

SLOVENSKI STANDARD

SIST EN 61869-6:2017

01-februar-2017

Nadomešča:

SIST EN 60044-7:2000

SIST EN 60044-8:2003

Merilni transformatorji - 6. del: Dodatne splošne zahteve za merilne transformatorje majhnih moči (IEC 61869-6:2016)

Instruments transformers - Part 6: Additional general requirements for Low Power Instrument Transformers (IEC 61869-6:2016)

Ta slovenski standard je istoveten z: EN 61869-6:2016

ICS:

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

SIST EN 61869-6:2017

en

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 61869-6

December 2016

ICS 17.220.20

Supersedes EN 60044-7:2000 (partially),
EN 60044-8:2002 (partially)

English Version

**Instrument transformers - Part 6: Additional general
requirements for low-power instrument transformers
(IEC 61869-6:2016)**

Transformateurs de mesure - Partie 6: Exigences générales
supplémentaires concernant les transformateurs de mesure
de faible puissance
(IEC 61869-6:2016)

Messwandler - Teil 6: Zusätzliche allgemeine
Anforderungen für Kleinsignal-Messwandler
(IEC 61869-6:2016)

This European Standard was approved by CENELEC on 2016-06-01. 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.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

EN 61869-6:2016**European foreword**

The text of document 38/501/FDIS, future edition 1 of IEC 61869-6, prepared by IEC/TC 38 "Instrument transformers" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61869-6:2016.

The following dates are fixed:

- latest date by which the document has to be (dop) 2017-06-23
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2019-12-23
standards conflicting with the
document have to be withdrawn

This document is to be read jointly with, and is based on, EN 61869-1:2009, *General requirements*. However, the reader is encouraged to use the most recent edition of that document.

This document follows the structure of EN 61869 series and supplements or modifies the corresponding clauses in EN 61869-1 Standard.

When a particular clause/subclause of Part 1, is not mentioned in this Part 6, that clause/subclause applies as far as is reasonable. When this standard states "addition", "modification" or "replacement", the relevant text in Part 1 is to be adapted accordingly.

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

– clauses, subclauses, tables, figures and notes that are numbered starting from 601 are additional to those in Part 1;

– additional annexes are lettered 6A, 6B, etc.

This document, jointly with EN 61869-1:2009, supersedes EN 60044-7:2000 (partially) and EN 60044-8:2002 (partially).

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

Endorsement notice

The text of the International Standard IEC 61869-6:2016 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 standards indicated:

IEC 60044-7:1999	NOTE	Harmonized as EN 60044-7:2000 (not modified).
IEC 60044-8:2002	NOTE	Harmonized as EN 60044-8:2002 (not modified)
IEC 61508-1	NOTE	Harmonized as EN 61508-1.
IEC 61508-3	NOTE	Harmonized as EN 61508-3.
IEC 61850 Series	NOTE	Harmonized as EN 61850 Series.
IEC 61869 Series	NOTE	Harmonized as EN 61869 Series.
IEC 61869-5	NOTE	Harmonized as EN 61869-5.
IEC 61869-9	NOTE	Harmonized as EN 61869-9.
IEC 61869-10	NOTE	Harmonized as EN 61869-10.
IEC 61869-11	NOTE	Harmonized as EN 61869-11.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When 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.cenelec.eu

Annex ZA of EN 61869:2009 is applicable with the following additions:

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
-	-	Voltage characteristics of electricity supplied by public electricity networks	EN 50160	2010
IEC 60068-2-6	2007	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	2008
IEC 60255-27	2013	Measuring relays and protection equipment - Part 27: Product safety requirements	EN 60255-27	2014
IEC 60603-7-1	2011	Connectors for electronic equipment - Part 7-1: Detail specification for 8-way, shielded, free and fixed connectors	EN 60603-7-1	2011
IEC 60794-2	2002	Optical fibre cables - Part 2: Indoor cables - Sectional specification	EN 60794-2	2003
IEC 60794-3	2014	Optical fibre cables - Part 3: Outdoor cables - Sectional specification	EN 60794-3	2015
IEC 60812	2006	Analysis techniques for system reliability - Procedure for failure mode and effects analysis (FMEA)	EN 60812	2006
IEC 61000-4-1	2006 ¹⁾	Electromagnetic compatibility (EMC) - Part 4-1: Testing and measurement techniques - Overview of IEC 61000-4 series	EN 61000-4-1	2007 ²⁾
IEC 61000-4-2	2008	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	2009
IEC 61000-4-3	2006	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
+A1	2007		+A1	2008
+A2	2010		+A2	2010

¹⁾ Superseded by IEC/TR 61000-4-1:2016.

