

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 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**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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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/>

⁴A 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 ± 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.

Nominal conductor diameter mm	Conductor diameter tolerance ± mm	Minimum increase of double glass-fibre covering mm	Maximum overall diameter of double glass-fibre covering mm		
			GL2	Grade 1 GL2	Grade 2 GL2
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	2,140	2,177
2,000	0,020	0,150	2,269	2,343	2,381
2,240	0,022	0,150	2,516	2,593	2,632
2,500	0,025	0,150	2,782	2,860	2,900
2,800	0,028	0,180	3,123	3,204	3,246
3,150	0,032	0,180	3,481	3,563	3,606
3,550	0,036	0,180	3,883	3,968	4,012
4,000	0,040	0,180	4,335	4,438	4,483
4,500	0,045	0,180	4,843	4,934	4,980
5,000	0,050	0,180	5,345	5,438	5,486

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 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.

4.2 Out of roundness of the conductor

The difference between the minimum and maximum diameter, at any one point, shall not be more than the figure given in column 2 of Table 1 or Table 2.

4.3 Minimum increase in diameter due to the covering

The minimum increase in diameter due to the covering shall not be less than the values given in Table 1 or Table 2.

4.4 Maximum overall diameter

The maximum overall diameter shall not exceed the values given in Table 1 or Table 2.

5 Electrical resistance

No minimum and maximum resistance values are specified.

For nominal resistance values see Annex B.

6 Elongation

The minimum elongation shall not be less than the values given in Table 3. These requirements shall apply to nominal conductor diameters over 0,630 mm.

Table 3 – Elongation

Nominal conductor diameter mm		With glass-fibre covering Minimum elongation %
Over	Up to and including	
–	0,630	–
0,630	1,250	15
1,250	2,800	20
2,800	5,000	30

7 Springiness

7.1 Nominal conductor diameters up to and including 1,600 mm

No requirements specified.

7.2 Nominal conductor diameters over 1,600 mm

The wire shall not exceed the maximum springback of:

- 5° for wires with a glass-fibre covering over a bare conductor;
- 5,5° for wires with a glass-fibre covering over an enamelled conductor.

8 Flexibility and adherence

The covering shall not open sufficiently to expose the bare or enamelled wire after bending on a mandrel diameter of ten times the nominal conductor diameter.

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

13.1 Glass-fibre covered bare round copper wires

Method of test according to 4.6 of IEC 60851-5:2008 ~~extended to this standard~~ shall apply.

The wire shall meet the requirements of Table 4.

Table 4 – Breakdown voltage for glass-fibre covered bare round copper wires

Nominal conductor diameter Mm		Mandrel diameter mm	Minimum breakdown voltage V	
Over	Up to and including		GL1 single glass-fibre covering	GL2 double glass- fibre covering
–	0,500	25	–	200
0,500	2,500	25	–	260
2,500	5,000	50	–	300

13.2 Glass-fibre covered enamelled round copper wires

Method of test according to 4.6 of IEC 60851-5:2008 ~~extended to this standard~~ shall apply.

The wire shall meet the requirements of Table 5.

Table 5 – Breakdown voltage of glass fibre-covered enamelled round copper wires

Nominal conductor diameter mm		Mandrel diameter Mm	Minimum breakdown voltage V			
Over	Up to and including		Grade 1 GL1 single glass- fibre covering	Grade 1 GL2 double glass-fibre covering	Grade 2 GL1 single glass- fibre covering	Grade 2 GL2 double glass-fibre covering
0,50	1,00	25	750	1 000	1 000	1 200
1,12	2,50	25	1 000	1 200	1 260	1 500
2,50	– 5,00	50	1 200	1 500	1 600	1 800

14 Continuity of ~~covering~~ insulation

Test inappropriate.

15 Temperature index

The temperature index is dependent on the type of impregnating agent used. The method of test used shall be agreed between purchaser and supplier. The maximum service temperature shall be determined by experience.

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 inappropriate.

21 Loss of mass

Test inappropriate.

23 Pin hole test

Test inappropriate.

