IEC 60317-0-7

Edition 2.0 2017-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Specifications for particular types of winding wires – Part 0-7: General requirements – Fully insulated (FIW) zero-defect enamelled round copper wire

Spécifications pour types particuliers de fils de bobinage – Partie 0-7: Exigences générales – Fil de section circulaire, isolé en continu (FIW), en cuivre émaillé, sans défaut d'isolation électrique

IEC 60317-0-7:2017-08(en-fr)

Documents
Document Sharing Hub
Full document details: IEC 60317-0-7 2017

THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2017 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 l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembé
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.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
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 also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

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: csc@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) 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 IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

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

La recherche avancée permet de trouver des publications IEC 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.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. 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 de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

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.

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

IEC 60317-0-7

Edition 2.0 2017-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Specifications for particular types of winding wires – Part 0-7: General requirements – Fully insulated (FIW) zero-defect enamelled round copper wire

Spécifications pour types particuliers de fils de bobinage – Partie 0-7: Exigences générales – Fil de section circulaire, isolé en continu (FIW), en cuivre émaillé, sans défaut d'isolation électrique

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.060.10

ISBN 978-2-8322-4722-8

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.

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

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 9
3.2.1 Methods of test 9
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 (for nominal diameters over 0,090 mm up to 0,900 mm) 10
4.3 Minimum overall diameter 10
4.4 Maximum overall diameter 10
5 Electrical resistance 11
6 Elongation 11
7 Springiness 11
8 Flexibility and adherence 12
8.1 Mandrel winding test (for nominal conductor diameters over 0,090 mm up to 0,900 mm) 12
8.2 Jerk test (for nominal diameters up to 0,900 mm) 13
9 Heat shock 13
10 Cut through 14
11 Resistance to abrasion 14
12 Resistance to solvents 14
13 Breakdown voltage 14
14 Continuity of insulation (nominal conductor diameters over 0,090 mm up to 0,900 mm) 15
14.1 Off-line high voltage continuity 15
14.2 In-line high voltage continuity 15
15 Temperature index 15
16 Resistance to refrigerants 15
17 Solderability 15
18 Heat or solvent bonding 15
19 Dielectric dissipation factor 16
20 Resistance to transformer oil 16
21 Loss of mass 16
23 Pin-hole test 16
30 Packaging 16
Annex A (normative) Supplemental requirements for FIW 17
A.1 Dimensions 17
A.2 Electrical resistance 18

AVA Documents
Document Sharing Hub
Full document details: IEC 60317-0-7 2017

A.3 Elongation 19
A.4 Springiness 20
A.5 Mandrel winding test 21
A.6 Heat shock 22
A.7 Breakdown voltage 24

Table 1 – Dimensions of enamelled wires (R 20) 10
Table 2 – Elongation at break 11
Table 3 – Springiness 12
Table 4 – Mandrel diameters for mandrel winding test 13
Table 5 – Heat shock 14
Table 6 – Breakdown voltage 15
Table A.1 – Dimensions of enamelled wires for grades FIW 3, 5, 7 and 9 17
Table A.2 – Dimensions of enamelled wires up to and including 0,090 mm and over 0,900 mm (R 20) for grades FIW 4, 6 and 8 18
Table A.3 – Electrical resistance 19
Table A.4 – Elongation at break 19
Table A.5 – Springiness for grades FIW 3, 5, 7 and 9 20
Table A.6 – Springiness for grades FIW 4, 6 and 8 21
Table A.7 – Mandrel diameters for mandrel winding test for grade FIW 3, 5, 7 and 9 21
Table A.8 – Mandrel diameters for mandrel winding test for grade FIW 4, 6 and 8, nominal conductor diameters up to and including 0,090 mm and over 0,900 mm 22
Table A.9 – Heat shock for grades FIW 3, 5, 7 and 9 23
Table A.10 – Heat shock for grades FIW 4, 6 and 8 23
Table A.11 – Breakdown voltage 24

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 0-7: General requirements – Fully insulated (FIW) zero-defect enamelled round copper wire

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC 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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60317-0-7 has been prepared by IEC technical committee 55: Winding wires.

