IEC 60317-0-3

Edition 4.0 2024-09
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Specifications for particular types of winding wires –
Part 0-3: General requirements – Enamelled round aluminium wire

IEC 60317-0-3:2024-04 RLV(en)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2024 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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

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

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

IEC 60317-0-3

Edition 4.0 2024-09
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Specifications for particular types of winding wires – Part 0-3: General requirements – Enamelled round aluminium wire

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 29.060.10

ISBN 978-2-8322-9701-8

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

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 4
INTRODUCTION 2
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 conductor 11
4.3 Minimum increase in diameter due to the insulation and the bonding layer 11
4.3.1 Enamelled wires without a bonding layer 11
4.3.2 Enamelled wires with a bonding layer 11
4.4 Maximum overall diameter 11
4.4.1 Enamelled wires without a bonding layer 11
4.4.2 Enamelled wires with a bonding layer 12
5 Electrical resistance 12
6 Elongation 12
7 Springiness 12
8 Flexibility and adherence 12
8.1 Mandrel winding test (nominal conductor diameters up to and including 1,600 mm) 12
8.2 Stretching test (nominal conductor diameters over 1,600 mm) 13
8.3 Jerk test (nominal conductor diameters up to and including 1,000 mm) 13
8.4 Peel test (nominal conductor diameters over 1,000 mm) 13
9 Heat shock 13
9.1 Nominal conductor diameters up to and including 1,600 mm 13
9.2 Nominal conductor diameters over 1,600 mm 13
10 Cut-through 13
11 Resistance to abrasion 13
12 Resistance to solvents 13
13 Breakdown voltage 14
13.1 General 14
13.2 Nominal conductor diameters up to and including 2,500 mm 14
13.3 Nominal conductor diameters over 2,500 mm 14
14 Continuity of insulation (nominal conductor diameters up to and including 1,600 mm) 14
15 Temperature index 15
16 Resistance to refrigerants 15
17 Solderability 15
18 Heat or solvent bonding 15
19 Dielectric dissipation factor 16

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

20 Resistance to transformer oil 16
21 Loss of mass 16
23 Pin hole test 16
30 Packaging 16
Annex A (informative) Dimensions for intermediate nominal conductor diameters (R 40) 17
A.1 General 17
A.2 Enamelled wires without a bonding layer 17
A.3 Enamelled wires with a bonding layer 18
Annex B (normative) Method for the calculation of linear resistance 19
Annex C (informative) Resistance 20
Bibliography 21

Table 1 – Dimensions of enamelled wires (R 20) 10
Table 2 – Dimensions of enamelled wires with a bonding layer (R 20) 11
Table 3 – Elongation 12
Table 4 – Mandrel winding 12
Table 5 – Heat shock 13
Table 6 – Breakdown voltage 14
Table 7 – Breakdown voltage 15
Table 8 – Continuity of insulation 15
Table A.2 – Dimensions of enamelled wires with a bonding layer (R 40) 18
Table C.1 – Electrical resistances 20

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 0-3: General requirements – Enamelled round aluminium 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 itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60317-0-3:2008+AMD1:2013+AMD2:2019 CSV. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 60317-0-3 has been prepared by IEC technical committee 55: Winding wires. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2008, Amendment 1:2013 and Amendment 2:2019. This edition constitutes a technical revision.

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

a) Revision to Clause 7, designating the test as inappropriate;

b) Revision to Clause 10, designating the test as inappropriate.

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

Draft	Report on voting
55/2049/FDIS	55/2054/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

INTRODUCTION

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent. IEC takes no position concerning the evidence, validity, and scope of this patent right.

The holder of this patent right has assured IEC that s/he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from the patent database available at patents.iec.ch/.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those in the patent database. IEC shall not be held responsible for identifying any or all such patent rights.

This part of IEC 60317 is one of a series that deals with insulated wires used for windings in electrical equipment. The series has three groups describing

1) winding wires and test methods (IEC 60851);
2) specifications for particular types of winding wires (IEC 60317);
3) packaging of winding wires (IEC 60264).

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 0-3: General requirements – Enamelled round aluminium wire

1 Scope

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

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 60172, *Test procedure for the determination of the temperature index of enamelled and tape wrapped winding wires*

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

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

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

ASTM B233-97, *Standard Specification for Aluminum 1350 Drawing Stock for Electrical Purposes*

EN 1715-2, *Aluminium and aluminium alloys – Drawing stock – Part 2: Specific requirements for electrical applications*

3 Terms, definitions, general notes, and appearance

3.1 Terms and definitions

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

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

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

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

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

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~~

3.1.6
enamelled wire
wire coated with an insulation of cured resin

3.1.7
grade
range of thickness of the insulation of a wire

3.1.8
insulation
coating or covering on the conductor with the specific function of withstanding voltage

3.1.9
nominal conductor ~~dimension~~ diameter
designation of the conductor size in accordance with the IEC 60317 series

3.1.10
normal vision
20/20 vision, with corrective lenses, if necessary

3.1.11
winding wire
wire used for winding a coil to provide a magnetic field

3.1.12
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, independent of the class of wire, are given in the IEC 60851 series.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

The clause numbers used in this document are identical with the respective test numbers of the IEC 60851 series.

In case of inconsistencies between the publication on methods of test and this document, IEC 60317-0-3 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 40 °C and a relative humidity 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 0,10 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 Table 1 and Table 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 Table 1 or Table 2.

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

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Table 1 – Dimensions of enamelled wires (R 20)

Nominal conductor diameter	Conductor tolerance	Minimum increase due to the insulation			Maximum overall diameter		
	±	mm			mm		
mm	mm	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
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
0,560	0,006	0,025	0,047	0,071	0,606	0,630	0,653
0,630	0,006	0,027	0,050	0,075	0,679	0,704	0,728
0,710	0,007	0,028	0,053	0,080	0,762	0,789	0,814
0,800	0,008	0,030	0,056	0,085	0,855	0,884	0,911
0,900	0,009	0,032	0,060	0,090	0,959	0,989	1,018
1,000	0,010	0,034	0,063	0,095	1,062	1,094	1,124
1,120	0,011	0,034	0,065	0,098	1,184	1,217	1,248
1,250	0,013	0,035	0,067	0,100	1,316	1,349	1,381
1,400	0,014	0,036	0,069	0,103	1,468	1,502	1,535
1,600	0,016	0,038	0,071	0,107	1,670	1,706	1,740
1,800	0,018	0,039	0,073	0,110	1,872	1,909	1,944
2,000	0,020	0,040	0,075	0,113	2,074	2,112	2,148
2,240	0,022	0,041	0,077	0,116	2,316	2,355	2,392
2,500	0,025	0,042	0,079	0,119	2,578	2,618	2,656
2,800	0,028	0,043	0,081	0,123	2,880	2,922	2,961
3,150	0,032	0,045	0,084	0,127	3,233	3,276	3,316
3,550	0,036	0,046	0,086	0,130	3,635	3,679	3,721
4,000	0,040	0,047	0,089	0,134	4,088	4,133	4,176
4,500	0,045	0,049	0,092	0,138	4,591	4,637	4,681
5,000	0,050	0,050	0,094	0,142	5,093	5,141	5,186

NOTE The dimensions of intermediate nominal conductor diameters for R 40 series are given in Annex A.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Table 2 – Dimensions of enamelled wires with a bonding layer (R 20)

