

INTERNATIONAL STANDARD



**Specifications for particular types of winding wires –
Part 2: Solderable polyurethane enamelled round copper wire, class 130, with a
bonding layer**

(<https://standards.iteh.ai>)

Document Preview

[IEC 60317-2:2019](#)

<https://standards.iteh.ai/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019>





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 Varembe
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 It also gives information on projects, replaced and withdrawn publications.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.

International
Standards
Document Preview

[IEC 60317-2:2019](https://standards.iteh.ai/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019)

<https://standards.iteh.ai/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019>



IEC 60317-2

Edition 5.1 2024-06
CONSOLIDATED VERSION

INTERNATIONAL STANDARD



Specifications for particular types of winding wires –
Part 2: Solderable polyurethane enamelled round copper wire, class 130, with a bonding layer

Document Preview

[IEC 60317-2:2019](https://standards.iteh.ai/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019)

<https://standards.iteh.ai/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.060.10

ISBN 978-2-8322-9188-7

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

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms, definitions, general notes and appearance.....	6
3.1 Terms and definitions.....	6
3.2 General notes	6
3.2.1 Methods of test.....	6
3.2.2 Winding wire.....	7
3.3 Appearance	7
4 Dimensions.....	7
5 Electrical resistance	7
6 Elongation	7
7 Springiness	7
8 Flexibility and adherence.....	7
9 Heat shock	7
10 Cut-through	7
11 Resistance to abrasion (nominal conductor diameters from 0,250 mm up to and including 2,000 mm).....	7
12 Resistance to solvents.....	8
13 Breakdown voltage	8
14 Continuity of insulation	8
15 Temperature index	8
16 Resistance to refrigerants.....	8
17 Solderability	9
17.1 General.....	9
17.2 Nominal conductor diameter up to and including 0,100 mm.....	9
17.3 Nominal conductor diameter over 0,100 mm	9
18 Heat or solvent bonding.....	9
18.1 Heat bonding	9
18.1.1 Heat bonding strength of a helical coil	9
18.1.2 Bond strength of a twisted coil.....	10
18.2 Solvent bonding.....	11
19 Dielectric dissipation factor.....	11
20 Resistance to transformer oil	11
21 Loss of mass	11
23 Pin hole test	11
30 Packaging	11
Bibliography.....	12
Table 1 – Resistance to abrasion.....	8
Table 2 – Loads.....	10

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 2: Solderable polyurethane enamelled round copper wire, class 130, with a bonding layer

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.

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

IEC 60317-2 edition 5.1 contains the fifth edition (2019-08) [documents 55/1785/FDIS and 55/1797/RVD] and its amendment 1 (2024-06) [documents 55/1980/CDV and 55/2016/RVC].

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

International Standard IEC 60317-2 has been prepared by IEC technical committee 55: Winding wires.

This fifth edition cancels and replaces the fourth edition published in 2012. This edition constitutes a technical revision.

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

- a) addition of heat bonding test loads for nominal conductor diameters up to and including 0,050 mm;
- b) addition of pin hole test requirements according to IEC 60317-0-1:2013.

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

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

The numbering of clauses in this standard is not continuous from Clauses 21 through 30 in order to reserve space for possible future wire requirements prior to those for wire packaging.

This International Standard is to be used in conjunction with IEC 60317-0-1:2013 and its Amendment 1:2019.

The committee has decided that the contents of this document and its amendment 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.

[IEC 60317-2:2019](https://standards.iteh.ai/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019)

<https://standards.iteh.ai/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019>

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This part of IEC 60317 forms an element of a series of standards which deals with insulated wires used for windings in electrical equipment. It is composed of the following series:

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

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

[IEC 60317-2:2019](https://standards.iteh.ai/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019)

<https://standards.iteh.ai/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019>

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 2: Solderable polyurethane enamelled round copper wire, class 130, with a bonding layer

1 Scope

This part of IEC 60317 specifies the requirements of solderable enamelled round copper winding wire of class 130 with a dual coating. The underlying coating is based on polyurethane resin, which may be modified providing it retains the chemical identity of the original resin and meets all specified wire requirements. The superimposed coating is a bonding layer based on a thermoplastic resin.

