SLOVENSKI STANDARD
SIST EN IEC 61803:2026

01-november-2026

Ugotavljanje močnostnih izgub v visokonapetostnih enosmernih (HVDC) pretvorniških postajah (IEC 61803:2026)

Determination of power losses in high-voltage direct current (HVDC) converter stations (IEC 61803:2026)

Bestimmung der Leistungsverluste in Hochspannungsgleichstrom-(HGÜ-)Stromrichterstationen mit netzgeführten Stromrichtern (IEC 61803:2026)

Sample Document

Détermination des pertes en puissance dans les postes de conversion en courant continu à haute tension (CCHT) (IEC 61803:2026)

get full document from standards.iteh.ai

Ta slovenski standard je istoveten z: **EN IEC 61803:2026**

ICS:

29.200	Usmerniki. Pretvorniki. Stabilizirano električno napajanje	Rectifiers. Convertors. Stabilized power supply

SIST EN IEC 61803:2026 **en,fr,de**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

Sample Document

get full document from standards.iteh.ai

SIST EN IEC 61803:2026

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61803

July 2026

ICS 29.200

Supersedes EN IEC 61803:2020

English Version

Determination of power losses in high-voltage direct current (HVDC) converter stations (IEC 61803:2026)

Détermination des pertes en puissance dans les stations de conversion en courant continu à haute tension (CCHT) (IEC 61803:2026)

Bestimmung der Leistungsverluste in Hochspannungsgleichstrom-(HGÜ-)Stromrichterstationen mit netzgeführten Stromrichtern (IEC 61803:2026)

This European Standard was approved by CENELEC on 2026-06-30. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

Sample Document

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2026 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

Ref. No. EN IEC 61803:2026 E

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

European foreword

The text of document 22F/860/FDIS, future edition 3 of IEC 61803, prepared by SC 22F "Power electronics for electrical transmission and distribution systems" of IEC/TC 22 "Power electronic systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61803:2026.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2027-07-31
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2029-07-31

This document supersedes EN IEC 61803:2020 and all of its amendments and corrigenda (if any).

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

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Sample Document

Endorsement notice

Preview document from standards.iteh.ai

The text of the International Standard IEC 61803:2026 was approved by CENELEC as a European Standard without any modification.

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

IEC 61000-4-7	NOTE	Approved as EN 61000-4-7
IEC 62751 series	NOTE	Approved as EN 62751 series
IEC 62751-1	NOTE	Approved as EN 62751-1
IEC 62751-2	NOTE	Approved as EN 62751-2

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cencenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60076-1	-	Power transformers - Part 1: General	EN 60076-1	-
IEC 60076-6	-	Power transformers - Part 6: Reactors	EN 60076-6	-
IEC 60633	-	High-voltage direct current (HVDC) transmission - Vocabulary	EN IEC 60633	-
IEC 60700-1	2015	Thyristor valves for high voltage direct current (HVDC) power transmission - Part 1: Electrical testing	EN 60700-1	2015
+ AMD1	2021		+ A1	2021
IEC 60871-1	-	Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V - Part 1: General	EN 60871-1	-
IEC 62747	-	Terminology for voltage-sourced converters (VSC) for high-voltage direct current (HVDC) systems	EN 62747	-

Sample Document
get full document from standards.iteh.ai

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

Sample Document

get full document from standards.iteh.ai

SIST EN IEC 61803:2026

IEC 61803

Edition 3.0 2026-05

INTERNATIONAL STANDARD

Determination of power losses in high-voltage direct current (HVDC) converter stations

Sample Document

get full document from standards.iteh.ai

ICS 29.200

ISBN 978-2-8327-1202-3

IEC 61803:2026-05(en)

