INTERNATIONAL STANDARD

IEC 60371-3-5

Second edition
2005-11

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)



Reference number
IEC 60371-3-5:2005(E)

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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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)

FOREWORD

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International Standard IEC 60371-3-5 has been prepared by IEC technical committee 15: Standards on specifications for electrical insulating materials.

This second edition cancels and replaces the first edition, published in 1992, and constitutes a technical revision.

The main changes with regard to the previous edition include adjustments needed to align this standard with changes included in the latest edition of IEC 60371-2.

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The text of this standard is based on the following documents:

FDIS	Report on voting
15/228/FDIS	15/246/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

This part of IEC 60371 forms part of a series which deals with insulating materials built up from mica splittings or mica paper with or without reinforcement, and with mica paper in its pure state for use in electrical equipment..

IEC 60371 consists of three parts under the main title *Specification for insulating materials based on mica:*

Part 1: Definitions and general requirements

Part 2: Methods of test

Part 3: Specifications for individual materials

This standard contains one of the sheets comprising part 3, as follows:

Sheet 5: Glass-backed mica paper with an epoxy resin binder for post-impregnation (VPI – *vacuum pressure impregnation)*

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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)

1 Scope

This part of IEC 60371 gives requirements for electrical insulating materials made by combining mica paper with glass fabric and bonding them together with a small amount of epoxy resin. The material is supplied in a flexible state and is designed for use in conjunction with vacuum pressure impregnation (VPI) with compatible impregnates. The final cured properties will be primarily dependent on the VPI resin used.

Two bond contents are specified:

– low bond with a resin content of (8 ± 3) %;
– medium bond with a resin content of (16 ± 3) %.

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

IEC 60371-3-2, *Insulating materials based on mica – Part 3: Specifications for individual materials – Sheet 2: Mica paper*

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

3 Designation

When ordering materials to this specification only the specification and type numbers need be quoted (see Tables 1 and 2).

Example: IEC 60371-3-5: type 5.1.01

The type number is derived from:

– the specification sheet number 5
– plus the sheet table number 5.1
– plus the number of the product in the sheet table 5.1.01

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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/m²		Mica content g/m²		Mass/ unit area g/m²		Permissable 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

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

Type	Descriptive code	Glass content g/m²		Mica content g/m²		Mass/ unit area g/m²		Permissable thickness range mm		Volatile content
		Nom.	Tol. ±	Nom.	Tol. ±	Nom.	Tol. ±	Mean	Individual	max. %
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.

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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 > 20 ≤ 500 > 500	±0,5 ±1,0 ±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.

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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;

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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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