



## PLANT PURCHASING SPECIFICATION BHOPAL

BP 12064

REV NO. 06

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### RECTANGULAR COPPER STRIP FLAT BAR HALF HARD - CLOSE TOLERANCE

SUPERSEDES  
BP 12064 Rev 05

#### 1. GENERAL

This specification covers the requirements of straight cold drawn bright, half hard, bare copper strip upto 6 mm thick and Flat Bar above 6 mm thick with radiused edges,

#### 2. APPLICATION

Used for the manufacture of field coils of Hydro Generators! Motors

#### 3. CONDITION OF DELIVERY

The material shall be supplied in half hard condition, in straight lengths as specified on our order & complying to the tolerances mentioned in clause 5.2. The material shall be supplied with their edges radiused as per cl 5.2.4

#### 4. COMPLIANCE WITH NATIONAL STANDARDS

The material shall comply with the requirements of the following Indian Standard & also meet the requirement of this specification:

##### 4.1 Strip upto 6 mm thick :

IS: 1897-Reaffirmed 2016 (G HB - Half-Hard) : Copper Strip for Electrical Purposes,

##### 4.2. Bar - Above 6 mm thick :

IS: 613 – Reaffirmed 2016 ( Condition Half Hard): Copper Rods and Bars for Electrical Purposes.

#### 5. DIMENSIONS AND TOLERANCES

##### 5.1 Sizes :

The material shall be supplied to the dimensions specified on the order.

##### 5.2 Tolerances :

5.2.1 Width & Thickness : The tolerance on width and thickness shall be as per Table-1

Revision :

Reviewed & IS Reaffirmed

Issued by :

STANDARDS AND MATERIALS GROUP  
TECHNICAL SERVICES DEPTMENT

Rev. 06

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**TABLE : 1**

| Specified Width or Thickness |                  | Tolerance<br>mm | *Total Variation of<br>thickness in a strip |
|------------------------------|------------------|-----------------|---------------------------------------------|
| Over (mm)                    | Upto & incl.(mm) |                 |                                             |
| -                            | 3.0              | 0.03            | 0.03                                        |
| 3.0                          | 6.3              | 0.05            | 0.05                                        |
| 6.3                          | 12.0             | 0.07            | 0.07                                        |
| 12.0                         | 25.0             | 0.10            | 0.10                                        |
| 25.0                         | 50.0             | 0.12            | 0.12                                        |
| 50.0                         | 100.0            | 0.25            | 0.25                                        |
| 100.0                        | 160.0            | 0.50            | 0.50                                        |

\*Note : Difference in measured, max. & min. thickness in a strip shall not exceed the value given in the column.

**5.2.2 Length** : The tolerance on length shall be + 5 - 0.

**5.2.3 The permissible tolerances for dimensions & shape shall be as follows :**

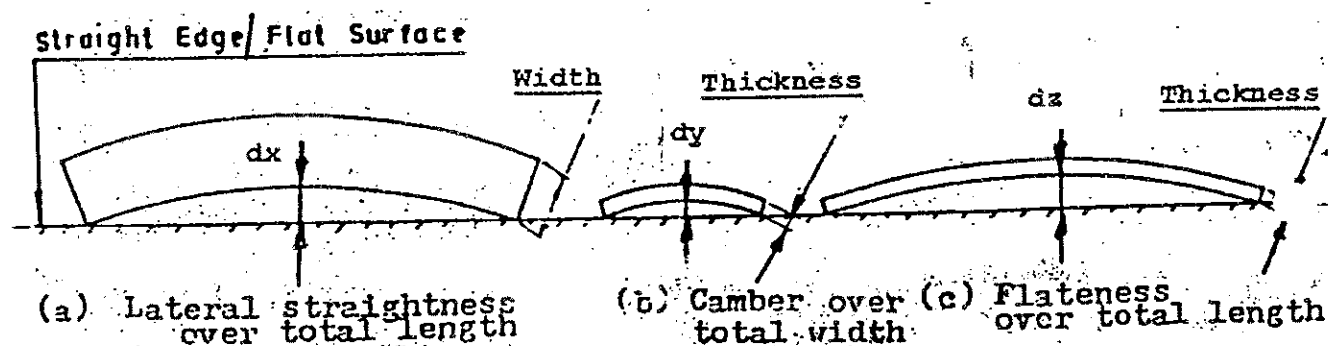
a) Deviation in lateral straightness over total length, dx

- for lengths upto 1 metre - 1 mm

- for lengths beyond 1 metre - 1.4 mm ( max.)

b) Camber on width, dy - 0.05 mm max

c) Flatness, dz - 0.50 mm max.



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

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

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5.2.4 The material shall be supplied with edges radiused as given in Table -2

| Thickness mm |             | Nominal Radius on Edges (mm) | Tolerance (mm) |
|--------------|-------------|------------------------------|----------------|
| Over         | Upto & incl |                              |                |
| -            | 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         | -           | 1.25"                        | ± 0.25         |

## 6.0 FREEDOM FROM DEFECTS

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

## 7.0 MANUFACTURE

### 7.1 Conductor Material Chemical composition :

The conductor shall be manufactured from copper cathodes to billets and by extrusion process

## 8.0 TEST SAMPLES

One sample per size per consignment of 3 tonnes or part thereof shall be selected for testing.

## 9.0 MECHANICAL PROPERTIES

### 9.1 Tensile Strength .

- Upto 6 mm Strip as per IS: 1897,

- Above 6 mm bar as per IS: 613

The material when tested in accordance with IS:1608.

### 9.2 Bend Test

The strip shall be subjected to transverse bend test. Where this is not possible, it shall be subjected to a longitudinal bend test. The strip when tested as per IS:1599 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.

### 9.3 Hardness:

When tested in accordance with IS 1501 (part 1), The hardness of the material shall be in range of 75 to 90 HV for strip as per IS: 1897 and 70 to 90 HV for Bar as per IS: 613.

**10.0 ELECTRICAL RESISTIVITY:**

The resistivity at 20°C of a conductor of one metre in length & of a uniform cross -sectional area of 1 mm<sup>2</sup>, in half-hard condition, shall not be greater than 0.01777 ohm.mm<sup>2</sup> / metre which corresponds to 97% (Min).conductivity of IEC Standard Refer IS: 613 -- Appendix - B for Temperature Correction Factor.

Alternately the method of measurement employing Eddy Current probes as per ASTM E 1004 is also acceptable.

**11.0 TEST CERTIFICATE -**

Three copies of Test Certificates shall be supplied, unless otherwise specified in the order.

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their despatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

BP 12064 (Rev.06) : Rectangular Copper Strip/Flat Bar Half Hard - Close Tolerance

Our Order No.

Size & Number of Strips / Bars.

Batch No.

Test results obtained for Electrical & Mechanical Properties, Chemical Composition and Dimensional Tolerance as per specification.

**12.0 PACKING AND MARKING:**

The material shall be supplied in straight lengths as ordered. Material shall be Wrapped with 200 mm wide 500 microns thickness polythene sheet and then packed wooden boxes with weight not exceeding 2500 kgs. Special Care shall be taken to ensure straightness tolerances are not damaged in transit.

Each bundle shall be legibly marked or labeled with the following information.

BP 12064 Rectangular Copper Strip / Flat Bar Half Hard - Close Tolerance.

Purchase Order No.

Size

Package Wt.

Supplier's Name