

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

ICS 29.060.10

ISBN 978-2-8322-8513-8

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	4
INTRODUCTION	2
1 Scope	7
2 Normative references	7
3 Terms, definitions, general notes on methods of test and appearance	7
3.1 Terms and definitions	7
3.2 General notes on methods of test	8
3.2.1 Methods of test	8
3.2.2 Winding wire	9
3.3 Appearance	9
4 Dimensions	9
4.1 Conductor diameter	9
4.2 Out of roundness of the conductor	13
4.3 Minimum increase in diameter due to the covering	13
4.4 Maximum overall diameter	14
5 Electrical resistance	14
6 Elongation	14
7 Springiness	14
7.1 Nominal conductor diameters up to and including 1,600 mm	14
7.2 Nominal conductor diameters over 1,600 mm	14
8 Flexibility and adherence	14
9 Heat shock	14
10 Cut-through	14
11 Resistance to abrasion	15
12 Resistance to solvents	15
13 Breakdown voltage	15
13.1 Glass-fibre covered bare round copper wires	15
13.2 Glass-fibre covered enamelled round copper wires	15
14 Continuity of covering insulation	15
15 Temperature index	16
16 Resistance to refrigerants	16
17 Solderability	16
18 Heat or solvent bonding	16
19 Dielectric dissipation factor	16
20 Resistance to hydrolysis and to transformer oil	16
21 Loss of mass	16
23 Pin hole test	16
30 Packaging	16
Annex A (informative) Diameters for intermediate nominal conductor diameters (R40)	18
Annex B (informative) Resistance	22
Annex C (informative) High temperature failure test	25
Bibliography	25

Table 1 – Diameters for single glass-fibre covered grade 1 or grade 2 enamelled round wires	10
Table 2 – Diameters for double glass-fibre covered, bare, grade 1 or grade 2 enamelled round wires	11
Table 3 – Elongation	14
Table 4 – Breakdown voltage for glass-fibre covered bare round copper wires	15
Table 5 – Breakdown voltage of glass fibre-covered enamelled round copper wires	15
Table A.1 – Diameters for single glass-fibre covered grade 1 or grade 2 enamelled round wires (R40)	18
Table A.2 – Diameters for double glass-fibre covered, bare, grade 1 or grade 2 enamelled round wires (R40)	19
Table B.1 – Electrical resistances	22

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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*).

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*¹

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*

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

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**

CONTENTS

FOREWORD	4
INTRODUCTION	6
1 Scope	7
2 Normative references	7
3 Terms, definitions, general notes and appearance	7
3.1 Terms and definitions	7
3.2 General notes	8
3.2.1 Methods of test	8
3.2.2 Winding wire	9
3.3 Appearance	9
4 Dimensions	9
4.1 Conductor diameter	9
4.2 Out of roundness of the conductor	11
4.3 Minimum increase in diameter due to the covering	11
4.4 Maximum overall diameter	11
5 Electrical resistance	12
6 Elongation	12
7 Springiness	12
7.1 Nominal conductor diameters up to and including 1,600 mm	12
7.2 Nominal conductor diameters over 1,600 mm	12
8 Flexibility and adherence	12
9 Heat shock	12
10 Cut-through	12
11 Resistance to abrasion	12
12 Resistance to solvents	13
13 Breakdown voltage	13
13.1 Glass-fibre covered bare round copper wires	13
13.2 Glass-fibre covered enamelled round copper wires	13
14 Continuity of insulation	13
15 Temperature index	13
16 Resistance to refrigerants	14
17 Solderability	14
18 Heat or solvent bonding	14
19 Dielectric dissipation factor	14
20 Resistance to hydrolysis and to transformer oil	14
21 Loss of mass	14
23 Pin hole test	14
30 Packaging	14
Annex A (informative) Diameters for intermediate nominal conductor diameters (R40)	15
Annex B (informative) Resistance	17
Bibliography	18

Table 1 – Diameters for single glass-fibre covered grade 1 or grade 2 enamelled round wires	10
Table 2 – Diameters for double glass-fibre covered, bare, grade 1 or grade 2 enamelled round wires	10
Table 3 – Elongation	12
Table 4 – Breakdown voltage for glass-fibre covered bare round copper wires.....	13
Table 5 – Breakdown voltage of glass fibre-covered enamelled round copper wires	13
Table A.1 – Diameters for single glass-fibre covered grade 1 or grade 2 enamelled round wires (R40)	15
Table A.2 – Diameters for double glass-fibre covered, bare, grade 1 or grade 2 enamelled round wires (R40)	16
Table B.1 – Electrical resistances	17

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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.

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).

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*