

INTERNATIONAL STANDARD



Specifications for particular types of winding wires –
Part 0-6: General requirements – Glass-fibre wound resin or varnish
impregnated, bare or enamelled round copper wire

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –**Part 0-6: General requirements –
Glass-fibre wound resin or varnish impregnated,
bare or enamelled round copper wire**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60317-0-6 has been prepared by IEC technical committee 55: Winding wires.

This second edition cancels and replaces the first edition published in 2001 and Amendment 1:2006. This edition constitutes a technical revision.

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

- revision to 3.3, Appearance;
- revision to Table 1, maximum overall diameter of grade 1 wire over single-glass fibre covering for nominal conductor diameters 1,600 mm – 5,000 mm;
- revision to Table 2, maximum overall diameter of grade 1 wire over double-glass fibre covering for nominal conductor diameters 1,600 mm – 5,000 mm;
- clarification in Table 3 measurement of elongation as “minimum elongation %”.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
55/1851/FDIS	55/1866/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 60851 (all parts). The clause numbers used in this part of IEC 60317 are identical with the respective test numbers of IEC 60851 (all parts).

In case of inconsistencies between IEC 60851 (all parts) and this part of IEC 60317, the latter prevails.

The numbering of clauses in this standard is not continuous from Clauses 21 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 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This part of IEC 60317 forms an element of a series of standards which deals with insulated wires used for windings in electrical equipment. It is composed of the following series:

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

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SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 0-6: General requirements – Glass-fibre wound resin or varnish impregnated, bare or enamelled round copper wire

1 Scope

This part of IEC 60317 specifies the general requirements of glass-fibre wound resin or varnish impregnated, bare or enamelled, round copper winding wires.

The range of nominal conductor diameters is given in the relevant specification sheet.

~~When a reference is made to a winding wire according to one of the IEC 60317 series, the following information should be given in the description:~~

- ~~— reference to IEC specification;~~
- ~~— nominal conductor diameter in millimetres;~~
- ~~— grade of coating and glass covering.~~

~~EXAMPLE: IEC 60317-48-0,500-1G2~~

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 60851 (all parts), *Winding wires – Test methods*

IEC 60851-5:1996/2008, *Winding wires – Test methods – Part 5: Electrical properties*⁴
IEC 60851-5/AMD1:2011
IEC 60851-5/AMD2:2019

~~IEC 60851-6:1996, *Winding wires – Test methods – Part 6: Thermal properties*~~

ISO 3:1973, *Preferred numbers – Series of preferred numbers*

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

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>

⁴~~A consolidated edition 3.1 exists (1997) that includes IEC 60851-5 (1996) and its amendment 1 (1997).~~

- ISO Online browsing platform: available at <http://www.iso.org/obp>:

3.1.1

coating

material deposited on a conductor or wire by suitable means and then dried and/or cured

3.1.2

conductor

bare metal after removal of the insulation

3.1.3

covering

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

3.1.4

crack

opening in the insulation which exposes the conductor to view at the stated magnification

3.1.5

enamelled wire

wire coated with an insulation of cured resin

3.1.6

grade

~~range of increase in dimension of the wire due to insulation~~

increase in the overall diameter of glass fibre covered wire due to the glass fibre covering and/or enamel

3.1.7

insulation

coating or covering on the conductor with the specific function of withstanding voltage

3.1.8

nominal conductor ~~dimension~~ diameter

designation of conductor size in accordance with the IEC 60317 series

3.1.9

winding wire

wire used for winding a coil to provide a magnetic field

3.1.10

wire

conductor coated or covered with an insulation

3.1.11

normal vision

20/20 vision, with corrective lenses, if necessary

3.2 **General notes ~~on methods of test~~**

3.2.1 **Methods of test**

All methods of test to be used for this document are given in ~~the various parts to~~ IEC 60851 (all parts).

The clause numbers used in this document are identical to the respective test numbers in ~~those parts of~~ IEC 60851 (all parts).

