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विशेष प्रकार के कुंडलण तार — विशिष्टि  
भाग 12 पॉलीविनाइल एसीटल एनामेलड गोल तांबे  
के तार, कक्षा 120  
(पहला पुनरीक्षण)

**Particular Types of Winding Wires —  
Specification**  
**Part 12 Polyvinyl Acetal Enamelled  
Round Copper Wire, Class 120**  
( *First Revision* )

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## NATIONAL FOREWORD

This Indian Standard (Part 12) (First Revision) which is identical with IEC 60317-12 : 2020 'Specifications for particular types of winding wires — Part 12: Polyvinyl acetal enamelled round copper wire, Class 120' Issued by The International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Winding Wire Sectional Committee and approval of the Electrotechnical Division Council.

This standard was first published in 2012. The first revision of this standard has been brought out to align it with the latest version of IEC 60317-12 : 2020.

This standard is published in various parts. Other parts in this series are:

Part 0	General requirements,
Sec 1	Enamelled round copper wire ( <i>second revision</i> )
Sec 2	Enamelled rectangular copper wire ( <i>second revision</i> )
Sec 3	Enamelled round aluminium wire ( <i>first revision</i> )
Sec 4	Glass-fibre wound resin or varnish impregnated, bare or enamelled rectangular copper wire ( <i>second revision</i> )
Sec 5	Glass-fibre braided, resin or varnish impregnated, bare or enamelled rectangular copper wire ( <i>first revision</i> )
Sec 6	Glass-fibre wound resin or varnish impregnated, bare or enamelled round copper wire
Part 1	Polyvinyl acetal enamelled round copper wire, Class 105
Part 2	Solderable polyurethane enamelled round copper wire, class 130, with a bonding layer ( <i>second revision</i> )
Part 3	Polyester enamelled round copper wire, Class 155 ( <i>first revision</i> )
Part 4	Solderable polyurethane enamelled round copper wire, Class 130,
Part 5	Polyester enamelled round aluminium wire, Class 155
Part 6	Oleo-resinous enamelled round aluminium wire, Class 105
Part 8	Polyesterimide enamelled round copper wire, Cass 180 ( <i>first revision</i> )
Part 9	Polyester enamelled round aluminium wire, Class 138
Part 13	Polyester or polyesterimide overcoated with polyamide-Imide enamelled round copper wire, Class 200 ( <i>first revision</i> )
Part 15	Polyesterimide enamelled round aluminium wire, Class 180
Part 16	Polyester enamelled rectangular copper wire, Class 155
Part 17	Polyvinyl acetal enamelled rectangular copper wire, Class 105 ( <i>first revision</i> )
Part 20	Solderable polyurethane enamelled round copper wire, class 155 ( <i>second revision</i> )
Part 21	Solderable polyurethane enamelled round copper wire overcoated with polyamide, Class 155
Part 23	Solderable polyesterimide enamelled round copper wire, Class 180

Part 25	Polyester or polyesterimide overcoated with polyamide - Imide enamelled round aluminium wire, Class 200
Part 26	Polyamide-Imide enamelled round copper wire, Class 200
Part 27	Paper tape covered rectangular copper wire ( <i>first revision</i> )
Part 28	Polyesterimide enamelled rectangular copper wire, Class 180 ( <i>first revision</i> )
Part 29	Part 29 Polyester or polyesterimide overcoated with polyamide-Imide enamelled rectangular copper wire, Class 200
Part 31	Glass fibre wound, resin or varnish impregnated, bare or enamelled rectangular copper wire, temperature index 180 ( <i>first revision</i> )
Part 32	Glass fibre wound, resin or varnish impregnated, bare or enamelled rectangular copper wire, temperature index 155 ( <i>first revision</i> )
Part 33	Glass fibre wound, resin or varnish impregnated, bare or enamelled rectangular copper wire, temperature index 200 ( <i>first revision</i> )
Part 34	Polyester enamelled round copper wire, Class 130 L ( <i>first revision</i> )
Part 35	Solderable polyurethane enamelled round copper wire, Class 155, with a bonding layer
Part 36	Solderable polyesterimide enamelled round copper wire, Class 180, with a bonding layer
Part 37	Polyesterimide enamelled round copper wire, Class 180, with a bonding layer
Part 38	Polyester or polyesterimide overcoated with polyamide-Imide, enamelled round copper wire, class 200, with a bonding layer
Part 39	Glass-fibre braided resin or varnish-impregnated, bare or enamelled rectangular copper wire, temperature index 180 ( <i>first revision</i> )
Part 43	Aromatic polyimide tape wrapped round copper wire, Class 240 ( <i>first revision</i> )
Part 44	Aromatic polyimide tape wrapped rectangular copper wire, Class 240 ( <i>first revision</i> )
Part 45	Polyester enamelled round copper wire, Class 130
Part 46	Aromatic polyimide enamelled round copper wire, Class 240
Part 47	Aromatic polyimide enamelled rectangular copper wire, Class 240
Part 48	Glass-fibre wound resin or varnish impregnated, bare or enamelled round copper wire, temperature index 155 ( <i>first revision</i> )
Part 49	Glass-fibre wound, high temperature resin or varnish - Impregnated, bare or enamelled round copper wire, Class 180 ( <i>first revision</i> )
Part 50	Glass-fibre wound, silicone resin or varnish impregnated, bare or enamelled round copper wire, class 200 ( <i>first revision</i> )
Part 53	Aromatic polyimide (Aramid) tape wrapped rectangular copper wire, temperature index 220

