

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Electrical insulation systems – Thermal evaluation of modifications to an established wire-wound EIS**

**Systèmes d'isolation électriques – Evaluation thermique des modifications apportées à un système d'isolation électrique éprouvé à enroulements à fil**



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**Electrical insulation systems – Thermal evaluation of modifications to an established wire-wound EIS**

**Systemes d'isolation électriques – Evaluation thermique des modifications apportées à un système d'isolation électrique éprouvé à enroulements à fil**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL INSULATION SYSTEMS –  
THERMAL EVALUATION OF MODIFICATIONS TO  
AN ESTABLISHED WIRE-WOUND EIS**

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This third edition cancels and replaces the second edition, published in 2004 by IEC TC 98: Electrical insulation systems (EIS). It constitutes an editorial revision.

The text of this standard is based on the following documents:

CDV	Report on voting
112/90/CDV	112/98/RVC

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

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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- withdrawn,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.

## INTRODUCTION

This International Standard describes procedures for the evaluation of changes to an established electrical insulation system (EIS) for wire-wound electrotechnical devices and the effect of these changes on the thermal classification of the established EIS.

General principles for evaluation and qualification of EIS can be found in IEC 60505. Unless the procedures of this standard indicate otherwise, the principles of IEC 60505 should be followed.

The thermal classification of an EIS is established either by known service life, in accordance with IEC 60505, or evaluated in accordance with IEC 61857 (all parts).

## ELECTRICAL INSULATION SYSTEMS – THERMAL EVALUATION OF MODIFICATIONS TO AN ESTABLISHED WIRE-WOUND EIS

### 1 Scope

This International Standard lists the required test procedures for qualification of modifications of an established electrical insulation system (EIS) with respect to its thermal classification. This standard is applicable to EIS used in wire-wound electrotechnical devices. The test procedures are comparative in that the performance of a candidate EIS is compared to that of a reference EIS, which has proven service experience in accordance with IEC 60505 or has been evaluated by one of the procedures given in the IEC 61857 series.

### 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 60085:2007, *Electrical insulation – Thermal evaluation and designation*

IEC 60172, *Test procedure for the determination of the temperature index of enamelled winding wires*

IEC 60216-5, *Electrical insulating materials – Thermal endurance properties – Part 5: Determination of relative thermal endurance index (RTE) of an insulating material*

IEC 60317-3, *Specifications for particular types of winding wires – Part 3: Polyester enamelled round aluminium wire, class 155*

IEC 60317-4, *Specifications for particular types of winding wires – Part 4: Solderable polyurethane enamelled round copper wire, class 130*

IEC 60317-7, *Specifications for particular types of winding wires – Part 7: Polyimide enamelled round copper wire, class 220*

IEC 60317-8, *Specifications for particular types of winding wires – Part 8: Polyesterimide enamelled round copper wire, class 180*

IEC 60317-13, *Specifications for particular types of winding wires – Part 13: Polyester or polyesterimide overcoated with polyamide-imide enamelled round copper wire, class 200*

IEC 60317-15, *Specifications for particular types of winding wires – Part 15: Polyesterimide enamelled round aluminium wire, class 180*

IEC 60317-16, *Specifications for particular types of winding wires – Part 16: Polyester enamelled rectangular copper wire, class 155*

IEC 60317-19, *Specifications for particular types of winding wires – Part 19: Solderable polyurethane enamelled round copper wire, overcoated with polyamide, class 130*

IEC 60317-20, *Specifications for particular types of winding wires – Part 20: Solderable polyurethane enamelled round copper wire, class 155*

IEC 60317-21, *Specifications for particular types of winding wires – Part 21: Solderable polyurethane enamelled round copper wire overcoated with polyamide, class 155*

IEC 60317-22, *Specifications for particular types of winding wires – Part 22: Polyester or polyesterimide enamelled round copper wire overcoated with polyamide, class 180*

IEC 60317-23, *Specifications for particular types of winding wires – Part 23: Solderable polyesterimide enamelled round copper wire, class 180*

IEC 60317-25, *Specifications for particular types of winding wires – Part 25: Polyester or polyesterimide overcoated with polyamide-imide enamelled round aluminium wire, class 200*

IEC 60317-29, *Specifications for particular types of winding wires – Part 29: Polyester or polyesterimide overcoated with polyamide-imide enamelled rectangular copper wire, class 200*

