

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Instrument transformers –
Part 11: Additional requirements for low-power passive voltage transformers**

**Transformateurs de mesure –
Partie 11: Exigences supplémentaires pour les transformateurs de tension
passifs de faible puissance**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2017 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 Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

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 also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

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: csc@iec.ch.

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.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

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 aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

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

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Instrument transformers –
Part 11: Additional requirements for low-power passive voltage transformers**

**Transformateurs de mesure –
Partie 11: Exigences supplémentaires pour les transformateurs de tension
passifs de faible puissance**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 17.220.20

ISBN 978-2-8322-5130-0

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

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	8
3.1 General definitions.....	8
3.2 Definitions related to dielectric ratings and voltages.....	10
3.4 Definitions related to accuracy	10
3.7 Index of abbreviations and symbols	11
5 Ratings.....	12
5.3 Rated insulation levels and voltages	12
5.5 Rated output.....	12
5.6 Rated accuracy class.....	12
5.1101 Standard values of rated voltages.....	15
5.1102 Standard values of rated voltage factor F_V	15
6 Design and construction	16
6.11 Electromagnetic compatibility (EMC).....	16
6.13 Markings.....	16
6.601 Requirements for optical transmitting system and optical output link	17
6.602 Requirements for electrical transmitting system and electrical wires for output link.....	17
6.603 Signal-to-noise ratio.....	17
6.604 Failure detection and maintenance announcement.....	18
6.605 Operability	18
6.606 Reliability and dependability	18
6.1101 Transient response requirements.....	18
6.1102 Voltage limitation device requirements.....	18
7 Tests.....	18
7.1 General.....	18
7.2 Type tests.....	20
7.3 Routine tests.....	23
7.4 Special tests.....	24
601 Information to be given with enquiries, tenders and orders	26
601.1 Designation.....	26
601.2 Dependability.....	27
Annex 11A (normative) Tests for impact of electric field from other phases.....	28
11A.1 General.....	28
11A.2 Test setup.....	28
11A.3 Test procedure.....	29
Annex 11B (informative) Designation of accuracy class when using corrected transformation ratio and ratio correction factor.....	30
11B.1 General.....	30
11B.2 Designation of accuracy class based on rated transformation ratio	31
11B.3 Designation of accuracy class based on individual ratio correction factor.....	31
Annex 11C (informative) Types of divider principles covered by this part of IEC 61869.....	32
Bibliography.....	33

Figure 1101 – General block diagram of a single-phase low-power passive voltage transformer	7
Figure 1102 – Terminal markings for passive LPVT	16
Figure 1103 – RC-divider with external low-voltage part outside the main housing	22
Figure 1104 – Connection for voltage withstand test of the external low-voltage part of a divider	23
Figure 1105 – Step response time of a passive LPVT	26
Figure 11A.1 – Test setup for LPVT used in air-insulated substations	28
Figure 11B.1 – Accuracy class designation improved, based on individual ratio correction factor CF_U	31
Figure 11C.1 – Divider principles	33
Table 1101 – Limits of ratio error and phase error for measuring LPVT	13
Table 1102 – Limits of ratio error and phase error for protection and multipurpose LPVT	14
Table 1103 – Standard values of rated voltage factors	15
Table 1104 – Pin assignment for RJ45 connectors used in passive LPVT	17
Table 10 – List of tests	19
Table 1105 – Burden values for basic accuracy tests	21
Table 1106 – Designation of a passive LPVT	27

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSTRUMENT TRANSFORMERS –**Part 11: Additional requirements for low-power
passive voltage transformers**

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, accept 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.

International Standard IEC 61869-11 has been prepared by IEC technical committee 38: Instrument transformers.

This first edition of IEC 61869-11, together with IEC 61869-1 and IEC 61869-6, cancels and replaces the relevant clauses or subclauses of the first edition of IEC 60044-7, published in 1997¹ and the first edition of IEC 60044-8, published in 2002¹. This edition constitutes a technical revision.

¹ IEC 60044-7 and IEC 60044-8 will eventually be replaced by the IEC 61869 series, but until all the relevant parts of the IEC 61869 series will be published, these two standards are still in force.

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

FDIS	Report on voting
38/549/FDIS	38/552/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.

This standard is Part 11 of IEC 61869, published under the general title *Instrument transformers*.

This Part 11 is to be read in conjunction with, and is based on, IEC 61869-1:2007, *General requirements* and IEC 61869-6:2016, *Additional general requirements for low power instrument transformers* – however, the reader is encouraged to use the most recent edition of these documents.

This Part 11 follows the structure of IEC 61869-1:2007 and IEC 61869-6:2016 and supplements or modifies the corresponding clauses.

When a particular subclause of Part 1 or Part 6 is not mentioned in this part Part 11, that subclause applies. When this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 or Part 6 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 1101 are additional to those in Part 1 and Part 6;
- additional annexes are lettered 11A, 11B, etc.

An overview of the planned 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: www.iec.ch.