Nominal conductor diameter	Conductor tolerance ±	Minimum increase underlying coating mm		Minimum increase bonding layer	Maximum overall diameter mm	
mm	mm	Grade 1B	Grade 2B	mm	Grade 1B	Grade 2B
0,250	0,004	0,017	0,032	0,013	0,300	0,316
0,280	0,004	0,018	0,033	0,013	0,331	0,348
0,315	0,004	0,019	0,035	0,014	0,369	0,387
0,355	0,004	0,020	0,038	0,015	0,413	0,432
0,400	0,005	0,021	0,040	0,016	0,461	0,481
0,450	0,005	0,022	0,042	0,016	0,514	0,536
0,500	0,005	0,024	0,045	0,017	0,568	0,590
0,560	0,006	0,025	0,047	0,017	0,630	0,654
0,630	0,006	0,027	0,050	0,018	0,704	0,729
0,710	0,007	0,028	0,053	0,019	0,788	0,815
0,800	0,008	0,030	0,056	0,020	0,882	0,911
0,900	0,009	0,032	0,060	0,020	0,987	1,017
1,000	0,010	0,034	0,063	0,021	1,091	1,123
1,120	0,011	0,034	0,065	0,022	1,214	1,247
1,250	0,013	0,035	0,067	0,022	1,346	1,379
1,400	0,014	0,036	0,069	0,023	1,499	1,533
1,600	0,016	0,038	0,071	0,023	1,702	1,738
1,800	0,018	0,039	0,073	0,024	1,905	1,942
2,000	0,020	0,040	0,075	0,025	2,108	2,146
NOTE The dimensions of intermediate nominal conductor diameters for R 40 series are given in Annex A.						

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

4.2 Out of roundness of 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 insulation and the bonding layer

4.3.1 Enamelled wires without a bonding layer

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

4.3.2 Enamelled wires with a bonding layer

The minimum increase in diameter due to the insulation including the bonding layer shall not be less than the values given in Table 2.

4.4 Maximum overall diameter

4.4.1 Enamelled wires without a bonding layer

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

4.4.2 Enamelled wires with a bonding layer

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

5 Electrical resistance

The aluminium rod being used shall comply with EN 1715-2 and ASTM B233-97.

No resistance values are specified.

By agreement between purchaser and supplier, resistance measurements may be made for nominal conductor diameters up to and including 1,000 mm. In case of such an agreement, the resistance at 20 °C shall be within the limits given in Annex C.

~~NOTE The nominal resistance is given in Annex C.~~

6 Elongation

The elongation at fracture and tensile strength shall not be less than the value given in Table 3.

Table 3 – Elongation

Nominal conductor diameter mm		Elongation minimum	Tensile strength minimum
Over	Up to and including	%	$N \cdot mm^{-2}$
–	0,400	10	90
0,400	1,000	12	90
1,000	2,000	15	80
2,000	5,000	15	70

7 Springiness

~~Test appropriate but no requirements specified.~~

Test inappropriate.

8 Flexibility and adherence

8.1 Mandrel winding test (nominal conductor diameters up to and including 1,600 mm)

The coating shall show no crack after the wire has been wound on a mandrel as specified in Table 4.

Table 4 – Mandrel winding

Nominal conductor diameter mm		Mandrel diameter
Over	Up to and including	
–	1,600	$3d$[a]

[a] d is the nominal diameter of the wire.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

8.2 Stretching test (nominal conductor diameters over ~~1,000~~ 1, 600 mm)

The coating shall show no crack after the wire has been elongated 15 %.

8.3 Jerk test (nominal conductor diameters up to and including 1,000 mm)

The coating shall show no crack or loss of adhesion.

8.4 Peel test (nominal conductor diameters over 1,000 mm)

Test appropriate but no requirements specified.

9 Heat shock

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

The coating shall show no crack. The mandrel diameter shall be as specified in Table 5. The minimum heat shock temperature is given in the relevant specification sheet.

Table 5 – Heat shock

Nominal conductor diameter mm		Mandrel diameter
Over	Up to and including	
–	1,600	$3d$[a]

[a] d is the nominal diameter of the wire.

9.2 Nominal conductor diameters over 1,600 mm

The coating shall show no crack after having been elongated 15 %. The minimum heat shock temperature is given in the relevant specification sheet.

10 Cut-through

Test inappropriate.

11 Resistance to abrasion

For requirements, see the relevant specification sheet.

12 Resistance to solvents

Following immersion in standard solvent, the coating shall not be removed using a pencil of hardness "H".

Using a pencil of hardness "H" the coating shall not be removed.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

13 Breakdown voltage

13.1 General

The wire shall meet the requirements given in 13.2 and 13.3, respectively, when tested at room temperature and at elevated temperature when this is required by the purchaser.

The elevated temperature is given in the relevant specification sheet.

13.2 Nominal conductor diameters up to and including 2,500 mm

At least four of the five specimens tested shall not break down at a voltage less than or equal to that given in Table 6.

For intermediate nominal conductor diameters, the figure of the next larger nominal conductor diameter applies.

Table 6 – Breakdown voltage

Nominal conductor diameter mm	Minimum breakdown voltage (RMS value) V					
	Grade 1 and grade 1B		Grade 2 and grade 2B		Grade 3	
	Room temperature	Elevated temperature	Room temperature	Elevated temperature	Room temperature	Elevated temperature
0,250	2 100	1 600	3 900	2 900	5 500	4 100
0,280	2 200	1 700	4 000	3 000	5 800	4 400
0,315	2 200	1 700	4 100	3 100	6 100	4 600
0,355	2 300	1 700	4 300	3 200	6 400	4 800
0,400	2 300	1 700	4 400	3 300	6 600	5 000
0,450	2 300	1 700	4 400	3 300	6 800	5 100
0,500	2 400	1 800	4 600	3 500	7 000	5 300
0,560	2 500	1 900	4 600	3 500	7 100	5 300
0,630	2 600	2 000	4 800	3 600	7 100	5 300
0,710	2 600	2 000	4 800	3 600	7 200	5 400
0,800	2 600	2 000	4 900	3 700	7 400	5 600
0,900	2 700	2 000	5 000	3 700	7 600	5 700
1,000 up to and including 2,500	2 700	2 000	5 000	3 800	7 600	5 700

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

13.3 Nominal conductor diameters over 2,500 mm

At least four of the five specimens tested shall not break down at a voltage less than or equal to that given in Table 7.

Table 7 – Breakdown voltage

Nominal conductor diameter mm	Minimum breakdown voltage (RMS value) V					
	Grade 1 and grade 1B		Grade 2 and grade 2B		Grade 3	
	Room temperature	Elevated temperature	Room temperature	Elevated temperature	Room temperature	Elevated temperature
~~Over~~ Greater than 2,500 up to and including 5,000	1 300	1 000	2 500	1 900	3 800	2 900

14 Continuity of insulation (nominal conductor diameters up to and including 1,600 mm)

The number of faults per 30 m of wire shall not exceed the values given in Table 8.

Table 8 – Continuity of insulation

Nominal conductor diameter mm		Maximum number of faults per 30 m		
Over	Up to and including	Grade 1 and grade 1B	Grade 2 and grade 2B	Grade 3
–	1,600	25	10	5

15 Temperature index

The test shall be carried out in accordance with IEC 60172.

The temperature index shall not be less than that given in the relevant specification sheet and the time to failure at the lowest test temperature shall not be less than 5 000 h.

When required by a purchaser, the supplier of the enamelled wire shall supply evidence that the wire meets the requirements for the temperature index.

NOTE The temperature index based on an extrapolated life of 20 000 h relates to enamelled wires tested unvarnished and not as part of an insulation system. The temperature in degrees Celsius corresponding to the temperature index is not necessarily that at which it is recommended that the wire be operated, and this will depend on many factors, including the type of equipment involved.

16 Resistance to refrigerants

For requirements, see the relevant specification sheet.

17 Solderability

Test inappropriate.

18 Heat or solvent bonding

For requirements, see the relevant specification sheet.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

19 Dielectric dissipation factor

For requirements, see the relevant specification sheet.

20 Resistance to transformer oil

For requirements, see the relevant specification sheet.

