IS/IEC 60371-3-2:2005 (2005): Specification for Insulating Materials Based on MICA, Part 3 Specification for Individual Materials, Section 2: Mica Paper [ETD 2: Solid Electrical Insulating Materials and Insulation Systems]

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IS/IEC 60371-3-2 : 2005
[Superseding IS 9299 (Part 3/Sec 7) : 1992]

भारतीय मानक

अभ्रक आधारित उष्मारोधी सामग्री की विशिष्टि

भाग 3 एकल सामग्री की विशिष्टियाँ

अनुभाग 2 अभ्रक पेपर

Indian Standard

SPECIFICATION FOR INSULATING MATERIALS BASED ON MICA

PART 3 SPECIFICATIONS FOR INDIVIDUAL MATERIALS

Section 2 Mica Paper

ICS 29.035.50

BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

May 2012 **Price Group 4**

Solid Electrical Insulating Materials and Insulating Systems Sectional Committee, ETD 02

NATIONAL FOREWORD

This Indian Standard (Part 3/Sec 2) which is identical with IEC 60371-3-2 : 2005 'Insulating materials based on mica — Part 3: Specifications for individual materials — Sheet 2: Mica paper' 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 7) : 1992 'Insulating materials based on built-up mica or treated mica paper: Part 3 Specification for individual materials, Section 7 Mica paper'. 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 as IS/IEC based on IEC 60371 in various parts/sections. Other parts 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 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 7) : 1992 and after the publication of this standard IS 9299 (Part 3/Sec 7) 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.

(*Continued on third cover*)

Indian Standard

SPECIFICATION FOR INSULATING MATERIALS BASED ON MICA

PART 3 SPECIFICATIONS FOR INDIVIDUAL MATERIALS

Section 2 Mica Paper

1 Scope

This part of IEC 60371 gives requirements for electrical insulating materials made from mica paper which is to be processed for built-up mica materials according to IEC 60371-1, such as rigid flat mica materials, flexible mica materials, curable flexible mica materials and shaped pieces.

Materials which conform to this specification meet established levels of performance. However, the selection of a 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.

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 60371-1:2003, *Specification for insulating materials based on mica – Part 1: Definitions and general requirements*

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

IEC 60554-2:2001, *Cellulosic papers for electrical purposes – Part 2: Methods of test*

IEC 60589:1977, *Methods of test for the determination of ionic impurities in electrical insulating materials by extraction with liquids*

ISO 534:2005, *Paper and board – Determination of thickness and apparent bulk density or apparent sheet density*

ISO 536:1995, *Paper and board – Determination of grammage*

ISO 5636-5:2003, *Paper and board – Determination of air permeance and air resistance (medium range) – Part 5: Gurley method*

3 General

3.1 Classification and designation

Mica papers are classified in several types depending on the nature of the mica minerals used and the manufacturing procedure. These types have different characteristics as regards thickness, mass per unit area and physical and chemical properties.

The nature of the mica minerals is designated by the symbols MPM or MPP, as follows:

MPM = mica paper, muscovite;

MPP = mica paper, phlogopite.

Since it would not be possible to harmonize the many-sided interests connected with mica paper made by diverse procedures, the following four main classes have been chosen:

Class 1 MPM: mica paper based on calcined muscovite, chemical process;

Class 2 MPM: mica paper based on calcined muscovite, mechanical process;

Class 3 MPM: mica paper based on uncalcined muscovite;

Class 4 MPP: mica paper based on uncalcined phlogopite.

The above classes are distinguished from each other by characteristic properties such as porosity, penetration and tensile strength. These properties are plotted versus mass per unit area in Figures 1 to 3 showing the possible ranges of the four different classes.

NOTE The base materials for MPM-types classes 1 and 2 can be blended in order to achieve a mica paper with characteristics lying between class 1 and class 2 types, and should be subject to contract.

The letter symbols for the nature of the mica minerals are followed by four digits indicating the class (first digit) and the mass per unit area (second to fourth digits).

Example: designation of mica paper based on calcined muscovite (MPM), with a mass per unit area of 50 g/m^2, whose properties meet the requirements given in Table 2 for class 1: Mica paper - IEC 60371-3-2 MPM-1050.

3.2 Standard forms of delivery

Mica papers may be supplied in rolls or sheet form.

