SLOVENSKI STANDARD
oSIST prEN IEC 61869-14:2026

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Instrumentni transformatorji - 14. del: Dodatne zahteve za tokovne transformatorje za enosmerno napajanje

Instrument transformers - Part 14: Additional requirements for current transformers for DC applications

Messwandler - Teil 14: Zusätzliche Anforderungen an Stromwandler für Gleichstromanwendungen

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ICS:

17.220.20	Merjenje električnih in magnetnih veličin	Measurement of electrical and magnetic quantities

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38/867/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

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DATE OF CIRCULATION: **2026-10-30**	CLOSING DATE FOR VOTING: **2027-01-22**
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SECRETARIAT: Italy	SECRETARY: Mr Filippo Frugoni
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 13,TC 33,TC 57,SC 77A,TC 85,TC 95,TC 115	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Electricity transmission and distribution,Electromagnetic Compatibility	
☒ SUBMITTED FOR CENELEC PARALLEL VOTING **Attention IEC-CENELEC parallel voting** The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

Instrument transformers - Part 14: Additional requirements for current transformers for DC applications

PROPOSED STABILITY DATE: 2032

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INSTRUMENT TRANSFORMERS –

Part 14: Additional requirements for current transformers for DC applications

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This second edition cancels and replaces the first edition published in 2018. This edition constitutes a technical revision.

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

FDIS	Report on voting
38/XX/FDIS	38/XX/RVD

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

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

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238 This Part 14 is to be used in conjunction with, and is based on, IEC 61869-1:2023, *General*
239 *requirements*, – however the reader is encouraged to use the most recent editions.

240 This Part 14 follows the structure of IEC 61869-1:2023 and supplements or modifies the
241 corresponding clauses.

242 For additional clauses, subclauses, figures, tables, annexes or notes, the following numbering
243 system is used:

244 • clauses, subclauses, tables, figures and notes that are numbered starting from 1401 are
245 additional to those in Part 1;
246 • additional annexes are lettered 14A, 14B, etc.

247 A list of all parts in the IEC 61869 series, published under the general title Instrument
248 transformers, can be found on the IEC website: www.iec.ch

249

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

253 • reconfirmed,
254 • withdrawn,
255 • replaced by a revised edition, or
256 • amended.

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INTRODUCTION

General

This document applies to current transformers intended to be used in DC applications with at least one of the following functions:

- measure DC current (with significant harmonics);
- withstand DC voltage.

This document is the first revision of the standard IEC 61869-14, defining additional requirements for current transformers for DC applications.

The main modifications of this revision are listed below:

- General
  - adaption of the new structure and requirements of IEC 61869-1:2023, general requirements for instrument transformers.
  - transfer of the definitions to the TC 38 Glossary IEC 61869-99
  - definitions related to composite AC and DC currents
  - introduction of CT1 for VSC applications
- Ratings
  - voltage ratings for composite AC and DC voltages including 3PWM
  - rated delay time definition for point to point connections
  - definition of fault analysis current factor K_{FAC}
  - definition of accuracy requirements for AC current measurement
  - definition of accuracy requirements for harmonics
  - revised step response times
- Design and construction
  - rating plate markings revised
- Tests
  - Revised list of tests
  - Table added indicating routine tests to be performed after a Type test
- Type tests
  - composite AC and DC current: definition to perform tests separately in two tests
  - step response time evaluation brought in line with definition in TC 38 Glossary IEC 61869-99
  - DC applied voltage test introduced for equipment using for example an optical link
- Routine tests
  - partial discharge measurement during DC applied voltage withstand test replaced by verification of partial discharge level during repeated AC applied withstand test with partial discharge measurement
  - composite AC and DC current: definition to perform tests separately in two tests
- Special tests
  - measurement of capacitance and dielectric dissipation factor eliminated, because test is already routine test.
  - even wetting DC voltage test eliminated, wet test performance, insulator performance under wet condition is covered during type tests under 7.2.4.

