

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Instrument transformers –
Part 1: General requirements**

**Transformateurs de mesure –
Partie 1: Exigences générales**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2023 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Instrument transformers –
Part 1: General requirements**

**Transformateurs de mesure –
Partie 1: Exigences générales**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 17.220.20

ISBN 978-2-8322-6940-4

<p>Warning! Make sure that you obtained this publication from an authorized distributor.</p> <p>Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.</p>
--

CONTENTS

FOREWORD.....	9
INTRODUCTION.....	12
1 Scope.....	14
2 Normative references	15
3 Terms, definitions, symbols and abbreviated terms.....	18
3.1 Terms and definitions.....	18
3.2 Symbols and abbreviated terms	18
4 Normal and special environmental conditions	19
4.1 General.....	19
4.2 Normal environmental conditions	20
4.2.1 Ambient air temperature	20
4.2.2 Altitude	20
4.2.3 Vibrations or earth tremors	20
4.2.4 Exposure to pollution	20
4.2.5 Other environmental conditions for indoor instrument transformers.....	20
4.2.6 Other environmental conditions for outdoor instrument transformers.....	21
4.2.7 IT with outdoor parts.....	21
4.3 Special environmental conditions	21
4.3.1 General	21
4.3.2 Altitude	21
4.3.3 Ambient temperature	21
4.3.4 Vibrations or earth tremors	22
4.3.5 Earthquakes	22
5 Ratings.....	22
5.1 General.....	22
5.2 Voltage ratings.....	22
5.2.1 Highest voltage for equipment (U_m).....	22
5.2.2 Power system earthing	25
5.2.3 Standard values for rated primary voltage (U_{pr}).....	25
5.2.4 Standard values for rated secondary voltage (U_{sr})	25
5.2.5 Rated auxiliary power supply voltage (U_{ar}).....	25
5.3 Current ratings.....	26
5.3.1 Standard values for rated primary current (I_{pr})	26
5.3.2 Standard values for rated secondary current (I_{sr})	26
5.3.3 Standard values for rated continuous thermal current (I_{cth}).....	26
5.3.4 Short-time current ratings	26
5.4 Dielectric ratings	27
5.4.1 General	27
5.4.2 Rated primary terminal insulation level	27
5.4.3 Other requirements for primary terminal insulation.....	27
5.4.4 Between-section insulation requirements	29
5.4.5 Insulation requirements for secondary terminals and low-voltage components	29
5.5 Rated frequency (f_r).....	30
5.6 Output ratings	30

5.6.1	Rated output for inductive instrument transformers and CVTs	30
5.6.2	Rated burden for LPITs	30
5.6.3	Standard values for the rated delay time for EITs (t_{dr})	30
5.7	Accuracy requirements	30
5.7.1	General	30
5.7.2	Rated accuracy classes	31
5.7.3	Accuracy class extension for harmonics	31
5.7.4	Accuracy requirements for harmonics	31
5.7.5	Harmonic requirements for LPIT protection accuracy classes	34
5.7.6	Anti-aliasing filter for EIT using digital data processing	34
6	Design and construction	36
6.1	Requirements for liquids used in equipment	36
6.1.1	General	36
6.1.2	Liquid quality	36
6.1.3	Liquid level indicator	37
6.1.4	Liquid tightness	37
6.2	Requirements for gases used in equipment	37
6.2.1	General	37
6.2.2	Gas quality	37
6.2.3	Gas monitoring device	37
6.2.4	Gas tightness	37
6.2.5	Pressure-relief device	38
6.3	Requirements for solid materials used in equipment	38
6.4	Requirements for temperature rise of parts and components	38
6.4.1	General	38
6.4.2	Influence of altitude on temperature rise	40
6.5	Requirements for earthing of equipment	41
6.5.1	General	41
6.5.2	Earthing of the enclosure	41
6.5.3	Electrical continuity	41
6.6	Requirements for the external insulation	41
6.6.1	Pollution	41
6.6.2	Altitude	42
6.7	Mechanical requirements	43
6.8	Multiple chopped impulses on primary terminals	44
6.9	Internal arc fault protection requirements	45
6.10	Degrees of protection by enclosures	45
6.10.1	General	45
6.10.2	Protection against access to hazardous parts and protection of the equipment against ingress of solid foreign objects and water	45
6.10.3	Protection of enclosure against mechanical impact under normal operating conditions	46
6.11	Electromagnetic compatibility (EMC)	46
6.11.1	General	46
6.11.2	Requirements for immunity	46
6.11.3	Requirements for emission	50
6.11.4	Requirements for transmitted overvoltage (TOV)	50
6.11.5	Requirements for radio interference voltage (RIV)	50
6.12	Corrosion	50