The text of the IEC standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appears referring to this standard, they should be read as 'Indian Standard'; and
- b) Comma (,) has been used as a decimal marker, while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to International Standards for which Indian Standards also exists. The corresponding Indian Standards, which are to be substituted, are listed below along with their degree of equivalence for the editions indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
IEC 60317-0-1 : 2013 Specifications for particular types of winding wires — Part 0-1: General requirements — Enamelled round copper wire	IS 13730 (Part 0/Sec 1) : 2018/IEC 60317-0-1 : 2013 Specifications for particular types of winding wires: Part 0 general requirements, Sec 1 Enamelled round copper wire ( <i>second revision</i> )	Identical

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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## 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).

PARTICULAR TYPES OF WINDING WIRES —  
SPECIFICATIONSPART 12 POLYVINYL ACETAL ENAMELLED ROUND COPPER WIRE  
CLASS 120

( First Revision )

**1 Scope**

This part of IEC 60317 specifies the requirements of enamelled round copper winding wires of class 120 with a sole coating based on polyvinyl acetal or polyvinyl formal resin, which can be modified provided it retains the chemical identity of the original resin and meets all specified wire requirements.

NOTE 1 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.

NOTE 2 Polyvinyl acetal is a general name for a family of thermoplastic vinyl resins produced by the condensation of polyvinyl alcohol with an aldehyde. Examples are polyvinyl acetal, polyvinyl formal and polyvinyl butyral.

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

- Grade 1: 0,040 mm up to and including 2,500 mm;
- Grade 2: 0,040 mm up to and including 5,000 mm;
- Grade 3: 0,080 mm up to and including 5,000 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 60317-0-1:2013, *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. In case of inconsistencies between IEC 60317-0-1 and this document, IEC 60317-12 shall prevail.

### **3.2.2 Winding wire**

Class 120 is a thermal class that requires a minimum temperature index of 120 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, where the constant  $K$  used for the calculation of the number of revolutions for the peel test shall be 175 mm.

## **9 Heat shock**

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

### **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 1.



**Table 1 – Heat shock**

Nominal conductor diameter mm		Elongation before winding on mandrel %	Mandrel diameter <sup>b</sup>
Over	Up to and including		
–	0,050	20 <sup>a</sup>	0,150 mm
0,050	1,600	–	<i>D</i>
<sup>a</sup> Or until it breaks, whichever is less. <sup>b</sup> <i>D</i> is the overall diameter of the wire.			

## 9.2 Nominal conductor diameters over 1,600 mm

Subclause 9.2 of IEC 60317-0-1:2013 applies.

## 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 2,500 mm)

The wire shall meet the requirements given in Table 2.

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

**Table 2 – Resistance to abrasion**

Nominal conductor diameter  mm	Grade 1		Grade 2		Grade 3	
	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	Minimum average force to failure  N	Minimum force to failure of each measurement  N
0,250	3,00	2,55	4,90	4,15	5,80	4,90
0,280	3,25	2,75	5,25	4,45	6,25	5,30
0,320	3,50	2,95	5,65	4,80	6,70	5,70
0,360	3,75	3,20	6,05	5,15	7,20	6,10
0,400	4,05	3,45	6,50	5,50	7,70	6,50
0,450	4,35	3,70	7,00	5,90	8,25	7,00
0,500	4,65	3,95	7,50	6,35	8,85	7,50
0,560	5,00	4,25	8,00	6,80	9,50	8,05
0,630	5,35	4,55	8,60	7,30	10,2	8,65
0,710	5,70	4,85	9,20	7,80	10,9	9,25
0,800	6,10	5,15	9,90	8,40	11,7	9,90
0,900	6,55	5,55	10,6	9,00	12,5	10,6
1,000	7,05	5,95	11,3	9,60	13,3	11,3
1,120	7,60	6,45	12,1	10,2	14,2	12,0
1,250	8,20	6,95	12,9	11,0	15,2	12,9
1,400	8,80	7,45	13,9	11,8	16,4	13,9
1,600	9,45	8,00	14,9	12,6	17,6	14,9
1,800	10,1	8,60	16,0	13,5	18,8	16,0
2,000	10,9	9,20	17,1	14,4	20,2	17,1
2,240	11,7	9,90	18,2	15,4	21,6	18,3
2,500	12,5	10,6	19,4	16,4	23,0	19,5

## 12 Resistance to solvents

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

## 13 Breakdown voltage

Clause 13 of IEC 60317-0-1:2013 applies. The elevated temperature shall be 120 °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 120.

## 16 Resistance to refrigerants

Test appropriate but no requirements specified.

## 17 Solderability

Test inappropriate.

### **18 Heat or solvent bonding**

Test inappropriate.

### **19 Dielectric dissipation factor**

Test inappropriate.

### **20 Resistance to transformer oil**

Test according to Clause 6 of IEC 60851-4:2016 appropriate. Test requirements are under consideration.

### **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*

IEC 60851-4:2016, *Winding wires – Test methods – Part 4: Chemical properties*

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