

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Non-cellulosic papers for electrical purposes –
Part 3: Specifications for individual materials – Sheet 4: Aramid fibre paper
containing not more than 50 % of mica particles**

**Papiers non cellulosiques pour usages électriques –
Partie 3: Spécifications pour matériaux particuliers – Feuille 4: Papier en fibre
aramide ne contenant pas plus de 50 % de particules de mica**



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CONTENTS

| | |
|---|---|
| FOREWORD..... | 3 |
| INTRODUCTION..... | 5 |
| 1 Scope..... | 6 |
| 2 Normative references..... | 6 |
| 3 Requirements..... | 6 |
| Bibliography..... | 9 |
| Table 1 – Physical and electrical requirements..... | 7 |

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

NON-CELLULOSIC PAPERS FOR ELECTRICAL PURPOSES –

Part 3: Specifications for individual materials – Sheet 4: Aramid fibre paper containing not more than 50 % of mica particles

FOREWORD

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International Standard IEC 60819-3-4 has been prepared by IEC technical committee 15: Solid electrical insulating materials.

This second edition cancels and replaces the first edition published in 2001. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: the document was updated including new thicknesses and relevant values as from Table 1.

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

| CDV | Report on voting |
|------------|------------------|
| 15/689/CDV | 15/706/RVC |

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.

A list of all parts in the IEC 60819 series, published under the general title *Non-cellulosic papers for electrical purposes*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This International Standard is one of a series which deals with non-cellulosic papers for electrical purposes.

The series consists of three parts:

Part 1: Definitions and general requirements (IEC 60819-1).

Part 2: Methods of test (IEC 60819-2).

Part 3: Specifications for individual materials (IEC 60819-3).

This standard is one of the sheets comprising Part 3:

Sheet 4: Aramid fibre paper containing not more than 50 % of mica particles.

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NON-CELLULOSIC PAPERS FOR ELECTRICAL PURPOSES –

Part 3: Specifications for individual materials – Sheet 4: Aramid fibre paper containing not more than 50 % of mica particles

1 Scope

This sheet of IEC 60819-3 specifies requirements for two types of aramid fibre paper containing mica particles and designated as PAaM.

- type 1: calendered aramid paper containing mica particles;
- type 2: uncalendered aramid paper containing mica particles.

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.

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2 Normative references

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

IEC 60819-1, *Non-cellulosic papers for electrical purposes – Part 1: Definitions and general requirements*

IEC 60819-2:2001, *Non-cellulosic papers for electrical purposes – Part 2: Methods of test*

3 Requirements

In addition to complying with the general requirements in IEC 60819-1, papers shall comply with the specific requirements appropriate to their type as given in the following list and in Table 1.

- The mica content of either type of paper shall be up to 50 % by mass.
- Thermal classification: based on long-term thermal ageing tests and the resulting Arrhenius graph, experience has shown that non-cellulose papers listed in this sheet may be suitable for use in electrical apparatus and shall have a relative temperature index (RTI) of at least 220.
- The moisture content of type 1 paper shall not exceed 10,0 %.
- The moisture content of type 2 paper shall not exceed 14,0 %.
- The dissipation factor measured in accordance with Clause 6 of IEC 60819-2:2001 shall not exceed 0,1. The permittivity for type 1 shall be $4,5 \pm 0,5$. The permittivity for type 2 shall be $3,0 \pm 0,5$.
- Apparent density shall be for the two types described:
 - type 1: $1,10 \text{ g/cm}^3 \pm 15 \%$
 - type 2: $0,4 \text{ g/cm}^3 \pm 15 \%$

