IEC 60317-0-1

Edition 4.1 2019-08
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

Spécifications pour types particuliers de fils de bobinage – Partie 0-1: Exigences générales – Fil de section circulaire en cuivre émaillé

IEC 60317-0-1:2013-10+AMD1:2019-08 CSV(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.060.10

ISBN 978-2-8322-7316-6

IEC 60317-0-1

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REDLINE VERSION

VERSION REDLINE

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FOREWORD

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

IEC 60317-0-1 edition 4.1 contains the fourth edition (2013-10) [documents 55/1409/FDIS and 55/1430/RVD] and its amendment 1 (2019-08) [documents 55/1782/FDIS and 55/1799/RVD].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 60317-0-1 has been prepared by IEC technical committee 55: Winding wires.

This fourth edition constitutes a technical revision.

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

– revision to the definition of nominal conductor dimension;
– new subclause containing general notes on winding wire, formerly a part of the scope;
– revision to elongation requirements in Table 4;
– revisions to Clause 13, Breakdown voltage, to include new requirements for intermediate wire diameters;
– revision to continuity of insulation requirements in Table 13;
– revision to the introduction of Annex A;
– revision to B.2 of Annex B;
– revision to Table C.1 of Annex C.

This standard is to be read in conjunction with the IEC 60851 series. The clause numbers used in this part of IEC 60317 are identical with the respective test numbers of the IEC 60851 series.

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

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

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 the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- 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 is one of a series which deals with insulated wires used for windings in electrical equipment. The series has three groups describing:

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

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 0-1: General requirements – Enamelled round copper wire

1 Scope

This part of IEC 60317 specifies general requirements of enamelled round copper winding wires with or without bonding layer.

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60172, *Test procedure for the determination of the temperature index of enamelled winding wires*

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

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

ISO 1190-1, *Copper and copper alloys – Code of designation – Part 1: Designation of materials*

ASTM B49-17, *Standard Specification for Copper Rod for Electrical Purposes*

EN 1977:2013, *Copper and copper alloys – Copper drawing stock (wire rod)*

3 Terms, definitions, general notes and appearance

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

3.1 Terms and definitions

3.1.1
bonding layer
material which is deposited on an enamelled wire and which has the specific function of bonding wires together

3.1.2
class
thermal performance of a wire expressed by the temperature index and the heat shock temperature

3.1.3
coating
material which is deposited on a conductor or wire by a suitable means and then dried and/or cured

3.1.4
conductor
bare metal after removal of the insulation

3.1.5
crack
opening in the insulation which exposes the conductor to view at the stated magnification

3.1.6
dual coating
insulation composed of two different materials, an underlying and a superimposed coating

3.1.7
enamelled wire
wire coated with an insulation of cured resin

3.1.8
grade
range of thickness of the insulation of a wire

3.1.9
insulation
coating or covering on the conductor with the specific function of withstanding voltage

3.1.10
nominal conductor dimension
designation of the conductor size in accordance with the IEC 60317 series

3.1.11
normal vision
20/20 vision, with corrective lenses, if necessary

3.1.12
sole coating
insulation composed of one material

3.1.13
winding wire
wire used for winding a coil to provide a magnetic field

3.1.14
wire
conductor coated or covered with an insulation

3.2 General notes

3.2.1 Methods of test

All methods of test to be used for this part of IEC 60317 are given in the IEC 60851 series.

The clause numbers used in this standard are identical to the corresponding test numbers in the IEC 60851 series of standards.

In case of inconsistencies between the publication on methods of test and this standard, IEC 60317-0-1 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 from 15 °C to ~~35~~ 40 °C and a relative humidity ~~from 45~~ of 25 % to 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

See the relevant specification sheet.

In addition, 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.

EXAMPLE IEC 60317-1 – 0,500 Grade 2

3.3 Appearance

The film coating shall be essentially smooth and continuous, free from streaks, blisters and foreign material when examined with normal vision, as wound on the original spool or reel.

When agreed upon between the user and supplier, examination using 6× to 10× magnification shall be used for wires with a nominal diameter less than 0,1 mm.

4 Dimensions

4.1 Conductor diameter

The series of preferred nominal conductor diameters shall correspond to series R 20 according to ISO 3. The actual values and their tolerances are given in Tables 1 and 2.

The series of intermediate diameters from which the user may select intermediate nominal conductor diameters, when required for technical reasons, shall correspond to series R 40 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 Tables 1 or 2.

Table 1 – Dimensions of enamelled wires (R 20) – Preferred nominal conductor diameters *(1 of 2)*

Nominal conductor diameter	Conductor tolerance ±	Minimum increase due to the insulation mm			Maximum overall diameter mm		
mm	mm	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
0,018		0,002	0,004	0,006	0,022	0,024	0,026
0,020		0,002	0,004	0,007	0,024	0,027	0,030
0,022		0,002	0,005	0,008	0,027	0,030	0,033
0,025		0,003	0,005	0,008	0,031	0,034	0,037
0,028		0,003	0,006	0,009	0,034	0,038	0,042
0,032		0,003	0,007	0,010	0,039	0,043	0,047
0,036		0,004	0,008	0,011	0,044	0,049	0,053
0,040		0,004	0,008	0,012	0,049	0,054	0,058
0,045		0,005	0,009	0,013	0,055	0,061	0,066
0,050		0,005	0,010	0,014	0,060	0,066	0,072
0,056		0,006	0,011	0,015	0,067	0,074	0,081
0,063		0,006	0,012	0,017	0,076	0,083	0,090
0,071	0,003	0,007	0,012	0,018	0,084	0,091	0,098
0,080	0,003	0,007	0,014	0,020	0,094	0,101	0,108
0,090	0,003	0,008	0,015	0,022	0,105	0,113	0,120
0,100	0,003	0,008	0,016	0,023	0,117	0,125	0,132
0,112	0,003	0,009	0,017	0,026	0,130	0,139	0,147
0,125	0,003	0,010	0,019	0,028	0,144	0,154	0,163
0,140	0,003	0,011	0,021	0,030	0,160	0,171	0,181
0,160	0,003	0,012	0,023	0,033	0,182	0,194	0,205
0,180	0,003	0,013	0,025	0,036	0,204	0,217	0,229
0,200	0,003	0,014	0,027	0,039	0,226	0,239	0,252
0,224	0,003	0,015	0,029	0,043	0,252	0,266	0,280
0,250	0,004	0,017	0,032	0,048	0,281	0,297	0,312
0,280	0,004	0,018	0,033	0,050	0,312	0,329	0,345
0,315	0,004	0,019	0,035	0,053	0,349	0,367	0,384
0,355	0,004	0,020	0,038	0,057	0,392	0,411	0,428
0,400	0,005	0,021	0,040	0,060	0,439	0,459	0,478
0,450	0,005	0,022	0,042	0,064	0,491	0,513	0,533
0,500	0,005	0,024	0,045	0,067	0,544	0,566	0,587