21 Loss of mass

For requirements, see the relevant specification sheet.

23 Pin hole test

Requirements under consideration.

30 Packaging

The kind of packaging ~~may~~ can influence certain properties of the wire, for example springback. Therefore, the kind of packaging, for example the type 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 by purchaser and supplier. 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 by purchaser and supplier.

Where wires are delivered in coils, the dimensions and the maximum weights 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 attached to each packaging unit as agreed between supplier and user and shall include the following information:

a) manufacturer's name and/or trade mark;

b) type of wire and insulation, for instance trade name and/or IEC specification number;

c) net mass of wire;

d) nominal dimension(s) of wire and grade of insulation;

e) date of manufacture.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Annex A
(informative)

Dimensions for intermediate nominal conductor diameters (R 40)

A.1 General

This Annex A covers those intermediate nominal conductor diameters from which the user may select intermediate sizes only for technical reasons.

Minimum overall diameter requirements may be used in lieu of the maximum overall diameters in Table A.1 or Table A.2 provided they are based on the minimum increases.

A.2 Enamelled wires without a bonding layer

Table A.1 – Dimensions of enamelled wires (R 40)

Nominal conductor diameter	Conductor tolerance	Minimum increase due to the insulation			Maximum overall diameter		
	±	mm			mm		
mm	mm	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
0,265	0,004	0,018	0,033	0,050	0,297	0,314	0,330
0,300	0,004	0,019	0,035	0,053	0,334	0,352	0,369
0,335	0,004	0,020	0,038	0,057	0,372	0,391	0,408
0,375	0,005	0,021	0,040	0,060	0,414	0,434	0,453
0,425	0,005	0,022	0,042	0,064	0,466	0,488	0,508
0,475	0,005	0,024	0,045	0,067	0,519	0,541	0,562
0,530	0,006	0,025	0,047	0,071	0,576	0,600	0,623
0,600	0,006	0,027	0,050	0,075	0,649	0,674	0,698
0,670	0,007	0,028	0,053	0,080	0,722	0,749	0,774
0,750	0,008	0,030	0,056	0,085	0,805	0,834	0,861
0,850	0,009	0,032	0,060	0,090	0,909	0,930	0,968
0.950	0,010	0,034	0,063	0,095	1,012	1,044	1,074
1.060	0,011	0,034	0,065	0,098	1,124	1,157	1,188
1.180	0,012	0,035	0,067	0,100	1,246	1,279	1,311
1.320	0,013	0,036	0,069	0,103	1,388	1,422	1,455
1.500	0,015	0,038	0,071	0,107	1,570	1,606	1,640
1.700	0,017	0,039	0,073	0,110	1,772	1,809	1,844
1.900	0,019	0,040	0,075	0,113	1,974	2,012	2,048
2.120	0,021	0,041	0,077	0,116	2,196	2,235	2,272
2.360	0,024	0,042	0,079	0,119	2,438	2,478	2,516
2.650	0,027	0,043	0,081	0,123	2,730	2,772	2,811
3.000	0,030	0,045	0,084	0,127	3,083	3,126	3,166
3.350	0,034	0,046	0,086	0,130	3,435	3,479	3,521
3.750	0,038	0,047	0,089	0,134	3,838	3,883	3,926
4.250	0,043	0,049	0,092	0,138	4,341	4,387	4,431
4.750	0,048	0,050	0,094	0,142	4,843	4,891	4,936

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

A.3 Enamelled wires with a bonding layer

Table A.2 – Dimensions of enamelled wires with a bonding layer (R 40)

Nominal conductor diameter	Conductor tolerance	Minimum increase due to the insulation		Minimum increase due to bonding layer	Maximum overall diameter	
mm	± mm	mm		mm	mm	
		Grade 1B	Grade 2B		Grade 1B	Grade 2B
0,265	0,004	0,018	0,033	0,013	0,316	0,333
0,300	0,004	0,019	0,035	0,014	0,354	0,372
0,335	0,004	0,020	0,038	0,015	0,393	0,412
0,375	0,005	0,021	0,040	0,016	0,436	0,456
0,425	0,005	0,022	0,042	0,016	0,489	0,511
0,475	0,005	0,024	0,045	0,017	0,543	0,565
0,530	0,006	0,025	0,047	0,017	0,600	0,624
0,600	0,006	0,027	0,050	0,018	0,674	0,699
0,670	0,007	0,028	0,053	0,019	0,748	0,775
0,750	0,008	0,030	0,056	0,020	0,832	0,861
0,850	0,009	0,032	0,060	0,020	0,937	0,967
0.950	0,010	0,034	0,063	0,021	1,041	1,073
1.060	0,011	0,034	0,065	0,022	1,154	1,187
1.180	0,012	0,035	0,067	0,022	1,276	1,309
1.320	0,013	0,036	0,069	0,023	1,419	1,453
1.500	0,015	0,038	0,071	0,023	1,602	1,638
1.700	0,017	0,039	0,073	0,024	1,805	1,842
1.900	0,019	0,040	0,075	0,025	2,008	2,046

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Annex B
(normative)

Method for the calculation of linear resistance

The limits of electrical resistance for nominal conductor diameters up to and including 1,000 mm are calculated on the following basis:

The minimum and the maximum values of resistance are calculated from the nominal value of the resistivity by accounting for each conductor diameter the relevant dimensional tolerance.

The linear resistance is calculated from

$$R_{min} = \rho_{min} \times q^{-1}{}_{max} \ (\Omega \cdot m^{-1})$$

$$R_{max} = \rho_{max} \times q^{-1}{}_{min} \ (\Omega \cdot m^{-1})$$

where:

ρ_{min} = 1/36,2 Ω mm^2·m^{-1};

ρ_{max} = 1/35,5 Ω mm^2·m^{-1};

q is the cross-section of the conductor, in square millimetres.

where

q_{max} is the maximum cross-section of the conductor in square millimetres, calculated from the nominal conductor diameter ~~minus~~ plus the dimensional tolerance;

q_{min} is the minimum cross-section of the conductor in square millimetres, calculated from the nominal conductor diameter ~~plus~~ minus the dimensional tolerance.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Annex C
(informative)

Resistance

The figures for nominal resistance in Table C.1 are given for information only. They are calculated on the basis of the nominal conductor diameter and a nominal resistivity of 1/35,85 $\Omega mm^2 \cdot m^{-1}$.

The minimum and maximum resistance figures for nominal conductor diameter up to and including 1,000 mm are derived from calculations made according to Annex B.

Table C.1 – Electrical resistances

Nominal conductor diameter mm	Resistance at 20 °CΩ/m		
	Minimum	Nominal	Maximum
0,250	0,545 2	0,568 3	0,592 7
0,280	0,436 1	0,453 0	0,470 8
0,315	0,345 6	0,357 9	0,370 8
0,355	0,272 9	0,281 8	0,291 1
0,400	0,214 4	0,222 0	0,229 9
0,450	0,169 9	0,175 4	0,181 1
0,500	0,137 9	0,142 1	0,146 4
0,560	0,109 8	0,113 3	0,116 9
0,630	0,086 95	0,089 48	0,092 11
0,710	0,068 42	0,089 48	0,092 11
0,800	0,053 87	0,070 45	0,072 57
0,900	0,042 57	0,043 85	0,045 18
1,000	0,034 48	0,035 52	0,036 59