NOTE A modified resin is a resin that has undergone a chemical change, or contains one or more additives to enhance certain performance or application characteristics.

The range of nominal conductor diameters covered by this standard is:

- Grade 1B: 0,020 mm up to and including 2,000 mm;
- Grade 2B: 0,020 mm up to and including 2,000 mm.

The nominal conductor diameters are specified in Clause 4 of IEC 60317-0-1:2013.

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 60317-0-11:2013, *Specifications for particular types of winding wires – Part 0-1: General requirements – Enamelled round copper wire*
IEC 60317-0-1:2013/AMD1:2019

3 Terms, definitions, general notes and appearance

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60317-0-1 apply.

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

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

3.2 General notes

3.2.1 Methods of test

Subclause 3.2.1 of IEC 60317-0-1:2013 and IEC 60317-0-1:2013/AMD1:2019 applies.

¹ There exists a consolidated edition 4.1:2021 that includes IEC 60317-0-1:2013 and its Amendment 1:2019.

In case of inconsistencies between IEC 60317-0-1 and this ~~standard~~ document, IEC 60317-2 shall prevail.

3.2.2 Winding wire

Class 130 is a thermal class that requires a minimum temperature index of 130 and a heat shock temperature of at least 155 °C.

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.

3.3 Appearance

Subclause 3.3 of IEC 60317-0-1:2013 applies.

4 Dimensions

Clause 4 of IEC 60317-0-1:2013 applies.

5 Electrical resistance

Clause 5 of IEC 60317-0-1:2013 and IEC 60317-0-1:2013/AMD1:2019 applies.

6 Elongation

Clause 6 of IEC 60317-0-1:2013 applies.

7 Springiness

Clause 7 of IEC 60317-0-1:2013 applies.

8 Flexibility and adherence

Clause 8 of IEC 60317-0-1:2013 applies. The constant K used for the calculation of the number of revolutions for the peel test shall be 150 mm.

9 Heat shock

Clause 9 of IEC 60317-0-1:2013 applies. The minimum heat shock temperature shall be 155 °C.

10 Cut-through

No failure shall occur within 2 min at 170 °C.

11 Resistance to abrasion (nominal conductor diameters from 0,250 mm up to and including 2,000 mm)

The wire shall meet the requirements given in Table 1.

For intermediate nominal conductor diameters, the value of the next largest nominal conductor diameter applies.

Table 1 – Resistance to abrasion

Nominal conductor diameter mm	Grade 1		Grade 2	
	Minimum average force to failure N	Minimum force to failure of each measurement N	Minimum average force to failure N	Minimum force to failure of each measurement N
0,250	2,30	1,95	4,10	3,50
0,280	2,50	2,10	4,40	3,70
0,315	2,70	2,30	4,75	4,00
0,355	2,90	2,50	5,10	4,30
0,400	3,15	2,70	5,45	4,60
0,450	3,40	2,90	5,80	4,90
0,500	3,65	3,10	6,20	5,25
0,560	3,90	3,30	6,65	5,60
0,630	4,20	3,55	7,10	6,00
0,710	4,50	3,80	7,60	6,45
0,800	4,80	4,10	8,10	6,90
0,900	5,20	4,40	8,70	7,40
1,000	5,60	4,75	9,30	7,90
1,120	6,00	5,15	10,0	8,50
1,250	6,50	5,55	10,7	9,10
1,400	7,00	5,95	11,4	9,70
1,600	7,50	6,35	12,2	10,4
1,800	8,00	6,80	13,1	11,1
2,000	8,60	7,30	14,0	11,9

Document Preview

12 Resistance to solvents

Test inappropriate.

[IEC 60317-2:2019](https://standards.cen.eu/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019)

<https://standards.cen.eu/catalog/standards/iec/1fe32226-4891-428e-aba1-4157ced2dcfd/iec-60317-2-2019>

13 Breakdown voltage

Clause 13 of IEC 60317-0-1:2013 applies. The elevated temperature shall be 130 °C.

14 Continuity of insulation

Clause 14 of IEC 60317-0-1:2013 applies.

15 Temperature index

Clause 15 of IEC 60317-0-1:2013 applies. The minimum temperature index shall be 130.

16 Resistance to refrigerants

Test inappropriate.