

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

Specifications for particular types of winding wires –  
Part 46: Aromatic polyimide enamelled round copper wire, class 240

Spécifications pour types particuliers de fils de bobinage –  
Partie 46: Fil de section circulaire en cuivre emailé avec polyimide aromatique,  
classe 240



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

## Part 46: Aromatic polyimide enamelled round copper wire, class 240

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International Standard IEC 60317-46 has been prepared by IEC technical committee 55: Winding wires.

This second edition cancels and replaces the first edition published in 1997. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- deletion of the "in some countries" statement in the scope;
- new subclause containing general notes on winding wire, formerly a part of the scope;
- new subclause containing requirements for appearance;
- revision to the notes in Clause 19, Dielectric dissipation factor;
- new Clause 23, Pin-hole test.

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

| FDIS         | Report on voting |
|--------------|------------------|
| 55/1420/FDIS | 55/1441/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.

This International standard is to be read in conjunction with the IEC 60317-0-1:2013.

The numbering of clauses in this standard is not continuous from Clauses 20 and 30 in order to reserve space for possible future wire requirements prior to those for wire packaging.

A list of all parts in the IEC 60317 series, published under the general title *Specifications for particular types of winding wires*, 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- withdrawn,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 part of IEC 60317 is one of a series which deals with insulated wires used for windings in electrical equipment. The series has three groups describing:

- 1) Winding wires – Test methods (IEC 60851);
- 2) Specifications for particular types of winding wires (IEC 60317);
- 3) Packaging of winding wires (IEC 60264).

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# SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

## Part 46: Aromatic polyimide enamelled round copper wire, class 240

### 1 Scope

This part of IEC 60317 specifies the requirements of enamelled round copper winding wire of class 240 with a sole coating of aromatic polyimide resin.

The range of nominal conductor diameters covered by this standard is:

- grade 1: 0,020 mm up to and including 2,000 mm;
- grade 2: 0,020 mm up to and including 5,000 mm.

The nominal conductor diameters are specified in Clause 4 of IEC 60317-0-1:2013.

### 2 Normative reference

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 60317-0-1:2013, *Specifications for particular types of winding wires – Part 0-1: General requirements – Enamelled round copper wire*  
<http://standards.iteh.ai/standards/sist/f493e7ce-ed0-4940-9865-dbe5a14c1c12/iec-60317-46-2013>

### 3 Terms, definitions, general notes and appearance

#### 3.1 Terms and definitions

Subclause 3.1 of IEC 60317-0-1:2013 applies.

#### 3.2 General notes

##### 3.2.1 Methods of test

Subclause 3.2.1 of IEC 60317-0-1:2013 applies. In case of inconsistencies between IEC 60317-0-1:2013 and this standard, the latter shall prevail.

##### 3.2.2 Winding wire

Class 240 is a thermal class that requires a minimum temperature index of 240 and heat shock temperature of at least 260 °C.

The temperature in degrees Celsius corresponding to the temperature index is not necessarily that at which it is recommended that the wire be used, and this will depend on many factors, including the type of equipment involved.

#### 3.3 Appearance

Subclause 3.3 of IEC 60317-0-1:2013 applies.



#### 4 Dimensions

Clause 4 of IEC 60317-0-1:2013 applies.

#### 5 Electrical resistance

Clause 5 of IEC 60317-0-1:2013 applies.

#### 6 Elongation

Clause 6 of IEC 60317-0-1:2013 applies.

#### 7 Springiness

Clause 7 of IEC 60317-0-1:2013 applies.

#### 8 Flexibility and adherence

Clause 8 of IEC 60317-0-1:2013 applies. For 8.4, the constant  $K$  used for the calculation of the number of revolutions for the peel test shall be 90 mm.

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#### 9 Heat shock

Clause 9 of IEC 60317-0-1:2013 applies. The minimum heat shock temperature shall be 260 °C.

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#### 10 Cut-through

No failure shall occur within 2 min at 450 °C.

