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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Electrical insulation systems – Thermal evaluation of modifications to an established electrical insulation system (EIS) – Part 1: Wire-wound winding EIS

Systèmes d'isolation électrique – Évaluation thermique des modifications apportées à un système d'isolation électrique (SIE) éprouvé – Partie 1: Système d'isolation électrique à enroulements à fils

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ELECTRICAL INSULATION SYSTEMS – THERMAL EVALUATION OF MODIFICATIONS TO AN ESTABLISHED ELECTRICAL INSULATION SYSTEM (EIS) –

Part 1: Wire-wound winding EIS

FOREWORD

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International Standard IEC 61858-1 has been prepared by IEC technical committee 112: Evaluation and qualification of electrical insulating materials and systems.

This first edition of IEC 61858-1 cancels and replaces the third edition of IEC 61858, published in 2008. It constitutes a technical and editorial revision.

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

a) this part is specifically for wire-wound winding EIS;
b) new figures and charts support the contents.

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

CDV	Report on voting
112/252/CDV	112/275/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.

A list of all parts in the IEC 61858 series, published under the general title *Electrical insulation systems – Thermal evaluation of modifications to an established electrical insulation system (EIS)*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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

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- withdrawn,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

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INTRODUCTION

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

This Part 1 of IEC 61858 is for wire-wound winding EIS. Part 2 of IEC 61858 addresses modifications of form-wound winding 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 the IEC 61857 series.

ELECTRICAL INSULATION SYSTEMS – THERMAL EVALUATION OF MODIFICATIONS TO AN ESTABLISHED ELECTRICAL INSULATION SYSTEM (EIS) –

Part 1: Wire-wound winding EIS

1 Scope

This part of IEC 61858 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 winding 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

Les documents suivants sont cités en référence de manière normative, en intégralité ou en partie, dans le présent document et sont indispensables pour son application. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

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 60317-1, *Specifications for particular types of winding wires – Part 1: Polyvinyl acetal enamelled round copper wire, class 105*

IEC 60317-2, *Specifications for particular types of winding wires – Part 2: Solderable polyurethane enamelled round copper wire, class 130, with a bonding layer*

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

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

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

IEC 60317-12, *Specifications for particular types of winding wires – Part 12: Polyvinyl acetal enamelled round copper wire, class 120*

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 60317-19, *Specifications for particular types of winding wires – Part 19: Solderable polyurethane enamelled round copper wire overcoated with polyamide, class 130* (withdrawn)[1]

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 60317-26, *Specifications for particular types of winding wires – Part 26: Polyamide-imide enamelled round copper wire, class 200*

IEC 60317-34, *Specifications for particular types of winding wires – Part 34: Polyester enamelled round copper wire, class 130 L* (withdrawn)[1]

IEC 60317-35, *Specifications for particular types of winding wires – Part 35: Solderable polyurethane enamelled round copper wire, class 155, with a bonding layer*

IEC 60317-36, *Specifications for particular types of winding wires – Part 36: Solderable polyesterimide enamelled round copper wire, class 180, with a bonding layer*

IEC 60317-37, *Specifications for particular types of winding wires – Part 37: Polyesterimide enamelled round copper wire, class 180, with a bonding layer*

IEC 60317-38, *Specifications for particular types of winding wires – Part 38: Polyester or polyesterimide overcoated with polyamide-imide enamelled round copper wire, class 200, with a bonding layer*

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

IEC 60317-43, *Specifications for particular types of winding wires – Part 43: Aromatic polyimide tape wrapped round copper wire, class 240*

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

IEC 60317-48, *Specifications for particular types of winding wires – Part 48: Glass-fibre wound resin or varnish impregnated, bare or enamelled round copper wire, temperature index 155*

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[1] Withdrawn.

IEC 60317-50, *Specifications for particular types of winding wires – Part 50: Glass-fibre wound silicone resin or varnish impregnated, bare or enamelled round copper wire, temperature index 200*

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

IEC 60317-53, *Specifications for particular types of winding wires – Part 53: Aromatic polyamide (aramid) tape wrapped rectangular copper wire, temperature index 220*

IEC 60317-54, *Specifications for particular types of winding wires – Part 54: Polyester enamelled round copper wire, class 155 L*
(withdrawn)[2]

IEC 60317-55, *Specifications for particular types of winding wires – Part 55: Solderable polyurethane enamelled round copper wire overcoated with polyamide, class 180*

IEC 60317-57, *Specifications for particular types of winding wires – Part 57: Polyamide-imide enamelled round copper wire, class 220*

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 61857-1:2008, *Electrical insulation systems – Procedures for thermal evaluation – Part 1: General requirements – Low voltage*

IEC 61857-21, *Electrical insulation systems – Procedures for thermal evaluation – Part 21: Specific requirements for general purpose models – Wire-wound applications*

IEC 62317-2, *Ferrite cores – Dimensions – Part 2: Pot-cores for use in telecommunications, power supply, and filter applications.*

3 Terms and definitions

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

3.1
enamelled winding wire
insulated conductors made in accordance with the IEC 60317 series

3.2
wrapped insulated winding wire
insulated conductor, round or shaped, where the insulation is applied as a tape, with or without an adhesive, made from a film or a paper and applied to the conductor, made in accordance with the IEC 60317 series

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2 Withdrawn.