This second edition cancels and replaces the first 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) reduction in the number of grades of FIW from 3 through 9 to 4, 6 and 8 only;
b) reduction of the wire diameter range from (0,040 to 1,000) mm to (0,090 to 0,900) mm for several requirements;
c) revision of Clause 5 to delete the Table 2 resistance requirements;

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

d) revision of Clause 13 to clarify that breakdown is determined when a calculated minimum test voltage is reached, which can be less than 10 000 V;

e) expansion of Annex A to include requirements for FIW 3, 5, 7 and 9 and for all grades, wire diameters below 0,090 mm and above 0,900 mm.

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

FDIS	Report on voting
55/1619/FDIS	55/1623/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

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

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

INTRODUCTION

The IEC 60317 series is part of a group of International Standards which define insulated wires used for windings in electrical equipment:

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

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 0-7: General requirements – Fully insulated (FIW) zero-defect enamelled round copper wire

1 Scope

This part of IEC 60317 establishes general requirements for fully insulated (FIW) zero-defect enamelled round copper wires.

The nominal conductor diameter range is given in the relevant technical specification.

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

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

IEC 60851-5:2008, *Winding wires – Test methods – Part 5: Electrical properties*
IEC 60851-5:2008/AMD1:2011

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

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 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

3.1.1
class
thermal performance of a wire expressed by the temperature index and the heat shock temperature

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

3.1.2
coating
material that is deposited on a conductor or wire by suitable means and then dried and/or cured

3.1.3
conductor
bare metal after removal of the insulation

3.1.4
crack
opening in the insulation that exposes the conductor to view at the stated magnification

3.1.5
enamelled wire
wire coated with an insulation of cured resin

3.1.6
grade of FIW
range of overall diameter of a wire

3.1.7
increase
difference between measured overall outer diameter and measured conductor diameter

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

3.1.9
nominal conductor dimension
designation of the conductor size in accordance with IEC 60317-0-1

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

3.1.11
sole coating
insulation composed of one material

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

3.1.14
zero-defect wire
winding wire that exhibits no electrical discontinuities when tested under specific conditions

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

3.2 General notes

3.2.1 Methods of test

All test methods used in this document shall be applied in accordance with the test methods of IEC 60851 (all parts).

The clause numbers used in this document are identical to the corresponding test numbers in the test methods of IEC 60851 (all parts).

In case of inconsistencies between the test methods standard and this document, this document shall prevail.

Where no specific range of nominal diameter is given for a test, the test method shall apply to all nominal dimensions covered by this document.

Unless otherwise agreed, all tests shall be carried out at a temperature between 15 °C and 40 °C, and at a relative humidity of 45 % to 75 %. Before each test, the specimen shall be preconditioned under these atmospheric conditions for a time sufficient to allow the specimens to reach a stable state. These requirements do not affect the online high voltage continuity test according to IEC 60851-5.

The wire to be tested shall be removed from the packaging in such a way that it is not subjected to elongation or unnecessary bending. Before each test, sufficient wire shall be discarded to ensure that no damaged wire is included in the test specimen.

3.2.2 Winding wire

Where a wire type is referenced to Clause 2, the following information shall be provided:

a) reference to the relevant standard;

b) nominal conductor diameter in mm;

c) grade of FIW.

Example IEC 60317-56 – 0,500 grade of FIW 6.

3.3 Appearance

The wire coating shall be essentially smooth and uniform, and free from streaks, blisters and foreign material in accordance with good commercial practice when examined with normal vision, as wound on the original spool or reel.

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

4 Dimensions

4.1 Conductor diameter

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

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 Table A.1.

The conductor diameter shall not differ from the nominal diameter by more than the tolerance given in Table 1.

AVA Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

4.2 Out of roundness of conductor (for nominal diameters over 0,090 mm up to 0,900 mm)

The difference between the minimum and maximum diameter shall not exceed the figures in column 2 of Table 1 at any point.

4.3 Minimum overall diameter

The minimum overall diameter of enamelled wires shall not be less than the values in Table 1.

4.4 Maximum overall diameter

The maximum overall diameter of enamelled wires shall not exceed the values in Table 1.

For intermediate nominal diameters, the minimum external diameter shall be calculated linearly to the next larger nominal diameter.

