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IS/IEC 60371-3-5:2005 (2005): Specification for Insulating Materials Based on MICA, Part 3 Specification for Individual Materials, Section 5: Glass-Backed Mica Paper with an Epoxy Resin Binder for Post - Impregnation (VPI) [ETD 2: Solid Electrical Insulating Materials and Insulation Systems]



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भारतीय मानक

अभ्रक आधारित उष्मारोधी सामग्री की विशिष्टि

भाग 3 एकल सामग्री की विशिष्टियाँ

अनुभाग 5 पोस्ट-इम्प्रेगनेशन (वी पी आई) के लिए एपॉक्सी रेजिन बाइंडर सहित
कांच-पृष्ठित अभ्रक पेपर

Indian Standard

**SPECIFICATION FOR INSULATING
MATERIALS BASED ON MICA**

PART 3 SPECIFICATIONS FOR INDIVIDUAL MATERIALS

**Section 5 Glass-Backed Mica Paper with an Epoxy Resin Binder
for Post-Impregnation (VPI)**

ICS 29.035.50

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BUREAU OF INDIAN STANDARDS
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NATIONAL FOREWORD

This Indian Standard (Part 3/Sec 5) which is identical with IEC 60371-3-5 : 2005 'Insulating materials based on mica — Part 3: Specifications for individual materials — Sheet 5: Glass-backed mica paper with an epoxy resin binder for post-impregnation (VPI)' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Solid Electrical Insulating Materials and Insulating Systems Sectional Committee and approval of the Electrotechnical Division Council.

This standard is a part of series of standards based on IEC 60371 series. The committee has now decided to adopt the IEC Standard to harmonize it with the latest developments taken place at international level. This standard is now being published in single number based on IEC 60371 in various parts/sections. Other parts/sections in this series are:

- Part 1 Definitions and general requirements
- Part 2 Methods of test
- Part 3 Specifications for individual materials,
 - Section 1 Commutator separators and materials
 - Section 2 Mica paper
 - Section 3 Specification for rigid mica materials for heating equipment
 - Section 4 Polyester film-backed mica paper with a B-stage epoxy resin binder
 - Section 6 Glass-backed mica paper with a B-stage epoxy resin binder
 - Section 7 Polyester film mica paper with an epoxy resin binder for single conductor taping
 - Section 8 Mica paper tapes for flame-resistant security cables
 - Section 9 Moulding micanite

The text of IEC Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain terminology and conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
IEC 60371-2 : 2004 Specification for insulating materials based on mica — Part 2: Methods of test	IS/IEC 60371-2 : 2004 Specification for insulating materials based on mica: Part 2 Methods of test	Identical

(Continued on third cover)

IS/IEC 60371-3-5 : 2005

The descriptive code quoted in Tables 1 and 2, for example G23/M80/R08 for type 5.1.01, Table 1, is derived from:

- glass content (G) 23 g/m²
- muscovite mica content (M) 80 g/m²
- resin content (R) 8 ± 3 %.

NOTE For phlogopite mica paper the letter "M" is replaced by the letter "P".