3.3 Marking

Rolls and packets of mica paper supplied as complying with this specification shall be marked with the following:

– supplier, manufacturer and trade name;
– batch/roll number;
– designation in accordance with 3.1;
– net mass of roll or packet.

The marks shall be durable and fixed in such a manner that they can be read until the mica paper is completely unrolled, or the packet has been completely used.

4 General requirements

The mica paper shall comply with the requirements of IEC 60371-1 and with this standard.

4.1 Conditions as received

Mica paper shall be supplied wound on cores sufficiently tightly to enable the material to be unwound smoothly without telescoping. On receipt, the roll end shall form a plane circular surface with no apparent telescoping.

The difference between the roll width and the paper width shall be subject to contract between purchaser and supplier.

The width of the rolls and their core and outer diameter shall be subject to contract between purchaser and supplier.

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

Mica paper in sheets or when unrolled shall be flat and smooth, free from defects such as compressed spots, holes, creases and contamination, e.g. large hard mica particles and electrically conductive inclusions.

Splices in mica paper are not acceptable.

4.2 Properties

When tested according to Clause 5, the measured values shall conform with the requirements given in Table 2.

5 Tests

5.1 Test specimens

The number of test specimens necessary for each test is indicated in the test method.

If delivered in rolls, the two outermost layers of mica paper shall be removed prior to taking a sample of about 1 m^2.

If mica paper is delivered in sheets, one sheet constitutes the specimen which has to meet the requirements for the respective batch.

5.1.1 Sampling and preparation of test specimens

For any test, the specimens shall be cut in such a manner that the full width of the material is represented. The cut edge shall be straight and free from tears and cracks. Die cutting is preferred when possible.

5.1.2 Dimensions of test specimens

The dimensions of the test specimens for each test are given in Table 1.

The mean thickness is the average of ten thickness measurements made on the test sheet or sample, at approximately equispaced locations across the diagonal of the sheet or sample.

Table 1 – Dimensions of test specimens

Requirements	Test method		Test specimens	
	Publication	Clause or subclause	Dimensions mm	Tolerances mm
Mass per unit area	IEC 60554-2	3	100 × 100 alternatively ∅ 113	± 0,2 ±0,2
Conductivity of the aqueous extract	IEC 60589			
Loss of mass at 500 °C	IEC 60371-2	7.4.1		
Tensile strength	IEC 60554-2	5	15 × 250	± 0,2
Air porosity	ISO 5636-5		50 × 120	± 1
Penetration	IEC 60371-2	20	75 × 75	± 1

Table 2 – Requirements for mica paper

Class	Range of mass per unit area	Preferred types	Mass per unit area			Thickness		Air porosity	Impregnation time	Conductivity of an aqueous extract	Loss of mass	Tensile strength
			Nominal	Admissible deviation between mean value and nominal value	Admissible deviation between individual values and nominal value	Expected thickness	Maximum difference between individual readings and mean of all values		Non-sieve side			
	g/m^2		g/m^2	%	%	µm	%	s/100 ml	s	µS/cm (max.)	% (max.)	N/cm width
			Test method according to									
			IEC 60554-2, Clause 6 and ISO 536			IEC 60554-2, 5.1 and ISO 534		ISO 5636-5	IEC 60371-2, Clause 20	IEC 60589	IEC 60371-2, 7 4.1	IEC 60554-2, Clause 8
1	50 ... 120	MPM 1050 MPM 1060 MPM 1075	50 60 75	±4	±6	45 50 60	±10	Figure 1	Figure 2	70	0,5	Figure 3
2	120 ... 300	MPM 2120 MPM 2150 MPM 2180 MPM 2250	120 150 180 250	±4	±7	90 110 130 180	±14	Figure 1	Figure 2	20	0,5	Figure 3
3	80 ... 560	MPM 3080 MPM 3120 MPM 3160 MPM 3250 MPM 3370	80 120 160 250 370	±5	±7 ... ±12 [1)]	55 85 105 160 240	±15	Figure 1	Figure 2	10	0,4	Figure 3
4	60 ... 250	MPP 4080 MPP 4120 MPP 4160	80 120 160	±5	±7 ... ±12 [1)]	60 75 95	±15	Figure 1	Figure 2	10	0,4	Figure 3

1) The figures indicate that the maximum deviation between individual values of thickness and the nominal value for these classes of mica paper may range from ± 7 % to ± 12 %, dependent upon the specific grade of material.

The actual admissible deviation shall be subject to contract between purchaser and supplier.