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- accuracy test on the composite signal is eliminated, it is covered during type tests under 7.2.15.

- new annexes:
  - Annex A (normative): Identification of test specimen;
  - Annex B (informative): Recommendation for contents of failure reports;
  - Annex C (informative) Fire hazard;
  - Annex D (informative): Sample test;
  - Annex E (informative): Technique used in temperature rise test of transformers to determine the thermal time constant by an experimental estimation;
  - Annex F (informative): guidance for the extension of validity of type tests and special tests;
  - Annex G (informative): Guidance for the calculation of equivalent diameter in case of irregular shape of insulating part;
  - Annex H (informative): Test circuits
  - Annex I (normative): seismic qualification of instrument transformers;
  - Annex 14B (normative): Composite AC/DC voltages

Depending on the position of the current transformer on the DC system, different kinds of applications exist, which are briefly described in 4.1401, together with the approximate voltage or current wave shape.

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INSTRUMENT TRANSFORMERS –

Part 14: Specific requirements for current transformers for DC applications

1 Scope

This part of IEC 61869 provides all requirements specific to current transformers to be used in DC applications (DC CTs), whatever the technology used. The output signal can be analogue or digital. When it is analogue, it is available as low voltage representing the primary current.

It is applicable to newly manufactured current transformers used for measuring, protection and/or control applications in power systems with a rated voltage above 1,5 kV DC.

The general configuration of a single-pole low-power instrument transformer is described in Figure 1 of IEC 61869-1:2023.

NOTE A bushing type current transformer, although having no primary insulation level for itself is often placed on a system with a nominal voltage > 1,5 kV DC and therefore falls within the scope of this document. Example: CT placed on an HV bushing or a cable.

DC CT for railway applications are not part of this standard and are covered by IEC TC9.

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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.

Clause 2 of IEC 61869-1:2023 applies with the following additions:

IEC 60071-11:2022, *Insulation coordination - Part 11:* Definitions, principles and rules for HVDC systems

IEC 60270:2025, *High voltage test techniques – Partial discharge measurements*

IEC TS 60815-4:2016, *Selection and dimensioning of high-voltage insulators intended for use in polluted conditions – Part 4: Insulators for DC systems*

IEC TS 61245:2015, *Artificial pollution tests on high-voltage ceramic and glass insulators to be used on DC systems*

IEC 61869-1:2023, *Instrument transformers – Part 1: General requirements*

IEC 61869-2, *Instrument transformers – Part 2: Additional requirements for current transformers*

IEC 61869-9:2016, *Instrument transformers – Part 9: Digital interface for instrument transformers*

IEC 61869-99:2022, *Instrument transformers – Part 99: Glossary*

IEC/TR 61869-103:2012, *Instrument transformers – The use of instrument transformers for power quality measurements*

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IEC 62475 :2010, *High-current test techniques – Definitions and requirements for test currents and measuring systems*

IEC TS 62271-5:2024, *High-voltage switchgear and controlgear – Part5: Common specification for direct current switchgear and controlgear*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

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.

For the purposes of this document, the terms and definitions of IEC 61869-99 apply with the following addition.

3.1.1401

Absolute error

ε_A

error (expressed in A) that a current transformer introduces into the measurement, and which arises from the fact that the actual transformation ratio is not equal to the rated transformation ratio

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Note 1 to entry: The absolute error is defined by the following formula:

$$\varepsilon_A = K_r \cdot U_s - I_p$$

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where

K_r is the rated transformation ratio in A/V;

I_p is the DC value of the actual primary current in steady state;

U_s is the DC value of the output voltage.

