

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Instrument transformers –**  
**Part 13: Stand-alone merging unit (SAMU)**  
**(standards.iteh.ai)**

**Transformateurs de mesure –**  
**Partie 13: Concentrateur autonome (SAMU)**  
**(standards.iteh.ai)**

IEC 61869-13:2021  
<https://standards.iteh.ai/catalog/standards/sist/23e66639-f390-4ec1-9e06-f9f68a19d592/iec-61869-13-2021>



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2021 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  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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](http://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 It also gives information on projects, replaced and withdrawn publications.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 online collection - [oc.iec.ch](http://oc.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.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://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.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://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](mailto:sales@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.

#### Recherche de publications IEC - [webstore.iec.ch/advsearchform](http://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 online collection - [oc.iec.ch](http://oc.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.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://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.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Service Clients - [webstore.iec.ch/csc](http://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](mailto:sales@iec.ch).

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Instrument transformers –**  
**Part 13: Stand-alone merging unit (SAMU)**

**Transformateurs de mesure –**  
**Partie 13: Concentrateur autonome (SAMU)**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 17.220.20

ISBN 978-2-8322-9284-6

**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.....	9
2 Normative references .....	9
3 Terms and definitions .....	11
4 Normal and special service conditions .....	14
5 Ratings.....	15
6 Design and construction .....	23
7 Tests .....	32
8 Rules for transport, storage, erection, operation and maintenance.....	49
9 Safety.....	49
Annex 13A (informative) Measurement chain accuracy class considerations .....	50
Annex 13B (informative) Measurement examples of switching and lightning surge voltage in gas-insulated switchgear .....	52
Annex 13C (normative) Low-power instrument transformer inputs .....	63
Bibliography.....	67
Figure 1301 – Stand-alone merging unit (functional concept example).....	7
Figure 1302 – Stand-alone merging unit application example.....	7
Figure 1303 – Illustration of the SAMU position in relation to other devices and standards in the functional chain.....	8
Figure 1304 – Specified input current time constant $T_I$ .....	13
Figure 1305 – Dynamic range concept example .....	19
Figure 604 (modified) – Examples of subassembly subjected to EMC tests – Usual structure used in HV AIS applications .....	34
Figure 1306 – Gradual shutdown – Startup test .....	38
Figure 1307 – C-O-C-O duty cycle .....	39
Figure 13A.1 – SAMU application example .....	50
Figure 13B.1 – Constructional example of GIS with typical surge voltage sources.....	52
Figure 13B.2 – Measured 550 kV GIS construction .....	53
Figure 13B.3 – Measurement results showing a switching surge peak voltage magnitude caused by the DS operation in Figure 13B.2 .....	54
Figure 13B.4 – Measured 275 kV GIS construction .....	55
Figure 13B.5 – Switching and lightning surge voltage waveforms.....	56
Figure 13B.6 – Switching surge voltage measurement setup on a 550 kV GIS with/without an insulating flange surge absorber .....	57
Figure 13B.7 – Switching surge voltage measurement results when the DS was operated with/without the surge absorber.....	58
Figure 13B.8 – CT secondary circuit configuration for the 500 kV GIS .....	59
Figure 13B.9 – DS control circuit configuration for the 500 kV GIS test.....	59
Figure 13B.10 – Waveforms of switching surge voltage at measured point I (see Table 13B.3).....	60
Figure 13B.11 – Block diagram of the electronic VT with amplifier tested in the 500 kV GIS system .....	61

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

IEC 61869-13:2021

<https://standards.iteh.ai/catalog/standards/sist/23e66639-f390-4ec1-9e06-1708a19d392/iec-61869-13-2021>

1708a19d392/iec-61869-13-2021

Figure 13B.12 – Lightning surge voltage as a function of surge absorbing capacitor value...	61
Figure 13B.13 – Lightning surge voltage as a function of coaxial cable length .....	62
Table 1301 – Insulation requirements for analogue inputs.....	16
Table 1302 – Measuring accuracy class 0,05.....	17
Table 1303 – Limits of current error and phase error for SAMU measuring accuracy current channels .....	18
Table 1304 – Limits of current errors for SAMU TPM class rated protection accuracy current channels .....	20
Table 1305 – Limits of voltage error and phase error for SAMU voltage channels .....	21
Table 1306 – SAMU TCTR class settings.....	23
Table 1307 – SAMU TVTR class settings.....	23
Table 1308 – Immunity requirements and tests .....	24
Table 1309 – Acceptance criteria for EMC immunity tests.....	25
Table 1310 – Radiated emissions tests .....	27
Table 1311 – Conducted emissions tests .....	27
Table 1312 – SAMU rating plate markings .....	28
Table 1313 – Ratings defined in accordance with IEC 61850-7-4 .....	32
Table 10 – List of tests.....	33
Table 1314 – Dry-heat test – Operational.....	44
Table 1315 – Cold test – Operational.....	44
Table 1316 – Dry-heat test at maximum storage temperature .....	45
Table 1317 – Cold test at minimum storage temperature .....	45
Table 1318 – Change of temperature (Cyclic temperature test).....	46
Table 1319 – Damp heat steady state test .....	47
Table 1320 – Cyclic temperature with humidity test.....	48
Table 13A.1 – Combined accuracy class table .....	50
Table 13B.1 – Measurement results showing switching and lightning surge voltage recorded for the setup in Figure 13B.4 .....	55
Table 13B.2 – Measurement results of switching surge voltage on CT secondary circuit.....	59
Table 13B.3 – Measurement results showing the switching surge voltage coupling to the DS control circuit .....	59
Table 13C.1 – ITRat setting units.....	65
Table 13C.2 – SAMU rating plate marking modifications .....	65