6.13	Markings	50
6.13.1	General	50
6.13.2	Terminal markings	51
6.13.3	Rating plate markings	51
6.14	Requirements for LPIT secondary terminal connection	52
6.14.1	Requirements for digital output connection	52
6.14.2	Requirements for analogue output connections	53
6.15	EIT secondary signal noise	54
6.16	Fire hazard	55
6.17	Pressure withstand of gas-filled enclosures	55
6.18	Failure detection of EIT	55
6.19	Operability	55
6.20	Reliability and dependability of electronic part of EIT	55
6.21	Vibration requirements	56
6.22	Storage climatic conditions withstand capability	56
7	Tests	56
7.1	General	56
7.1.1	Classification of tests	56
7.1.2	List of tests	57
7.1.3	Sequence of tests	58
7.1.4	Testing conditions	60
7.2	Type tests	60
7.2.1	General	60
7.2.2	Temperature rise test	61
7.2.3	Impulse voltage withstand test on primary terminals	62
7.2.4	Wet test for outdoor type instrument transformers	65
7.2.5	Electromagnetic compatibility (EMC) tests	66
7.2.6	Tests for accuracy	71
7.2.7	Verification of the degree of protection by enclosures	74
7.2.8	Enclosure tightness test at ambient temperature	74
7.2.9	Proof test for the gas-filled enclosure	74
7.2.10	Mechanical tests	75
7.2.11	Voltage withstand test of low-voltage components and secondary terminals	76
7.2.12	Storage climatic environmental tests	77
7.2.13	Vibration test	79
7.2.14	Durability of markings	80
7.2.15	Tests for accuracy for harmonics	80
7.2.16	Test for anti-aliasing	81
7.3	Routine tests	81
7.3.1	Power-frequency voltage withstand test on primary terminals	81
7.3.2	Partial discharge measurement	82
7.3.3	Power-frequency voltage withstand tests between sections	84
7.3.4	Power-frequency voltage withstand tests on secondary terminals	85
7.3.5	Power-frequency voltage withstand test for low-voltage components	85
7.3.6	Test for accuracy	85
7.3.7	Verification of markings	86
7.3.8	Enclosure tightness test at ambient temperature	86
7.3.9	Pressure test for the gas-filled enclosure	86

7.3.10	Measurement of capacitance and dielectric dissipation factor	87
7.4	Special tests	87
7.4.1	Multiple chopped impulse test on primary terminals	87
7.4.2	Transmitted overvoltage test.....	88
7.4.3	Internal arc fault test.....	92
7.4.4	Enclosure tightness test at low and high temperatures.....	93
7.4.5	Insulation resistance measurement on secondary terminals.....	94
7.4.6	Corrosion test.....	94
7.4.7	Fire hazard test	94
7.4.8	Thermo-mechanical endurance test	95
7.4.9	Vibration and shock tests.....	95
7.4.10	Tests for accuracy versus harmonics	98
7.4.11	Seismic qualification	98
7.5	Commissioning tests	98
7.5.1	General	98
7.5.2	Final installation inspection and tests	98
7.5.3	Gas dew point test.....	99
7.6	Sample tests	99
8	Rules for transport, storage, erection, operation and maintenance.....	99
8.1	General.....	99
8.2	Conditions during transport, storage and installation	99
8.3	Installation	99
8.3.1	General	99
8.3.2	Unpacking and lifting	99
8.3.3	Assembly.....	100
8.3.4	Mounting	100
8.3.5	Connections	100
8.3.6	Final installation inspection and tests	100
8.4	Operation.....	101
8.5	Maintenance	101
8.5.1	General	101
8.5.2	Responsibilities for the manufacturer	101
8.5.3	Responsibilities for the user.....	101
8.6	Failure report	102
9	Safety.....	102
10	Influence of products on the natural environment.....	102
Annex A (normative)	Identification of test specimen	103
A.1	General.....	103
A.2	Data.....	103
A.3	Drawings.....	103
Annex B (informative)	Recommendation for contents of failure reports.....	104
B.1	General.....	104
B.2	Content.....	104
Annex C (informative)	Fire hazard	106
C.1	Fire hazard	106
C.2	Fire hazard test.....	106
Annex D (informative)	Sample test.....	107
D.1	Sample test definition	107