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

CONTENTS

FOREWORD 3
1 Scope 5
2 Normative references 5
3 Terms, definitions and symbols 6
3.1 Terms and definitions 6
3.2 Symbols 7
3.2.1 Common 7
3.2.2 Line-commutated converters 8
4 Overview 8
4.1 General 8
4.2 Ambient conditions 12
4.2.1 General 12
4.2.2 Outdoor standard reference temperature 12
4.2.3 Coolant standard reference temperature 12
4.2.4 Standard reference air pressure 12
4.3 Operating parameters 12
5 Determination of equipment losses 13
5.1 Thyristor valve losses (LCC only) 13
5.1.1 General 13
5.1.2 Thyristor conduction loss per valve 16
5.1.3 Thyristor spreading loss per valve 17
5.1.4 Other conduction losses per valve 19
5.1.5 DC voltage-dependent loss per valve 19
5.1.6 Damping loss per valve (resistor-dependent term) 20
5.1.7 Damping loss per valve (change of capacitor energy term) 21
5.1.8 Turn-off losses per valve 22
5.1.9 Reactor loss per valve 22
5.1.10 Total valve losses 23
5.1.11 Temperature effects 23
5.1.12 No-load operation loss per valve 24
5.2 Transformer losses 24
5.2.1 General 24
5.2.2 No-load operation losses 24
5.2.3 Operating losses 25
5.2.4 Auxiliary power losses 26
5.3 AC filter losses 26
5.3.1 General 26
5.3.2 AC filter capacitor losses 27
5.3.3 AC filter reactor losses 27
5.3.4 AC filter resistor losses 28
5.3.5 Total AC filter losses 28
5.4 Shunt capacitor bank losses 28
5.5 Shunt reactor losses 28
5.6 DC smoothing reactor losses 29
5.7 DC filter losses 30
5.7.1 General 30

Sample Document
Get full document from standards.iteh.ai

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

5.7.2 DC filter capacitor losses 30
5.7.3 DC filter reactor losses 31
5.7.4 DC filter resistor losses 31
5.7.5 Total DC filter losses 31
5.8 Auxiliaries and station service losses 31
5.9 Series filter losses 32
5.10 Phase reactor losses (VSC only) 33
5.11 Valve reactor losses (VSC only) 35
5.12 Other equipment losses 35
Annex A (informative) Calculation of harmonic currents and voltages (LCC only) 36
A.1 Harmonic currents in converter transformers 36
A.2 Harmonic currents in the AC filters 36
A.3 Harmonic voltages on the DC side 37
A.4 DC side harmonic currents in the smoothing reactor 37
Annex B (informative) Typical station losses 38
Annex C (informative) HVDC converter station loss evaluation – An illustration 39
C.1 General 39
C.2 Loss evaluation under various cases 40
Bibliography 43

Figure 1 – Typical high-voltage direct current (HVDC) equipment for one pole of an LCC scheme 10
Figure 2 – Typical high-voltage direct current (HVDC) equipment for one pole of a VSC scheme 11
Figure 3 – Simplified three-phase diagram of an HVDC 12-pulse converter (LCC) 14
Figure 4 – Simplified equivalent circuit of a typical thyristor valve 15
Figure 5 – Current and voltage waveforms of a valve operating in a 12-pulse converter 16
Figure 6 – Thyristor on-state characteristic 17
Figure 7 – Conduction current and voltage drop of thyristor 18
Figure 8 – Distribution of commutating inductance between L_1 and L_2 20
Figure 9 – Thyristor current during reverse recovery 22
Figure 10 – Typical phase reactor and valve reactor arrangement per arm of a VSC scheme 34

Table B.1 – Typical values of losses for a LCC station 38
Table B.2 – Typical values of losses for a VSC MMC station 38
Table C.1 – Conditions for calculation of losses in case D1 41
Table C.2 – Conditions for calculation of losses in case D2 41

Sample Document
Get full document from standards.iteh.ai

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

Determination of power losses in high-voltage direct current (HVDC) converter stations

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

Sample Document
Standards.iteh.ai

IEC 61803 has been prepared by subcommittee 22F: Power electronics for electrical transmission and distribution systems, of IEC technical committee 22: Power electronic systems and equipment. It is an International Standard.

This third edition cancels and replaces the second edition published in 2020. This edition constitutes a technical revision.

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

a) HVDC stations with voltage-sourced converters (VSC) technology have been included;
b) to facilitate the application of this document and to ensure its quality remains consistent, 5.1.8 and 5.8 have been reviewed, taking into consideration that the present thyristor production technology provides considerably less thyristor parameters dispersion comparing with the situation in 1999 when the first edition of IEC 61803 was developed; therefore, the production records of thyristors can be used for the power losses calculation;

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

c) the calculation of the total station load losses (cases D1 and D2 in Annex C) has been corrected.