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Bibliography

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

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

IEC 60317-0-3

Edition 4.0 2024-09

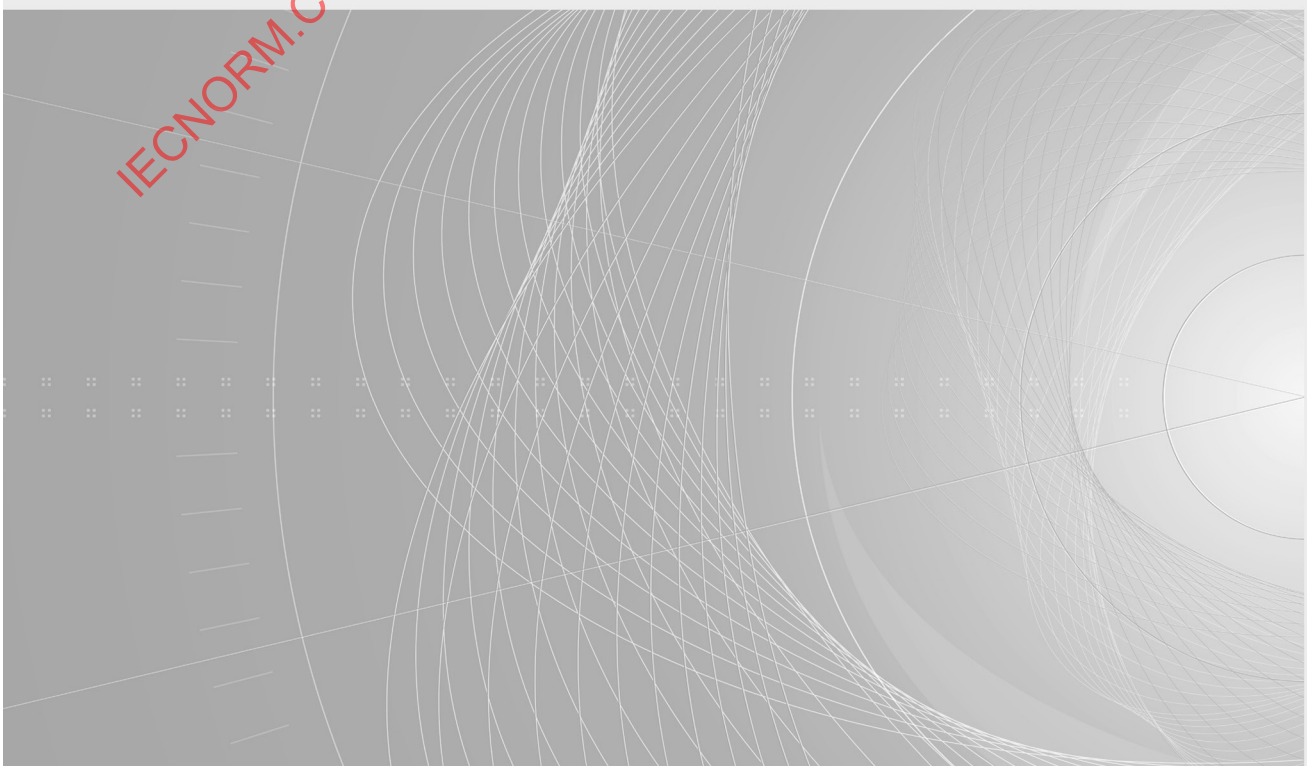
INTERNATIONAL STANDARD

NORME INTERNATIONALE

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Specifications for particular types of winding wires –
Part 0-3: General requirements – Enamelled round aluminium wire

Spécifications pour types particuliers de fils de bobinage –
Partie 0-3: Exigences générales – Fil de section circulaire en aluminium émaillé



IEC 60317-0-3:2024-09(en-fr)

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 conductor 11
4.3 Minimum increase in diameter due to the insulation and the bonding layer 11
4.3.1 Enamelled wires without a bonding layer 11
4.3.2 Enamelled wires with a bonding layer 11
4.4 Maximum overall diameter 11
4.4.1 Enamelled wires without a bonding layer 11
4.4.2 Enamelled wires with a bonding layer 12
5 Electrical resistance 12
6 Elongation 12
7 Springiness 12
8 Flexibility and adherence 12
8.1 Mandrel winding test (nominal conductor diameters up to and including 1,600 mm) 12
8.2 Stretching test (nominal conductor diameters over 1,600 mm) 13
8.3 Jerk test (nominal conductor diameters up to and including 1,000 mm) 13
8.4 Peel test (nominal conductor diameters over 1,000 mm) 13
9 Heat shock 13
9.1 Nominal conductor diameters up to and including 1,600 mm 13
9.2 Nominal conductor diameters over 1,600 mm 13
10 Cut-through 13
11 Resistance to abrasion 13
12 Resistance to solvents 13
13 Breakdown voltage 14
13.1 General 14
13.2 Nominal conductor diameters up to and including 2,500 mm 14
13.3 Nominal conductor diameters over 2,500 mm 14
14 Continuity of insulation (nominal conductor diameters up to and including 1,600 mm) 15
15 Temperature index 15
16 Resistance to refrigerants 15
17 Solderability 15
18 Heat or solvent bonding 15
19 Dielectric dissipation factor 16

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

20 Resistance to transformer oil 16
21 Loss of mass 16
23 Pin hole test 16
30 Packaging 16
Annex A (informative) Dimensions for intermediate nominal conductor diameters (R 40) 17
A.1 General 17
A.2 Enamelled wires without a bonding layer 17
A.3 Enamelled wires with a bonding layer 18
Annex B (normative) Method for the calculation of linear resistance 19
Annex C (informative) Resistance 20
Bibliography 21

Table 1 – Dimensions of enamelled wires (R 20) 10
Table 2 – Dimensions of enamelled wires with a bonding layer (R 20) 11
Table 3 – Elongation 12
Table 4 – Mandrel winding 12
Table 5 – Heat shock 13
Table 6 – Breakdown voltage 14
Table 7 – Breakdown voltage 15
Table 8 – Continuity of insulation 15
Table A.2 – Dimensions of enamelled wires with a bonding layer (R 40) 18
Table C.1 – Electrical resistances 20

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 0-3: General requirements – Enamelled round aluminium 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 itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

IEC 60317-0-3 has been prepared by IEC technical committee 55: Winding wires. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2008, Amendment 1:2013 and Amendment 2:2019. This edition constitutes a technical revision.

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

a) Revision to Clause 7, designating the test as inappropriate;
b) Revision to Clause 10, designating the test as inappropriate.

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

Draft	Report on voting
55/2049/FDIS	55/2054/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

INTRODUCTION

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent. IEC takes no position concerning the evidence, validity, and scope of this patent right.

The holder of this patent right has assured IEC that s/he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from the patent database available at patents.iec.ch/.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those in the patent database. IEC shall not be held responsible for identifying any or all such patent rights.

This part of IEC 60317 is one of a series that deals with insulated wires used for windings in electrical equipment. The series has three groups describing

1) winding wires and test methods (IEC 60851);
2) specifications for particular types of winding wires (IEC 60317);
3) packaging of winding wires (IEC 60264).

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 0-3: General requirements – Enamelled round aluminium wire

1 Scope

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

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 60172, *Test procedure for the determination of the temperature index of enamelled and tape wrapped winding wires*

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

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

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

ASTM B233-97, *Standard Specification for Aluminum 1350 Drawing Stock for Electrical Purposes*

EN 1715-2, *Aluminium and aluminium alloys – Drawing stock – Part 2: Specific requirements for electrical applications*

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 terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

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

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

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
enamelled wire
wire coated with an insulation of cured resin

3.1.7
grade
range of thickness of the insulation of a wire

3.1.8
insulation
coating or covering on the conductor with the specific function of withstanding voltage

3.1.9
nominal conductor diameter
designation of the conductor size in accordance with the IEC 60317 series

3.1.10
normal vision
20/20 vision, with corrective lenses, if necessary

3.1.11
winding wire
wire used for winding a coil to provide a magnetic field

3.1.12
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, independent of the class of wire, are given in the IEC 60851 series.

The clause numbers used in this document are identical with the respective test numbers of the IEC 60851 series.

