

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

Specifications for particular types of winding wires –  
Part 1: Polyvinyl acetal enamelled round copper wire, class 105

Spécifications pour types particuliers de fils de bobinage –  
Partie 1: Fil de section circulaire en cuivre emailé avec acétal de polyvinyle,  
classe 105



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## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references.....	6
3 Terms, definitions and general notes on methods of test and appearance.....	6
3.1 Terms and definitions.....	6
3.2 General notes on methods of test.....	6
3.3 Appearance.....	7
4 Dimensions.....	7
5 Electrical resistance.....	7
6 Elongation.....	7
7 Springiness.....	7
8 Flexibility and adherence.....	7
9 Heat shock.....	7
9.1 Nominal conductor diameters up to and including 1,600 mm.....	7
9.2 Nominal conductor diameters over 1,600 mm.....	7
10 Cut-through.....	8
11 Resistance to abrasion (nominal conductor diameters from 0,250 mm up to and including 2,500 mm).....	8
12 Resistance to solvents.....	8
13 Breakdown voltage.....	9
14 Continuity of insulation.....	9
15 Temperature index.....	9
16 Resistance to refrigerants.....	9
17 Solderability.....	9
18 Heat and solvent bonding.....	9
19 Dielectric dissipation factor.....	9
20 Resistance to transformer oil.....	9
21 Loss of mass.....	9
23 Pin hole test.....	9
30 Packaging.....	9
Table 1 – Heat shock.....	7
Table 2 – Resistance to abrasion.....	8

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**SPECIFICATIONS FOR PARTICULAR TYPES  
OF WINDING WIRES –****Part 1: Polyvinyl acetal enamelled  
round copper wire, class 105**

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International Standard IEC 60317-1 has been prepared by IEC technical committee 55: Winding wires.

This fourth edition of IEC 60317-1 cancels and replaces the third edition published in 1990, its Amendment 1 (1997) and Amendment 2 (1997). This edition constitutes a technical revision.

The main changes with respect to the previous edition are as follows:

- new requirements for appearance;
- deletion of high temperature failure requirements;
- new pin hole test requirements.

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

FDIS	Report on voting
55/1176/FDIS	55/1187/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 IEC 60317-0-1 (2008).

A list of all the parts in the IEC 60317 series, 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 amendment and the base 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 and methods of test (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 1: Polyvinyl acetal enamelled round copper wire, class 105

#### 1 Scope

This Part of IEC 60317 specifies the general requirements of enamelled round copper winding wires of class 105 with a sole coating based on polyvinyl acetal resin, which may be modified providing it retains the chemical identity of the original resin and meets all specified wire requirements.

NOTE A modified resin is a resin that has undergone a chemical change, or contains one or more additives to enhance certain performance or application characteristics.

Class 105 is a thermal class that requires a minimum temperature index of 105 and a heat shock temperature of at least 155 °C.

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

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

- Grade 1: 0,040 mm up to and including 2,500 mm.
- Grade 2: 0,040 mm up to and including 5,000 mm.
- Grade 3: 0,080 mm up to and including 5,000 mm.

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

#### 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 60317-0-1:2008, *Specifications for particular types of winding wires – Part 0-1: General requirements – Enamelled round copper wire*

#### 3 Terms, definitions and general notes on methods of test and appearance

##### 3.1 Terms and definitions

For terms and definitions, see 3.1 of IEC 60317-0-1. In case of inconsistencies between IEC 60317-0-1 and this standard, IEC 60317-1 shall prevail.

##### 3.2 General notes on methods of test

For general notes on methods of test, see 3.2 of IEC 60317-0-1. In case of inconsistencies between IEC 60317-0-1 and this standard, IEC 60317-1 shall prevail.



### 3.3 Appearance

See 3.3 of IEC 60317-0-1.

### 4 Dimensions

See Clause 4 of IEC 60317-0-1.

### 5 Electrical resistance

See Clause 5 of IEC 60317-0-1.