²⁾ Withdrawn publication.

EN 61869-6:2016

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61000-4-4	2012	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2012
IEC 61000-4-5	2014	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2014
IEC 61000-4-6	2013	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	2014
IEC 61000-4-7	2002	Electromagnetic compatibility (EMC) - Part 4-7: Testing and measurement techniques - General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto	EN 61000-4-7	2002
+A1	2008		+A1	2009
IEC 61000-4-8	2009	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	EN 61000-4-8	2010
IEC 61000-4-9	1993	Electromagnetic compatibility (EMC) - Part 4-9: Testing and measurement techniques - Pulse magnetic field immunity test	EN 61000-4-9	1993 ³⁾
+A1	2000		+A1	2001 ³⁾
IEC 61000-4-10	1993 ⁴⁾	Electromagnetic compatibility (EMC) - Part 4-10: Testing and measurement techniques - Damped oscillatory magnetic field immunity test	EN 61000-4-10	1993
+A1	2000		+A1	2001
IEC 61000-4-11	2004	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	2004
IEC 61000-4-13	2002	Electromagnetic compatibility (EMC) - Part 4-13: Testing and measurement techniques - Harmonics and interharmonics including mains signaling at a.c. power port, low frequency immunity tests	EN 61000-4-13	2002
+A1	2009		+A1	2009

³⁾ Superseded by EN 61000-4-9:2016 (IEC 61000-4-9:2016): DOW = 2019-08-17.

⁴⁾ Superseded by IEC 61000-4-10:2016.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61000-4-16	1998	Electromagnetic compatibility (EMC) - Part 4-16: Testing and measurement techniques - Test for immunity to conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz	EN 61000-4-16	1998 ⁵⁾
+A1	2001		+A1	2004
+A2	2009		+A2	2011
IEC 61000-4-18	2006	Electromagnetic compatibility (EMC) - Part 4-18: Testing and measurement techniques - Damped oscillatory wave immunity test	EN 61000-4-18 + corr. September	2007 2007
+A1	2010		+A1	2010
IEC 61000-4-29	2000	Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests	EN 61000-4-29	2000
IEC 61025	2006	Fault Tree Analysis (FTA)	EN 61025	2007
IEC 61076-2-101	2012	Connectors for electronic equipment - Product requirements - Part 2-101: Circular connectors - Detail specification for M12 connectors with screw-locking	EN 61076-2-101	2012
IEC/TS 61850-2	2003	Communication networks and systems in substations - Part 2: Glossary	-	-
IEC 61850-7-4	2010	Communication networks and systems for power utility automation - Part 7-4: Basic communication structure - Compatible logical node classes and data object classes	EN 61850-7-4	2010
IEC 61869-1 (mod)	2007	Instrument transformers - Part 1: General requirements	EN 61869-1	2009
IEC 61869-2	2012	Instrument transformers - Part 2: Additional requirements for current transformers	EN 61869-2	2012
IEC 61869-3	2011	Instrument transformers - Part 3: Additional requirements for inductive voltage transformers	EN 61869-3	2011
IEC/TR 61869-103	2012	Instrument transformers - The use of instrument transformers for power quality measurement	-	-
IEC 62271-100	2008	High-voltage switchgear and controlgear - Part 100: Alternating current circuit-breakers	EN 62271-100	2009
+A1	2012		+A1	2012
CISPR 11 (mod)	2015	Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement	EN 55011	2016

⁵⁾ Superseded by EN 61000-4-16:2016 (IEC 61000-4-16:2015): DOW = 2019-01-13.