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

Draft	Report on voting
22F/860/FDIS	22F/868/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

– reconfirmed,
– withdrawn, or
– revised.

Sample Document

get full document from standards.iteh.ai

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

1 Scope

This document applies to all high-voltage direct current (HVDC) converter stations with line-commutated converters (LCC) as well with voltage-sourced converters (VSC) used for power exchange (power transmission or back-to-back installation) in utility systems. For line-commutated converters (LCC), this document presumes the use of 12-pulse thyristor converters but can, with due care, also be used for 6-pulse thyristor converters.

Where VSC is referred to in this document, it is assumed to be of the MMC-type or similar, with very low harmonic generation. It is important to treat other types of VSC as appropriate.

In some applications, synchronous compensators, static var compensators (SVC), or static synchronous compensator (STATCOM) are connected to the AC bus of the HVDC converter station. The loss determination procedures for such equipment are not included in this document.

This document presents a set of standard procedures for determining the total losses of an HVDC converter station, except for VSC valves which are covered by the IEC 62751 series. The procedures cover all parts, except as noted above, and address no-load operation and operating losses together with their methods of calculation which use, wherever possible, measured parameters.

Converter station designs employing novel components or circuit configurations compared to the typical design assumed in this document, or designs equipped with unusual auxiliary circuits that can affect the losses, are assessed on their own merits.

Sample Document

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Get full document from Standards.iteh.ai

IEC 60076-1, *Power transformers - Part 1: General*

IEC 60076-6, *Power transformers - Part 6: Reactors*

IEC 60633, *High-voltage direct current (HVDC) transmission - Vocabulary*

IEC 60700-1:2015, *Thyristor valves for high voltage direct current (HVDC) power transmission - Part 1: Electrical testing*
IEC 60700-1:2015/AMD1:2021

IEC 60871-1, *Shunt capacitors for a.c. power systems having a rated voltage above 1 000 V - Part 1: General*

IEC 62747, *Terminology for voltage-sourced converters (VSC) for high-voltage direct current (HVDC) systems*

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

3 Terms, definitions and symbols

For the purposes of this document, the terms and definition given in IEC 60633, IEC 62747 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

– IEC Electropedia: available at http://www.electropedia.org/

– ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Terms and definitions

3.1.1
auxiliary losses
electric power required to feed the converter station auxiliary loads

Note 1 to entry: The auxiliary losses depend on the number of converter units used and whether the station is in no-load operation or carrying load, in which case the auxiliary losses depend on the load level.

3.1.2
equipment no-load operation losses
losses produced in an item of equipment with the converter station energised but with the converters blocked and all station service loads and auxiliary equipment connected as required for immediate pick-up of load to specified minimum power

3.1.3
load level
set of AC system and converter operating conditions at which the converter station is operating

Sample Document

Note 1 to entry: For LCC schemes, the load level is defined by the direct current, direct voltage, firing angle, AC system voltage and converter transformer tap-changer position.

get full document from standards.iteh.ai

Note 2 to entry: For VSC schemes, the load level is defined by the direct current, direct voltage, AC system voltage, interface transformer tap-changer position (where appropriate), converter AC voltage, converter AC current and the phase angle between converter AC voltage and current.

3.1.4
equipment operating losses
losses produced in an item of equipment at a given load level with the converter station energised and the converters operating

3.1.5
rated load
load corresponding to operation at nominal values of the operating conditions defined in 3.1.3

Note 1 to entry: The AC system shall be assumed to be at nominal frequency, and its 3-phase voltages are nominal and balanced. The position of the tap-changer of the converter/interface transformer and the number of AC filters and shunt reactive elements, if any connected, shall be consistent with operation at rated load, coincident with nominal conditions.

3.1.6
total station no-load operation losses
sum of all equipment no-load operation losses (3.1.2) and corresponding auxiliary losses (3.1.1)

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

3.1.7
total station operating losses
sum of all equipment operating losses (3.1.4) and corresponding auxiliary losses (3.1.1) at a particular load level

Note 1 to entry: An illustrative example using total station operating losses and corresponding loss evaluation is given in Annex C, case D1.