Table 1 – Composition low bond, with a resin content in the range (8 ± 3) %

Type	Descriptive code	Glass content g/m ²		Mica content g/m ²		Mass/ unit area g/m ²		Permissible thickness range mm		Volatile content max. %
		Nom. ±	Tol. ±	Nom. ±	Tol. ±	Nom. ±	Tol. ±	Mean	Individual	
5.1.01	G23/M80/R08	23	2	80	7	112	12	0,08-0,12	0,07-0,13	0,5
5.1.02	G23/P80/R08	23	2	80	7	112	12	0,08-0,12	0,07-0,13	0,5
5.1.03	G23/M120/R08	23	2	120	10	155	15	0,09-0,13	0,08-0,14	0,5
5.1.04	G23/P120/R08	23	2	120	10	155	15	0,09-0,13	0,08-0,14	0,5
5.1.05	G32/M120/R08	32	3	120	10	165	17	0,10-0,14	0,09-0,15	0,5
5.1.06	G32/P120/R08	32	3	120	10	165	17	0,10-0,14	0,09-0,15	0,5
5.1.07	G23/M160/R08	23	2	160	13	199	20	0,11-0,16	0,10-0,17	0,5
5.1.08	G23/P160/R08	23	2	160	13	199	20	0,11-0,16	0,10-0,17	0,5
5.1.09	G32/M160/R08	32	3	160	13	209	21	0,12-0,17	0,11-0,18	0,5
5.1.10	G32/P160/R08	32	3	160	13	209	21	0,12-0,17	0,11-0,18	0,5
5.1.11	G23/M180/R08	23	2	180	14	220	22	0,13-0,18	0,12-0,19	0,5
5.1.12	G23/P180/R08	23	2	180	14	220	22	0,13-0,18	0,12-0,19	0,5
5.1.13	G32/M180/R08	32	3	180	14	231	23	0,14-0,19	0,13-0,20	0,5
5.1.14	G32/P180/R08	32	3	180	14	231	23	0,14-0,19	0,13-0,20	0,5
5.1.15	G23/M250/R08	23	2	250	20	297	30	0,16-0,21	0,15-0,22	0,5
5.1.16	G23/P250/R08	23	2	250	20	297	30	0,16-0,21	0,15-0,22	0,5
5.1.17	G32/M250/R08	32	3	250	20	307	31	0,17-0,22	0,16-0,23	0,5
5.1.18	G32/P250/R08	32	3	250	20	307	31	0,17-0,22	0,16-0,23	0,5

Table 2 – Composition medium bond, with a resin content in the range of (16 ± 3) %

Type	Descriptive code	Glass content g/m ²		Mica content g/m ²		Mass/ unit area g/m ²		Permissible thickness range mm		Volatile content max. %
		Nom.	Tol. ±	Nom.	Tol. ±	Nom.	Tol. ±	Mean	Individual	
5.2.01	G23/M120/R16	23	2	120	10	170	17	0,10-0,14	0,09-0,15	0,5
5.2.02	G23/P120/R16	23	2	120	10	170	17	0,10-0,14	0,09-0,15	0,5
5.2.03	G32/M120/R16	32	3	120	10	181	18	0,12-0,16	0,11-0,17	0,5
5.2.04	G32/P120/R16	32	3	120	10	181	18	0,12-0,16	0,11-0,17	0,5
5.2.05	G23/M160/R16	23	2	160	13	218	22	0,12-0,17	0,11-0,18	0,5
5.2.06	G23/P160/R16	23	2	160	13	218	22	0,12-0,17	0,11-0,18	0,5
5.2.07	G32/M160/R16	32	3	160	13	229	23	0,14-0,19	0,13-0,20	0,5
5.2.08	G32/P160/R16	32	3	160	13	229	23	0,14-0,19	0,13-0,20	0,5
5.2.09	G23/M180/R16	23	2	180	14	242	24	0,14-0,19	0,13-0,20	0,5
5.2.10	G23/P180/R16	23	2	180	14	242	24	0,14-0,19	0,13-0,20	0,5
5.2.11	G32/M180/R16	32	3	180	14	253	26	0,16-0,21	0,15-0,22	0,5
5.2.12	G32/P180/R16	32	3	180	14	253	26	0,16-0,21	0,15-0,22	0,5
5.2.13	G23/M250/R16	23	2	250	20	325	33	0,17-0,22	0,16-0,23	0,5
5.2.14	G23/P250/R16	23	2	250	20	325	33	0,17-0,22	0,16-0,23	0,5
5.2.15	G32/M250/R16	32	3	250	20	336	34	0,19-0,24	0,18-0,25	0,5
5.2.16	G32/P250/R16	32	3	250	20	336	34	0,19-0,24	0,18-0,25	0,5

4 Requirements: raw materials

4.1 Mica paper

Mica paper referred to in this specification shall comply with the requirements of IEC 60371-3-2.

4.2 Glass fabric

Normally the glass fabric shall be continuous filament glass fibre made from E glass. Unless otherwise agreed to between purchaser and seller, the glass fibre shall be in the loom state and have a size content not greater than 3 % by weight.

For some applications a special type of size may be necessary and any requirements shall be subject to the purchase contract.

4.3 Epoxy resin

Any epoxy resin system may be used which enables the material to meet the requirements of this specification.

5 Requirements: composition and tolerances

When tested by the method of Clause 7 of IEC 60371-2 the composition of the products shall lie within the limits of Tables 1 and 2 for the appropriate grade of mica paper.

6 Requirements for material (as received)

6.1 General

All materials in any one consignment shall have the same properties, within the limits of this specification, throughout the length of each roll.