D.2	Sample tests	107
Annex E (informative)	Technique used in temperature rise test of transformers to determine the thermal time constant by an experimental estimation.....	108
Annex F (informative)	Guidance for the extension of validity of type tests or special tests of instrument transformers	111
F.1	General.....	111
F.2	Information needed for extension of type test validity	111
F.3	Application of extension criteria	112
F.3.1	Dielectric tests.....	112
F.3.2	Temperature rise tests.....	112
F.3.3	Short-time and dynamic withstand current tests (current transformers)	113
F.3.4	Internal arc fault tests	114
F.3.5	Multiple chopped impulse test.....	114
Annex G (informative)	Guidance for the calculation of equivalent diameter in case of irregular shape of insulating part	116
G.1	General.....	116
G.2	Current transformers and earthed voltage transformers	116
G.3	Unearthed voltage transformers	117
Annex H (informative)	Test circuits	119
H.1	Test circuits for accuracy measurements in steady state for current transformers with analogue secondary signal.....	119
H.2	Test circuits for accuracy measurements in steady state for voltage transformers with analogue secondary signal.....	123
Annex I (normative)	Seismic qualification of instrument transformers	127
I.1	Scope	127
I.2	Seismic conditions	127
I.2.1	Time-history	127
I.2.2	Seismic severity of application.....	127
I.2.3	Superelevation factor (k_{se})	129
I.3	Seismic qualification information	129
I.3.1	Qualification options	129
I.3.2	General information provided by purchaser.....	129
I.4	Qualification procedure	129
I.4.1	General	129
I.4.2	Qualification by static calculation or dynamic analysis	130
I.4.3	Qualification by test	137
I.5	Validity of qualification	139
Bibliography	140
Figure 1	– General block diagram of single-phase LPITs	14
Figure 2	– Example of digital data acquisition system	34
Figure 3	– Example of frequency response mask for EIT with digital output	36
Figure 4	– Altitude correction factor for the temperature rise.....	40
Figure 5	– Factor m for the switching impulse voltage (U_{SIL}) withstand test.....	43
Figure 6	– Example structure used in HV AIS applications subjected to EMC tests	48
Figure 7	– Example of structure used in HV GIS applications subjected to EMC tests	49
Figure 8	– Duplex LC connector.....	53
Figure 9	– RIV measuring circuit.....	66

Figure 10 – Temperature cycle accuracy test	73
Figure 11 – Test circuit for partial discharge measurement	82
Figure 12 – Alternative circuit for partial discharge measurement	83
Figure 13 – Example of balanced test circuit for partial discharge measurement	83
Figure 14 – Voltage profile for partial discharge measurement	84
Figure 15 – Transmitted overvoltage measurement: test impulse waveforms	89
Figure 16 – Transmitted overvoltage measurement: primary test configuration for AIS equipment.....	90
Figure 17 – Transmitted overvoltage measurement: primary test configuration for GISs (CTs and VTs)	90
Figure 18 – Transmitted overvoltage measurement: example of correct secondary test connection for CT and VT	91
Figure 19 – Typical configuration for internal arc fault test	92
Figure E.1 – Graphical extrapolation to ultimate temperature rise	110
Figure G.1 – Shed dimensions	116
Figure G.2 – Examples of MV CTs and earthed VTs	117
Figure G.3 – Example of a CT with multiple insulator areas	117
Figure G.4 – Examples of unearthed VTs	118
Figure G.5 – Example of a VT with multiple insulator areas.....	118
Figure H.1 – Test circuit for accuracy measurements of inductive CTs.....	119
Figure H.2 – Test circuit for analogue accuracy measurements of LPCTs	120
Figure H.3 – Test circuit for analogue accuracy measurements of LPCTs (alternative solution).....	121
Figure H.4 – Test circuit for digital accuracy measurements of LPCTs	122
Figure H.5 – Test circuit for accuracy measurements of inductive VTs or CVTs	123
Figure H.6 – Test circuit for analogue accuracy measurements of LPVTs	124
Figure H.7 – Test circuit for analogue accuracy measurements of LPVTs (alternative solution).....	125
Figure H.8 – Test circuit for digital accuracy measurements of LPVTs	126
Figure I.1 – Record of time-history in real (3 dimensional)	127
Figure I.2 – Required response spectrum.....	128
Figure I.3 – Flowchart of qualification procedure	130
Figure I.4 – Measured deflection in free oscillation	132
Figure I.5 – Sketch of the parameters in static calculation.....	134
 Table 1 – Operating ambient temperature categories	 20
Table 2 – Rated primary terminal insulation levels for instrument transformers for AC applications	24
Table 3 – Insulation requirements for power supply terminals	26
Table 4 – Partial discharge test voltages and permissible levels for AC applications.....	28
Table 5 – Maximum values of $\tan\delta$	29
Table 6 – LPIT secondary terminal and low-voltage component terminal withstand capability	29
Table 7 – WB0 extension for harmonics	32
Table 8 – Accuracy class extensions for wide bandwidth applications	33

