



CORPORATE PURCHASING SPECIFICATION

AA 120 01

Rev. No. 04

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COPPER STRIP – ANNEALED

1.0 GENERAL:

This specification governs the quality requirements of bright annealed bare Copper strip of thickness over 0.15 mm and upto 10 mm and widths upto 800 mm with radiused edges.

2.0 APPLICATION:

Used for general electrical purposes such as bus bars, connectors etc.

3.0 CONDITION FO DELIVERY:

The strip shall be supplied in annealed condition, in coils or straight lengths as specified in BHEL order. The strips shall be supplied with their edges radiused as per clause 5.3.

4.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply with the requirements of the following national standard and also meet the requirements of this specification.

IS: 1897 – 2008 : Copper strips for Electrical Purposes.

Gr: 'O' 'Annealed'

5.0 DIMENSIONS AND TOLERANCES:

5.1 **Sizes:** Copper Strips shall be supplied to the dimensions specified in BHEL order:

5.2 Tolerances:

Tolerances on width, thickness, length and straightness shall be as per IS:3052, reproduced below.

5.2.1 Length (Rotary sheared):

<u>Length, mm</u>		<u>Tolerance, ± mm</u>
Over	upto & incl.	
160	1000	3
1000	2000	6
2000	4000	9

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5.2.2 Thickness:

Tolerance on thickness shall be as follows:

Thickness, mm		Tolerance, $\pm$ mm				
Over	upto and incl.	upto and incl. 160 wide	over 160 upto & incl. 300 wide	over 300 upto& incl. 450 wide	over 450 upto& incl. 630 wide	over 630 upto& incl. 800 wide
0.16	0.28	0.015	0.02	0.025	0.03	0.04
0.28	0.63	0.020	0.025	0.03	0.04	0.05
0.63	0.90	0.025	0.03	0.04	0.05	0.06
0.90	1.20	0.030	0.04	0.05	0.06	0.07
1.20	2.00	0.040	0.05	0.06	0.07	0.09
2.00	2.80	0.050	0.06	0.07	0.09	0.11
2.80	3.50	0.060	0.07	0.09	0.11	0.14
3.50	4.50	0.070	0.09	0.11	0.14	0.17
4.50	6.00	0.090	0.11	0.14	0.17	0.20
6.00	8.00	0.110	0.14	0.17	0.20	0.25
8.00	10.00	0.140	0.17	0.20	0.25	0.30

5.2.3 Width:

5.2.3.1 Tolerance on width for rotary sheared strip upto 4 mm thickness shall be as follows

Thickness, mm		Tolerance, $\pm$ mm				
Over	upto and incl.	upto and incl. 0.25 Thick	over 0.25 upto & incl. 0.55 Thick	over 0.55 upto& incl. 1.0 Thick	over 1.0 upto& incl. 2.0 Thick	over 2 upto& incl. 4.0 Thick
-	10	By agreement				
10	50	0.10	0.15	0.2	0.3	-
50	100	0.15	0.20	0.3	0.5	0.6
100	200	0.20	0.30	0.5	0.6	0.8
200	400	0.30	0.50	0.6	0.8	1.0
400	600	0.50	0.60	0.8	1.0	1.4
600	800	0.60	0.80	1.0	1.4	1.5

5.2.3.2 Tolerance on width for guillotine sheared strip above 4 mm thick shall be as follows:

Width, mm		Tolerance, $\pm$ mm	
Over	upto & Incl.	Over 4.0 upto & incl. 5.0 thick	Over 5.0 upto & incl. 10.0 thick
--	500	2	3
500	800	3	4



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5.2.4 Straightness:

The edges of strips supplied in straight lengths shall not vary from a straight line by more than 5 mm in any 1000 mm length.

5.3 Radius on Edges:

The strip shall be supplied with edges radiused as per IS: 1897, reproduced below:

Thickness, mm		Nominal radius on edges, mm	Tolerance on radius, mm
Over	up to & incld.		
--	1.00	semi-circular	± 0.06
1.00	1.60	0.60	+ 0.15 - 0.10
1.60	2.25	0.80	± 0.15
2.25	3.55	1.00	± 0.20
3.55	10.00	1.25	± 0.25

6.0 MANUFACTURE:

The strip shall be manufactured from copper of ETP grade conform to IS:191.