#### 11 Resistance to abrasion (nominal conductor diameters from 0,250 mm up to and including 2,500 mm)

The wire shall meet the requirements given in Table 1.

For intermediate nominal conductor diameters, the value of the next larger nominal conductor diameter is taken.

**Table 1 – Resistance to abrasion**

| Nominal conductor diameter<br>mm | Grade 1                               |   | Grade 2                               |   |
|----------------------------------|---------------------------------------|---|---------------------------------------|---|
|                                  | Minimum average force to failure<br>N | Minimum force to failure of each measurement<br>N | Minimum average force to failure<br>N | Minimum force to failure of each measurement<br>N |
| 0,250                            | 2,00                                  | 1,70  | 3,35                                  | 2,85  |
| 0,280                            | 2,15                                  | 1,85  | 3,60                                  | 3,05  |
| 0,315                            | 2,30                                  | 2,00  | 3,90                                  | 3,30  |
| 0,355                            | 2,50                                  | 2,15  | 4,20                                  | 3,55  |
| 0,400                            | 2,70                                  | 2,30  | 4,50                                  | 3,80  |
| 0,450                            | 2,90                                  | 2,45  | 4,80                                  | 4,05  |
| 0,500                            | 3,10                                  | 2,65  | 5,15                                  | 4,35  |
| 0,560                            | 3,35                                  | 2,85  | 5,50                                  | 4,65  |
| 0,630                            | 3,60                                  | 3,05  | 5,90                                  | 5,00  |
| 0,710                            | 3,90                                  | 3,30  | 6,35                                  | 5,40  |
| 0,800                            | 4,20                                  | 3,60  | 6,80                                  | 5,80  |
| 0,900                            | 4,50                                  | 3,90  | 7,30                                  | 6,20  |
| 1,000                            | 4,90                                  | 4,20  | 7,80                                  | 6,60  |
| 1,120                            | 5,30                                  | 4,50  | 8,35                                  | 7,10  |
| 1,250                            | 5,70                                  | 4,80  | 8,95                                  | 7,60  |
| 1,400                            | 6,15                                  | 5,20  | 9,60                                  | 8,15  |
| 1,600                            | 6,65                                  | 5,60  | 10,3                                  | 8,75  |
| 1,800                            | 7,15                                  | 6,05  | 11,0                                  | 9,35  |
| 2,000                            | 7,70                                  | 6,55  | 11,8                                  | 10,0  |
| 2,240                            | –                                     | –   | 12,6                                  | 10,7  |
| 2,500                            | –                                     | –   | 13,4                                  | 11,4  |

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**12 Resistance to solvents**

Clause 12 of IEC 60317-0-1:2013 applies, except that the change shall not exceed one grade of pencil hardness.

**13 Breakdown voltage**

Clause 13 of IEC 60317-0-1:2013 applies. The elevated temperature shall be 240 °C.

**14 Continuity of insulation**

Clause 14 of IEC 60317-0-1:2013 applies.

**15 Temperature index**

Clause 15 of IEC 60317-0-1:2013 applies. The minimum temperature index shall be 240.

**16 Resistance to refrigerants**

Test appropriate, but no requirements specified.

**17 Solderability**

Test inappropriate.

**18 Heat or solvent bonding**

Test inappropriate.

**19 Dielectric dissipation factor**

The dielectric dissipation factor  $\tan \delta$  shall not exceed  $60 \times 10^{-4}$  at a frequency of 1 000 Hz.

NOTE 1 Test under consideration.

NOTE 2 In case the dielectric dissipation factor  $\tan \delta$  cannot be measured, this measurement is replaced by a measurement of the loss of mass.

**20 Resistance to transformer oil**

Test appropriate, but no requirements specified.

**21 Loss of mass**

Test appropriate, but no requirements specified.

**23 Pin hole test**

Clause 23 of IEC 60317-0-1:2013 applies.

**30 Packaging**

Clause 30 of IEC 60317-0-1:2013 applies.

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