Table 9 – Harmonic requirements for protection accuracy classes	34
Table 10 – Anti-aliasing filter requirements	35
Table 11 – Permissible temporary leakage rates for gas systems	38
Table 12 – Limits of temperature and temperature rise for various parts, materials and dielectrics of instrument transformers	39
Table 13 – Specific creepage distances by site pollution severity class, as defined in the former publication	42
Table 14 – Maximum static withstand loads	44
Table 15 – Maximum gas-in-oil level in instrument transformers	44
Table 16 – Arc fault duration and performance criteria	45
Table 17 – Immunity requirements and test levels	47
Table 18 – Acceptance criteria for EMC immunity tests	49
Table 19 – Connectors	54
Table 20 – List of tests	57
Table 21 – Gas type and pressure during tests	58
Table 22 – Required routine tests	59
Table 23 – Modalities of application of the test loads to be applied to the primary terminals	76
Table 24 – Dry heat test, storage temperature	78
Table 25 – Cold test, storage temperature	78
Table 26 – Damp heat steady state test	79
Table 27 – Transmitted overvoltage limits	89
Table 28 – Shock severity levels	97
Table A.1 – Example of drawing to be submitted	103
Table C.1 – Fire hazard of electrotechnical products	106
Table F.1 – Extension criteria for dielectric withstand performance	112
Table F.2 – Extension criteria for temperature rise performance	113
Table F.3 – Extension criteria for short-time and dynamic withstand current performance	113
Table F.4 – Extension criteria for internal arc fault tests	114
Table F.5 – Extension criteria for multiple chopped impulse test	115
Table I.1 – Seismic severity levels	128
Table I.2 – External mass to simulate external forces	137
Table I.3 – Comparable seismic levels	139

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSTRUMENT TRANSFORMERS –

Part 1: General requirements

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

IEC 61869-1 has been prepared by IEC technical committee 38: Instrument transformers. It is an International Standard.

This second edition cancels and replaces the first edition published in 2007 and IEC 61869-6:2016. This edition constitutes a technical revision.

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

- a) merger with IEC 61869-6:2016;
- b) new scope: equipment for HV applications with a nominal voltage > 1 kV AC or 1,5 kV DC;
- c) new classification of some special tests as type tests or routine test;
- d) additional type tests, additional special tests and new clause for commissioning tests;
- e) new annexes E, F, G and I.

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

Draft	Report on voting
38/718/FDIS	38/722/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.

A list of all parts in the IEC 61869 series, published under the general title *Instrument transformers*, can be found on the IEC website. An overview of the planned or existing set of standards at the date of publication of this document is given below.

The updated list of standards issued by IEC TC 38 is available at the website: <https://www.iec.ch>

Product family standard	Product standard	Title
61869-1 General requirements	61869-2	Additional requirements for current transformers
	61869-3	Additional requirements for inductive voltage transformers
	61869-4	Additional requirements for combined transformers
	61869-5	Additional requirements for capacitor voltage transformers
	61869-7	Additional requirements for low-power voltage transformers
	61869-8	Additional requirements for low-power current transformers
	61869-9	Digital interface for instrument transformers
	61869-10	Additional requirements for current sensors
	61869-11	Additional requirements for voltage sensors
	61869-12	Additional requirements for combined low-power instrument transformers
	61869-13	Stand-alone merging unit (SAMU)
	61869-14	Additional requirements for current transformers for DC applications
	61869-15	Additional requirements for voltage transformers for DC applications
	61869-16	TEDS (transducer electronic data sheet) for instrument transformers
	61869-99	Glossary

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

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This document is the first revision of IEC 61869-1, defining common requirements for instrument transformers, applicable to all types or technologies.

Furthermore, the document is the result of a merger of IEC 61869-1:2007 (*General requirements*) and IEC 61869-6:2016 (*Additional general requirements for low-power instrument transformers*) with the aim of having one single document and simplify the comprehension for the reader of LPIT product-specific standards.