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## INSTRUMENT TRANSFORMERS –

## Part 13: Stand-alone merging unit (SAMU)

## 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.

International Standard IEC 61869-13 has been prepared by IEC technical committee 38: Instrument transformers.

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

FDIS	Report on voting
38/634/FDIS	38/640/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.

A list of all parts in the IEC 61869 series, published under the general title *Instrument transformers*, can be found on the IEC website.

This Part 13 is to be used in conjunction with IEC 61869-9:2016, *Digital interface for instrument transformers*, and IEC 61869-6:2016, *Additional general requirements for low-power instrument transformers*, which, in turn, are based on IEC 61869-1:2007, *General requirements*.

This Part 13 follows the structure of IEC 61869-1:2007 and IEC 61869-6:2016 and supplements or modifies their corresponding clauses.

When a particular clause/subclause of Part 1 or Part 6 is not mentioned in this Part 13, that subclause applies. When this document 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 note, the following numbering system is used:

- clauses, subclauses, tables, figures and notes that are numbered starting from 1301 are additional to those in Part 1 and Part 6;
- additional annexes are lettered 13A, 13B, 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](http://www.iec.ch).

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 61869-13:2021](https://standards.iteh.ai/catalog/standards/sist/23e66639-f390-4ec1-9e06-f9f68a19d592/iec-61869-13-2021)

<https://standards.iteh.ai/catalog/standards/sist/23e66639-f390-4ec1-9e06-f9f68a19d592/iec-61869-13-2021>

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

iTeh STANDARD PREVIEW  
(standards for sale)  
<https://standards.iteh.ai/catalog/standards/61869-13-2021-60044-1-2006-9f68a19d592/ie>

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 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.**