30 Packaging

The type of packaging ~~may~~ can influence certain properties of the wire, for example springback. Therefore, the type of packaging, for example the kind of spool, shall be agreed between purchaser and supplier.

The wire shall be evenly and compactly wound on spools or placed in containers. No spool or container shall contain more than one length of wire unless agreed to between purchaser and supplier. The marking of the label when there is more than one length and/or identification of the separate lengths in the package shall be agreed to between purchaser and supplier.

Where wires are delivered in coils, the dimensions and the maximum mass of such coils shall be agreed between purchaser and supplier. Any additional protection for coils shall also be agreed between purchaser and supplier.

Labels shall be securely attached to the flange of each spool and (where applicable) container and shall include the following information:

- a) manufacturer's name and/or trademark;
- b) type of wire and insulation;
- c) net mass of wire;
- d) diameter(s) of wire and grade of insulation;
- e) date of manufacture;
- f) appropriate IEC specification number.

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Annex A
(informative)

Diameters for intermediate nominal conductor diameters (R40)

Annex A sets out intermediate nominal conductor diameters from which the user may select intermediate sizes only for technical reasons (see Table A.1 and Table A.2).

Table A.1 – Diameters for single glass-fibre covered grade 1 or grade 2 enamelled round wires (R40)

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
0,530	0,006	0,102	0,746	0,765
0,600	0,006	0,102	0,809	0,834
0,670	0,007	0,102	0,882	0,909
0,750	0,008	0,102	0,970	0,997
0,850	0,009	0,102	1,075	1,105
0,950	0,010	0,102	1,170	1,210
1,060	0,011	0,102	1,290	1,325
1,180	0,012	0,102	1,412	1,448
1,320	0,013	0,102	1,560	1,596
1,500	0,015	0,102	1,741	1,780
1,700	0,017	0,102		1,985
1,900	0,019	0,102		2,185
2,120	0,021	0,102		2,415
2,360	0,024	0,102		2,660
2,650	0,027	0,114		2,990
3,000	0,030	0,114		3,342
3,350	0,034	0,114		3,696
3,750	0,038	0,114		4,103
4,250	0,043	0,114		4,611
4,750	0,048	0,114		5,120

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
0,530	0,006	0,102	0,746	0,765
0,600	0,006	0,102	0,809	0,834
0,670	0,007	0,102	0,882	0,909
0,750	0,008	0,102	0,970	0,997
0,850	0,009	0,102	1,075	1,105
0,950	0,010	0,102	1,170	1,210
1,060	0,011	0,102	1,290	1,325
1,180	0,012	0,102	1,412	1,448
1,320	0,013	0,102	1,560	1,596
1,500	0,015	0,102	1,741	1,780
1,700	0,017	0,102	1,948	1,985
1,900	0,019	0,102	2,147	2,185
2,120	0,021	0,102	2,376	2,415
2,360	0,024	0,102	2,620	2,660
2,650	0,027	0,114	2,948	2,990
3,000	0,030	0,114	3,299	3,342
3,350	0,034	0,114	3,652	3,696
3,750	0,038	0,114	4,058	4,103
4,250	0,043	0,114	4,565	4,611
4,750	0,048	0,114	5,072	5,120

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Table A.2 – Diameters for double glass-fibre covered, bare, grade 1 or grade 2 enamelled round wires (R40)

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
0,530	0,006	0,150	0,772	0,823	0,847
0,600	0,006	0,150	0,843	0,895	0,921
0,670	0,007	0,150	0,918	0,970	0,997
0,750	0,008	0,150	0,998	1,053	1,082
0,850	0,009	0,150	1,099	1,158	1,190
0,950	0,010	0,150	1,199	1,261	1,298
1,060	0,011	0,150	1,310	1,374	1,407
1,180	0,012	0,150	1,441	1,506	1,540
1,320	0,013	0,150	1,582	1,650	1,684
1,500	0,015	0,150	1,767	1,837	1,873
1,700	0,017	0,150	1,968		2,077
1,900	0,019	0,150	2,169		2,281
2,120	0,021	0,150	2,396		2,512
2,360	0,024	0,150	2,642		2,760
2,650	0,027	0,180	2,973		3,096
3,000	0,030	0,180	3,331		3,456
3,350	0,034	0,180	3,665		3,800
3,750	0,038	0,180	4,085		4,233
4,250	0,043	0,180	4,593		4,730
4,750	0,048	0,180	5,095		5,236

