



PLANT PURCHASING SPECIFICATION BHOPAL

BP 28189

REV NO. 13

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SUPERSEDES

BP 28189 Rev.12

POLYESTER FILM - MICA TAPE INSULATED RECTANGULAR COPPER CONDUCTOR

1. GENERAL :

This specification governs the requirement of rectangular copper conductors insulated with a layer of polyester film tape, over which is applied one or two layers of Mica Paper Tape having polyester film as support foil for fine / medium or special grade of covering respectively. This support foil shall be on outside surface of the insulated conductor. Polyester film and mica paper tape shall be applied in same direction. The insulated conductor has temperature index of at least 155.

2. APPLICATION :

These conductors are used for stator coil of A.C. Machines.

3. COMPLIANCE WITH NATIONAL STANDARDS :

There is no Indian Standard covering this type of material.

4. SIZES :

The conductor shall be supplied to the size specified on our order.

5. TEST METHOD :

As stated against each clause.

6. SAMPLE FOR TEST:

5meter long sample of taped conductor shall be supplied for testing and approval purpose.

7. JOINTS:

No joints shall be made in the copper conductor after it is drawn. Any joint made during the drawing process shall be only resistance welded.

8. CONDUCTORS:

8.1 Conductor Material :

The bare conductor shall be manufactured from high conductivity copper complying with AA 12030 "Rectangular Copper Conductors - Annealed, controlled oxygen.

Note : It is preferable to manufacture conductor from continuous cast copper bars provided all other acceptance parameters and conditions remain same.

Revision :
Reviewed & Brought up to date

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9. INSULATION :

9.1 Fine covering

1. One 30 % overlapped layer of Polyester Film Non-adhesive Tape to BP 22887.
2. One 30 % overlapped layer of Epoxy Mica Tape to BP 25185.

9.2 Medium covering

1. One 50 % overlapped layer of Polyester Film Non- Adhesive Tape to BP 22887.
2. One 50 % overlapped layer of Epoxy Mica Tape to BP 25185.

9.3 Special covering

1. One 30 % overlapped layer of Polyester Film Non- Adhesive Tape to BP 22887.
2. Two 30 % overlapped layers of Epoxy Mica Tape to BP 25185.

The thickness and width of Polyester Film and Mica Tape for all sizes of conductor as well as all types of covering shall be as given below.

Thickness of Polyester Film	0.019 mm
Width of Polyester Film	12 mm
Thickness of Mica Tape	0.09 mm
Width of Mica Tape	12 mm

Each layer of tape shall be continuous, firmly applied and substantially free from creases. No bonding of adhesive material shall be used except to anchor ends of tape. Any such bonding or adhesive material shall have no deleterious effect on the properties of insulation.

NOTE : To prevent the inclusion of copper dust or other extraneous matter under the tape covering, the conductor shall be fully cleaned by felt pads or other suitable means before entering the mica taping machine.

10. INCREASE IN DIMENSIONS DUE TO THE COVERING :

The increase in dimension due to covering shall be as stated below :

Type of covering	Max. increase in dimension due to covering (mm)
Fine	0.34
Medium	0.55
Special	0.70

However the overall dimensions shall not exceed the nominal size of the bare conductor plus maximum increase due to insulation as specified above.

11. PROPERTIES OF INSULATED CONDUCTORS :

11.1 Electrical Strength (BDV) at Room Temperature :

The Electrical Breakdown voltage test (AC) shall be conducted on 5 samples. The samples shall be heated in an oven at 150 ± 3 deg.C for 15 minutes and shall be cooled down to room temperature. These shall then be bent edgewise on a mandrel of 50 mm diameter. On visual examination, no damages / cracks should appear on insulated conductor surface after bending. Any bent sample with damages / cracks shall be discarded for testing and new sample shall be selected and processed as above.

The insulation shall be stripped off at the ends for electrical connection. The samples shall be placed in a metal vessel filled with steel balls of 1 to 3 mm diameter and vessel solidly connected to earth. A sinusoidal a.c. voltage of 50 HZ frequency is applied and increased from zero with uniform rate of approximately 200 volts per second until breakdown occurs. The electrical breakdown voltage (AC) shall not be less than the values specified below :

Type of Covering	BDV (kV)
Fine	2.5
Medium	3.5
Special	3.5

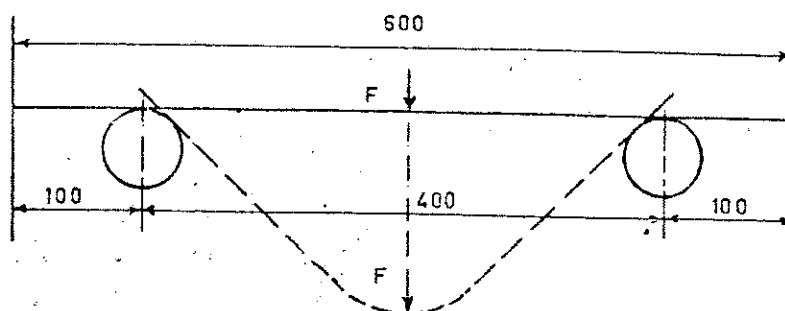
12. TEST AFTER REMOVAL OF POLYESTER-MICA PAPER TAPE

The covered conductor after removal of polyester - mica-paper tape shall meet the following requirements.

12.1 Hardness :

Area of Cross Section	Hardness (Hv)
Upto 8 mm^2	63, Max.
Above 8 mm^2	60, Max.

12.2 Stiffness Test upto 10 mm width :





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The straightened flat wire 600 mm long, is placed with the width horizontal on 2 Rollers of 15 mm dia, and an axial distance of 400 mm so that there is a projection of 100 mm each on both sides.

Load is applied at the centre of the flat wire till it slides through the rollers.

The stiffness value X_w is calculated by the formula :-

$$X_w = \frac{F \times (100 \text{ mm})}{W} \quad \frac{N}{\text{mm}^2}$$

F = Load in Newtons

$$W = \text{Moment of Resistance} = \frac{B_1 S_1^2}{6} \text{ mm}^3$$

Where ' B_1 ' = width & ' S_1 ' = thickness, in mm

Three tests shall be carried out. The mean value shall not exceed X_w value as given in the table below :

Stiffness N/mm ²	Thickness mm			
	Upto 1.5	Over 1.5 Upto 2.5	Over 2.5 Upto 4	4 and above
X_w	130	140	145	150

13. TEST CERTIFICATE :

Unless otherwise specified three copies of the test certificate shall be supplied along with each consignment

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 :

BP 28189 (Rev.13) : Polyester film-Mica Tape Insulated Rectangular Copper Conductors.

BHEL Order No.

Batch No.

Test values obtained & certificate of compliance with clause 8 to 12.



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14. PACKING AND MARKING :

The covered conductor shall be wound on drums generally conforming to IS:2069. About 60 kg of covered conductor shall be supplied in each drum. If cross section of covered conductor exceeds 15 sq. mm. bobbin dia shall be 400 to 450 mm otherwise it shall be around 300 mm. Flange dia to suit above bobbin dia shall be selected.

The wire shall be protected against possible damage, from the inner faces of the flanges of the drums, by lining each flange with thick paper or card-board. Paper spacers shall be filled in the empty space between conductor and flange of the drum.

A layer of packing paper shall be inserted between each layer of conductor during winding on drums.

Each drum shall be marked with the following :

BP 28189 : Polyester film - Mica Tape Insulated Rectangular Copper Conductors.

BHEL Order No.

Suppliers Name.

Size of Conductor.

Weight of wire (i) Gross (ii) Net.