IEC 60317-30, *Specifications for particular types of winding wires – Part 30: Polyimide enamelled rectangular copper wire, class 220*

IEC 60317-34, *Specifications for particular types of winding wires – Part 34: Polyester enamelled round copper wire, class 130 L*

IEC 60317-42, *Specifications for particular types of winding wires – Part 42: Polyester-amide-imide enamelled round copper wire, class 200*

IEC 60317-46, *Specifications for particular types of winding wires – Part 46: Aromatic polyimide enamelled round copper wire, class 240*

IEC 60317-47, *Specifications for particular types of winding wires – Part 47: Aromatic polyimide enamelled rectangular copper wire, class 240*

IEC 60317-51, *Specifications for particular types of winding wires – Part 51: Solderable polyurethane enamelled round copper wire, class 180*

IEC 60505, *Evaluation and qualification of electrical insulation systems*

IEC 61033, *Test methods for the determination of bond strength of impregnating agents to an enamelled wire substrate*

IEC 61857 (all parts), *Electrical insulation systems – Procedures for thermal evaluation*

IEC 61857-1, *Electrical insulation systems – Procedures for thermal evaluation – Part 1: General requirements – Low voltage*

### **3 Terms and definitions**

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

#### **3.1**

##### **electrical insulation system**

##### **EIS**

insulating structure containing one or more electrical insulating materials (EIM) together with associated conducting parts employed in an electrotechnical device

**3.2**  
**electrical insulating material**  
**EIM**

material with negligibly low electric conductivity, used to separate conducting parts at different electrical potentials

**3.3**  
**candidate EIS**

EIS under evaluation to determine its service capability (thermal)

**3.4**  
**reference EIS**

established EIS evaluated on the basis of either a known service experience record or a known comparative functional evaluation

**3.5**  
**EIS assessed thermal endurance index**  
**EIS ATE**

numerical value of temperature in degrees Celsius for the reference EIS as derived from known service experience or a known comparative functional evaluation

**3.6**  
**EIS relative thermal endurance index**  
**EIS RTE**

numerical value of the temperature in degrees Celsius of the candidate EIS which is relative to the known EIS ATE of a reference EIS, when both EIS are subjected to the same ageing and diagnostic procedures in a comparative test