EN 61869-6:2016

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO/IEC/IEEE 21451-4	2010	Information technology - Smart transducer - interface for sensors and actuators - Part 4: Mixed-mode communication protocols and Transducer Electronic Data Sheet (TEDS) formats		-



IEC 61869-6

Edition 1.0 2016-04

INTERNATIONAL STANDARD



Instrument transformers – Part 6: Additional general requirements for low-power instrument transformers

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 17.220.20

ISBN 978-2-8322-3330-6

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	6
1 Scope.....	10
2 Normative reference	10
3 Terms and definitions	13
3.1 General terms and definitions	13
3.2 Terms and definitions related to dielectric ratings and voltages.....	17
3.3 Terms and definitions related to current ratings	17
3.4 Terms and definitions related to accuracy	21
3.5 Terms and definitions related to other ratings	26
3.7 Index of abbreviations and symbols	26
4 Normal and special service conditions.....	28
4.2 Normal service conditions	28
4.2.3 Vibrations or earth tremors	28
4.2.601 Partially outdoor LPIT	28
5 Ratings.....	28
5.3 Rated insulation levels and voltages	28
5.3.5 Insulation requirements for secondary terminals	28
5.3.601 Rated auxiliary power supply voltage (U_{ar})	28
5.4 Rated frequency.....	29
5.5 Rated output	29
5.5.601 Rated burden (R_{br})	29
5.5.602 Standard values for the rated delay time (t_{dr})	29
5.6 Rated accuracy class	30
6 Design and construction	30
6.7 Mechanical requirements.....	30
6.11 Electromagnetic compatibility (EMC).....	30
6.11.3 Requirements for immunity	30
6.11.4 Requirement for transmitted overvoltages.....	32
6.11.601 Emission requirements	32
6.13 Markings	33
6.601 Requirements for optical transmitting system and optical output link.....	33
6.601.1 General	33
6.601.2 Optical connectors	33
6.601.3 Fibre optic terminal box.....	33
6.601.4 Total cable length	33
6.602 Requirements for electrical transmitting system and electrical wires for output link	33
6.602.1 Connectors	33
6.602.2 Earthing of the output cable.....	34
6.603 Signal-to-noise ratio	34
6.604 Failure detection and maintenance announcement	35
6.605 Operability	35
6.606 Reliability and dependability	35
6.607 Vibrations	35
7 Tests.....	36
7.1 General.....	36

7.1.2	List of tests	36
7.2	Type tests	37
7.2.1	General	37
7.2.2	Temperature-rise test.....	37
7.2.3	Impulse voltage withstand test on primary terminals.....	37
7.2.5	Electromagnetic compatibility (EMC) tests	37
7.2.6	Test for accuracy	41
7.2.601	Low-voltage component voltage withstand test	43
7.3	Routine tests.....	44
7.3.1	Power-frequency voltage withstand tests on primary terminals	44
7.3.4	Power-frequency voltage withstand tests on secondary terminals	45
7.3.5	Test for accuracy	45
7.3.601	Power-frequency voltage withstand test for low-voltage components	45
7.4	Special tests	45
7.4.601	Vibration tests.....	45
601	Information to be given with enquiries, tenders and orders.....	46
601.1	Designation.....	46
601.2	Dependability	46
Annex 6A (normative)	LPIT frequency response and accuracy requirements for harmonics.....	47
6A.1	General.....	47
6A.2	Requirements for noise and distortion.....	47
6A.3	Anti-aliasing filter requirements for LPIT using digital data processing.....	47
6A.4	LPIT accuracy requirements for harmonics and low frequencies	49
6A.4.1	General	49
6A.4.2	Measuring accuracy classes.....	49
6A.4.3	Accuracy class extension for quality metering and low bandwidth d.c. applications	50
6A.4.4	Protective accuracy classes	51
6A.4.5	Special high bandwidth protection accuracy class	51
6A.4.6	Special accuracy classes for d.c. coupled low-power voltage transformers	52
6A.5	Tests for accuracy versus harmonics and low frequencies.....	52
6A.6	Test arrangement and test circuit.....	53
6A.6.1	Test for accuracy for harmonics and low frequencies	53
6A.6.2	Type test for proper anti-aliasing	53
Annex 6B (informative)	Transient performances of low-power current transformers	55
6B.1	General.....	55
6B.2	Short-circuit currents in power systems.....	55
6B.3	Conventional current transformer equivalent circuit.....	58
6B.4	Types of current transformers.....	60
6B.4.1	Types of conventional CTs	60
6B.4.2	Types of low-power current transformers	61
6B.5	Transient performance of current transformers.....	62
6B.5.1	Transient performance of conventional current transformers	62
6B.5.2	Transient performance of low-power current transformers	63
6B.6	Summary	64
Annex 6C (informative)	Transient performances of low-power voltage transformers.....	65
6C.1	Overview	65

