



CORPORATE PURCHASING SPECIFICATION

AA 120 13

Rev. No. 03

PAGE 1 OF 5

0.1% SILVER BEARING COPPER STRIP / PROFILE HALF HARD – STRAIGHT

1.0 General :

This specification governs the quality requirements of strip and profile (grooved) section, of high conductivity silver bearing copper, half-hard, with close, straightness tolerances.

2.0 APPLICATION:

Used in rotor windings of Turbo-generators and Hydrogenerators.

3.0 CONDITION OF DELIVERY:

The material shall be supplied in half-hard condition and in straight lengths as specified in the order/drawing and complying to tolerances mentioned in clause 5.2.

The strip shall be supplied with the edges radiused as per clause 5.2.5.

4.0 COMPLIANCE WITH NATIONAL STANDARDS :

There is no Indian Standard covering this type of material.

5.0 DIMENSIONS AND TOLERANCES :

5.1 Sizes :

Material shall be supplied to the dimensions specified in BHEL order. Thickness, width, radius on edges of profile (wherever applicable) shall be as stated in BHEL order / drawing.

5.2 Tolerances:

5.2.1 Thickness and Width:

The tolerances on thickness and width shall be as per the table given below :

Width or thickness, mm		Tolerance ±, mm
Over	Upto & incl.	
-	3.0	0.03
3.0	6.3	0.05
6.3	12.0	0.07
12.0	25.0	0.10
25.0	50.0	0.12
50.0	100.0	0.25
100.0	160.0	0.50

Revisions :

Clause No.15.23 of MOM 15th Meeting.

APPROVED :

INTERPLANT MATERIAL RATIONALISATION
COMMITTEE-MRC (NFC&W+HE)

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**5.2.2 Length :**

Tolerance on length shall be
+ 5.0 mm
- 0.0

5.2.3 Straightness - Strip :

Deviation in lateral straightness over total length:

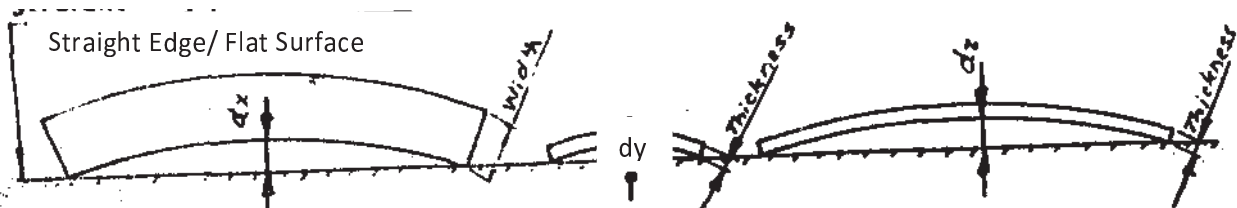
- for lengths upto 1 metre : 1.0 mm Max
- for lengths beyond 1 metre : 1.4 mm Max.

5.2.4 Profile - Dimension and Shape :

The permissible tolerances for dimensions and shape shall be as follows:

Deviation in lateral straightness over total length, dx

- for lengths upto 1 metre : 1.0 mm Max.
- for lengths beyond 1 metre : 1.4 mm Max.
- Camber on width, dy : 0.05 mm Max
- Flatness, dz : 0.50 mm Max



(a) Lateral straightness
Over r total length

(b) Camber over
total width

(c) Flatness
over total length

Any deviation in Straightness, Camber on Width & Flatness shall be gradual and not in steps. The angle of any deviation shall be such that if the angle were continued, the deviation obtained would not exceed the values specified above, over complete lengths or complete width.

Note: Deviation, if any, in meeting the above tolerances shall be clearly indicated in quotation/offers for consideration of BHEL.



CORPORATE PURCHASING SPECIFICATION

AA 120 13

Rev. No. 03

PAGE 3 OF 5

5.2.5 Radius, on Edges :

The strip shall be supplied with edges radiused as per the table given below:

Thickness mm		Nominal Radius On Edges, mm	Tolerance mm
Over	Upto & incld		
-	1.0	Semi-circular	± 0.06
1.0	1.6	0.60	+0.15 -0.10
1.60	2.25	0.80	±0.15
2.25	3.55	1.00	±0.20
3.55	12.00	1.25	±0.25

6.0 MANUFACTURE :

Material shall be manufactured from copper of ETP grade conform to IS ; 191 with addition of silver.

7.0 FREEDOM FROM DEFECTS :

The material shall be clean, bright, smooth and free from harmful defects. Oil, if any, shall be removed completely after drawing.

8.0 CHEMICAL COMPOSITION :

The chemical composition of the material, when analysed in accordance with IS : 440, (Method of chemical analysis of copper) or by any other instrumental / conventional method shall be as follows.

Element	Percent	
	Min.	Max.
Copper	99.85	-
Silver	0.10	0.12
Oxygen	-	0.6
Bismuth*	-	0.001
Lead*	-	0.005
Total of all impurities Excl. 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.

CORPORATE PURCHASING SPECIFICATION



9.0 TEST SAMPLES :

One sample 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.

10.0 MECHANICAL PROPERTIES :

10.1 Tensile :

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

Tensile Strength	260 to 280 N / mm ²
0.1% Proof Stress	220 to 260 N / mm ²
Elongation on 5.65 √S ₀ Gauge Length	25 Percent Minimum

10.2 Hardness (Brinell) :*

When tested in accordance with IS : 1500, the material shall have a Brinell Hardness of 80 to 90 HB

10.3 Bend Test (Edgewise) :

The material shall not show any sign of cracks, when bent once on edge through an angle of 90° around a former of radius equal to 1.5 times the width of the strip.

The strip when tested in accordance with IS : 1897 shall withstand a bend test through an angle of 180°. over a former of radius equal to the thickness of the strip. The material shall show no sign of cracks or failures upon the convex surface of the bend.

11.0 ELECTRICAL RESISTIVITY (AS RECEIVED) :

When measured in accordance with IS : 3635, the electrical resistivity at 20 deg. C shall not be greater than 0.01759 ohm mm²/ metre, which is equivalent to an electrical conductivity of 98%, 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 shall also be acceptable

12.0 TEST CERTIFICATES :

Unless otherwise stated, three copies of certificates shall be supplied along with each consignment.

In addition, the supplier shall ensure to enclose one copy each of the test certificates along with the despatch documents and shipping list to facilitate quick clearance of the material.



CORPORATE PURCHASING SPECIFICATION

AA 120 13

Rev. No. 03

PAGE 5 OF 5

The test certificate shall bear the following information :

AA 12013 : Rev.03

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.

13.0 PACKING AND MARKING :

The material shall be supplied in wooden boxes/crates suitably packed for sea worthiness which shall be finished smooth internally with no protruding screws or nail ends so as to prevent damage or distortion during transit.

Each box / crates shall be legibly marked or labeled with the following information.

AA 12013 : 0.1% Silver Bearing Copper Strip Half Hard-Straight.

BHEL Order No.

Manufacturer's / Supplier's Name.

Lot / Identification / Batch / Melt No.

Size and Quantity Supplied.

14.0 REFERRED STANDARDS (LATEST PUBLICATIONS INCLUDING AMENDMENTS)

- | | | |
|------------------|---------------|-----------|
| 1. IS: 191 | 2. IS:440 | 3.IS:613 |
| 5. IS:1500(Pt.1) | 5. IS:1608 | 6.IS:3635 |
| 7. IS: 5885 | 8.ASTM E 1004 | |