2) Air Porosity shall be measured in accordance with ISO 5636/5: 2003. clause 3.2 “Air Resistance”. Results shall be expressed in seconds per 100 ml.

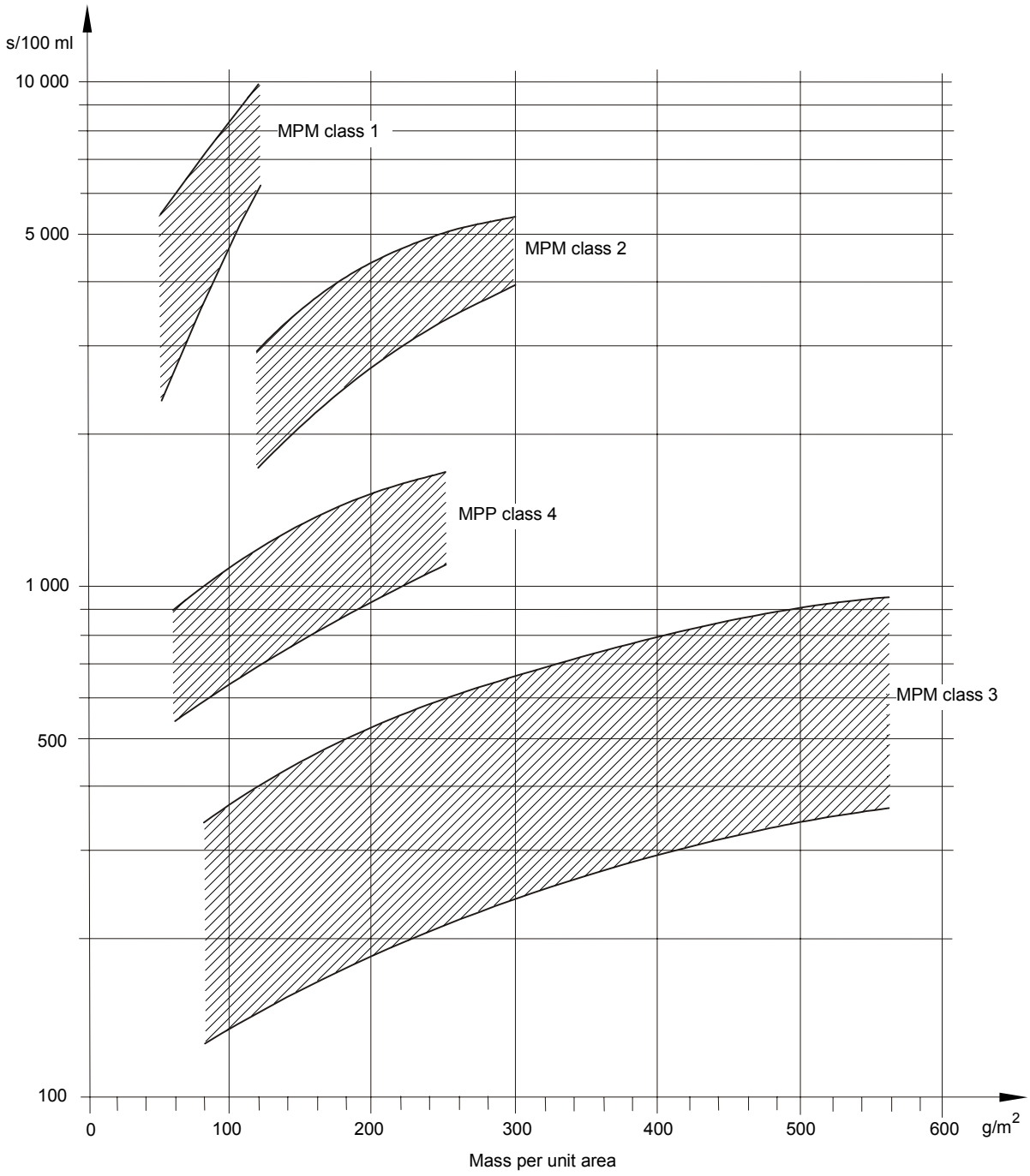

Figure 1 – Mica paper – Air porosity

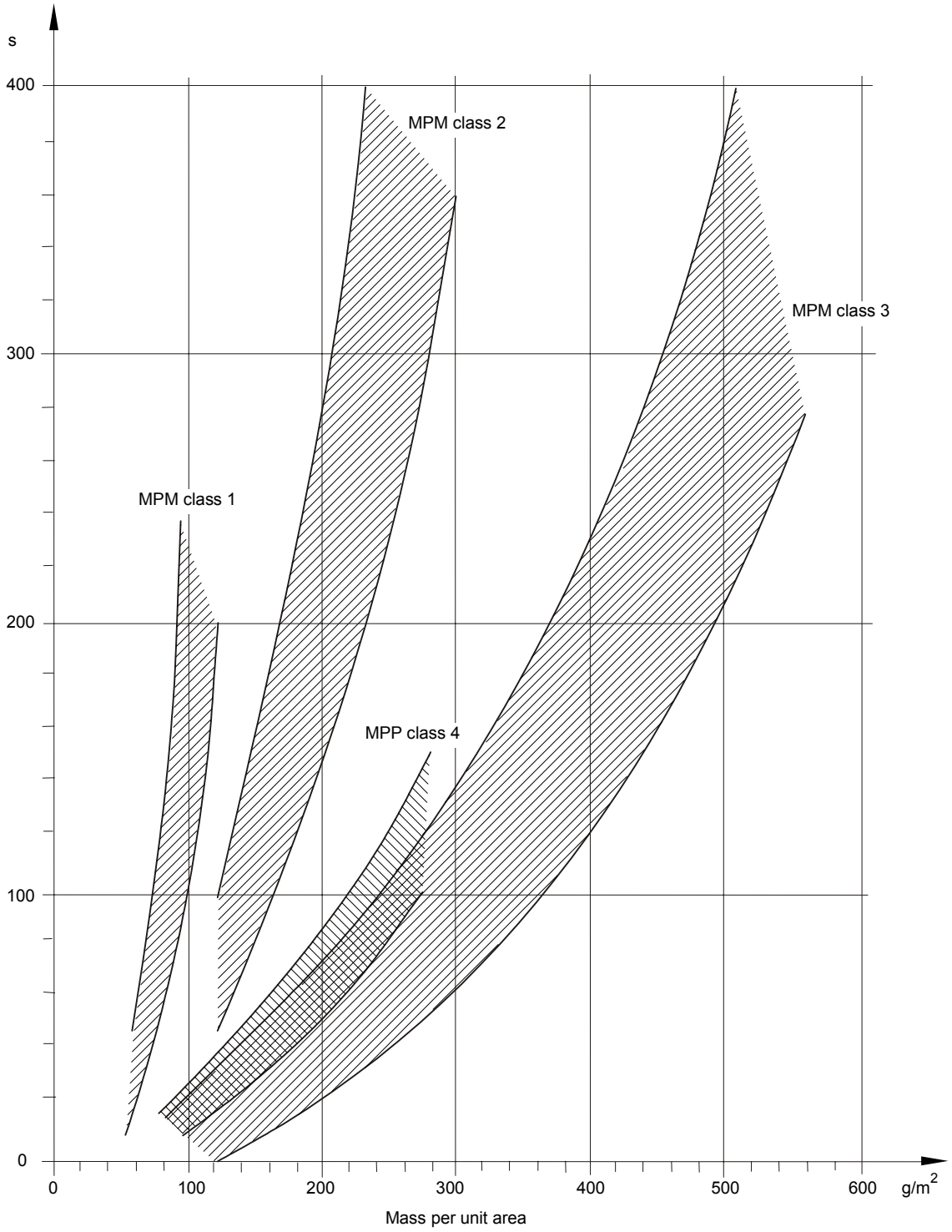

Figure 2 – Mica paper – Penetration

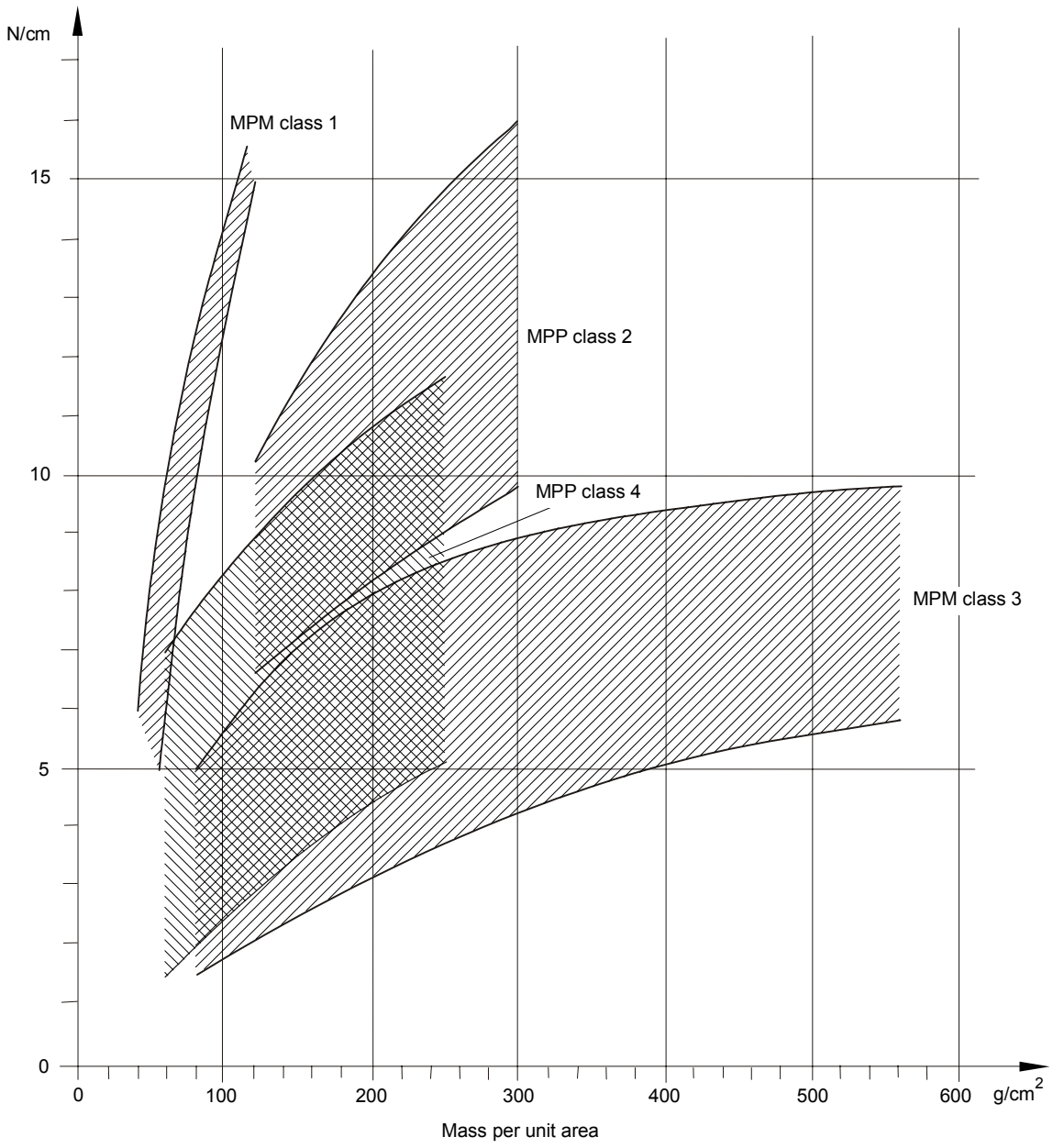

Figure 3 – Mica paper – Tensile strength

(*Continued from second cover*)

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:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC 60371-1 : 2003 Specification for insulating materials based on mica — Part 1: Definitions and general requirements	IS/IEC 60371-1 : 2003 Specification for insulating materials based on mica: Part 1 Definitions and general requirements	Identical
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	do
IEC 60554-2 : 2001 Cellulosic papers for electrical purposes — Part 2: Method of test	IS 9335 (Part 2) : 1998 Cellulosic papers for electric purposes: Part 2 Methods of test	do
IEC 60589 : 1977 Methods of test for the determination of ionic impurities in electrical insulating materials by extraction with liquids	IS 10581 : 1983 Methods of test for the determination of ionic impurities in electrical insulating materials by extraction with liquids	do

The technical committee has reviewed the provisions of the following International Standards referred to in this adopted standard and has decided that they are acceptale for use in conjuction with this standard:

International Standard	*Title*
ISO 534 : 2005	Paper and board — Determination of thickness and apparent bulk density or apparent sheet density
ISO 536 : 1995	Paper and board — Determination of grammage
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.

Bureau of Indian Standards

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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'.

This Indian Standard has been developed from Doc No.: ETD 02 (6090).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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