In case of inconsistencies between the IEC 60851 parts concerning methods of test and this document, IEC 60317-0-6 shall prevail.

Where no specific range of nominal conductor diameters is given for a test, the test applies to all nominal conductor diameters covered by the specification sheet.

Unless otherwise specified, all tests shall be carried out at a temperature ranging between 15 °C and ~~35~~ 40 °C and a relative humidity between ~~45~~ 25 % and 75 %. Before measurements are made, the specimens shall be preconditioned under these atmospheric conditions for a time sufficient to allow the specimens to reach stability.

The wire to be tested shall be removed from the packaging in such a way that the wire will not be subjected to tension or unnecessary bends. Before each test, sufficient wire should be discarded to ensure that any damaged wire is not included in the test specimens.

3.2.2 Winding wire

When reference is made to a winding wire according to a standard of the IEC 60317 series mentioned under Clause 2, the following information is given in the description:

- reference to IEC specification;
- nominal conductor diameter in millimetres;
- grade of coating and glass covering.

EXAMPLE IEC 60317-48 – 1,000 Grade 1 GL1

The coating is characterised by the following different grades of thickness:

- GL1, bare conductor with 1 layer of glass fibre;
- GL2, bare conductor with 2 layers of glass fibre;
- grade 1 GL1, enamelled grade 1 (grade 1) with 1 layer of glass fibre (GL1);
- grade 1 GL2, enamelled grade 1 (grade 1) with 2 layers of glass fibre (GL2);
- grade 2 GL1, enamelled grade 2 (grade 2) with 1 layer of glass fibre (GL1);
- grade 2 GL2, enamelled grade 2 (grade 2) with 2 layers of glass fibre (GL2).

3.3 Appearance

The fibrous covering shall be smooth as agreed upon between customer and supplier in accordance with good commercial practice and be free from physical damage and foreign material when examined with normal vision, as wound on the original spool or reel.

4 Dimensions

4.1 Conductor diameter

The series of preferred nominal conductor diameters shall correspond to series R20 according to ISO 3. The actual values and their tolerances are given in Table 1 and Table 2.

The series of intermediate diameters from which the user shall select intermediate nominal conductor diameters, when required for technical reasons, shall correspond to series R40 according to ISO 3. The actual values and their tolerances are given in Annex A.

The conductor diameter shall not differ from the nominal diameter by more than the limit given in Table 1 and Table 2.

Table 1 – Diameters for single glass-fibre covered grade 1 or grade 2 enamelled round wires

Nominal conductor diameter mm	Conductor diameter tolerance ± mm	Minimum increase single-glass-fibre covering mm	Maximum overall diameter single-glass-fibre covering mm	
			Grade 1G1	Grade 2G1
0,500	0,005	0,064	0,665	0,685
0,560	0,006	0,102	0,776	0,795
0,630	0,006	0,102	0,839	0,864
0,710	0,007	0,102	0,922	0,949
0,800	0,008	0,102	1,020	1,047
0,900	0,009	0,102	1,125	1,155
1,000	0,010	0,102	1,230	1,260
1,120	0,011	0,102	1,352	1,385
1,250	0,013	0,102	1,485	1,518
1,400	0,014	0,102	1,640	1,676
1,600	0,016	0,102	1,841	1,880
1,800	0,018	0,102		2,085
2,000	0,020	0,102		2,285
2,240	0,022	0,102		2,535
2,500	0,025	0,102		2,800
2,800	0,028	0,114		3,130
3,150	0,032	0,114		3,492
3,550	0,036	0,114		3,896
4,000	0,040	0,114		4,353
4,500	0,045	0,114		4,861
5,000	0,050	0,114		5,370

NOTE 1 – For intermediate nominal conductor diameters, the minimum increase figure corresponding to the next larger nominal conductor diameter must be taken.

NOTE 2 – The dimensions of intermediate nominal conductor diameters for the R40 series are given in annex A.