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Nominal conductor diameter mm	Conductor diameter tolerance \pm mm	Minimum increase of double glass-fibre covering mm	Maximum overall diameter, of double glass-fibre covering mm		
			GL2	Grade 1 GL2	Grade 2 GL2
0,530	0,006	0,150	0,772	0,823	0,847
0,600	0,006	0,150	0,843	0,895	0,921
0,670	0,007	0,150	0,918	0,970	0,997
0,750	0,008	0,150	0,998	1,053	1,082
0,850	0,009	0,150	1,099	1,158	1,190
0,950	0,010	0,150	1,199	1,261	1,298
1,060	0,011	0,150	1,310	1,374	1,407
1,180	0,012	0,150	1,441	1,506	1,540
1,320	0,013	0,150	1,582	1,650	1,684
1,500	0,015	0,150	1,767	1,837	1,873
1,700	0,017	0,150	1,968	2,040	2,077
1,900	0,019	0,150	2,169	2,243	2,281
2,120	0,021	0,150	2,396	2,473	2,512
2,360	0,024	0,150	2,642	2,720	2,760
2,650	0,027	0,180	2,973	3,054	3,096
3,000	0,030	0,180	3,331	3,413	3,456
3,350	0,034	0,180	3,665	3,756	3,800
3,750	0,038	0,180	4,085	4,188	4,233
4,250	0,043	0,180	4,593	4,684	4,730
4,750	0,048	0,180	5,095	5,188	5,236

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Annex B
(informative)

Resistance

The figures for nominal resistance are given for information only (see Table B.1). They are calculated on the basis of the nominal conductor diameter and a nominal resistivity of $1/58,5 \Omega \text{ mm}^2\text{m}^{-1}$.

Table B.1 – Electrical resistances

Nominal conductor diameter	Nominal resistance
mm	Ω/m
0,500	0,087 06
0,560	0,069 40
0,630	0,054 84
0,710	0,043 18
0,800	0,034 01
0,900	0,026 87
1,000	0,021 76
1,120	0,017 35
1,250	0,013 93
1,400	0,011 10
1,600	0,008 502
1,800	0,006 718
2,000	0,005 444
2,240	0,004 338
2,500	0,003 482
2,800	0,002 776
3,150	0,002 193
3,550	0,001 727
4,000	0,001 360
4,500	0,001 075
5,000	0,000 8706

Nominal conductor diameter	Nominal resistance
mm	Ω/m
0,500	0,087 06
0,560	0,069 40
0,630	0,054 84
0,710	0,043 18
0,800	0,034 01
0,900	0,026 87
1,000	0,021 76
1,120	0,017 35
1,250	0,013 93
1,400	0,011 10
1,600	0,008 502
1,800	0,006 718
2,000	0,005 441
2,240	0,004 338
2,500	0,003 482
2,800	0,002 776
3,150	0,002 193
3,550	0,001 727
4,000	0,001 360
4,500	0,001 075
5,000	0,000 8706

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Annex C
(informative)

High temperature failure test

~~No requirements are specified.~~

~~For the test method, see annex A of IEC 60851-6.~~

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IEC 60317 (all parts), *Specifications for particular types of winding wires*

IEC 60317-0-1:~~1997~~, *Specifications for particular types of winding wires – Part 0-1: General requirements – Enamelled round copper wire*

IEC 60317-48:~~1999~~, *Specifications for particular types of winding wires – Part 48: Glass-fibre wound resin or varnish impregnated, bare or enamelled round copper wire, temperature index 155*

IEC 60317-49:~~1999~~, *Specifications for particular types of winding wires – Part 49: Glass-fibre wound resin or varnish impregnated, bare or enamelled round copper wire, temperature index 180*

IEC 60317-50:~~1999~~, *Specifications for particular types of winding wires – Part 50: Glass-fibre wound silicone resin or varnish impregnated, bare or enamelled round copper wire, temperature index 200*

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

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

**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**

**Spécifications pour types particuliers de fils de bobinage –
Partie 0-6: Exigences générales – Fil de section circulaire en cuivre nu
ou émaillé, guipé de fibres de verre imprégnées de résine ou de vernis**

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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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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.