### 6 Elongation

See Clause 6 of IEC 60317-0-1.

### 7 Springiness

See Clause 7 of IEC 60317-0-1.

### 8 Flexibility and adherence

See Clause 8 of IEC 60317-0-1, where the constant  $K$  used for the calculation of the number of revolutions for the peel test shall be 175 mm.

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### 9 Heat shock

The minimum heat shock temperature shall be 155 °C.

#### 9.1 Nominal conductor diameters up to and including 1,600 mm

The coating shall show no crack. The mandrel diameter shall be as specified in Table 1.

**Table 1 – Heat shock**

Nominal conductor diameter mm		Elongation before winding on mandrel %	Mandrel diameter <sup>b</sup>
Over	Up to and including		
–	0,050	20 <sup>a</sup>	0,150 mm
0,050	1,600	–	$D$

<sup>a</sup> Or to the breaking point of the copper, whichever is less.  
<sup>b</sup>  $D$  is the overall diameter of the wire.

#### 9.2 Nominal conductor diameters over 1,600 mm

See 9.2 of IEC 60317-0-1.

## 10 Cut-through

No failure shall occur within 2 min at 170 °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 2.

**Table 2 – Resistance to abrasion**

Nominal conductor diameter mm	Grade 1		Grade 2		Grade 3	
	Minimum average force to failure	Minimum force to failure of each measurement	Minimum average force to failure	Minimum force to failure of each measurement	Minimum average force to failure	Minimum force to failure of each measurement
	N	N	N	N	N	N
0,250	3,00	2,55	4,90	4,15	5,80	4,90
0,280	3,25	2,75	5,25	4,45	6,25	5,30
0,315	3,50	2,95	5,65	4,80	6,70	5,70
0,355	3,75	3,20	6,05	5,15	7,20	6,10
0,400	4,05	3,45	6,50	5,50	7,70	6,50
0,450	4,35	3,70	7,00	5,90	8,25	7,00
0,500	4,65	3,95	7,50	6,35	8,85	7,50
0,560	5,00	4,25	8,00	6,80	9,5	8,05
0,630	5,35	4,55	8,60	7,30	10,2	8,65
0,710	5,70	4,85	9,20	7,80	10,9	9,25
0,800	6,10	5,15	9,90	8,40	11,7	9,9
0,900	6,55	5,55	10,6	9,00	12,5	10,6
1,000	7,05	5,95	11,3	9,60	13,3	11,3
1,120	7,60	6,45	12,1	10,2	14,2	12,0
1,250	8,20	6,95	12,9	11,0	15,2	12,9
1,400	8,80	7,45	13,9	11,8	16,4	13,9
1,600	9,45	8,00	14,9	12,6	17,6	14,9
1,800	10,1	8,60	16,0	13,5	18,8	16,0
2,000	10,9	9,20	17,1	14,4	20,2	17,1
2,240	11,7	9,90	18,2	15,4	21,6	18,3
2,500	12,5	10,6	19,4	16,4	23,0	19,5

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

## 12 Resistance to solvents

See Clause 12 of IEC 60317-0-1.

**13 Breakdown voltage**

See Clause 13 of IEC 60317-0-1, where the elevated temperature shall be 105 °C.

**14 Continuity of insulation**

See Clause 14 of IEC 60317-0-1.

**15 Temperature index**

See Clause 15 of IEC 60317-0-1, where the minimum temperature index shall be 105.

**16 Resistance to refrigerants**

Test appropriate but no requirements are specified.

**17 Solderability**

Test inappropriate.

**18 Heat and solvent bonding**

Test inappropriate.

**19 Dielectric dissipation factor**

Test inappropriate.

**20 Resistance to transformer oil**

Test appropriate but no requirements specified.

**21 Loss of mass**

Test inappropriate.

**23 Pin hole test**

See Clause 23 of IEC 60317-0-1

**30 Packaging**

See Clause 30 of IEC 60317-0-1.

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