PRODUCT FAMILY STANDARDS	PRODUCT STANDARD	PRODUCTS	OLD STANDARD	
IEC 61869-1 GENERAL REQUIREMENTS	IEC 61869-2	ADDITIONAL REQUIREMENTS FOR CURRENT TRANSFORMERS	IEC 60044-1 IEC 60044-6	
	IEC 61869-3	ADDITIONAL REQUIREMENTS FOR INDUCTIVE VOLTAGE TRANSFORMERS	IEC 60044-2	
	IEC 61869-4	ADDITIONAL REQUIREMENTS FOR COMBINED TRANSFORMERS	IEC 60044-3	
	IEC 61869-5	ADDITIONAL REQUIREMENTS FOR CAPACITIVE VOLTAGE TRANSFORMERS	IEC 60044-5	
	IEC 61869-6 ADDITIONAL GENERAL REQUIREMENTS FOR LOW-POWER INSTRUMENT TRANSFORMERS	IEC 61869-7	ADDITIONAL REQUIREMENTS FOR ELECTRONIC VOLTAGE TRANSFORMERS	IEC 60044-4
		IEC 61869-8	SPECIFIC REQUIREMENTS FOR ELECTRONIC CURRENT TRANSFORMERS	IEC 60044-8
		IEC 61869-9	DIGITAL INTERFACE FOR INSTRUMENT TRANSFORMERS	
		IEC 61869-10	ADDITIONAL REQUIREMENTS FOR LOW-POWER PASSIVE CURRENT TRANSFORMERS	
		IEC 61869-11	ADDITIONAL REQUIREMENTS FOR LOW-POWER PASSIVE VOLTAGE TRANSFORMERS	IEC 60044-7
		IEC 61869-12	ADDITIONAL REQUIREMENTS FOR COMBINED ELECTRONIC INSTRUMENT TRANSFORMER OR COMBINED LOW-POWER PASSIVE INSTRUMENT TRANSFORMERS	
		IEC 61869-13	STAND-ALONE MERGING UNIT	
		IEC 61869-14	ADDITIONAL REQUIREMENTS FOR CURRENT TRANSFORMERS FOR DC APPLICATIONS	
	IEC 61869-15	ADDITIONAL REQUIREMENTS FOR VOLTAGE TRANSFORMERS FOR DC APPLICATIONS		

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://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 publication 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

Low-power passive voltage transformers are based on the voltage divider principle. They can be built for example as resistive dividers, capacitive dividers or resistive-capacitive dividers. Annex 11C shows the schematic diagram of the different dividers.

According to a general block diagram given in Figure 601 of IEC 61869-6:2016, the low-power passive voltage transformers do not use an active primary converter (i.e. without any active electronic component); therefore, there is no need for primary power supply. Additionally, neither the secondary converter nor the secondary power supply is used.

The general block diagram of a low-power passive voltage transformer is given in Figure 1101.

The applied technology decides which part is necessary for the realization of a low-power passive voltage transformer, i.e. it is not necessary that the transmitting cable or primary converter described in Figure 1101 be included in the low-power passive voltage transformer.

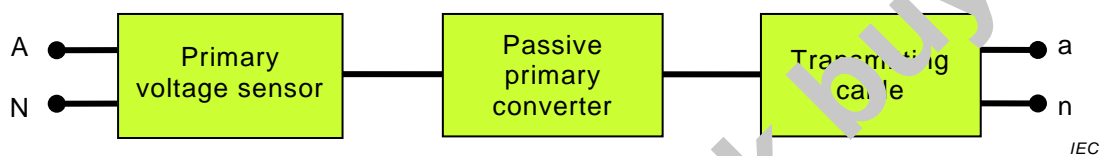


Figure 1101 – General block diagram of a single-phase low-power passive voltage transformer.

INSTRUMENT TRANSFORMERS –

Part 11: Additional requirements for low-power passive voltage transformers

1 Scope

This part of IEC 61869 is a product standard and covers only additional requirements for low-power passive voltage transformers (passive LPVT). The product standard for low-power passive voltage transformers is composed of IEC 61869-1, along with IEC 61869-6 and this document with specific requirements.

This document is applicable to newly manufactured low-power passive voltage transformers with analogue output having rated frequencies from 15 Hz to 100 Hz for use with electrical measuring instruments or electrical protective devices.

This document covers low-power passive voltage transformers used for measurement or protection and low-power passive voltage transformers used for both measurement and protection.

Low-power passive voltage transformers have analogue output only (for digital output or for technology using any kind of active electronic components refer to future IEC 61869-7²). Such low-power passive voltage transformers can include the secondary signal cable (transmitting cable). The secondary voltage of the low-power passive voltage transformer is proportional to the primary voltage. Derivative output signals are not within the scope of this 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.

Clause 2 of IEC 61869-1:2016 is applicable with the following additions:

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61869-1 and IEC 61869-6 apply with the following additions and modifications:

3.1 General definitions

3.1.613 transmitting system

Definition 3.1.613 of IEC 61869-6:2016 is applicable with the following addition:

² Under preparation.