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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.

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

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

3 Terms, definitions, general notes 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/>
- 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**

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 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**3.2.1 Methods of test**

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

The clause numbers used in this document are identical to the respective test numbers in 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 40 °C and a relative humidity between 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 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
0,560	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 1GL1 is a single glass-fibre covering over grade 1 enamelled wire. Grade 2GL1 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 of double glass-fibre covering mm	Maximum overall diameter of double glass-fibre covering mm		
			GL2	Grade 1 GL2	Grade 2 GL2
			0,500	0,005	0,115
0,560	0,006	0,150	0,802	0,853	0,877
0,630	0,006	0,150	0,873	0,925	0,951

Nominal conductor diameter mm	Conductor diameter tolerance ± mm	Minimum increase of double glass-fibre covering mm	Maximum overall diameter of double glass-fibre covering mm		
			GL2	Grade 1 GL2	Grade 2 GL2
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	2,140	2,177
2,000	0,020	0,150	2,269	2,343	2,381
2,240	0,022	0,150	2,516	2,593	2,632
2,500	0,025	0,150	2,782	2,860	2,900
2,800	0,028	0,180	3,123	3,204	3,246
3,150	0,032	0,180	3,481	3,563	3,606
3,550	0,036	0,180	3,883	3,968	4,012
4,000	0,040	0,180	4,335	4,438	4,483
4,500	0,045	0,180	4,843	4,934	4,980
5,000	0,050	0,180	5,345	5,438	5,486

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 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.

4.2 Out of roundness of the conductor

The difference between the minimum and maximum diameter, at any one point, shall not be more than the figure given in column 2 of Table 1 or Table 2.

4.3 Minimum increase in diameter due to the covering

The minimum increase in diameter due to the covering shall not be less than the values given in Table 1 or Table 2.

4.4 Maximum overall diameter

The maximum overall diameter shall not exceed the values given in Table 1 or Table 2.

5 Electrical resistance

No minimum and maximum resistance values are specified.

For nominal resistance values see Annex B.

6 Elongation

The minimum elongation shall not be less than the values given in Table 3. These requirements shall apply to nominal conductor diameters over 0,630 mm.

Table 3 – Elongation

Nominal conductor diameter mm		With glass-fibre covering Minimum elongation %
Over	Up to and including	
0,630	1,250	15
1,250	2,800	20
2,800	5,000	30

7 Springiness

7.1 Nominal conductor diameters up to and including 1,600 mm

No requirements specified.

7.2 Nominal conductor diameters over 1,600 mm

The wire shall not exceed the maximum springback of:

- 5° for wires with a glass-fibre covering over a bare conductor;
- 5,5° for wires with a glass-fibre covering over an enamelled conductor.

8 Flexibility and adherence

The covering shall not open sufficiently to expose the bare or enamelled wire after bending on a mandrel diameter of ten times the nominal conductor diameter.

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

13.1 Glass-fibre covered bare round copper wires

Method of test according to 4.6 of IEC 60851-5:2008 shall apply.

The wire shall meet the requirements of Table 4.

Table 4 – Breakdown voltage for glass-fibre covered bare round copper wires

Nominal conductor diameter mm		Mandrel diameter mm	Minimum breakdown voltage V	
Over	Up to and including		GL1 single glass-fibre covering	GL2 double glass-fibre covering
–	0,500	25	–	200
0,500	2,500	25	–	260
2,500	5,000	50	–	300

13.2 Glass-fibre covered enamelled round copper wires

Method of test according to 4.6 of IEC 60851-5:2008 shall apply.

The wire shall meet the requirements of Table 5.