3.3
random wound coils
coils for use in an electrotechnical device made with enamelled winding wire without concern for the location of the turns

3.4
precision wound coils
coils for use in an electrotechnical device made with enamelled winding wire with each turn positioned in a specific and successive way

3.5
form wound winding coil
rectangular wire formed to a coil for use in an electrotechnical device

Note 1 to entry: Usually made with an insulated conductor this may be enamelled, fibrous wrapped or enamelled with fibrous wrapping. Afterwards the coil is wound it receives multiple layers of tape wrapped insulation and is vacuum- or vacuum-pressure impregnated with a resin, or wrapped with sufficient layers of a pre-impregnated B-stage tape and processed using resin-rich method.

3.6
wire-wound winding electrical insulation system
EIS evaluated with the wire wound coils that are either random or precision wound; not form wound coils

3.7
wire-wound winding electrotechnical device
electrotechnical device designed utilizing a wire-wound EIS

3.8
electrical insulation system
EIS

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

3.9
electrical insulating material
EIM
material with negligibly low electric conductivity, used to separate conducting parts at different electrical potentials

3.10
candidate EIS
EIS under evaluation concerning its thermal endurance for service capability

3.11
reference EIS
established EIS evaluated on the basis of either a known service experience record or a known comparative functional evaluation

3.12
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

3.13
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 selecting the following evaluating procedures:

- Procedure A Without test
- Procedure B Compatibility test in accordance with Clause 10
- Procedure C Single-point thermal aging test Clause 11
- Procedure D Full thermal aging test in accordance with Clause 12

The main evaluation points are as following:

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 Figure 1 is an overview of this standard for guidance in selecting the proper clauses for evaluation.