6C.2	General.....	65
6C.2.1	Defining primary and secondary voltages.....	65
6C.2.2	Normal service conditions of the network.....	65
6C.2.3	Abnormal service conditions of the network	66
6C.2.4	Rated secondary voltages	66
6C.2.5	Steady-state conditions	66
6C.3	Transient conditions	66
6C.3.1	Theoretical considerations	66
6C.3.2	Definition of transient error.....	73
6C.3.3	Test of transient performance.....	73
Annex 6D	(informative) Test circuits.....	78
6D.1	Test circuits for accuracy measurements in steady state for low-power current transformers.....	78
6D.2	Test circuits for accuracy measurements in steady state for low-power voltage transformers	81
Annex 6E	(informative) Graph explaining the accuracy requirements for multi-purpose low-power current transformer.....	84
Bibliography	85
Figure 601	– General block diagram of a single-phase LPIT.....	10
Figure 602	– Primary time constant T_p	19
Figure 603	– Duty cycles, single energization	20
Figure 604	– Duty cycles, double energization.....	21
Figure 605	– Examples of subassembly subjected to EMC tests – Usual structure used in HV AIS applications	38
Figure 606	– Examples of subassembly subjected to EMC tests – Usual structure used in MV applications	39
Figure 607	– Examples of subassembly subjected to EMC tests – Usual structure used in HV GIS applications	39
Figure 608	– Temperature cycle accuracy test.....	42
Figure 6A.1	– Digital data acquisition system example.....	48
Figure 6A.2	– Frequency response mask for metering accuracy class 1 ($f_r = 60 \text{ Hz}$, $f_s =$ 4 800 Hz)	49
Figure 6B.1	– Illustration of a fault in a power system	56
Figure 6B.2	– Short-circuit current a.c. and d.c. components	56
Figure 6B.3	– Symmetric fault current	57
Figure 6B.4	– Asymmetric fault current.....	57
Figure 6B.5	– Equivalent electrical circuit of a conventional CT.....	58
Figure 6B.6	– Flux-current characteristic for a conventional CT without remanence representation	59
Figure 6B.7	– Representation of hysteresis and remanent flux for a conventional CT	60
Figure 6B.8	– Comparison of flux-current characteristics for gapped and gapless CTs.....	62
Figure 6B.9	– Secondary current distorted due to the CT saturation	63
Figure 6B.10	– AC component for non-saturated and saturated CT	63
Figure 6C.1	– Schematic diagram explaining the trapped charge phenomena.....	69
Figure 6C.2	– Voltages during trapped charges phenomena	70
Figure 6C.3	– Modelization example of a simplified low-power voltage transformer.....	72

Figure 6C.4 – Testing arrangement for short time constant	76
Figure 6C.5 – Testing arrangement for long time constant	77
Figure 6C.6 – Typical waveform of $e(t)$ during test	77
Figure 6D.1 – Test circuit for analogue accuracy measurements in steady state	78
Figure 6D.2 – Test circuit for analogue accuracy measurements in steady state (alternative solution)	79
Figure 6D.3 – Test circuit for digital accuracy measurements in steady state	80
Figure 6D.4 – Test circuit for analogue accuracy measurements in steady state	81
Figure 6D.5 – Test circuit for analogue accuracy measurements in steady state (alternative solution)	82
Figure 6D.6 – Test circuit for digital accuracy measurements in steady state	83
Figure 6E.1 – Accuracy limits of a multi-purpose low-power current transformer	84
 Table 601 – Secondary terminal and low voltage component withstand capability	 28
Table 602 – Immunity requirements and tests	30
Table 603 – Connectors	34
Table 10 – List of tests	36
Table 6A.1 – Anti-aliasing filter	48
Table 6A.2 – Measuring accuracy classes	50
Table 6A.3 – Accuracy classes extension for quality metering and low bandwidth d.c. applications	50
Table 6A.4 – Accuracy classes extension for high bandwidth d.c. applications	51
Table 6A.5 – Protective accuracy classes	51
Table 6A.6 – Accuracy classes for special high bandwidth protection	52
Table 6A.7 – Accuracy classes for special d.c. coupled low-power voltage transformers	52
Table 6A.8 – Accuracy classes for harmonics	53
Table 6B.1 – Protective CTs	61
Table 6C.1 – Primary short circuit	71
Table 6C.2 – Trapped charges	71
Table 6C.3 – Limits of instantaneous voltage error for protective electronic voltage transformers in case of trapped charges reclose	71