Table 5 – Breakdown voltage of glass fibre-covered enamelled round copper wires

Nominal conductor diameter mm		Mandrel diameter mm	Minimum breakdown voltage V			
Over	Up to and including		Grade 1 GL1 single glass-fibre covering	Grade 1 GL2 double glass-fibre covering	Grade 2 GL1 single glass-fibre covering	Grade 2 GL2 double glass-fibre covering
0,50	1,00	25	750	1 000	1 000	1 200
1,12	2,50	25	1 000	1 200	1 260	1 500
2,50	5,00	50	1 200	1 500	1 600	1 800

14 Continuity of insulation

Test inappropriate.

15 Temperature index

The temperature index is dependent on the type of impregnating agent used. The method of test used shall be agreed between purchaser and supplier. The maximum service temperature shall be determined by experience.

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 inappropriate.

21 Loss of mass

Test inappropriate.

23 Pin hole test

Test inappropriate.

30 Packaging

The type of packaging can influence certain properties of the wire, for example springback. Therefore, the type of packaging, for example the kind of spool, shall be agreed between purchaser and supplier.

The wire shall be evenly and compactly wound on spools or placed in containers. No spool or container shall contain more than one length of wire unless agreed to between purchaser and supplier. The marking of the label when there is more than one length and/or identification of the separate lengths in the package shall be agreed to between purchaser and supplier.

Where wires are delivered in coils, the dimensions and the maximum mass of such coils shall be agreed between purchaser and supplier. Any additional protection for coils shall also be agreed between purchaser and supplier.

Labels shall be securely attached to the flange of each spool and (where applicable) container and shall include the following information:

- a) manufacturer's name and/or trademark;
- b) type of wire and insulation;
- c) net mass of wire;
- d) diameter(s) of wire and grade of insulation;
- e) date of manufacture;
- f) appropriate IEC specification number.

Annex A (informative)

Diameters for intermediate nominal conductor diameters (R40)

Annex A sets out intermediate nominal conductor diameters from which the user may select intermediate sizes only for technical reasons (see Table A.1 and Table A.2).

**Table A.1 – Diameters for single glass-fibre covered
grade 1 or grade 2 enamelled round wires (R40)**

Nominal conductor diameter mm	Conductor diameter tolerance ± mm	Minimum increase of single glass-fibre covering mm	Maximum overall diameter of single glass-fibre covering	
			mm	
			Grade 1 GL1	Grade 2 GL1
0,530	0,006	0,102	0,746	0,765
0,600	0,006	0,102	0,809	0,834
0,670	0,007	0,102	0,882	0,909
0,750	0,008	0,102	0,970	0,997
0,850	0,009	0,102	1,075	1,105
0,950	0,010	0,102	1,170	1,210
1,060	0,011	0,102	1,290	1,325
1,180	0,012	0,102	1,412	1,448
1,320	0,013	0,102	1,560	1,596
1,500	0,015	0,102	1,741	1,780
1,700	0,017	0,102	1,948	1,985
1,900	0,019	0,102	2,147	2,185
2,120	0,021	0,102	2,376	2,415
2,360	0,024	0,102	2,620	2,660
2,650	0,027	0,114	2,948	2,990
3,000	0,030	0,114	3,299	3,342
3,350	0,034	0,114	3,652	3,696
3,750	0,038	0,114	4,058	4,103
4,250	0,043	0,114	4,565	4,611
4,750	0,048	0,114	5,072	5,120

Table A.2 – Diameters for double glass-fibre covered, bare, grade 1 or grade 2 enamelled round wires (R40)