In case of inconsistencies between the publication on methods of test and this document, IEC 60317-0-3 shall prevail.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

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 40 °C and a relative humidity 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 0,10 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 Table 1 and Table 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 Table 1 or Table 2.

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

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Table 1 – Dimensions of enamelled wires (R 20)

Nominal conductor diameter	Conductor tolerance	Minimum increase due to the insulation			Maximum overall diameter		
	±	mm			mm		
mm	mm	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
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
0,560	0,006	0,025	0,047	0,071	0,606	0,630	0,653
0,630	0,006	0,027	0,050	0,075	0,679	0,704	0,728
0,710	0,007	0,028	0,053	0,080	0,762	0,789	0,814
0,800	0,008	0,030	0,056	0,085	0,855	0,884	0,911
0,900	0,009	0,032	0,060	0,090	0,959	0,989	1,018
1,000	0,010	0,034	0,063	0,095	1,062	1,094	1,124
1,120	0,011	0,034	0,065	0,098	1,184	1,217	1,248
1,250	0,013	0,035	0,067	0,100	1,316	1,349	1,381
1,400	0,014	0,036	0,069	0,103	1,468	1,502	1,535
1,600	0,016	0,038	0,071	0,107	1,670	1,706	1,740
1,800	0,018	0,039	0,073	0,110	1,872	1,909	1,944
2,000	0,020	0,040	0,075	0,113	2,074	2,112	2,148
2,240	0,022	0,041	0,077	0,116	2,316	2,355	2,392
2,500	0,025	0,042	0,079	0,119	2,578	2,618	2,656
2,800	0,028	0,043	0,081	0,123	2,880	2,922	2,961
3,150	0,032	0,045	0,084	0,127	3,233	3,276	3,316
3,550	0,036	0,046	0,086	0,130	3,635	3,679	3,721
4,000	0,040	0,047	0,089	0,134	4,088	4,133	4,176
4,500	0,045	0,049	0,092	0,138	4,591	4,637	4,681
5,000	0,050	0,050	0,094	0,142	5,093	5,141	5,186
NOTE The dimensions of intermediate nominal conductor diameters for R 40 series are given in Annex A.							

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Table 2 – Dimensions of enamelled wires with a bonding layer (R 20)

Nominal conductor diameter	Conductor tolerance ±	Minimum increase underlying coating mm		Minimum increase bonding layer	Maximum overall diameter mm	
mm	mm	Grade 1B	Grade 2B	mm	Grade 1B	Grade 2B
0,250	0,004	0,017	0,032	0,013	0,300	0,316
0,280	0,004	0,018	0,033	0,013	0,331	0,348
0,315	0,004	0,019	0,035	0,014	0,369	0,387
0,355	0,004	0,020	0,038	0,015	0,413	0,432
0,400	0,005	0,021	0,040	0,016	0,461	0,481
0,450	0,005	0,022	0,042	0,016	0,514	0,536
0,500	0,005	0,024	0,045	0,017	0,568	0,590
0,560	0,006	0,025	0,047	0,017	0,630	0,654
0,630	0,006	0,027	0,050	0,018	0,704	0,729
0,710	0,007	0,028	0,053	0,019	0,788	0,815
0,800	0,008	0,030	0,056	0,020	0,882	0,911
0,900	0,009	0,032	0,060	0,020	0,987	1,017
1,000	0,010	0,034	0,063	0,021	1,091	1,123
1,120	0,011	0,034	0,065	0,022	1,214	1,247
1,250	0,013	0,035	0,067	0,022	1,346	1,379
1,400	0,014	0,036	0,069	0,023	1,499	1,533
1,600	0,016	0,038	0,071	0,023	1,702	1,738
1,800	0,018	0,039	0,073	0,024	1,905	1,942
2,000	0,020	0,040	0,075	0,025	2,108	2,146
NOTE The dimensions of intermediate nominal conductor diameters for R 40 series are given in Annex A.						

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

4.2 Out of roundness of 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 insulation and the bonding layer

4.3.1 Enamelled wires without a bonding layer

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

4.3.2 Enamelled wires with a bonding layer

The minimum increase in diameter due to the insulation including the bonding layer shall not be less than the values given in Table 2.

4.4 Maximum overall diameter

4.4.1 Enamelled wires without a bonding layer

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

4.4.2 Enamelled wires with a bonding layer

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

5 Electrical resistance

The aluminium rod being used shall comply with EN 1715-2 and ASTM B233-97.

No resistance values are specified.

By agreement between purchaser and supplier, resistance measurements may be made for nominal conductor diameters up to and including 1,000 mm. In case of such an agreement, the resistance at 20 °C shall be within the limits given in Annex C.

6 Elongation

The elongation at fracture and tensile strength shall not be less than the value given in Table 3.

Table 3 – Elongation

Nominal conductor diameter mm		Elongation minimum	Tensile strength minimum
Over	Up to and including	%	$N \cdot mm^{-2}$
–	0,400	10	90
0,400	1,000	12	90
1,000	2,000	15	80
2,000	5,000	15	70

7 Springiness

Test inappropriate.

8 Flexibility and adherence

8.1 Mandrel winding test (nominal conductor diameters up to and including 1,600 mm)

The coating shall show no crack after the wire has been wound on a mandrel as specified in Table 4.

Table 4 – Mandrel winding

Nominal conductor diameter mm		Mandrel diameter
Over	Up to and including	
–	1,600	$3d$[a]
[a] d is the nominal diameter of the wire.		

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

8.2 Stretching test (nominal conductor diameters over 1,600 mm)

The coating shall show no crack after the wire has been elongated 15 %.

8.3 Jerk test (nominal conductor diameters up to and including 1,000 mm)

The coating shall show no crack or loss of adhesion.

8.4 Peel test (nominal conductor diameters over 1,000 mm)

Test appropriate but no requirements specified.

9 Heat shock

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

The coating shall show no crack. The mandrel diameter shall be as specified in Table 5. The minimum heat shock temperature is given in the relevant specification sheet.

Table 5 – Heat shock

Nominal conductor diameter mm		Mandrel diameter
Over	Up to and including	
–	1,600	$3d$[a]

[a] d is the nominal diameter of the wire.

9.2 Nominal conductor diameters over 1,600 mm

The coating shall show no crack after having been elongated 15 %. The minimum heat shock temperature is given in the relevant specification sheet.

10 Cut-through

Test inappropriate.

11 Resistance to abrasion

For requirements, see the relevant specification sheet.

12 Resistance to solvents

Following immersion in standard solvent, the coating shall not be removed using a pencil of hardness "H".

Using a pencil of hardness "H" the coating shall not be removed.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

13 Breakdown voltage

13.1 General

The wire shall meet the requirements given in 13.2 and 13.3, respectively, when tested at room temperature and at elevated temperature when this is required by the purchaser.

The elevated temperature is given in the relevant specification sheet.

13.2 Nominal conductor diameters up to and including 2,500 mm

At least four of the five specimens tested shall not break down at a voltage less than or equal to that given in Table 6.

For intermediate nominal conductor diameters, the figure of the next larger nominal conductor diameter applies.

Table 6 – Breakdown voltage

Nominal conductor diameter mm	Minimum breakdown voltage (RMS value) V					
	Grade 1 and grade 1B		Grade 2 and grade 2B		Grade 3	
	Room temperature	Elevated temperature	Room temperature	Elevated temperature	Room temperature	Elevated temperature
0,250	2 100	1 600	3 900	2 900	5 500	4 100
0,280	2 200	1 700	4 000	3 000	5 800	4 400
0,315	2 200	1 700	4 100	3 100	6 100	4 600
0,355	2 300	1 700	4 300	3 200	6 400	4 800
0,400	2 300	1 700	4 400	3 300	6 600	5 000
0,450	2 300	1 700	4 400	3 300	6 800	5 100
0,500	2 400	1 800	4 600	3 500	7 000	5 300
0,560	2 500	1 900	4 600	3 500	7 100	5 300
0,630	2 600	2 000	4 800	3 600	7 100	5 300
0,710	2 600	2 000	4 800	3 600	7 200	5 400
0,800	2 600	2 000	4 900	3 700	7 400	5 600
0,900	2 700	2 000	5 000	3 700	7 600	5 700
1,000 up to and including 2,500	2 700	2 000	5 000	3 800	7 600	5 700

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

13.3 Nominal conductor diameters over 2,500 mm

At least four of the five specimens tested shall not break down at a voltage less than or equal to that given in Table 7.