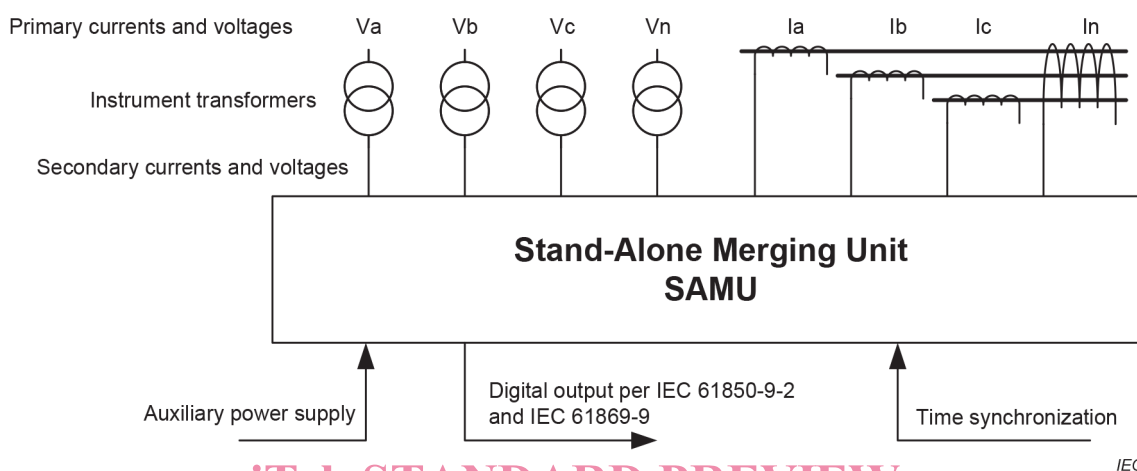


## INTRODUCTION

**General**

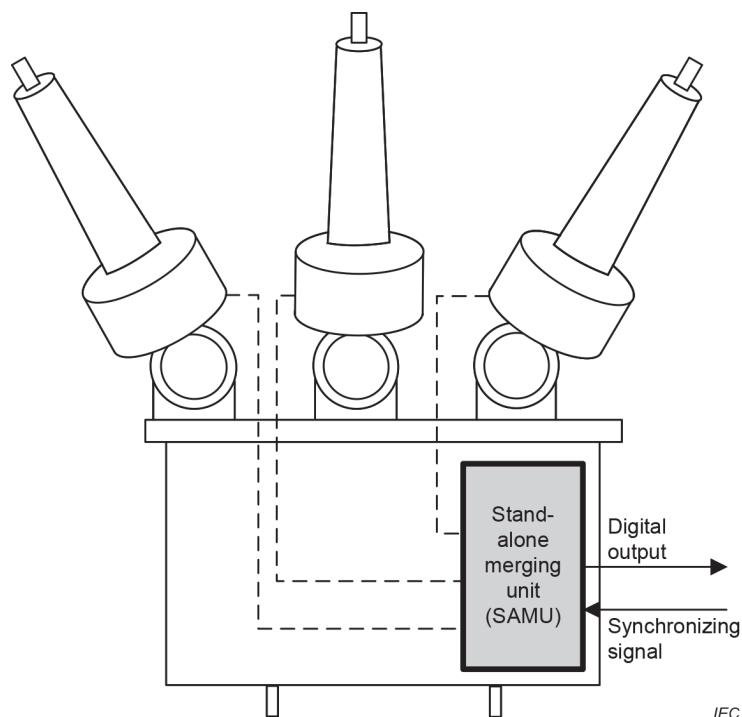
This document is an IEC 61869 series product standard which defines additional requirements for a stand-alone merging unit (SAMU).

The general block diagram showing a typical SAMU application example is given in Figure 1301.



**Figure 1301 – Stand-alone merging unit (functional concept example)**

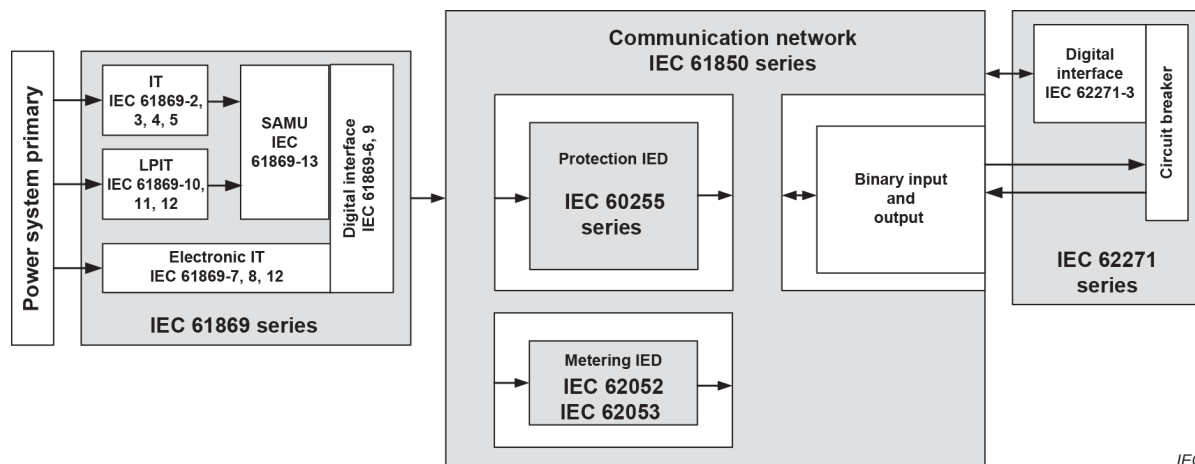
An application example showing a three-phase dead tank circuit breaker equipped with bushing type current transformers and a stand-alone merging unit mounted inside the breaker control cabinet is shown in Figure 1302.



**Figure 1302 – Stand-alone merging unit application example**

The SAMU output may be used by many devices and is therefore of interest to multiple technical committees in addition to TC 38, for example: TC 57: Power systems management and

associated information exchange, TC 95: Measuring relays and protection equipment, TC 13: Electrical energy measurement and control, TC 85: Measuring equipment for electrical and electromagnetic quantities, and TC 17: High-voltage switchgear and controlgear, as shown in Figure 1303.



**Figure 1303 – Illustration of the SAMU position in relation to other devices and standards in the functional chain**

**Position of this document in relation to IEC 61850 (all parts) of TC 57**

IEC 61850 (all parts) is a series used to define various aspects of power utility communications. Its applicability to this document is inherited through IEC 61869-9 which defines applicable sample rates and a digital interface in accordance with IEC 61850-9-2 and related standards.

<https://standards.iteh.ai/catalog/standards/sist/23e66639-f390-4ec1-9e06-10a13d52-icc61869-9-1-21>

**Position of this document in relation to IEC 60255 (all parts) of TC 95**

IEC 60255 (all parts) standardizes the design and performance aspects applicable to measuring relays and protection equipment used in the various fields of electrical engineering. Since the SAMU is an integral part of the digital substation-based protection system, its EMC performance and environmental aspects are considered for harmonization with IEC 60255-1, IEC 60255-26 and safety aspects defined in IEC 60255-27. SAMU outputs are inputs for protection functions covered by the IEC 60255-1xx series.