7.0 FREEDOM FROM DEFECTS:

The strips shall be clean, bright, smooth and free from harmful defects.

8.0 CHEMICAL COMPOSITION:

The analysis of copper when analyzed in accordance with IS:440 or any other conventional/instrumental methods shall be as follows:

Element	Percent, min.	Percent, max.
Copper and Silver	99.90	--
Bismuth*	--	0.001
Lead*	--	0.005
Total of all impurities excluding silver and oxygen exclusive silver and oxygen	--	0.030

* These elements need not be determined when the material supplied conforms with mechanical and electrical properties specified in this specification. However, the supplier shall ensure that the composition of the material lies within the limits specified above.

9.0 TEST SAMPLES:

One sampling per size per melt per consignment of 3 tonnes or part thereof shall be taken for chemical, mechanical and electrical tests.

The sample shall be cut off cold and shall receive no further treatment before being tested.

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10.0 MECHANICAL PROPERTIES:

10.1 Tensile strength (For sizes over 0.5 mm to 10mm thick) :

The test samples, when tested in accordance with IS: 1608 shall show the following properties:

Tensile Strength : 205 N/mm² , minimum.
Elongation on 4√A or 50 mm gauge length: 35% , min

10.2 Bend Test:

The strip shall not be subjected to transverse bend test. Where this is not possible, it shall be subjected to a longitudinal bend test. The strip when tested in accordance with IS: 1897 shall withstand a close bend test, through an angle of 180⁰, without showing any sign of cracks or failures upon the convex surface of the bend.

10.3 Hardness (Vickers):

Hardness test is mandatory for thickness upto 0.5mm. When tested in accordance with IS:1501, the strips shall have a Vickers hardness not exceeding 60 HV.

11.0 ELECTRICAL RESISTIVITY (AS RECEIVED):

When measured in accordance with IS: 3635, the electrical resistivity at 20⁰ C shall not be greater than 0.01737 ohm-mm²/metre, which is equivalent to an electrical conductivity of 99.25%, minimum of IACS standard.(Refer Appendix B of IS: 613 for temperature correction factor).

Alternatively, the method of measurement employing eddy current probes as per ASTM E 1004 is also acceptable.

12.0 INSPECTION AT SUPPLIER'S WORKS:

Whenever specified, tests and inspection are to be conducted in the presence of BHEL'S representative.

The supplier shall offer BHEL'S representative all reasonable facilities, without charge to satisfy the latter that the material is being furnished in accordance with this specification. The supplier shall prepare and provide necessary test specimens for testing to be carried out at his premises. If facilities are not available at his carrying out the prescribed tests elsewhere. The supplier shall notify BHEL in advance about the readiness of the material for inspection and testing.

BHEL reserves the right to test the material at BHEL'S works and the final acceptance of the material shall be based on these test results.

13.0 TEST CERTIFICATES:

Unless otherwise specified, three copies of test certificates shall be supplied along with eachconsignment. 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.



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The test certificate shall bear the following information:

AA 120 01, Rev 04: Copper strip – Annealed

BHEL Order No,

Manufacturer's/Supplier's Name :

Lot/Identification/Batch/Melt No.

Sizes and Quantity Supplied

Results of dimensional inspection, chemical analysis, mechanical and electrical tests as per this specification.

14.0 PACKING AND MARKING:

The material shall be supplied in coils or drums or in straight length as ordered. The minimum eye of coil or barrel diameter of drums shall be 250 mm.

The material not supplied in drums shall be hessian wrapped and tied with string and not with wire and shall be suitably protected to with wire and shall be suitably protected to avoid damage in transit. Each coil or drum or bundle shall be legibly marked or labeled with the following information.

Each coil or drum or bundle shall be legibly marked or labeled with the following information:

AA 12001: Copper strip – Annealed

BHEL Order No.

Manufacturer's/Supplier's Name :

Lot/Identification/Batch/Melt No.

Sizes and Quantity Supplied

15.0 REFERRED STANDARDS (Latest Publications Including Amendments):

- | | | | |
|----------------|------------|------------|-------------|
| 1. IS:191 | 2. IS:440 | 3. IS:613 | 4. IS: 1501 |
| 5. IS:1608 | 6. IS:1897 | 7. IS:3052 | 8. IS:3635 |
| 9. ASTM E 1004 | | | |