Table 7 – Breakdown voltage

Nominal conductor diameter mm	Minimum breakdown voltage (RMS value) V					
	Grade 1 and grade 1B		Grade 2 and grade 2B		Grade 3	
	Room temperature	Elevated temperature	Room temperature	Elevated temperature	Room temperature	Elevated temperature
Greater than 2,500 up to and including 5,000	1 300	1 000	2 500	1 900	3 800	2 900

14 Continuity of insulation (nominal conductor diameters up to and including 1,600 mm)

The number of faults per 30 m of wire shall not exceed the values given in Table 8.

Table 8 – Continuity of insulation

Nominal conductor diameter mm		Maximum number of faults per 30 m		
Over	Up to and including	Grade 1 and grade 1B	Grade 2 and grade 2B	Grade 3
–	1,600	25	10	5

15 Temperature index

The test shall be carried out in accordance with IEC 60172.

The temperature index shall not be less than that given in the relevant specification sheet and the time to failure at the lowest test temperature shall not be less than 5 000 h.

When required by a purchaser, the supplier of the enamelled wire shall supply evidence that the wire meets the requirements for the temperature index.

NOTE The temperature index based on an extrapolated life of 20 000 h relates to enamelled wires tested unvarnished and not as part of an insulation system. The temperature in degrees Celsius corresponding to the temperature index is not necessarily that at which it is recommended that the wire be operated, and this will depend on many factors, including the type of equipment involved.

16 Resistance to refrigerants

For requirements, see the relevant specification sheet.

17 Solderability

Test inappropriate.

18 Heat or solvent bonding

For requirements, see the relevant specification sheet.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

19 Dielectric dissipation factor

For requirements, see the relevant specification sheet.

20 Resistance to transformer oil

For requirements, see the relevant specification sheet.

21 Loss of mass

For requirements, see the relevant specification sheet.

23 Pin hole test

Requirements under consideration.

30 Packaging

The kind of packaging can influence certain properties of the wire, for example springback. Therefore, the kind of packaging, for example the type 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 by purchaser and supplier. 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 by purchaser and supplier.

Where wires are delivered in coils, the dimensions and the maximum weights 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 attached to each packaging unit as agreed between supplier and user and shall include the following information:

a) manufacturer's name and/or trade mark;

b) type of wire and insulation, for instance trade name and/or IEC specification number;

c) net mass of wire;

d) nominal dimension(s) of wire and grade of insulation;

e) date of manufacture.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Annex A
(informative)

Dimensions for intermediate nominal conductor diameters (R 40)

A.1 General

This Annex A covers those intermediate nominal conductor diameters from which the user may select intermediate sizes only for technical reasons.

Minimum overall diameter requirements may be used in lieu of the maximum overall diameters in Table A.1 or Table A.2 provided they are based on the minimum increases.

A.2 Enamelled wires without a bonding layer

Table A.1 – Dimensions of enamelled wires (R 40)

Nominal conductor diameter	Conductor tolerance	Minimum increase due to the insulation			Maximum overall diameter		
	±	mm			mm		
mm	mm	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
0,265	0,004	0,018	0,033	0,050	0,297	0,314	0,330
0,300	0,004	0,019	0,035	0,053	0,334	0,352	0,369
0,335	0,004	0,020	0,038	0,057	0,372	0,391	0,408
0,375	0,005	0,021	0,040	0,060	0,414	0,434	0,453
0,425	0,005	0,022	0,042	0,064	0,466	0,488	0,508
0,475	0,005	0,024	0,045	0,067	0,519	0,541	0,562
0,530	0,006	0,025	0,047	0,071	0,576	0,600	0,623
0,600	0,006	0,027	0,050	0,075	0,649	0,674	0,698
0,670	0,007	0,028	0,053	0,080	0,722	0,749	0,774
0,750	0,008	0,030	0,056	0,085	0,805	0,834	0,861
0,850	0,009	0,032	0,060	0,090	0,909	0,930	0,968
0.950	0,010	0,034	0,063	0,095	1,012	1,044	1,074
1.060	0,011	0,034	0,065	0,098	1,124	1,157	1,188
1.180	0,012	0,035	0,067	0,100	1,246	1,279	1,311
1.320	0,013	0,036	0,069	0,103	1,388	1,422	1,455
1.500	0,015	0,038	0,071	0,107	1,570	1,606	1,640
1.700	0,017	0,039	0,073	0,110	1,772	1,809	1,844
1.900	0,019	0,040	0,075	0,113	1,974	2,012	2,048
2.120	0,021	0,041	0,077	0,116	2,196	2,235	2,272
2.360	0,024	0,042	0,079	0,119	2,438	2,478	2,516
2.650	0,027	0,043	0,081	0,123	2,730	2,772	2,811
3.000	0,030	0,045	0,084	0,127	3,083	3,126	3,166
3.350	0,034	0,046	0,086	0,130	3,435	3,479	3,521
3.750	0,038	0,047	0,089	0,134	3,838	3,883	3,926
4.250	0,043	0,049	0,092	0,138	4,341	4,387	4,431
4.750	0,048	0,050	0,094	0,142	4,843	4,891	4,936

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

A.3 Enamelled wires with a bonding layer

Table A.2 – Dimensions of enamelled wires with a bonding layer (R 40)

Nominal conductor diameter	Conductor tolerance	Minimum increase due to the insulation		Minimum increase due to bonding layer	Maximum overall diameter	
mm	± mm	mm			mm	
		Grade 1B	Grade 2B	mm	Grade 1B	Grade 2B
0,265	0,004	0,018	0,033	0,013	0,316	0,333
0,300	0,004	0,019	0,035	0,014	0,354	0,372
0,335	0,004	0,020	0,038	0,015	0,393	0,412
0,375	0,005	0,021	0,040	0,016	0,436	0,456
0,425	0,005	0,022	0,042	0,016	0,489	0,511
0,475	0,005	0,024	0,045	0,017	0,543	0,565
0,530	0,006	0,025	0,047	0,017	0,600	0,624
0,600	0,006	0,027	0,050	0,018	0,674	0,699
0,670	0,007	0,028	0,053	0,019	0,748	0,775
0,750	0,008	0,030	0,056	0,020	0,832	0,861
0,850	0,009	0,032	0,060	0,020	0,937	0,967
0.950	0,010	0,034	0,063	0,021	1,041	1,073
1.060	0,011	0,034	0,065	0,022	1,154	1,187
1.180	0,012	0,035	0,067	0,022	1,276	1,309
1.320	0,013	0,036	0,069	0,023	1,419	1,453
1.500	0,015	0,038	0,071	0,023	1,602	1,638
1.700	0,017	0,039	0,073	0,024	1,805	1,842
1.900	0,019	0,040	0,075	0,025	2,008	2,046

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Annex B
(normative)

Method for the calculation of linear resistance

The limits of electrical resistance for nominal conductor diameters up to and including 1,000 mm are calculated on the following basis:

The minimum and the maximum values of resistance are calculated from the nominal value of the resistivity by accounting for each conductor diameter the relevant dimensional tolerance.