Nominal conductor diameter mm	Conductor diameter tolerance ± mm	Minimum increase of double glass-fibre covering mm	Maximum overall diameter, of double glass-fibre covering mm		
			GL2	Grade 1 GL2	Grade 2 GL2
0,530	0,006	0,150	0,772	0,823	0,847
0,600	0,006	0,150	0,843	0,895	0,921
0,670	0,007	0,150	0,918	0,970	0,997
0,750	0,008	0,150	0,998	1,053	1,082
0,850	0,009	0,150	1,099	1,158	1,190
0,950	0,010	0,150	1,199	1,261	1,298
1,060	0,011	0,150	1,310	1,374	1,407
1,180	0,012	0,150	1,441	1,506	1,540
1,320	0,013	0,150	1,582	1,650	1,684
1,500	0,015	0,150	1,767	1,837	1,873
1,700	0,017	0,150	1,968	2,040	2,077
1,900	0,019	0,150	2,169	2,243	2,281
2,120	0,021	0,150	2,396	2,473	2,512
2,360	0,024	0,150	2,642	2,720	2,760
2,650	0,027	0,180	2,973	3,054	3,096
3,000	0,030	0,180	3,331	3,413	3,456
3,350	0,034	0,180	3,665	3,756	3,800
3,750	0,038	0,180	4,085	4,188	4,233
4,250	0,043	0,180	4,593	4,684	4,730
4,750	0,048	0,180	5,095	5,188	5,236

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Annex B (informative)

Resistance

The figures for nominal resistance are given for information only (see Table B.1). They are calculated on the basis of the nominal conductor diameter and a nominal resistivity of $1/58,5 \Omega \text{ mm}^2\text{m}^{-1}$.

Table B.1 – Electrical resistances

Nominal conductor diameter mm	Nominal resistance Ω/m
0,500	0,087 06
0,560	0,069 40
0,630	0,054 84
0,710	0,043 18
0,800	0,034 01
0,900	0,026 87
1,000	0,021 76
1,120	0,017 35
1,250	0,013 93
1,400	0,011 10
1,600	0,008 502
1,800	0,006 718
2,000	0,005 441
2,240	0,004 338
2,500	0,003 482
2,800	0,002 776
3,150	0,002 193
3,550	0,001 727
4,000	0,001 360
4,500	0,001 075
5,000	0,000 8706

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IEC 60264 (all parts), *Packaging of winding wires*

IEC 60317 (all parts), *Specifications for particular types of winding wires*

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

IEC 60317-48, *Specifications for particular types of winding wires – Part 48: Glass-fibre wound resin or varnish impregnated, bare or enamelled round copper wire, temperature index 155*

IEC 60317-49, *Specifications for particular types of winding wires – Part 49: Glass-fibre wound resin or varnish impregnated, bare or enamelled round copper wire, temperature index 180*

IEC 60317-50, *Specifications for particular types of winding wires – Part 50: Glass-fibre wound silicone resin or varnish impregnated, bare or enamelled round copper wire, temperature index 200*

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

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

SPÉCIFICATIONS POUR TYPES PARTICULIERS DE FILS DE BOBINAGE –

**Partie 0-6: Exigences générales –
Fil de section circulaire en cuivre nu ou émaillé,
guipé de fibres de verre imprégnées de résine ou de vernis**

AVANT-PROPOS

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La Norme internationale IEC 60317-0-6 a été établie par le comité d'études 55 de l'IEC: Fils de bobinage.

Cette deuxième édition annule et remplace la première édition parue en 2001 et l'Amendement 1:2006. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- révision du 3.3, Aspect;

- révision du Tableau 1, diamètre extérieur maximal de fil de grade 1 sur une enveloppe de fibres de verre simple couche pour les diamètres nominaux des conducteurs 1,600 mm – 5,000 mm;
- révision du Tableau 2, diamètre extérieur maximal de fil de grade 1 sur une enveloppe de fibres de verre double couche pour les diamètres nominaux des conducteurs 1,600 mm – 5,000 mm;
- clarification dans le Tableau 3 concernant le mesurage de l'allongement pour bien établir qu'il s'agit de "l'allongement minimal en %".

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
55/1851/FDIS	55/1866/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

La présente Norme internationale doit être lue conjointement avec l'IEC 60851 (toutes les parties). Les numéros des articles utilisés dans la présente partie de l'IEC 60317 sont identiques aux numéros respectifs des essais de l'IEC 60851 (toutes les parties).

En cas de divergences entre l'IEC 60851 (toutes les parties) et la présente partie de l'IEC 60317, cette dernière prévaut.

