

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Specifications for particular types of winding wires –  
Part 27: Paper tape covered rectangular copper wire**

**Spécifications pour types particuliers de fils de bobinage –  
Partie 27: Fil de section rectangulaire en cuivre recouvert de ruban papier**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SPECIFICATIONS FOR PARTICULAR  
TYPES OF WINDING WIRES –****Part 27: Paper tape covered rectangular copper wire**

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International Standard IEC 60317-27 has been prepared by IEC technical committee 55: Winding wires.

This fourth edition cancels and replaces the third edition published in 1998, Amendment 1: 1999. This edition constitutes a technical revision.

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

- new subclause containing general notes on winding wire, formerly a part of the scope;
- revision to references to IEC 60317-0-2:2013 to clarify that their application is normative;
- new 3.3, Appearance;
- modification to 4.4, Increase in dimensions due to paper tape covering;
- deletion of Clause 22, High temperature failure;

– new Clause 23, Pin hole test.

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

FDIS	Report on voting
55/1414/FDIS	55/1435/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 60317-0-2:2013.

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

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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 27: Paper tape covered rectangular copper wire

### 1 Scope

This part of IEC 60317 specifies the requirements of paper tape covered rectangular copper winding wires. This covering consists of two or more layers of paper tape, all in the same direction and is primarily intended for winding coils for oil immersed transformers.

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

- width:           min. 2,0 mm       max. 16,0 mm;
- thickness:     min. 0,80 mm   max. 5,60 mm.

The paper tapes covered by this standard are restricted to those specified in IEC 60554-1 having thicknesses in the range 25 µm to 125 µm inclusive.

### 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 60317-0-2:2013, *Specifications for particular types of winding wires – Part 0-2: General requirements – Enamelled rectangular copper wire*

IEC 60554-1, *Specification for cellulosic papers for electrical purposes – Part 1: Definitions and general requirements*

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

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60317-0-2 and the following apply.

##### 3.1.1 covering

material which is wound, wrapped or braided around a bare or insulated conductor

#### 3.2 General notes

##### 3.2.1 Methods of test

Subclause 3.2.1 of IEC 60317-0-2:2013 applies. In case of inconsistency between IEC 60317-0-2:2013 and this standard, IEC 60317-27 shall prevail.



### 3.2.2 Winding wire

The number of paper tapes, type of paper, paper tape thickness, and the degree of overlap shall be agreed upon between the purchaser and supplier.

When a reference is made to winding wire according to this standard, the following information shall be given in the description:

- reference to IEC 60317-27;
- nominal conductor dimensions in millimetres (width × thickness);
- nominal increase in dimensions due to paper.

EXAMPLE: IEC 60317-27 4,00 × 1,00 + 0,20

- proof stress minimum (and maximum) value

EXAMPLES: IEC 60317-27 4,00 × 1,00 + 0,20 IEC 60317-27 7,00 × 2,50 + 1,00  $R_{p0,2} = 150$  MPa

### 3.3 Appearance

The conductor shall be essentially free from copper dust and other extraneous matter when examined with normal vision, as wound on the original spool or reel. The paper covering shall be of one or more tapes wrapped firmly, closely, evenly, and continuously around the conductor.

No bonding or adhesive material shall be used except to anchor the ends of paper tapes.

## 4 Dimensions

### 4.1 Conductor dimensions

Subclause 4.1 of IEC 60317-0-2: 2013 applies.

### 4.2 Tolerance on conductor dimensions

Subclause 4.2 of IEC 60317-0-2: 2013 applies.

### 4.3 Rounding of corners

Subclause 4.3 of IEC 60317-0-2: 2013 applies.

### 4.4 Increase in dimensions due to paper tape covering

The increase in width or thickness due to the paper tape covering shall be agreed between purchaser and supplier and the minus tolerance shall not exceed the values given in Table 1.

The increase in width due to the paper covering shall be equal to or less than the increase in thickness.

The maximum increase may be exceeded, provided that the maximum overall dimension does not exceed the sum of the maximum dimensions of the conductor plus the maximum increase given in Table 1.

**Table 1 – Increase in dimensions**

Increase in dimensions due to the paper covering mm		Tolerance %
Over	Up to and including	
–	0,50	-10 0
0,50	1,25	-7,5 0
1,25	–	-5 0

#### 4.5 Maximum overall dimensions

The overall dimensions shall be measured under a pressure of  $(1 \pm 0,1)$  N/mm<sup>2</sup> over the cross-section of the bare conductor nominal dimension.

The overall dimensions shall not exceed the sum of the maximum bare dimensions given in 4.2 and the maximum increase in dimensions permitted in 4.4.

#### 5 Electrical resistance

Clause 5 of IEC 60317-0-2:2013 applies.

#### 6 Elongation

Clause 6 of IEC 60317-0-2:2013 applies.

NOTE When the value of the proof stress of the copper is specified between minimum and maximum limits, the requirements are agreed upon between the purchaser and supplier. The description of the term “proof stress” and the method of determination are given in Annex A.

#### 7 Springiness

Test appropriate but no requirements specified.

#### 8 Flexibility and adherence

Because of the great variation in the number and the thickness of papers applied, the requirements for flexibility shall be agreed between purchaser and supplier at the time of placing the order.

#### 9 Heat shock

Test inappropriate.

#### 10 Cut-through

Test inappropriate.

**11 Resistance to abrasion**

Test inappropriate.

**12 Resistance to solvents**

Test inappropriate.

**13 Breakdown voltage**

Test inappropriate.

**14 Continuity of insulation**

Test inappropriate.

**15 Temperature index**

Test requirements under consideration.

**16 Resistance to refrigerants**

Test inappropriate.

**17 Solderability**

Test inappropriate.

**18 Heat or solvent bonding**

Test inappropriate.

**19 Dielectric dissipation factor**

Test inappropriate.

**20 Resistance to hydrolysis and to transformer oil**

Test appropriate but no requirements specified.

**21 Loss of mass**

Test inappropriate.

**23 Pin hole test**

Test inappropriate.