The linear resistance is calculated from

$$R_{min} = \rho_{min} \times q^{-1}{}_{max} \ (\Omega \cdot m^{-1})$$

$$R_{max} = \rho_{max} \times q^{-1}{}_{min} \ (\Omega \cdot m^{-1})$$

where:

ρ_{min} = 1/36,2 Ω mm^2·m^{-1};

ρ_{max} = 1/35,5 Ω mm^2·m^{-1};

q is the cross-section of the conductor, in square millimetres.

where

q_{max} is the maximum cross-section of the conductor in square millimetres, calculated from the nominal conductor diameter plus the dimensional tolerance;

q_{min} is the minimum cross-section of the conductor in square millimetres, calculated from the nominal conductor diameter minus the dimensional tolerance.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Annex C
(informative)

Resistance

The figures for nominal resistance in Table C.1 are given for information only. They are calculated on the basis of the nominal conductor diameter and a nominal resistivity of 1/35,85 $\Omega mm^2 \cdot m^{-1}$.

The minimum and maximum resistance figures for nominal conductor diameter up to and including 1,000 mm are derived from calculations made according to Annex B.

Table C.1 – Electrical resistances

Nominal conductor diameter mm	Resistance at 20 °CΩ/m		
	Minimum	Nominal	Maximum
0,250	0,545 2	0,568 3	0,592 7
0,280	0,436 1	0,453 0	0,470 8
0,315	0,345 6	0,357 9	0,370 8
0,355	0,272 9	0,281 8	0,291 1
0,400	0,214 4	0,222 0	0,229 9
0,450	0,169 9	0,175 4	0,181 1
0,500	0,137 9	0,142 1	0,146 4
0,560	0,109 8	0,113 3	0,116 9
0,630	0,086 95	0,089 48	0,092 11
0,710	0,068 42	0,089 48	0,092 11
0,800	0,053 87	0,070 45	0,072 57
0,900	0,042 57	0,043 85	0,045 18
1,000	0,034 48	0,035 52	0,036 59

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Bibliography

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

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

SOMMAIRE

AVANT-PROPOS 24
INTRODUCTION 26
1 Domaine d'application 27
2 Références normatives 27
3 Termes, définitions, notes générales et aspect 27
3.1 Termes et définitions 27
3.2 Notes générales 28
3.2.1 Méthodes d'essai 28
3.2.2 Fil de bobinage 29
3.3 Aspect 29
4 Dimensions 29
4.1 Diamètre du conducteur 29
4.2 Faux-rond du conducteur 31
4.3 Accroissement minimal de diamètre dû à l'isolant et à la couche adhérente 31
4.3.1 Fils émaillés sans couche adhérente 31
4.3.2 Fils émaillés avec une couche adhérente 31
4.4 Diamètre extérieur maximal 31
4.4.1 Fils émaillés sans couche adhérente 31
4.4.2 Fils émaillés avec une couche adhérente 32
5 Résistance électrique 32
6 Allongement 32
7 Effet ressort 32
8 Souplesse et adhérence 32
8.1 Essai d'enroulement sur mandrin (diamètres nominaux des conducteurs inférieurs ou égaux à 1,600 mm) 32
8.2 Essai d'allongement (diamètres nominaux des conducteurs supérieurs à 1,600 mm) 33
8.3 Essai de traction brusque (diamètres nominaux des conducteurs inférieurs ou égaux à 1,000 mm) 33
8.4 Essai d'adhérence (diamètres nominaux des conducteurs supérieurs à 1,000 mm) 33
9 Choc thermique 33
9.1 Diamètres nominaux des conducteurs inférieurs ou égaux à 1,600 mm 33
9.2 Diamètres nominaux des conducteurs supérieurs à 1,600 mm 33
10 Thermoplasticité 33
11 Résistance à l'abrasion 33
12 Résistance aux solvants 33
13 Tension de claquage 34
13.1 Généralités 34
13.2 Diamètres nominaux des conducteurs inférieurs ou égaux à 2,500 mm 34
13.3 Diamètres nominaux des conducteurs supérieurs à 2,500 mm 34
14 Continuité de l'isolant (diamètres nominaux des conducteurs inférieurs ou égaux à 1,600 mm) 35
15 Indice de température 35
16 Résistance aux réfrigérants 35
17 Brasabilité 35

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

18 Adhérence par chaleur ou par solvant 35
19 Facteur de dissipation diélectrique 36
20 Résistance à l'huile de transformateur 36
21 Perte de masse 36
23 Détection des microfissures en immersion 36
30 Conditionnement 36
Annexe A (informative) Dimensions pour les diamètres nominaux intermédiaires des conducteurs (R 40) 37
A.1 Généralités 37
A.2 Fils émaillés sans couche adhérente 37
A.3 Fils émaillés avec une couche adhérente 38
Annexe B (normative) Méthode pour le calcul de la résistance linéique 39
Annexe C (informative) Résistance 40
Bibliographie 41

Tableau 1 – Dimensions pour les fils émaillés (R 20) 30
Tableau 2 – Dimensions pour les fils émaillés avec une couche adhérente (R 20) 31
Tableau 3 – Allongement 32
Tableau 4 – Enroulement sur mandrin 32
Tableau 5 – Choc thermique 33
Tableau 6 – Tension de claquage 34
Tableau 7 – Tension de claquage 35
Tableau 8 – Continuité de l'isolant 35
Tableau A.2 – Dimensions pour les fils émaillés avec une couche adhérente (R 40) 38
Tableau C.1 – Résistances électriques 40

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

_____

SPÉCIFICATIONS POUR TYPES PARTICULIERS DE FILS DE BOBINAGE –

Partie 0-3: Exigences générales – Fil de section circulaire en aluminium émaillé

AVANT-PROPOS

1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
9) L'IEC attire l'attention sur le fait que la mise en application du présent document peut entraîner l'utilisation d'un ou de plusieurs brevets. L'IEC ne prend pas position quant à la preuve, à la validité et à l'applicabilité de tout droit de brevet revendiqué à cet égard. À la date de publication du présent document, l'IEC n'a pas reçu notification qu'un ou plusieurs brevets pouvaient être nécessaires à sa mise en application. Toutefois, il y a lieu d'avertir les responsables de la mise en application du présent document que des informations plus récentes sont susceptibles de figurer dans la base de données de brevets, disponible à l'adresse https://patents.iec.ch. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets.

L'IEC 60317-0-3 a été établie par le comité d'études 55 de l'IEC: Fils de bobinage. Il s'agit d'une Norme internationale.

Cette quatrième édition annule et remplace la troisième édition parue en 2008, l'Amendement 1:2013 et l'Amendement 2:2019. Cette édition constitue une révision technique.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

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

a) révision de l'Article 7, pour indiquer que l'essai ne s'applique pas;

b) révision de l'Article 10, pour indiquer que l'essai ne s'applique pas.

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

Projet	Rapport de vote
55/2049/FDIS	55/2054/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

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

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera

- reconduit,
- supprimé, ou
- révisé.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

INTRODUCTION

La Commission Électrotechnique Internationale (IEC) attire l'attention sur le fait qu'il est déclaré que la conformité avec les dispositions du présent document peut impliquer l'utilisation d'un brevet. L'IEC ne prend pas position quant à la preuve, à la validité et à la portée de ces droits de propriété.

Le détenteur de ces droits de propriété a donné l'assurance à l'IEC qu'il consent à négocier des licences avec des demandeurs du monde entier à des termes et conditions raisonnables et non discriminatoires. À ce propos, la déclaration du détenteur des droits de propriété est enregistrée à l'IEC. Des informations peuvent être obtenues dans la base de données des droits de propriété, disponible à l'adresse suivante: patents.iec.ch/.