3.1.1402

fault analysis current factor

K_{FAC}

ratio of the maximum peak fault currents to be analysed to the rated primary current

$$k_{FAC} = \frac{\hat{I}_{analysis}}{I_{pr}}$$

where

$\hat{I}_{analysis}$ is the measured peak fault current to be analysed for converter protection, analysis with less stringent accuracy requirements

3.1.1403

AC grid power frequency

$f_{rACgrid}$

Rated frequency of the AC grid to which the HVDC station is connected

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3.2 Symbols and abbreviated terms

The table in 3.2 of IEC 61869-1:2023 is replaced by the following one:

CT	current transformer
DC	Direct Current
F	mechanical load
$f_{\mathbf{rAC}}$	rated AC grid power frequency
I_{cth}	rated continuous thermal current
I_{pr}	rated primary current
IT	instrument transformer
K_{ALF}	accuracy limit factor
K_{epr}	rated extended primary current factor
K_{FAC}	fault analysis current factor
K_{r}	rated transformation ratio
Z_{br}	rated burden
t_{d}	delay time
t_{dr}	rated delay time
T_{set}	settling time
T_{sr}	step response time
U_{ar}	auxiliary power supply voltage
U_{DC}	DC system voltage
U_{DCmax}	highest DC voltage of a system
U_{h}	voltage harmonic of frequency f_{h}
U_{hAmax}	voltage harmonic with the highest amplitude
U_{m}	highest voltage for equipment
U_{sr}	rated secondary voltage
ε	ratio error
ε_{A}	absolute error
3PWM	Pulse width modulation with third harmonic, also known as third harmonic injection (THI)

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4 Normal and special environmental conditions

Clause 4 of IEC 61869-1:2023 applies with the following addition.

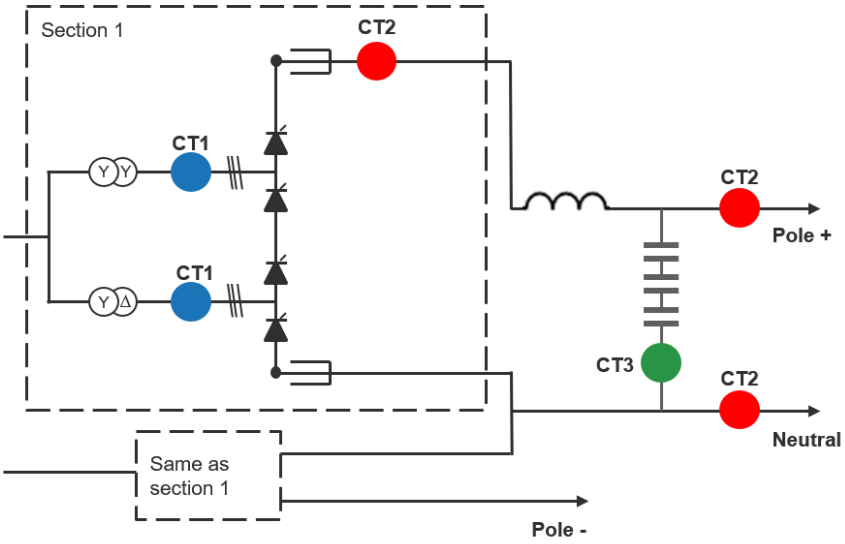
4.1401 Operational environment and configurations of DC CT in Converter-based systems

4.1401.1 Line-commutated converters (LCC)

Line-commutated converters (LCC) are based on thyristor converters (see Figure 1401). They are characterized by a single direction of current flow, and a voltage polarity reversal possibility. Significant voltage and current harmonics exist up to frequencies of about 3 kHz to 4 kHz.

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411

412 **Figure 1401 – Example of LCC scheme**

413 We distinguish three main locations for DC CTs in LCC applications, covered in this standard:

414 • CT1: measurement of the current at the AC side of the converter;

415 • CT2: measurement of the current at the DC side of the converter;

416 • CT3: measurement of the current in the DC filter.

417 NOTE The numbering is for orientation purposes only.

418 Table 1401 gives an overview of the current and voltage waveshapes as well as the main
419 characteristics of the different applications of the CT.

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