3.1.8
total station load losses
difference between total station operating losses (3.1.7) and total station no-load operation losses (3.1.6)

Note 1 to entry: Such calculated total station load losses are considered as being quantitatively equivalent to load losses as in conventional AC substation practice.

Note 2 to entry: It is recognized that some purchasers evaluate total station no-load operation losses (3.1.6) and total station load losses individually instead of the evaluating total station operating losses (3.1.7).

Note 3 to entry: An illustrative example to derive load losses, equivalent load losses and corresponding loss evaluation is given in Annex C, case D2.

3.1.9
station essential auxiliary load
load whose failure affects the conversion capability of the HVDC converter station (e.g. valve cooling), as well as load that remains working in case of complete loss of AC power supply (e.g. battery chargers, operating mechanisms)

3.2 Symbols

Sample Document

3.2.1 Common

get full document from standards.iteh.ai

f AC system frequency, in hertz (Hz)

I_d direct current, in amperes (A)

I_n harmonic RMS current of order n, in amperes (A)

n harmonic order

P power loss in an item of equipment, in watts (W)

Q_n quality factor of a reactor at harmonic order n

R resistance value, in ohms (Ω)

U_d direct voltage, in volts (V)

U_n harmonic RMS voltage of order n, in volts (V)

X_n inductive reactance at harmonic order n, in ohms (Ω)

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026

SIST EN IEC 61803:2026

3.2.2 Line-commutated converters

α (trigger/firing) delay angle, in radians (rad)

γ extinction angle, in radians (rad)

μ overlap angle, in radians (rad)

L_1 inductance, in henrys (H), referred to the valve winding, between the commutating voltage source and the point of common coupling between star- and delta-connected windings; L_1 shall include any external inductance between the transformer line-winding terminals and the point of connection of the AC harmonic filters

L_2 inductance, in henrys (H), referred to the valve winding, between the point of common coupling between star- and delta-connected windings; the valve L_2 shall include the saturated inductance of the valve reactors

m electromagnetic notch coupling factor, $m = L_1/(L_1 + L_2)$

N_t number of series-connected thyristors per valve

U_{vo} RMS value of the phase-to-phase no-load voltage on the valve side of the converter transformer excluding harmonics, in volts (V)

4 Overview

4.1 General

It is important for suppliers to know in detail how and where losses are generated, since this affects component and equipment ratings. Purchasers are interested in a verifiable loss figure which allows equitable bid comparison and in a procedure which can objectively verify the guaranteed performance requirements of the supplier after delivery. The main purpose of this document is to serve the purchasers this specific interest.

As a general principle, it would be desirable to determine the efficiency of an HVDC converter station by a direct measurement of its energy losses. However, attempts to determine the station losses by subtracting the measured output power from the measured input power should recognize that such measurements have an inherent inaccuracy, especially if performed at high voltage. The losses of an HVDC converter station at full load are generally less than 1 % of the transmitted power. Therefore, the loss measured as a small difference between two large quantities is not likely to be a sufficiently accurate indication of the actual losses.

In some special circumstances, it can be possible, for example, to arrange a temporary test connection in which two converters are operated from the same AC source and also connected together via their DC terminals. In this connection, the power drawn from the AC source equals the losses in the circuit though in most cases this does not represent a normal operating design mode. However, the AC source shall also provide var support and commutating voltage to the two converters. Once again, there are practical measurement difficulties, and it is still important that the losses are recalculated/corrected for nominal parameters and ambient/operating conditions.

In order to avoid the problems described above since these practical measurements are unreliable and also will depend on the type of HVDC solution, it is recommended to use this document which standardizes a method of calculating the HVDC converter station losses by summing the losses calculated for each item of equipment. The standardized calculation method will help the purchaser to meaningfully compare the competing bids. It will also allow an easy generation of performance curves for the wide range of operating conditions in which the performance has to be known. In the absence of an inexpensive experimental method which could be employed for an objective verification of losses during type tests, the calculation method is the next best alternative as it uses, wherever possible, experimental data obtained from measurements on individual equipment and components under conditions equivalent to those encountered in real operation.

SIST EN IEC 61803:2026 • https://standards.iteh.ai/catalog/standards/sist/2c2dc5f4-5c70-4ce6-9c55-0bb7fb7ec98c/sist-en-iec-61803-2026