**4 General considerations**

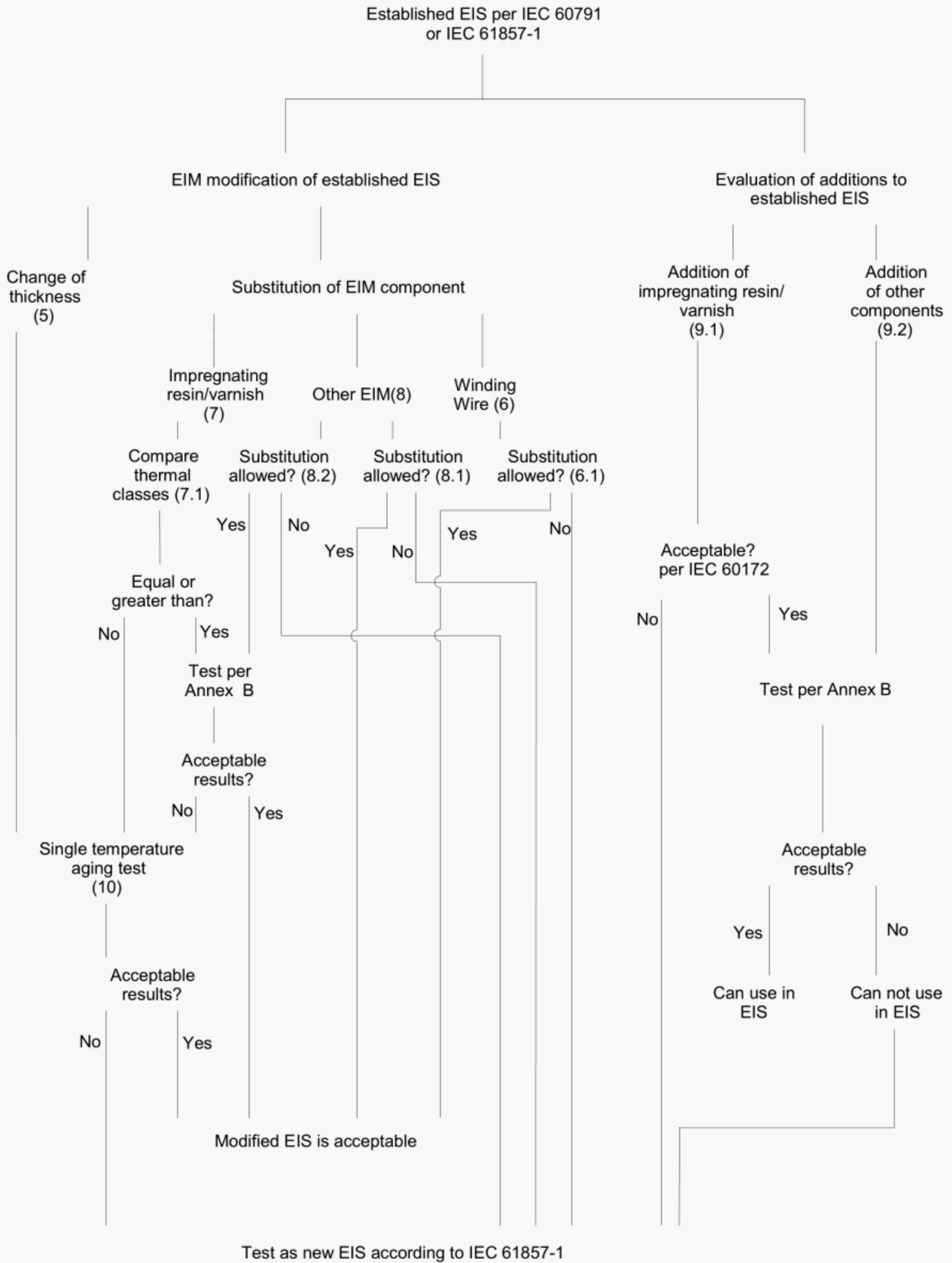
This standard provides relatively low cost and short-time methods by which the user can make modifications to an established EIS by evaluating

- a) the impact on the thermal life of the EIS if the thickness of an EIM is changed,
- b) the compatibility, under thermal stress, of a substituted EIM,
- c) the compatibility, under thermal stress, of other components used in intimate contact with an established EIS.

EIM having different temperature indices (ATE/RTE) according to IEC 60216-5, may be combined to form an EIS having a thermal class that may be higher or lower than that of any of the individual components according to IEC 60505.

There may be more than one EIS in a particular apparatus. These EIS may have different thermal classes.

The following overview (Figure 1) is a flow chart for guidance in selecting the proper clauses for evaluation.



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Figure 1 – Overview of evaluation methods

## 5 Evaluation of the change of thickness of an EIM

### 5.1 Samples

Representative samples of the established EIS (the reference EIS) and of the EIS with reduced EIM thickness(es) (the candidate EIS) shall be evaluated in accordance with Clause 10.

### 5.2 Acceptance

A candidate EIS that meets the acceptance criteria according to Clause 10 shall be assigned the same thermal class as the established EIS.

If the results of the candidate EIS testing are outside the acceptance criteria according to Clause 10, then full thermal ageing in accordance with IEC 61857-1 shall be conducted in order to establish its thermal class.

NOTE Full thermal ageing may be accomplished by testing at additional temperatures, according to IEC 61857-1.

## 6 Substitution of winding wire

### 6.1 General

Substitution of a winding wire evaluated in the established EIS can be made without additional testing when one or more of the following conditions have been met:

- a) the winding wire conforms to an IEC 60317 specification having the same chemical composition, according to the Annex A groupings, as the winding wire evaluated in the established EIS but is of a different size or shape;
- b) the winding wire conforms to an IEC 60317 specification having the same chemical composition, according to the Annex A groupings, as the winding wire evaluated in the established EIS and has an equal or higher thermal class;
- c) the winding wire is a bare conductor insulated with one of the EIM evaluated as part of the established EIS in accordance with IEC 61857-1. The thickness to be used shall be such that the electrical stress per unit thickness is not greater than the stress to which the EIM was subjected during the ageing test.

NOTE For substitution of an alternate EIM, refer to Clause 8.

