

CONSOLIDATED VERSION

VERSION CONSOLIDÉE



**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 60317-0-3:2008](https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008)

<https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you 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 on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

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: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

CONSOLIDATED VERSION

VERSION CONSOLIDÉE



**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 60317-0-3:2008](https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008)

<https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.060.10

ISBN 978-2-8322-1135-9

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

REDLINE VERSION

VERSION REDLINE



**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 60317-0-3:2008](https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008)

<https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008>

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms, definitions and , general notes on methods of tests and appearance.....	7
3.1 Definitions.....	7
3.2 General notes on methods of test	8
3.2.1 Methods of test.....	8
3.2.2 Winding wire.....	9
3.3 Appearance.....	9
4 Dimensions.....	9
4.1 Conductor diameter.....	9
4.2 Out of roundness of 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.....	11
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 1,000 mm).....	12
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.....	13
13.1 General.....	13
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	15
20	Resistance to transformer oil	15
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
Annex B (informative)	Method for the calculation of linear resistance	19
Annex C (informative)	Resistance	20
Bibliography	21
Table 1 –	Dimensions of enamelled wires (R 20)	9
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	14
Table 8 –	Continuity of insulation.....	15
Table A.1 –	Dimensions of enamelled wires (R 40)	17
Table A.2 –	Dimensions of enamelled wires with a bonding layer (R 40).....	18
Table C.1 –	Electrical resistances	20

<https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008>

<https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008>

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This Consolidated version of IEC 60317-0-3 bears the edition number 3.1. It consists of the third edition (2008) [documents 55/1056/FDIS et 55/1068/RVD] and its amendment 1 (2012) [documents 55/1405/FDIS and 55/1426/RVD]. The technical content is identical to the base edition and its amendment.

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

This publication has been prepared for user convenience.

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

Technical changes from the previous edition include clarification to appearance requirements, revisions to the wire size ranges applicable to the flexibility and adherence tests, and clarification that pin hole test requirements are under consideration.

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

A list of all the parts in the IEC 60317 series, under the general title *Specifications for particular types of winding wires*, can be found on the IEC website.

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 IEC 60851.

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

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.

iTeh Standards
(<http://standards.itih.ai>)
Document Preview

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 publication using a colour printer.

INTRODUCTION

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).

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 60317-0-3:2008](https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008)

<https://standards.iteh.ai/catalog/standards/iec/33f5352a-e10c-4a74-90eb-1a06996ec366/iec-60317-0-3-2008>

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.

~~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 60317-14 – 0,500 Grade 1~~

2 Normative references

The following referenced documents are indispensable for the application 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 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*

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

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

3.1 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

the 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**

the 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**

the 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
winding wire**

wire used for winding a coil to provide a magnetic field

**3.1.13
wire**

conductor coated or covered with an insulation

3.2 General notes ~~on methods of test~~

3.2.1 Methods of test

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

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

In case of inconsistencies between the publication on methods of test and this standard, 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 35 °C and a relative humidity from 45 % 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 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.

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

Table 1 – Dimensions of enamelled wires (R 20)

Nominal conductor diameter mm	Conductor tolerance ± mm	Minimum increase due to the insulation mm			Maximum overall diameter 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 1 National committees may use minimum overall diameter requirements provided they are based on the minimum increases.~~

~~NOTE 2 For intermediate nominal conductor diameters, the minimum increase figure corresponding to the next larger nominal conductor diameter should be taken.~~

NOTE-3 The dimensions of intermediate nominal conductor diameters for R 40 series are given in Annex A.