



PLANT PURCHASING SPECIFICATION BHOPAL

BP 12082

Rev.No. 06

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SUPERSEDES
BP 12082 Rev.05

HIGH CONDUCTIVITY COPPER TUBES

1. GENERAL :

This specification governs the quality requirements of high conductivity copper tube, up to 125mm outside diameter.

2. APPLICATION :

For use in Traction Motor /Current Transformers.

3. CONDITION OF DELIVERY :

The tube shall be supplied in solid drawn condition in straight lengths.

Ends shall be cut clean and square with the axis of the tube.

4. COMPLIANCE WITH NATIONAL STANDARDS :

There is no Indian standard for this material. However assistance has been drawn from IS: 2501/BSEN 13600.

5. DIMENSIONS AND TOLERANCES :

5.1 Sizes

These tubes shall be designated by outside diameter and thickness. The material shall be supplied to the dimensions as specified in purchase order.

The sizes shall be selected from IS: 5493.

5.2 Tolerances :-

The tolerances shall comply with IS: 5493, as detailed below.

Revision :
Reviewed and No change in document.

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5.2.1 Diameter:-

The mean diameter of the tube shall not vary from the specified diameter by more than the amount of tolerance given below. The mean diameter is half the sum of two diameters measured at right angles at any section of the tube.

Outside Diameter Specified mm	Tolerances Nominal ± mm
Up to 10	0.08
Over 10 to 18	0.10
Over 18 to 32	0.12
Over 32 to 50	0.15
Over 50 to 80	0.20
Over 80 to 125	0.25

5.2.2 Thickness:

The mean thickness of the tube shall not vary from the specified thickness by more than $\pm 12.5\%$ of the specified wall thickness. However total weight of the tubes should not differ by more than $\pm 5\%$ from the nominal dimensions.

5.2.3 Length

The tube ordered in the specified length shall be within the tolerances as specified below:

Specified length (metres)	*Tolerance on specified Length (mm)
Upto & including 3	+4
Over 3 upto 6	+6
Over 6 upto 10	+8

*Note: Minus tolerances are not permissible.

5.3 Straightness :

For the acceptable straightness of the tubes, the permissible max. Deflection shall not exceed 2 mm per meter.

6 MANUFACTURE :

The tubes shall be solid drawn; temper annealed and in no case shall be redrawn from used tubes.



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7 FREEDOM FROM DEFECTS :

The tubes shall be round, straight, smooth, clean, uniform in diameter and free from cracks seams, slivers, scales, deleterious film in the bore and other harmful defects.

The ends shall be cut clean and square with the axis of the tube.

8 CHEMICAL COMPOSITION :

The chemical composition of the material shall be as follows :

Copper including silver : 99.9% Min

Note: These elements need not be determined when the material supplied conforms with Electrical & Mechanical properties specified in this specification. However, the supplier shall ensure that the composition of material conforms the specified limits.

9 TEST SAMPLES:

One sample per size, per batch, per consignment, shall be selected for test.

10. MECHANICAL PROPERTIES:

10.1 Tensile :

Test pieces when tested in accordance with IS: 1608 shall show a tensile strength of

245 N/ mm² Minimum.

10.2 Hardness :

The material when tested in accordance with IS: 1501 shall show a vicker's hardness of 75-90 HV.

11. ELECTRICAL CONDUCTIVITY :

The electrical conductivity of the material when tested at 20°C in the 'As Received' condition shall be 97% min. of IACS standard which is equivalent to resistivity of 0.01777 Ohm mm²/ meter max.

The material shall be tested in accordance with IS 3635.

Alternatively, the eddy current probe method as per ASTM E1004 is also acceptable. Refer Appendix B of IS: 613 for temperature correction factor.



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12. TEST CERTIFICATE :

Unless otherwise stated on the order three copies of the test certificate shall be supplied.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their dispatch documents to facilitate quick clearance of the material. The test certificate shall bear the following information :

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BHEL Order No.

Manufacturer's / Supplier's Name.

Size and number of tubes.

Batch No.

Results of Tests:

Test results obtained for Electrical and Mechanical Properties and Dimensional tolerances as per this specification.

13. PACKING AND MARKING :

The tubes shall be suitably, Hessian wrapped and packed to prevent damage during transit.

Each package shall bear the following information.

BP 12082: High conductivity Copper tubes.

Manufacture/Supplier's Name.

Size and weight of the material.