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मानक

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IS/IEC 60371-3-1 (2003): Specification for insulating materials based on mica, Part 3 Specification for individual materials, Section 1: Commutator Separators and materials [ETD 2: Solid Electrical Insulating Materials and Insulation Systems]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

अभ्रक आधारित उष्मारोधी सामग्री की विशिष्टि

भाग 3 एकल सामग्री की विशिष्टियाँ

अनुभाग 1 दिक्परिवर्तक विलगुनक और सामग्री

Indian Standard

**SPECIFICATION FOR INSULATING
MATERIALS BASED ON MICA**

PART 3 SPECIFICATIONS FOR INDIVIDUAL MATERIALS

Section 1 Commutator Separators and Materials

ICS 29.035.50

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NATIONAL FOREWORD

This Indian Standard (Part 3/Sec 1) which is identical with IEC 60371-3-1 : 2006 'Specification for insulating materials based on mica — Part 3: Specifications for individual materials — Sheet 1: Commutator separators and materials' 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 was first published as IS 9299 (Part 3/Sec 1) : 1979 'Insulating materials based on built-up mica or treated mica paper: Part 3 Specification for individual materials, Section 1 Rigid mica material for commutator separators'. 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 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 5 Glass-backed mica paper with an epoxy resin binder for post-impregnation (VPI)
 - 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

This standard supersedes IS 9299 (Part 3/Sec 1) : 1979 and after the publication of this standard IS 9299 (Part 3/Sec 1) shall be treated as withdrawn.

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 appear to the following International Standard for which Indian Standard also exists. The corresponding Indian Standard which is to be substituted in its place is listed below along with its degree of equivalence for the edition 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)

*Indian Standard***SPECIFICATION FOR INSULATING
MATERIALS BASED ON MICA****PART 3 SPECIFICATIONS FOR INDIVIDUAL MATERIALS****1 Scope** **Section 1 Commutator Separators and Materials**

This sheet of IEC 60371-3 applies to several types of rigid materials based on mica splittings or mica paper for commutator separators. These products shall be made from muscovite or phlogopite mica, built up from mica splittings or mica paper by the use of a suitable bonding medium. They are supplied in the following forms:

- sheets in the dimensions in which they are pressed or after trimming;
- strips cut from sheets;
- commutator separators having the shapes and dimensions and in the conditions ordered by the user.

The normal manufacturing thicknesses lie between 0,3 mm and 2 mm.

Materials which conform to this specification meet established levels of performance.

However, the selection of material by a user for a specific application should be based on the actual requirements necessary for adequate performance in that application and not based on this specification alone.

Safety warning:

It is the responsibility of the user of the methods contained or referred to in this document to ensure that they are used in a safe manner.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60371-2:2004, *Specification for insulating materials based on mica – Part 2: Methods of test*

3 General requirements

The material as supplied shall be of uniform hardness, free from soft patches and foreign matter.

The bonding medium used shall be agreed between supplier and purchaser.

The materials, when tested in accordance with the methods given in IEC 60371-2, shall comply with the requirements of this publication.

4 Thickness

4.1 Definition of nominal thickness

The nominal thickness is that stated when ordering, being the thickness on delivery (before assembly of the commutator).

4.2 Measurements and tolerances

The tolerances with respect to the nominal thickness, in millimetres, are given in Tables 1 and 2.

4.2.1 Sheets, strips and separators having a surface area $\leq 10 \text{ cm}^2$

Specimen: as in 4.2.1 and 4.2.4 of IEC 60371-2. The thickness shall be measured with the apparatus given in 4.1.3 of that standard (diameter of measuring faces 6 mm to 8 mm, pressure: 7 MPa).

The thickness measurements shall be in accordance with 4.3 of IEC 60371-2.

Table 1 – Thickness tolerances for sheets, strips and separators having a surface $\leq 10 \text{ cm}^2$

Property	Mica splittings	Mica paper (normal tolerance)	Mica paper (close tolerance)
Tolerance of specimen	$\pm 0,03 \text{ mm}$	$\pm 0,03 \text{ mm}$	$\pm 0,02 \text{ mm}$
Difference between maximum and minimum values of thickness on same specimen	0,06 mm	0,06 mm	0,04 mm

4.2.2 Separators having a surface area greater than 10 cm^2

4.2.2.1 Separators supplied individually

Specimen: as in 4.2.5 a) of IEC 60371-2.

The thickness measurement shall be in accordance with 4.3 of IEC 60371-2.

Table 2 – Thickness tolerances for separators having a surface area greater than 10 cm^2

Property	Mica splittings	Mica paper
Tolerance of specimen	$\pm 0,02 \text{ mm}$	$\pm 0,015 \text{ mm}$
Difference between maximum and minimum values of thickness on same specimen	0,04 mm	0,03 mm

4.2.2.2 Stack height of separators supplied in packeted stacks

The nominal height of the stack and the number of separators per stack should be stated when material is ordered. The stack height shall be measured in accordance with 4.1.4 of IEC 60371-2. With a pressure of 30 MPa the variation in height from the nominal shall be agreed upon between purchaser and supplier.