Table 1 – Dimensions of enamelled wires (R 20)

Nominal conductor diameter	Conductor tolerance	Minimum overall diameter			Maximum overall diameter		
		mm			mm		
mm	± mm	Grade of FIW 4	Grade of FIW 6	Grade of FIW 8	Grade of FIW 4	Grade of FIW 6	Grade of FIW 8
0,100	0,003	0,133	0,165	0,197	0,148	0,180	0,212
0,112	0,003	0,148	0,182	0,216	0,164	0,198	0,232
0,125	0,003	0,164	0,200	0,236	0,181	0,217	0,253
0,140	0,003	0,182	0,222	0,262	0,201	0,241	0,281
0,160	0,003	0,206	0,250	0,294	0,227	0,271	0,315
0,180	0,003	0,230	0,278	0,326	0,253	0,301	0,349
0,200	0,003	0,253	0,303	0,353	0,277	0,327	0,377
0,224	0,003	0,281	0,335	0,389	0,307	0,361	0,415
0,250	0,004	0,313	0,373	0,433	0,342	0,402	0,462
0,280	0,004	0,346	0,408	0,470	0,376	0,438	0,500
0,315	0,004	0,385	0,447	0,509	0,415	0,477	0,539
0,355	0,004	0,429	0,491	0,553	0,459	0,521	0,583
0,400	0,005	0,479	0,541	0,603	0,509	0,571	0,633
0,450	0,005	0,534	0,596	0,658	0,564	0,626	0,688
0,500	0,005	0,588	0,670		0,628	0,710	
0,560	0,006	0,654	0,736		0,694	0,776	
0,630	0,006	0,729	0,811		0,769	0,851	
0,710	0,007	0,815	0,897		0,855	0,937	
0,800	0,008	0,912	1,014		0,962	1,064	
0,900	0,009	1,019	1,121		1,069	1,171	

NOTE 1 Dimensions for additional R 20 series diameters are given in Annex A.

NOTE 2 Dimensions for grade FIW 3, 5, 7 and 9 are given in Annex A.

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

5 Electrical resistance

By agreement between purchaser and supplier, resistance measurements may be made for nominal conductor diameters over 0,090 mm up to and including 0,900 mm. In case of such agreement, the resistance at 20 °C shall be within the limits given in IEC 60317-0-1:2013, Annex C.

6 Elongation

The elongation at break shall not be less than the values in Table 2.

Table 2 – Elongation at break

Nominal conductor diameter mm	Minimum elongation at break %	Nominal conductor diameter mm	Minimum elongation at break %
0,100	16	0,315	23
0,112	17	0,355	23
0,125	17	0,400	24
0,140	18	0,450	25
0,160	19	0,500	25
0,180	20	0,560	26
0,200	21	0,630	27
0,224	21	0,710	28
0,250	22	0,800	28
0,280	22	0,900	29

7 Springiness

Wire shall not exceed the maximum springback given in Table 3, when tested on the mandrel using the specified tension.

For intermediate nominal conductor diameters, the springback value for the next larger nominal diameter shall apply.

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

Table 3 – Springiness

Nominal conductor diameter	Mandrel diameter	Tension	Maximum springback °		
mm	mm	N	Grade of FIW 4	Grade of FIW 6	Grade of FIW 8
0,100	5,0	0,25	N/A	N/A	N/A
0,112			N/A	N/A	N/A
0,125	7,0	0,50	N/A	N/A	N/A
0,140			N/A	N/A	N/A
0,160			N/A	N/A	N/A
0,180	10,0	1,00	N/A	N/A	N/A
0,200			N/A	N/A	N/A
0,224			N/A	N/A	N/A
0,250	12,5	2,00	N/A	N/A	N/A
0,280			N/A	N/A	N/A
0,315			N/A	N/A	N/A
0,355	19,0	4,00	N/A	N/A	N/A
0,400			N/A	N/A	N/A
0,450			N/A	N/A	N/A
0,500	25,0	8,00	63	80	
0,560			60	77	
0,630			64	95	
0,710	37,5	12,00	68	90	
0,800			60	N/A	
0,900	50,0	15,00	61	N/A	

