	MPa	516-585	IS1608
06	Modulus of Rupture	MPa	896-965	
07	Coefficient of Expansion	°F m/m·K	10.3×10^{-6}	
08	Resistivity	$\mu\Omega$ cm	4.1	
09	Bend Strength	MPa	667	
10	Thermal Conductivity	W/CM °C 20-400 °C	2.01	
11	Specific Heat	kg °C at 20°	214	

8. TEST METHODS:

- 1.0 The tests shall be performed on production parts, wherever practical or applicable.
- 2.0 At least one sample for chemical analysis shall be taken from each lot. A representative sample of chips may be obtained by milling, drilling, or crushing at least two pieces with dry tools, without lubrication. In order to obtain oil-free chips, the parts selected for test shall have the oil extracted in accordance with Test Method B328, if necessary.
- 3.0 Chemical composition, density, electrical conductivity & Hardness test on sample shall be done.

9. SAMPLE FOR TESTS:

The set of test specimens prepared from same batch and in same manner as consignments shall be supplied for testing and approval. The test sample size should be as per requirement specified in relevant test method of clause 8.

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10. TEST CERTIFICATE:

The supplier shall submit 3 copies of test certificates for tests specified in clause 8 giving the following information:

- a. BHEL Order No.
- b. Component name ,Drawing no and Rev no
- c. Supplier's Name
- d. Batch No.
- e. Results of chemical analysis, mechanical and all other tests as called for in this specification/order

11. PACKING AND MARKING

Each component shall be wrapped in paper having 200 micron thickness then in sealed air bubble wrap plastic. The material shall be suitably packed to prevent corrosion and damage during transit. The lot should be supplied in shock proof and unbreakable container/box. Necessary arrangement shall be made to avoid ingress of water into the container/box. Gross weight of container should be less than 30 kg. Each package shall be legibly and indelibly marked with the following:

- a. Component name ,Drawing no and Rev no
- b. BHEL Purchase Order No.
- c. Batch/Lot No.
- d. Manufacturer's /Suppliers Name
- e. Size & Quantity supplied
- f. Net & Gross Weight

12. ACCEPTANCE CRITERIA:

- a. Dimensional Report as per drawing.
- b. Finish as per clause 5.
- c. Silver Plating as per clause 6
- d. Test samples as per clause 9.
- e. Test certificate as per clause 10.
- f. Packing and Marking as per clause 11.

13. GAURENTEE CERTIFICATE

The components shall be warranted for trouble free performance and against any defect in the material for a period of not less than 12 months from the date of manufacturing.

14. REJECTION AND REPLACEMENT:

In the event of the material proving defective in the course of manufacture, such material shall be rejected notwithstanding any previous certification of satisfactory testing and/or inspection.

The supplier shall undertake to replace the material. Repairing of material is not acceptable.

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