L'attention est d'autre part attirée sur le fait que certains des éléments du présent document peuvent faire l'objet de droits de propriété autres que ceux qui ont été enregistrés dans la base de données des droits de propriété. L'IEC ne saurait être tenue pour responsable de l'identification de ces droits de propriété en tout ou partie.

La présente partie de l'IEC 60317 est l'une des normes d'une série qui traite des fils isolés utilisés dans les enroulements des appareils électriques. La série comporte trois groupes définissant respectivement

1) les fils de bobinage et les méthodes d'essai (IEC 60851);
2) les spécifications pour types particuliers de fils de bobinage (IEC 60317);
3) le conditionnement des fils de bobinage (IEC 60264).

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

SPÉCIFICATIONS POUR TYPES PARTICULIERS DE FILS DE BOBINAGE –

Partie 0-3: Exigences générales – Fil de section circulaire en aluminium émaillé

1 Domaine d'application

La présente partie de l'IEC 60317 spécifie les exigences générales pour les fils de bobinage de section circulaire en aluminium émaillé, avec ou sans couche adhérente.

La plage des diamètres nominaux des conducteurs est donnée dans la feuille de spécification appropriée.

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 60172, *Méthode d'essai pour la détermination de l'indice de température des fils de bobinage émaillés et enveloppés de ruban*

IEC 60317 (toutes les parties), *Spécifications pour types particuliers de fils de bobinage*

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

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

ASTM B233-97, *Standard Specification for Aluminum 1350 Drawing Stock for Electrical Purposes*

EN 1715-2, *Aluminium et alliages d'aluminium – Fil machine – Partie 2: Exigences spécifiques relatives aux applications électriques*

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 https://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse https://www.iso.org/obp

3.1.1
couche adhérente
matériau qui est déposé sur un fil émaillé, et qui a pour fonction particulière de coller les fils entre eux

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

3.1.2
classe
performance thermique d'un fil de bobinage exprimée par l'indice de température et la température de choc thermique

3.1.3
revêtement
matériau qui est déposé sur un conducteur ou sur un fil par des moyens appropriés, puis séché et/ou cuit

3.1.4
conducteur
métal nu après enlèvement de l'isolant

3.1.5
craquelure
fente dans l'isolant qui rend le conducteur visible sous un grossissement donné

3.1.6
fil émaillé
fil revêtu d'un isolant fait d'une résine cuite

3.1.7
grade
plage d'épaisseurs d'isolant d'un fil

3.1.8
isolant
revêtement ou enveloppe sur le conducteur qui a pour fonction particulière de supporter la tension électrique

3.1.9
diamètre nominal du conducteur
désignation de la taille du conducteur selon la série IEC 60317

3.1.10
vision normale
vision de 20/20, avec port de lentilles correctrices, si nécessaire

3.1.11
fil de bobinage
fil utilisé pour fabriquer un bobinage qui fournit un champ magnétique

3.1.12
fil
conducteur revêtu ou enveloppé d'un isolant

3.2 Notes générales

3.2.1 Méthodes d'essai

Toutes les méthodes d'essai à utiliser dans la présente partie de l'IEC 60317, indépendamment de la classe du fil, sont données dans la série de normes IEC 60851.

Les numéros d'articles utilisés dans le présent document sont identiques aux numéros d'essais correspondants de la série de normes IEC 60851.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

En cas de divergences entre la publication relative aux méthodes d'essai et le présent document, l'IEC 60317-0-3 doit prévaloir.

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

Sauf spécification contraire, tous les essais doivent être effectués à une température comprise entre 15 °C et 40 °C et à une humidité relative de 25 % à 75 %. Avant de procéder aux mesurages, les éprouvettes doivent être préconditionnées dans ces conditions atmosphériques pendant une durée suffisante pour leur permettre d'atteindre la stabilité.

Le fil à soumettre à l'essai doit être prélevé de son conditionnement de façon qu'il ne soit pas soumis à une traction ou à des pliages inutiles. Avant chaque essai, il convient d'éliminer une longueur de fil suffisante pour s'assurer que les éprouvettes ne comportent aucun fil endommagé.

3.2.2 Fil de bobinage

Voir la feuille de spécification appropriée.

En outre, lorsqu'il est fait référence à un fil de bobinage conforme à une norme de la série IEC 60317 indiquée à l'Article 2, les informations suivantes sont données dans la description:

- la référence de la spécification IEC;
- le diamètre nominal du conducteur en millimètres;
- le grade.

EXEMPLE IEC 60317-1 – 0,500 Grade 2.

3.3 Aspect

Le film de revêtement doit être essentiellement lisse et continu, exempt de rayures, de bulles et de corps étrangers lorsqu'il est examiné avec une vision normale, tandis qu'il est enroulé sur la bobine ou le touret d'origine.

En cas d'accord entre l'utilisateur et le fournisseur, un grossissement de 6× à 10× doit être utilisé pour examiner les fils dont le diamètre nominal est inférieur à 0,10 mm.

4 Dimensions

4.1 Diamètre du conducteur

La série des diamètres nominaux préférentiels des conducteurs doit correspondre à la série R 20 de l'ISO 3. Les valeurs réelles et leurs tolérances sont données dans le Tableau 1 et le Tableau 2.

L'utilisateur peut choisir des diamètres intermédiaires pour des raisons techniques. Ces diamètres nominaux intermédiaires des conducteurs doivent être choisis dans la série R 40 de l'ISO 3. Les valeurs réelles et leurs tolérances sont données à l'Annexe A.

Le diamètre du conducteur ne doit pas s'écarter du diamètre nominal d'une valeur supérieure à la tolérance donnée dans le Tableau 1 ou le Tableau 2.

Pour les diamètres nominaux intermédiaires des conducteurs, la valeur de l'accroissement minimal qui correspond à celui du diamètre nominal immédiatement supérieur s'applique.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV

Tableau 1 – Dimensions pour les fils émaillés (R 20)

Diamètre nominal du conducteur	Tolérance du conducteur ±	Accroissement minimal dû à l'isolant mm			Diamètre extérieur maximal mm		
mm	mm	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
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
0,560	0,006	0,025	0,047	0,071	0,606	0,630	0,653
0,630	0,006	0,027	0,050	0,075	0,679	0,704	0,728
0,710	0,007	0,028	0,053	0,080	0,762	0,789	0,814
0,800	0,008	0,030	0,056	0,085	0,855	0,884	0,911
0,900	0,009	0,032	0,060	0,090	0,959	0,989	1,018
1,000	0,010	0,034	0,063	0,095	1,062	1,094	1,124
1,120	0,011	0,034	0,065	0,098	1,184	1,217	1,248
1,250	0,013	0,035	0,067	0,100	1,316	1,349	1,381
1,400	0,014	0,036	0,069	0,103	1,468	1,502	1,535
1,600	0,016	0,038	0,071	0,107	1,670	1,706	1,740
1,800	0,018	0,039	0,073	0,110	1,872	1,909	1,944
2,000	0,020	0,040	0,075	0,113	2,074	2,112	2,148
2,240	0,022	0,041	0,077	0,116	2,316	2,355	2,392
2,500	0,025	0,042	0,079	0,119	2,578	2,618	2,656
2,800	0,028	0,043	0,081	0,123	2,880	2,922	2,961
3,150	0,032	0,045	0,084	0,127	3,233	3,276	3,316
3,550	0,036	0,046	0,086	0,130	3,635	3,679	3,721
4,000	0,040	0,047	0,089	0,134	4,088	4,133	4,176
4,500	0,045	0,049	0,092	0,138	4,591	4,637	4,681
5,000	0,050	0,050	0,094	0,142	5,093	5,141	5,186

NOTE Les dimensions des diamètres nominaux intermédiaires des conducteurs pour la série R 40 sont données à l'Annexe A.

IECNORM.COM : Click to view the full PDF of IEC 60317-0-3:2024 RLV