BS EN 60317-21:2014

BSI Standards Publication

Specifications for particular types of winding wires

Part 21: Solderable polyurethane enamelled round copper wire overcoated with polyamide, class 155

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National foreword

This British Standard is the UK implementation of EN 60317-21:2014. It is identical to IEC 60317-21:2013. It supersedes BS EN 60317-21:1996 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/55, Winding wires.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English version

Specifications for particular types of winding wires - Part 21: Solderable polyurethane enamelled round copper wire overcoated with polyamide, class 155

(IEC 60317-21:2013)

Spécifications pour types particuliers de fils de bobinage - Partie 21: Fil brasable de section circulaire en cuivre émaillé avec polyuréthane et avec surcouche polyamide, classe 155 (CEI 60317-21:2013)

Technische Lieferbedingungen für bestimmte Typen von Wickeldrähten - Teil 21: Runddrähte aus Kupfer, verzinnbar, lackisoliert mit Polyurethan und darüber mit Polyamid, Klasse 155 (IEC 60317-21:2013)

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 55/1412/FDIS, future edition 3 of IEC 60317-21, prepared by IEC/TC 55 "Winding wires" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60317-21:2014.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2014-08-14
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-11-14

This document supersedes EN 60317-21:1995.

EN 60317-21:2014 includes the following significant technical changes with respect to EN 60317-21:1995:

– new 3.2.2 containing general notes on winding wire, formerly a part of the scope;

– revision to references to EN 60317-0-1: 2014 to clarify that their application is normative;

– consolidation of 17.1 and 17.2 of the solderability requirements;

– modification to Clause 19, Dielectric dissipation factor;

– new Clause 23, Pin hole test.

The numbering of clauses in this standard is not continuous from Clauses 20 and 30 in order to reserve space for possible future wire requirements prior to those for wire packaging.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 60317-21:2013 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60264 Series	NOTE	Harmonized as EN 60264 Series (not modified).
IEC 60317 Series	NOTE	Harmonized as EN 60317 Series (not modified).
IEC 60851 Series	NOTE	Harmonized as EN 60851 Series (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60317-0-1	2013	Specifications for particular types of winding wires - Part 0-1: General requirements - Enamelled round copper wire	EN 60317-0-1	2014

CONTENTS

INTRODUCTION

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

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

SPECIFICATIONS FOR PARTICULAR TYPES OF WINDING WIRES –

Part 21: Solderable polyurethane enamelled round copper wire overcoated with polyamide, class 155

1 Scope

This part of IEC 60317 specifies the requirements of solderable enamelled round copper winding wire of class 155 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 based on polyamide 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 1: 0,050 mm up to and including 1,600 mm;
– Grade 2: 0,050 mm up to and including 1,600 mm.

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

2 Normative references

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

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

3 Terms, definitions, general notes and appearance

3.1 Terms and definitions

Subclause 3.1 of IEC 60317-0-1:2013 applies.

3.2 General notes

3.2.1 Methods of test

Subclause 3.2.1 of IEC 60317-0-1:2013 applies. In case of inconsistencies between IEC 60317-0-1:2013 and this part of IEC 60317, the latter shall prevail.

3.2.2 Winding wire

Class 155 is a thermal class that requires a minimum temperature index of 155 and a heat shock temperature of at least 175 °C.

The temperature in °C 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 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. For 8.4, 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 175 °C.

10 Cut-through

No failure shall occur within 2 min at 200 °C.

11 Resistance to abrasion (nominal conductor diameters from 0,250 mm up to and including 1,600 mm)

The wire shall meet the requirements given in Table 1.

For intermediate nominal conductor diameters, the value of the next larger nominal conductor diameter shall be taken.

Table 1 – Resistance to abrasion

Nominal conductor diameter	Grade 1		Grade 2	
	Minimum average force to failure	Minimum force to failure of each measurement	Minimum average force to failure	Minimum force to failure of each measurement
mm	N	N	N	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	7,1	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

12 Resistance to solvents

Clause 12 of IEC 60317-0-1:2013 applies.

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 155 °C when this is required by the purchaser.

13.2 Nominal conductor diameters up to and including 0,100 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 2.

For intermediate nominal conductor diameters, the value of the next larger nominal conductor diameter shall be taken.

Table 2 – Breakdown voltage

Nominal conductor diameter mm	Minimum breakdown voltage (root-mean-square value) (r.m.s) V	
	Grade 1	Grade 2
	At room temperature	
0,050	275	550
0,056	300	600
0,063	350	650
0,071	375	650
0,080	375	750
0,090	450	800
0,100	450	850

13.3 Nominal conductor diameters over 0,100 mm up to and including 1,600 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 3.

For intermediate nominal conductor diameters, the value of the next larger nominal conductor diameter shall be taken.

Table 3 – Breakdown voltage

Nominal conductor diameter mm	Minimum breakdown voltage (r.m.s) V			
	Grade 1		Grade 2	
	Room temperature	155 °C	Room temperature	155 °C
0,112	1 200	900	2 400	1 800
0,125	1 300	1 000	2 500	1 900
0,140	1 400	1 100	2 700	2 000
0,160	1 500	1 100	2 900	2 200
0,180	1 500	1 100	3 000	2 300
0,200	1 600	1 200	3 100	2 300
0,224	1 700	1 300	3 300	2 500
0,250	1 900	1 400	3 500	2 600
0,280	2 000	1 500	3 600	2 700
0,315	2 000	1 500	3 700	2 800
0,355	2 100	1 600	3 900	2 900
0,400	2 100	1 600	4 000	3 000
0,450	2 100	1 600	4 000	3 000
0,500	2 200	1 700	4 100	3 100
0,560	2 200	1 700	4 100	3 100
0,630	2 300	1 700	4 300	3 200
0,710	2 300	1 700	4 300	3 200
0,800	2 300	1 700	4 400	3 300
0,900	2 400	1 800	4 500	3 400
1,000 up to and including 1,600	2 400	1 800	4 500	3 400

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 155.

16 Resistance to refrigerants

Test inappropriate.

17 Solderability

17.1 Nominal conductor diameters up to and including 0,100 mm

The temperature of the solder bath shall be (390 ± 5) °C. The maximum immersion time shall be 2 s.

The surface of the tinned wire shall be smooth and free from holes and enamel residues.

17.2 Nominal conductor diameters over 0,100 mm

The temperature of the solder bath shall be (390 ± 5) °C. The maximum immersion time (in seconds) shall be the following multiple of the nominal conductor diameter (in millimetres) with a minimum of 2 s.

Grade 1	Grade 2
8 s/mm	12 s/mm

The surface of the tinned wire shall be smooth and free from holes and enamel residues.

18 Heat or solvent bonding

Test inappropriate.

19 Dielectric dissipation factor

Test to be agreed between purchaser and supplier.

20 Resistance to transformer oil

Test inappropriate.

21 Loss of mass

Test inappropriate.

23 Pin hole test

Clause 23 of IEC 60317-0-1:2013 applies.

30 Packaging

Clause 30 of IEC 60317-0-1:2013 applies.

Bibliography

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

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

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

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