### 6.2 Substitution of enamel

For chemical composition substitution criteria, refer to Annex A.

### 6.3 Substitution of conductor material

An established EIS, which has been evaluated with copper as the conductor, may use either copper or aluminium conductor.

An established EIS, which has been evaluated with aluminium as the conductor, may use either aluminium or copper conductor, provided the thermal performance of the substitute winding wire has been established to be equal to or better than the winding wire evaluated.

### 6.4 Alternate winding wire

Winding wires that do not meet the criteria in 6.1 or 6.2 shall be evaluated in accordance with IEC 61857-1.

Examples would include either bondable winding wire, conductor insulated with an EIM not included in the established EIS, or lead wire used as an alternate winding wire.

## 7 Substitution of impregnating resin/varnish

### 7.1 Thermal class determination

The thermal classes of both the candidate resin/varnish and the resin/varnish used in the established EIS shall be determined by comparison of the manufacturer's thermal ageing data using the test methods in Table 1. Both tests shall be conducted.

**Table 1 – Thermal ageing test methods for resin/varnishes**

Test method	IEC designation
Twisted pair	IEC 60172 specifying the specific resin/varnish winding wire combination
Helical coil	IEC 61033 specifying the specific resin/varnish winding wire combination. Use 22 N as the value which specifies the end of life at each ageing temperature. A minimum of three ageing temperatures; the average life at the highest ageing temperature being a minimum of 100 h and the average life at the lowest ageing temperature being a minimum of 5 000 h. The temperature index value is defined as the temperature intercept for the time of 20 000 h. The helical-coil thermal class assigned to the resin/varnish winding wire combination shall be equal to or less than the temperature index (see IEC 60085:2007, Table 1, Thermal class assignment).

### 7.2 Evaluation

#### 7.2.1 Thermal classes equal or better

When both thermal classes of the candidate impregnating resin/varnish (twisted pair and helical coil) are equal to or higher than the thermal classes of the impregnating resin/varnish in the established EIS, then substitution is allowed:

- based on acceptable results when tested for compatibility using the procedure from Annex B, or
- based on acceptable results when tested according to Clause 10.

#### 7.2.2 One thermal class lower

If one or both of the thermal classes of the candidate impregnating resin/varnish (twisted pair and/or helical coil) are no more than one thermal class lower than the thermal classes of the impregnating resin/varnish of the established EIS, then substitution is allowed based on acceptable results when tested in accordance with Clause 10.

NOTE If the established EIS has received its thermal class rating without the inclusion of an impregnating resin/varnish, refer to 9.1 for addition of an impregnating resin/varnish.

#### 7.2.3 Other criteria

A resin/varnish not meeting the above criteria shall be evaluated according to IEC 61857-1.

## 8 Substitution with other EIM

### 8.1 Technically equivalent materials

Substitution with EIM, which have an identical chemical composition, is acceptable with no additional testing. Substitution or addition of select additives in an EIM may be allowed with reduced or no additional testing (if agreed upon by all interested parties).

## 8.2 Previous evaluation

An EIM evaluated as part of the established EIS, used in combination with another EIM or other component, may be used based upon acceptable results when tested for compatibility according to Annex B. The thickness of the EIM shall not be less than that which was evaluated in the established EIS.

## 8.3 Other

Substitution with or addition of any other EIM shall require full thermal evaluation per IEC 61857-1.

## 9 Evaluation of additions

### 9.1 Addition of an impregnating resin/varnish

An impregnating resin/varnish may be added to an established unvarnished EIS if the following conditions are met:

- a) the impregnating resin/varnish shall be evaluated with the specific winding wire according to IEC 60172 and the resultant thermal class shall be not more than one thermal class below that of the unvarnished winding wire;
- b) the candidate impregnating resin/varnish shall meet the criteria of 9.2.

### 9.2 Addition of other components

Other components that are to be used in conjunction with an established EIS shall be allowed based on acceptable results when tested for compatibility using the procedure from Annex B.

NOTE Such materials are typically used for mechanical, heat transfer, decoration, or other non-electrically stressed functions.

