IEC 60317-56

Edition 2.0 2017-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Specifications for particular types of winding wires –
Part 56: Solderable fully insulated (FIW) zero-defect polyurethane enamelled round copper wire, class 180

Spécifications pour types particuliers de fils de bobinage –
Partie 56: Fil brasable de section circulaire, isolé en continu, en cuivre émaillé avec polyuréthane sans défaut électrique, classe 180

IEC 60317-56:2017-08(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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FOREWORD

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International Standard IEC 60317-56 has been prepared by IEC technical committee 55: Winding wires.

This second edition cancels and replaces the first edition published in 2012. This edition constitutes a technical revision.

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

a) Clause 1: revision of the scope, reducing the number of grades of FIW from 3 through 9 to 4, 6 and 8 only;

b) Clause 1: revision of the scope, reducing the wire diameter range from (0,040 to 1,600) mm to (0,090 to 0,900) mm;

c) addition of an informative annex for abrasion resistance requirements for grades FIW 3 to 9.

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

FDIS	Report on voting
55/1616/FDIS	55/1622/RVD

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

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

This International standard is to be read in conjunction with IEC 60317-0-7:–[1].

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 the 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 document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

[1] Under preparation. Stage at the time of publication: IEC/FDIS 60317-0-7:2017.

INTRODUCTION

The IEC 60317 series is part of a group of International Standards which define insulated wires used for windings in electrical equipment:

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

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 56: Solderable fully insulated (FIW) zero-defect polyurethane enamelled round copper wire, class 180

1 Scope

This part of IEC 60317 specifies the requirements of solderable fully insulated (FIW) zero-defect enamelled round copper wire, class 180, with a single coating based on polyurethane resin, which may be modified providing it retains its chemical identity and satisfies all the required technical specifications.

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

- Grade of FIW 4, 6, 8: 0,090 mm up to and including 0,900 mm.

Nominal conductor diameters are specified in IEC 60317-0-7–.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60317-0-7:–, *Specifications for particular types of winding wires – Part 0-7: General requirements – Fully insulated (FIW) zero-defect enamelled round copper wire*

3 Terms and definitions, general notes and appearance

3.1 Terms and definitions

Subclause 3.1 of IEC 60317-0-7:– applies.

3.2 General notes

3.2.1 Methods of test

Subclause 3.2 of IEC 60317-0-7:– applies.

In case of inconsistencies between IEC 60317-0-7 and this document, the latter shall prevail.

3.2.2 Winding wire

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

Class 180 is a thermal class requiring a temperature index of at least 180 °C and a heat shock temperature of at least 200 °C.

The temperature in °C corresponding to the temperature index is not necessarily the temperature recommended as the wire's temperature in use, since this temperature depends on many factors, including the type of electrical equipment involved.

3.3 Appearance

Subclause 3.3 of IEC 60317-0-7:– applies.

4 Dimensions

Clause 4 of IEC 60317-0-7:– applies.

5 Electrical resistance

Clause 5 of IEC 60317-0-7:– applies.

6 Elongation

Clause 6 of IEC 60317-0-7:– applies.

7 Springiness

Clause 7 of IEC 60317-0-7:– applies.

8 Flexibility and adherence

Clause 8 of IEC 60317-0-7:– applies.

9 Heat shock

Clause 9 of IEC 60317-0-7:– applies. The minimum heat shock temperature shall be 200 °C.

10 Cut-through

No failure shall occur within 2 min at 245 °C.

11 Resistance to abrasion (for nominal diameters of 0,250 mm up to and including 0,900 mm)

The wire shall satisfy the requirements in Table 1. For intermediate nominal diameters, the amount of resistance to abrasion for the next larger nominal diameter shall apply.

For grades of FIW 3, 5, 7 and 9 and a nominal diameter of 1,000 mm, see Annex A.

Table 1 – Resistance to abrasion

Nominal conductor diameter	Resistance to abrasion	
	Grades of FIW 4, 6 and 8	
	Minimum of average value	Minimum
mm	N	N
0,250	4,10	3,50
0,280	4,40	3,70
0,315	4,75	4,00
0,355	5,10	4,30
0,400	5,45	4,60
0,450	5,80	4,90
0,500	6,20	5,25
0,560	6,65	5,60
0,630	7,10	6,00
0,710	7,60	6,45
0,800	8,10	6,90
0,900	8,70	7,40

12 Resistance to solvents

Clause 12 of IEC 60317-0-7:– applies.

13 Breakdown voltage

Clause 13 of IEC 60317-0-7: – applies. The elevated temperature shall be 180 °C.

14 Continuity of insulation

Clause 14 of IEC 60317-0-7: – applies.

15 Temperature index

Clause 15 of IEC 60317-0-7: – applies. The minimum temperature index shall be 180 °C.

16 Resistance to refrigerants

Test inappropriate.

17 Solderability

The temperature of the solder bath shall be (390 ± 5) °C. The maximum immersion time (in seconds) shall be the following multiple of the nominal conductor diameter (in millimetres) with a minimum of 4 s:

All grades of FIW
18 s/mm

The surface of the tinned wire shall be smooth and free of holes and enamel residue.

18 Heat or solvent bonding

Test inappropriate.

19 Dielectric dissipation factor

A test method shall be agreed between the user and the supplier.

20 Resistance to transformer oil

Test inappropriate.

21 Loss of mass

Test inappropriate.

23 Pin-hole test

Clause 23 of IEC 60317-0-7:– applies.

30 Packaging

Clause 30 of IEC 60317-0-7:– applies.