The main modifications of this revision are listed below:

- new scope: equipment for HV applications with a nominal voltage > 1 kV AC or 1,5 kV DC;
- transfer of the definitions to the TC 38 Glossary IEC 61869-99;
- ratings:
 - addition of HV insulation levels above 800 kV;
 - new DC insulation resistance requirements for secondary terminals;
 - additional accuracy class extensions for harmonics;
- design and construction:
 - additional mechanical requirements for EHV applications;
 - clarification of the altitude correction for external insulation and dielectric tests;
 - multiple chopped impulse test: definition of maximum gas-in-oil level before test;
 - internal arc fault protection: simplification of the acceptance criteria;
 - new requirements for storage climatic conditions withstand capability for LPIT;
- type tests:
 - temperature rise test: more accurate definition of the test duration;
 - lightning impulse test: new test procedure (15 impulses) for gas-insulated and resin-insulated instrument transformers, for $U_m \geq 300$ kV;
 - switching impulse test: to be performed in both polarities in case of gas-insulated instrument transformers;
 - chopped wave impulse test: moved from special test to type test;
 - test for accuracy: to be performed with regard to the temperature range and frequency;
 - mechanical test: moved from special test to type test;
 - new specification for storage climatic environmental tests;
- routine tests:
 - partial discharge measurement: addition of record of PD inception voltage and extinction voltage;
 - measurement of capacitance and $\tan\delta$: moved from special test to routine test;
- special tests:
 - transmitted overvoltage test: improved test procedure;
 - internal arc fault test: clarified test procedure;
 - new insulation resistance measurement on secondary terminals;
 - new test for resin insulated instrument transformers operating at low temperature;
 - vibration test: improvement and addition of a shock test for parts mechanically coupled to a circuit-breaker;
 - optional tests for accuracy versus harmonics and for anti-aliasing;

- commissioning tests (new clause):
 - new installation inspection;
 - gas dew point test moved from special test to commissioning tests;
 - new recommended insulation test on LV connection up to the LV cubicle;
- rules for transport, storage, erection, operation and maintenance:
 - new mandatory rules for user and manufacturer;
 - new conditions for transportation and storage;
- new annexes:
 - 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 I (normative): seismic qualification of instrument transformers.

INSTRUMENT TRANSFORMERS –

Part 1: General requirements

1 Scope

This part of IEC 61869 is applicable to newly manufactured instrument transformers intended for applications where the nominal voltage is higher than 1 kV AC or 1,5 kV DC, with an analogue or a digital secondary signal for measuring, protection and control purposes, with rated frequencies from 15 Hz to 400 Hz, or for DC applications.

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

The general requirements for instrument transformers for applications in LV systems (nominal voltage ≤ 1 kV AC or $\leq 1,5$ kV DC) are covered by IEC 61869-201.

This part of IEC 61869 is a product family standard and covers general requirements only. For each type of instrument transformer, the product standard is composed of this document and the relevant specific product standard.

This part of IEC 61869 contains the requirements for the limits of the errors both for analogue and digital secondary signals. The other characteristics of a digital interface for instrument transformer are standardised in IEC 61869-9 as an application of the IEC 61850 horizontal standard series, covering communication networks and systems for power utility automation.

This part of IEC 61869 considers bandwidth requirements. The accuracy requirements on harmonics and requirements for the anti-aliasing filter are specified in 5.7.

In the case of an LPIT, the general block diagram of single-phase devices is given in Figure 1.

According to the technology, it is not always necessary that all parts described in Figure 1 be included in the instrument transformer.

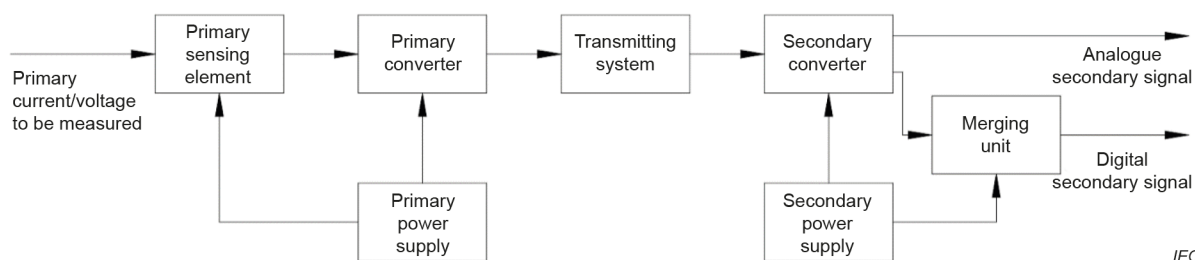


Figure 1 – General block diagram of single-phase LPITs

NOTE 2 A secondary power supply can be combined with a primary power supply or with a power supply of other instrument transformers.