## 10 Single-point thermal ageing test

### 10.1 Test objects

Representative test objects of the established EIS (reference EIS) and the candidate EIS shall be constructed and tested in accordance with IEC 61857-1 with the following exceptions:

- a) the reference and candidate EIS shall be concurrently tested at the same temperature;
- b) the ageing temperature should be selected from the full thermal ageing programme of the established EIS to give an expected test life of between 1 000 h to 2 000 h;
- c) when an EIM, evaluated in the established EIS with multiple EIM, is no longer available, the reference test objects shall be constructed with all remaining materials.

### 10.2 Establishing the EIS relative thermal endurance index (EIS RTE)

The EIS RTE of the candidate EIS shall be established by comparing the original regression slope of the reference EIS with the time–temperature data point for the candidate EIS (refer to IEC 61857-1, Figure 1). The comparison shall be made using the correlation time established according to:

Correlation time

$$t_x = t_R \times e^{\left( \frac{M}{T_R + 273,15} - \frac{M}{T_A + 273,15} \right)}$$

EIS RTE of the candidate EIS

$$T_c = \left( \frac{M}{\ln \left( \frac{t_x}{t_c} \right) + \frac{M}{T_A + 273,15}} \right) - 273,15$$

where

$M$  is the slope of the reference EIS regression equation;

$T_R$  is the EIS ATE of the reference EIS, in degrees Celsius (°C);

$T_A$  is the ageing temperature in degrees Celsius (°C);

$T_c$  is the EIS RTE of the candidate system in degrees Celsius (°C);

$t_R$  is the life of the reference EIS in hours (h);

$t_c$  is the life of the candidate EIS in hours (h);

$t_x$  is the correlation time in hours (h).

### 10.3 Interpretation of results

The candidate EIS shall be assigned the same thermal class rating as the reference EIS if the EIS RTE value, derived in 10.2, is within  $\pm 5$  K of the EIS ATE value of the reference EIS. If the EIS RTE value of the candidate EIS is not within  $\pm 5$  K of the EIS ATE value of the reference EIS, no thermal class rating shall be assigned to the candidate EIS. The candidate EIS can be aged at additional temperatures in accordance with IEC 61857-1 in order to establish the thermal class.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
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Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

Various types of commonly used enamelled winding wire, constructed in accordance with the IEC 60317 series, are presented in Table A.1. The accepted practice for substitution of winding wire is as follows:

- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

**Table A.1 – Winding wire types**

Chemical composition of enamel(s)	Thermal classes	IEC designation
Solderable polyurethane	130	60317-4
Solderable polyurethane/polyamide overcoat	130	60317-19
Solderable polyurethane	155	60317-20
Solderable polyurethane/polyamide overcoat	155	60317-21
Solderable polyurethane	180	60317-51
Non-solderable polyester	130	60317-34
Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.

**Annex A**  
(normative)

**Classes of winding wire**

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- a) winding wires of the same chemical composition with a thermal class equal to or higher than the type of wire evaluated in the established EIS may be substituted into the established EIS without additional testing;
- b) winding wire of a chemical composition not evaluated in the established EIS shall not be substituted;
- c) winding wire of the same chemical composition having a thermal classification lower than the thermal class of the wire type(s) evaluated in the established EIS shall not be substituted;
- d) winding wire substitutions not permitted under either b) or c) shall be tested according to IEC 61857-1.

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Non-solderable polyester	155	60317-3
Non-solderable polyester (rectangular)	155	60317-16
Non-solderable polyesterimide	180	60317-8
Non-solderable polyesterimide (aluminium)	180	60317-15
Non-solderable polyester or polyesterimide/polyamide overcoat	180	60317-22
Non-solderable polyester or polyesterimide/polyamide overcoat (aluminium)	180	60317-24 <sup>1</sup>
Non-solderable polyester or polyesterimide/polyamide-imide overcoat	200	60317-13
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (aluminium)	200	60317-25
Non-solderable polyester or polyesterimide/polyamide-imide overcoat (rectangular)	200	60317-29
Non-solderable polyester-amide-imide	200	60317-42
Solderable polyester	130	60317-41
Solderable polyesterimide	180	60317-23
Non-solderable polyimide	220	60317-7
Non-solderable polyimide (rectangular)	220	60317-30
Non-solderable polyimide	240	60317-46
Non-solderable polyimide (rectangular)	240	60317-47
NOTE Unless otherwise noted, IEC designations represent round, copper wire.		

<sup>1</sup> IEC 60317-24:1997 has been withdrawn, but may apply to reference EIS.