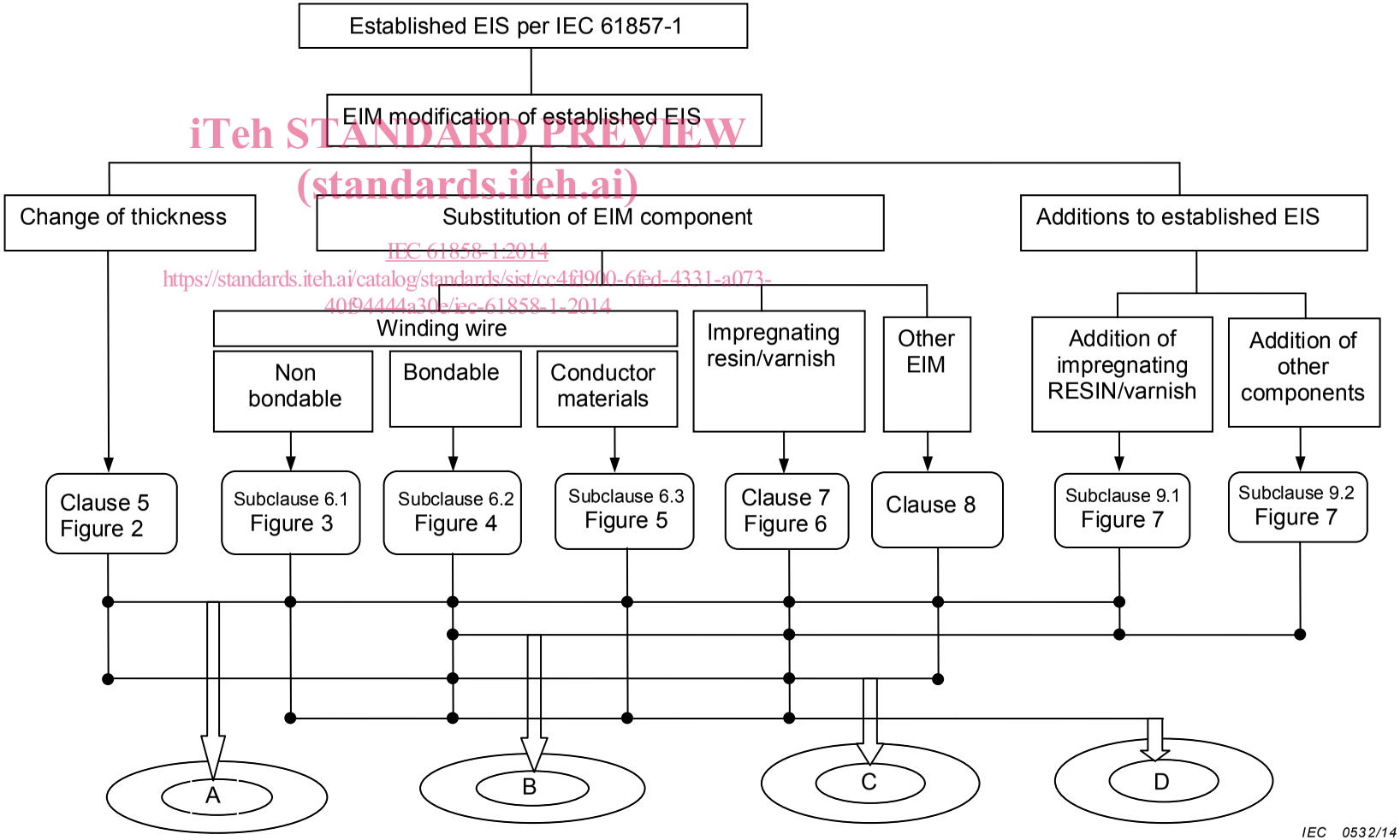

Figure 1 – Overview of evaluation methods

5 Substitution of phase or ground insulation

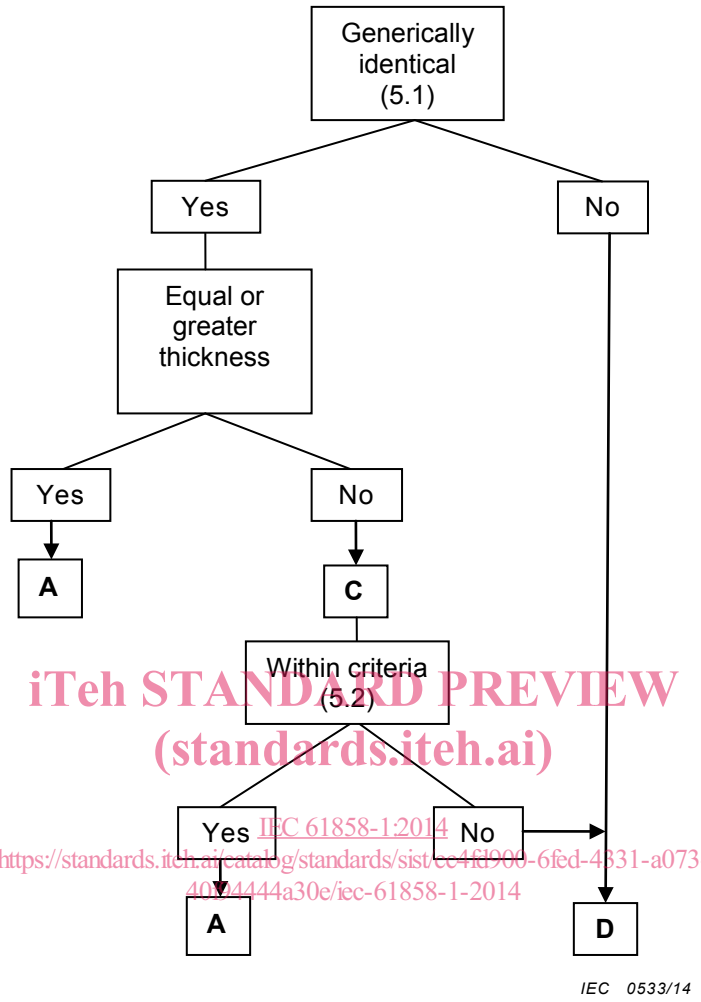

Figure 2 – Substitution of phase and ground insulation

5.1 Generically identical

"Generically identical" refers to both chemical and physical properties of the original and alternate materials having equal mechanical and electrical performances, in regards to the thermal endurance.

Basic chemical composition and physical identity can be established by analytical data based on appropriate analysis such as IR spectroscopic, thermogravimetric, differential thermal analysis (DTA) and/or atomic absorption analyses. The specific tests are typically agreed upon by the interested parties.

Generically identical and the same or increased thickness of an EIM can be substituted without additional test.

Substitution of generically identical EIM at a reduced thickness is allowed if it meets the criteria of Clause 10.

5.2 Substitution or addition of selected components and additives

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).