Table 1 – Physical and electrical requirements

| Property | Clause of IEC 60819-2:2001 | Units | Nominal Thickness mm | Type 1 | | Type 2 | |
|---|----------------------------|-------------------|----------------------|---------|---------|---------|---------|
| | | | | Minimum | Maximum | Minimum | Maximum |
| Thickness | 4 | mm | 0,080 | 0,073 | 0,097 | – | – |
| | | | 0,130 | 0,118 | 0,151 | – | – |
| | | | 0,150 | 0,132 | 0,168 | – | – |
| | | | 0,200 | 0,188 | 0,229 | 0,175 | 0,242 |
| | | | 0,250 | 0,241 | 0,295 | – | – |
| | | | 0,350 | 0,321 | 0,390 | 0,259 | 0,407 |
| Grammage | 5 | g/m ² | 0,080 | 74 | 105 | – | – |
| | | | 0,130 | 130 | 168 | – | – |
| | | | 0,150 | 160 | 196 | – | – |
| | | | 0,200 | 218 | 256 | 82 | 94 |
| | | | 0,250 | 271 | 322 | – | – |
| | | | 0,350 | 363 | 431 | 142 | 170 |
| Apparent density | – | g/cm ³ | 0,080 | 0,93 | 1,17 | – | – |
| | | | 0,130 | 0,98 | 1,22 | – | – |
| | | | 0,150 | 1,05 | 1,26 | – | – |
| | | | 0,200 | 1,05 | 1,22 | 0,35 | 0,44 |
| | | | 0,250 | 1,05 | 1,21 | – | – |
| | | | 0,350 | 1,04 | 1,20 | 0,36 | 0,48 |
| Electric strength | 10 | kV/mm | 0,080 | 20 | NR | – | – |
| | | | 0,130 | 23 | NR | – | – |
| | | | 0,150 | 28 | NR | – | – |
| | | | 0,200 | 29 | NR | 11 | NR |
| | | | 0,250 | 30 | NR | – | – |
| | | | 0,350 | 28 | NR | 11 | NR |
| Minimum edge tearing resistance Machine direction | 8 | N | 0,080 | 14 | NR | – | – |
| | | | 0,130 | 24 | NR | – | – |
| | | | 0,150 | 34 | NR | – | – |
| | | | 0,200 | 48 | NR | 19 | NR |
| | | | 0,250 | 48 | NR | – | – |
| | | | 0,350 | 90 | NR | 38 | NR |
| Minimum edge tearing resistance Cross Machine direction | 8 | N | 0,080 | 11 | NR | – | – |
| | | | 0,130 | 14 | NR | – | – |
| | | | 0,150 | 22 | NR | – | – |
| | | | 0,200 | 40 | NR | 11 | NR |
| | | | 0,250 | 47 | NR | – | – |
| | | | 0,350 | 69 | NR | 22 | NR |

| Property | Clause of IEC 60819-2:2001 | Units | Nominal Thickness mm | Type 1 | | Type 2 | |
|--|----------------------------|-------|----------------------|---------|---------|---------|---------|
| | | | | Minimum | Maximum | Minimum | Maximum |
| Tensile strength Machine direction | 7 | N/cm | 0,080 | 19 | NR | – | – |
| | | | 0,130 | 38 | NR | – | – |
| | | | 0,150 | 42 | NR | – | – |
| | | | 0,200 | 76 | NR | 13 | NR |
| | | | 0,250 | 78 | NR | – | – |
| | | | 0,350 | 102 | NR | 21 | NR |
| Tensile strength Cross machine direction | 7 | N/cm | 0,080 | 12 | NR | – | – |
| | | | 0,130 | 24 | NR | – | – |
| | | | 0,150 | 29 | NR | – | – |
| | | | 0,200 | 52 | NR | 8 | NR |
| | | | 0,250 | 53 | NR | – | – |
| | | | 0,350 | 71 | NR | 16 | NR |
| Elongation at break Machine direction | 7 | % | 0,080 | 1,0 | NR | – | – |
| | | | 0,130 | 1,3 | NR | – | – |
| | | | 0,150 | 1,3 | NR | – | – |
| | | | 0,200 | 1,3 | NR | 1,0 | NR |
| | | | 0,250 | 1,3 | NR | – | – |
| | | | 0,350 | 1,3 | NR | 1,2 | NR |
| Elongation at break Cross machine direction | 7 | % | 0,080 | 1,0 | NR | – | – |
| | | | 0,130 | 1,3 | NR | – | – |
| | | | 0,150 | 1,3 | NR | – | – |
| | | | 0,200 | 1,3 | NR | 1,5 | NR |
| | | | 0,250 | 1,3 | NR | – | – |
| | | | 0,350 | 1,3 | NR | 1,5 | NR |
| <p>Tensile strength and elongation at break requirements apply to test pieces having 25 mm width with jaw separation of 125 mm and separation speed of 0,85 mm/s.</p> <p>NOTE NR: no requirement</p> | | | | | | | |

Bibliography

IEC 60819-3 (all sheets), *Non-cellulosic papers for electrical purposes – Part 3: Specifications for individual materials*

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