La numérotation des articles dans la présente Norme n'est pas continue entre les Articles 21 et 30 afin de permettre l'introduction d'éventuelles futures exigences pour les fils avant celles concernant le conditionnement des fils.

Une liste de toutes les parties de la série IEC 60317, publiées sous le titre général *Spécifications pour types particuliers de fils de bobinage*, peut être consultée sur le site web de l'IEC.

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- amendé.

INTRODUCTION

La présente partie de l'IEC 60317 fait partie d'une série de normes qui traite des fils isolés utilisés dans les enroulements d'appareils électriques. L'ensemble est composé des séries de normes suivantes:

- 1) *Fils de bobinage – Méthodes d'essai* (série IEC 60851);
- 2) *Spécifications pour types particuliers de fils de bobinage* (série IEC 60317);
- 3) *Conditionnement des fils de bobinage* (série IEC 60264).

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SPÉCIFICATIONS POUR TYPES PARTICULIERS DE FILS DE BOBINAGE –

Partie 0-6: Exigences générales – Fil de section circulaire en cuivre nu ou émaillé, guipé de fibres de verre imprégnées de résine ou de vernis

1 Domaine d'application

La présente partie de l'IEC 60317 spécifie les exigences générales relatives aux fils de bobinage de section circulaire en cuivre, nus ou émaillés, guipés de fibres de verre imprégnées de résine ou de vernis.

La gamme des diamètres nominaux des conducteurs est donnée dans la feuille de spécification applicable.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60851 (toutes les parties), *Fils de bobinage – Méthodes d'essai*

IEC 60851-5: 2008, *Fils de bobinage – Méthodes d'essai – Partie 5: Propriétés électriques*
IEC 60851-5/AMD1:2011
IEC 60851-5/AMD2:2019

ISO 3, *Nombres normaux – Séries de nombres normaux*

3 Termes, définitions, notes générales et aspect

3.1 Termes et définitions

Pour les besoins du présent document, les termes et définitions suivants s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse <http://www.electropedia.org/>
- ISO Online browsing platform: disponible à l'adresse <http://www.iso.org/obp>:

3.1.1

revêtement

matériau déposé sur un conducteur ou sur un fil par des moyens appropriés, puis séché et/ou cuit

3.1.2

conducteur

métal nu après enlèvement de l'isolant

3.1.3

enveloppe

matériau enroulé, rubané ou tressé autour d'un conducteur nu ou revêtu

3.1.4

craquelure

fente dans l'isolant qui rend visible le conducteur sous un grossissement donné

3.1.5

fil émaillé

fil de bobinage revêtu d'un isolant fait d'une résine cuite

3.1.6

grade

accroissement du diamètre extérieur du fil recouvert d'une enveloppe de fibres de verre dû à l'enveloppe de fibres de verre et/ou à l'émail

3.1.7

isolant

revêtement ou enveloppe sur le conducteur qui a pour fonction particulière de supporter la tension électrique

3.1.8

diamètre nominal du conducteur

désignation de la taille du conducteur selon la série IEC 60317

3.1.9

fil de bobinage

fil utilisé pour fabriquer une bobine qui fournit un champ magnétique

3.1.10

fil

conducteur revêtu ou enveloppé d'un isolant

3.1.11

vision normale

vision parfaite (20/20), avec si nécessaire des lentilles correctives

3.2 Notes générales

3.2.1 Méthodes d'essai

Toutes les méthodes d'essai qui doivent être utilisées dans le présent document sont données dans l'IEC 60851 (toutes les parties).

Les numéros d'articles utilisés dans le présent document sont identiques aux numéros d'essais respectifs dans l'IEC 60851 (toutes les parties).

En cas de divergences entre les parties de l'IEC 60851 et le présent document, l'IEC 60317-0-6 doit prévaloir.

Dans le cas où aucune gamme spécifique de diamètres nominaux des conducteurs n'est donnée pour un essai, l'essai s'applique à tous les diamètres nominaux des conducteurs couverts par la feuille de spécification.