8 Flexibility and adherence

8.1 Mandrel winding test (for nominal conductor diameters over 0,090 mm up to 0,900 mm)

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

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

Table 4 – Mandrel diameters for mandrel winding test

Nominal conductor diameter		0 % elongation before winding		
mm		Grade of FIW 4	Grade of FIW 6	Grade of FIW 8
Over	Up to and incl.	Mandrel diameter mm	Mandrel diameter mm	Mandrel diameter mm
0,090	0,112	0,300	0,300	0,300
0,112	0,140	0,300	0,300	0,300
0,140	0,200	1 × d[a]	2 × d[a]	2 × d[a]
0,200	0,355	1 × d[a]	2 × d[a]	3 × d[a]
0,355	0,450	1 × d[a]	2 × d[a]	3 × d[a]
0,450	0,710	2 × d[a]	4 × d[a]	–
0,710	0,900	2 × d[a]	4 × d[a]	–

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

8.2 Jerk test (for nominal diameters up to 0,900 mm)

This test shall be performed with elongation of the specimen as specified in Table 3. The coating shall show no crack or loss of adhesion to the conductor.

9 Heat shock

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

For nominal conductor diameters up to and including 0,140 mm, Table 4 shall apply.

For intermediate nominal conductor diameters, the mandrel diameter of the next smaller nominal conductor diameter shall be taken.

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

Table 5 – Heat shock

Nominal conductor diameter mm	Mandrel diameter mm Overall diameter range		
	Grade of FIW 4	Grade of FIW 6	Grade of FIW 8
0,160	0,450	0,450	0,560
0,180	0,450	0,450	0,560
0,200	0,450	0,450	0,560
0,224	0,630	0,800	1,000
0,250	0,630	0,800	1,000
0,280	0,630	0,800	1,000
0,315	1,000	1,250	1,600
0,355	1,000	1,250	1,600
0,400	1,000	1,250	1,600
0,450	1,120	1,800	2,000
0,500	1,120	1,800	
0,560	1,400	1,800	
0,630	2,000	2,800	
0,710	2,000	2,800	
0,800	2,240	4,000	
0,900	4,000	6,000	

10 Cut through

For requirements, see the relevant specification sheet.

11 Resistance to abrasion

For requirements see the relevant specification sheet.

12 Resistance to solvents

The enamel coating shall not be removed when using a standard solvent and a pencil of hardness "H".

13 Breakdown voltage

Testing is carried out according to IEC 60851-5:2008/IEC 60851-5:2008/AMD 1:2011, 4.3.2. The specimen shall be deemed in compliance if no breakdown occurs when a minimum test voltage (V_{min}) is reached. V_{min} is determined by multiplying the minimum specific breakdown voltage in Table 6 by the minimum enamel increase, calculated from Table 1 as the difference between the nominal conductor diameter and the minimum overall diameter. In the case where V_{min} is calculated to be greater than 10 000 V, V_{min} shall be 10 000 V. When V_{min} or 10 000 V is reached, the testing process can be terminated.

The wire shall comply with the requirements in Table 6 when tested at room temperature, and at elevated temperature when required by the customer.

Documents
Document Sharing Hub

Full document details: IEC 60317-0-7 2017

The elevated temperature is provided in the relevant specification sheet.

Table 6 – Breakdown voltage

Nominal conductor diameter		Minimum specific breakdown voltage	
mm		V/µm	
Over	**Up to and including**	**Room temperature**	**Elevated temperature**
–	0,100	81	–
0,100	0,355	76	53
0,355	0,500	70	49
0,500	0,900	53	37
NOTE The specific breakdown voltage is the result of the quotient of the measured breakdown voltage and enamel increase.			

14 Continuity of insulation (nominal conductor diameters over 0,090 mm up to 0,900 mm)

14.1 Off-line high voltage continuity

When tested in accordance with IEC 60851-5:2008/IEC 60851-5:2008/AMD 1:2011, 5.3, no defects shall be permitted per 30 m ± 1 m conductor length.

14.2 In-line high voltage continuity

When tested in accordance with IEC 60851-5:2008/IEC 60851-5:2008/AMD 1:2011, 5.4, no defects shall be permitted over the entire manufactured length of conductor.

15 Temperature index

The test shall be carried out in accordance with IEC 60172 on unimpregnated specimens made from grade 2 enamelled wire having a nominal diameter of 1,000 mm.

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

16 Resistance to refrigerants

For requirements, see the relevant specification.

17 Solderability

For requirements, see the relevant specification.

18 Heat or solvent bonding

For requirements, see the relevant specification.

Documents
Document Sharing Hub
Full document details: IEC 60317-0-7 2017