NOTE 3 – Grade 1G1 is a single glass-fibre covering over grade 1 enamelled wire. Grade 2G1 is a single glass-fibre covering over grade 2 enamelled wire.

Nominal conductor diameter mm	Conductor diameter tolerance \pm mm	Minimum increase of single glass-fibre covering mm	Maximum overall diameter of single glass-fibre covering mm	
			Grade 1 GL1	Grade 2 GL1
0,500	0,005	0,064	0,665	0,685
0,560	0,006	0,102	0,776	0,795
0,630	0,006	0,102	0,839	0,864
0,710	0,007	0,102	0,922	0,949
0,800	0,008	0,102	1,020	1,047
0,900	0,009	0,102	1,125	1,155
1,000	0,010	0,102	1,230	1,260
1,120	0,011	0,102	1,352	1,385
1,250	0,013	0,102	1,485	1,518
1,400	0,014	0,102	1,640	1,676
1,600	0,016	0,102	1,841	1,880
1,800	0,018	0,102	2,048	2,085
2,000	0,020	0,102	2,247	2,285
2,240	0,022	0,102	2,496	2,535
2,500	0,025	0,102	2,760	2,800
2,800	0,028	0,114	3,088	3,130
3,150	0,032	0,114	3,449	3,492
3,550	0,036	0,114	3,852	3,896
4,000	0,040	0,114	4,308	4,353
4,500	0,045	0,114	4,815	4,861
5,000	0,050	0,114	5,322	5,370

For intermediate nominal conductor diameters, the minimum increase figure corresponding to the next larger nominal conductor diameter shall be taken.

NOTE 1 The dimensions of the intermediate nominal conductor diameters for the R40 series are given in Annex A.

NOTE 2 Grade 1G1 is a single glass-fibre covering over grade 1 enamelled wire. Grade 2G1 is a single glass-fibre covering over grade 2 enamelled wire.

Table 2 – Diameters for double glass-fibre covered, bare, grade 1 or grade 2 enamelled round wires

Nominal conductor diameter mm	Conductor diameter tolerance ± mm	Minimum increase double-glass-fibre covering mm	Maximum overall diameter double-glass-fibre-covering mm		
			Grade G2	Grade 1G2	Grade 2G2
0,500	0,005	0,115	0,670	0,723	0,745
0,560	0,006	0,150	0,802	0,853	0,877
0,630	0,006	0,150	0,873	0,925	0,951
0,710	0,007	0,150	0,958	1,010	1,037
0,800	0,008	0,150	1,048	1,103	1,132
0,900	0,009	0,150	1,149	1,208	1,240
1,000	0,010	0,150	1,249	1,311	1,348
1,120	0,011	0,150	1,370	1,434	1,467
1,250	0,013	0,150	1,511	1,576	1,610
1,400	0,014	0,150	1,662	1,730	1,764
1,600	0,016	0,150	1,867	1,937	1,973
1,800	0,018	0,150	2,068		2,177
2,000	0,020	0,150	2,269		2,381
2,240	0,022	0,150	2,516		2,632
2,500	0,025	0,150	2,782		2,900
2,800	0,028	0,180	3,123		3,246
3,150	0,032	0,180	3,481		3,606
3,550	0,036	0,180	3,883		4,012
4,000	0,040	0,180	4,335		4,483
4,500	0,045	0,180	4,843		4,980
5,000	0,050	0,180	5,345		5,486

NOTE 1—For intermediate nominal conductor diameters, the minimum increase figure corresponding to the next larger nominal conductor diameter must be taken.

NOTE 2—The dimensions of intermediate nominal conductor diameters for the R40 series are given in annex A.

NOTE 3—Grade G2 is a double glass-fibre covering over bare wire. Grade 1G2 is a double glass-fibre covering over grade 1 enamelled wire. Grade 2G2 is a double glass-fibre covering over grade 2 enamelled wire.