5 Dimensions, other than thickness

5.1 Sheets

The tolerance on the nominal length and on the nominal width on sheets trimmed to size is $\pm 5\%$.

NOTE Where sheets are not trimmed to size, tolerance on mass shall be agreed upon.

5.2 Strips

The tolerance on length is $\pm 5\%$ and the tolerance on the nominal width is $\pm 0,5$ mm.

5.3 Separators

The tolerances on overall dimensions are

- $\pm 0,3$ mm for separators with surface areas not exceeding 10 cm^2 ,
- $\pm 0,5$ mm for separators with a surface area over 10 cm^2 .

6 Detection of defects and conducting particles in sheets

As stated in Clause 19 of IEC 60371-2, until a method of detection of defects has been agreed, the type and number of defects shall be subject to contract.

7 Characteristics

Tables 3 and 4 give the specified values for the characteristics of products based on mica material for commutator separators, in whatever form they are delivered.

8 Form

Products based on mica or mica splittings for commutator separators are generally supplied:

- in sheets approximately 1 000 mm long and 500 mm to 1 000 mm wide;
- in strips approximately 1 000 mm long and not more than 200 mm wide;
- shaped commutator separators having a surface area up to 10 cm^2 are generally supplied in bulk (unless otherwise agreed between manufacturer and user);
- shaped commutator separators having surface area over 10 cm^2 are delivered either in bulk, in non-calibrated packets or in packeted stacks. The number of separators per packet, generally between 20 and 50, is subject to special agreement. Also, according to the type of material, intermediate layers may be used.

9 Marking

Packages shall be marked with the IEC publication reference and type of product (e.g. IEC 60371-3-1 Type P7), the manufacturer's identification, the nominal thickness and dimensions, and the number of pieces and/or weight in each package.

For products supplied in packets, the following additional indications shall be given on each packet:

- non-calibrated packets: the number of separators per packet;

- calibrated packets: the number of separators per packet and the total height of the stack (after subtracting the thicknesses of the intermediate layers).

Table 3 – Requirements for materials based on mica splittings

Type	Description	Nominal thickness mm	Minimum mica content %	Resistance to exudation and displacement °C a	Elastic compression max. %	Plastic compression max. %	Temperature of compression measurement °C	Electric strength kV/mm b
S1	Punching quality, muscovite	0,3 to 1,6	92	No requirement	3	5	150	7
S2	Punching quality, phlogopite							
S3	Standard quality, muscovite	0,5 to 2	95	200	3	5	160	7
S4	Standard quality, base sheet, phlogopite							
S5	Special quality A, muscovite	0,5 to 2	95	220	2	4	200	7
S6	Special quality A, phlogopite							
S15	Special quality B, muscovite	0,5 to 2	95	300	2	3	200	7
S16	Special quality B, phlogopite							
Relevant clause number of IEC 60371-2: Methods of test		4	7.6	12	13	13	13	16
a At the temperature specified, no exudation of binder or displacement of mica shall be detectable with normal corrected vision.								
b 6 mm electrodes for strips and separators; 25 mm to 75 mm electrodes for sheet materials.								
NOTE The density of all materials is in the range of 2,2 g/cm ³ to 2,6 g/cm ³ .								

Table 4 – Requirements for materials based on mica paper

Type	Description	Nominal thickness mm	Minimum mica content %	Resistance to exudation and displacement °C ^a	Elastic compression Max. %	Plastic compression Max. %	Temperature of compression measurement °C	Electric strength kV/mm ^b
P7	Punching quality, muscovite	0,3 to 1,6	90	No requirement	5	5	150	7
P8	Punching quality, phlogopite							
P9	Standard quality, muscovite	0,5 to 2	90	200	4	5	160	7
P10	Standard quality, base sheet, phlogopite							
P11	Special quality A, muscovite	0,5 to 2	90	220	2	4 ^c	200	7
P12	Special quality A, phlogopite							
P13	Special quality B, muscovite	0,5 to 2	90	300	2	3 ^c	200	7
P14	Special quality B, phlogopite							
Relevant clause number of IEC 60371-2 Methods of test		4	7,6	12	13	13	13	16

a At the temperature specified, no droplets of binder or displacement of mica should be observed in test in Clause 12.

b 6 mm electrodes for strips and separators; 25 mm to 75 mm electrodes for sheet materials.

c This may be reduced to 2 % when required by the purchaser.

NOTE The density of all materials is in the range of 2,0 g/cm³ to 2,4 g/cm³.

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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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