The surfaces shall be uniform and free from defects such as bubbles, pin-holes, creases and flaws.

Material supplied in rolls shall be capable of being unrolled continuously without damage, and the force required to unroll the material shall be substantially uniform. The material shall be supplied non-interleaved.

Unless otherwise specified in the purchase contract the material shall be rolled with the mica surface on the outside.

6.2 Width

This specification contains no requirement for width of tape. However, the following widths are preferred: 10, 12, 15, 20, 25, 30, 40 and 50 mm.

The maximum trimmed width of full width material and sheet normally available is 1 000 mm.

The tolerance on the width of the material shall be as in Table 3.

Table 3 – Tolerance on width

Nominal width mm	Tolerance mm
≤ 20	±0,5
> 20 ≤ 500	±1,0
> 500	±5,0

6.3 Thickness

Measure the thickness in accordance with Clause 4 of IEC 60371-2, using the apparatus given in 4.1.1 of that standard, making 10 measurements on one thickness of material. The measured values shall be in accordance with the requirements of Tables 1 and 2.

6.4 Length

There is no requirement in this specification for roll length, and this shall therefore be subject to the purchase contract.

For sheet material, the tolerance on length shall be the same as for width.

6.5 Cores

The tape shall be supplied compactly wound on cores of 25 mm, 40 mm, 55 mm, or 76 mm inside diameter which shall be free from sharp edges.

The width of the cores in relation to that of the tape shall be subject to the purchase contract.

Full width material and material wider than 100 mm shall be supplied on 55 mm or 76 mm cores.

6.6 Joins

The number of rolls with joins shall be limited to 25 % of any one consignment. Joined rolls of length less than 100 m shall contain no more than one join. The number of joins in rolls of length of 100 m or greater shall be subject to the purchase contract.

The method of making joins shall be subject to the purchase contract.

6.7 Tensile strength in the warp direction

When tested by the method of Clause 8 of IEC 60371-2, the tensile strength in the warp direction shall not be less than 100 N/10 mm width for 32 g/m² glass fabric and 60 N/10 mm width for 23 g/m² glass fabric.

For some applications lower or higher tensile strengths may be necessary, and any requirements shall be subject to the purchase contract.

6.8 Stiffness

The material shall be tested by the method of Clause 11 of IEC 60371-2.

The stiffness of the material shall be subject to the purchase contract.

6.9 Air porosity

The air permeance shall be measured in accordance with ISO 5636-5. The air permeance of the material shall be subject to purchase contract, except for low bond materials made with class 3 mica paper, based on non-calcinated muscovite, where the requirements of Table 4 shall apply.

Table 4 – Air porosity

Type	Descriptive code	Air porosity s/100 ml max
5.1.01	G23/M80/R08	800
5.1.03	G23/M120/R08	800
5.1.05	G32/M120/R08	800
5.1.07	G23/M160/R08	800
5.1.09	G32/M160/R08	800
5.1.15	G23/M250/R08	1 500
5.1.17	G32/M250/R08	1 500

7 Packing

The materials shall be packaged to ensure adequate protection during transport, handling and storage. Any necessary packing requirements shall be subject to the purchase contract.

Each package containing a number of unit packs shall have the following information clearly and indelibly marked on it:

- a) description of the material and the number of this specification;
- b) for material delivered in rolls, the width of the material and the length;

IS/IEC 60371-3-5 : 2005

- c) for material delivered as sheets, the dimensions of the sheet and the number of sheets in a stack, or the weight of the stack;
- d) the number of rolls, if applicable;
- e) the date of manufacture;
- f) shelf-life and storage conditions.

The manufacturer's reference number and batch number shall be identified on each package or roll.

Joined rolls shall be packed together clearly labelled on the outside of the container.

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<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
IEC 60371-3-2 : 2005 Insulating materials based on mica — Part 3: Specifications for individual materials — Sheet 2: Mica paper	IS/IEC 60371-3-2 : 2005 Insulating materials based on mica: Part 3 Specifications for individual materials, Section 2 Mica paper	Identical

The technical committee has reviewed the provision of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

<i>International Standard</i>	<i>Title</i>
ISO 5636-5 : 2003	Paper and board — Determination of air permeance and air resistance (medium range) — Part 5: Gurley method

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard alongwith amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

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