**Position of this document in relation to IEC 62052 (all parts) and IEC 62053 (all parts) of TC 13**

IEC 62052 (all parts) and IEC 62053 (all parts) provide standardization in the field of AC and DC electrical energy measurement and control. Since the SAMU digital output may be used as input to energy measurement devices, its accuracy and EMC performance aspects should be considered.

**Position of this document in relation to IEC 62271 (all parts) of TC 17**

IEC 62271 (all parts) applies to AC switchgear and controlgear designed for indoor and/or outdoor installation and for operation at service frequencies up to and including 60 Hz on systems having rated voltages above 1 000 V. Similar to IEC 62271-3 which defines the switchgear interface based on IEC 61850, this document defines the SAMU which may be installed inside the same switchgear cabinet and is therefore subject to the same environmental stress.

## INSTRUMENT TRANSFORMERS –

### Part 13: Stand-alone merging unit (SAMU)

#### 1 Scope

Clause 1 of IEC 61869-1:2007 is replaced by the following:

This part of IEC 61869 is a product standard and covers only additional requirements for stand-alone merging units (SAMUs) used for AC applications having rated frequencies from 15 Hz to 100 Hz. The digital output format specification is not covered by this document; it is standardized in IEC 61869-9 as an application of IEC 61850, which specifies the power utility communication architecture.

This document covers SAMUs having standardized analogue inputs (for example: 1 A, 5 A,  $3,25\text{ V} / \sqrt{3}$  or  $100\text{ V} / \sqrt{3}$ ) provided by instrument transformers compliant with relevant product standards (e.g. IEC 61869-2 to IEC 61869-5, IEC 61869-7, IEC 61869-8, IEC 61869-10, IEC 61869-11, IEC 60044-1 to IEC 60044-6, IEC 60185, IEC 60186, IEEE C57.13), and aims to convert them to the digital output compliant with IEC 61869-9. Other input and output types are outside the scope of this document. Appropriate SAMU functionality can be combined with switchgear controller functionality defined in IEC 62271-3 or other IED functionality defined in IEC 60255 (all parts).

(standards.iteh.ai)

Cyber security requirements are outside the scope of this document and are covered by the IEC 62351 series.

[IEC 61869-13:2021](https://standards.iteh.ai/catalog/standards/sist/23e66639-f390-4ec1-9e06-f9f68a19d592/iec-61869-13-2021)

<https://standards.iteh.ai/catalog/standards/sist/23e66639-f390-4ec1-9e06-f9f68a19d592/iec-61869-13-2021>

#### 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 61869-1:2007 is applicable with the following additions:

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 + 12 h cycle)*

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60255-27:2013, *Measuring relays and protection equipment – Part 27: Product safety requirements*

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*  
IEC 61000-4-3:2006/AMD1:2007  
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8 Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-9:2016, *Electromagnetic compatibility (EMC) – Part 4-9 Testing and measurement techniques – Impulse magnetic field immunity test*

IEC 61000-4-10:2016, *Electromagnetic compatibility (EMC) – Part 4-10 Testing and measurement techniques – Damped oscillatory magnetic field immunity test*

IEC 61000-4-11:2020, *Electromagnetic compatibility (EMC) – Part 4-11 Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61000-4-13, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests*

IEC 61000-4-16:2015, *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*

IEC 61000-4-17:1999, *Electromagnetic compatibility (EMC) – Part 4-17: Testing and measurement techniques – Ripple on d.c. input power port immunity test*  
IEC 61000-4-17:1999/AMD1:2001  
IEC 61000-4-17:1999/AMD1:2008

IEC 61000-4-18:2006, *Electromagnetic compatibility (EMC) – Part 4-18 Testing and measurement techniques – Damped oscillatory wave immunity test*,  
IEC 61000-4-18:2006/AMD1:2010

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*

IEC 61850-7-4, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

IEC 61869-1:2007, *Instrument transformers – Part 1: General requirements*

IEC 61869-2:2012, *Instrument transformers – Part 2: Additional requirements for current transformers*

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

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

IEC 61869-10:2017, *Instrument transformers – Part 10: Additional requirements for low-power passive current transformers*

IEC 61869-11:2017, *Instrument transformers – Part 11: Additional requirements for low-power passive voltage transformers*

CISPR 11, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

CISPR 32:2015/AMD1:2019

### 3 Terms and definitions

Clause 3 of IEC 61869-1:2007, Clause 3 of IEC 61869-6:2016 and Clause 3 of IEC 61869-9:2016 apply, with the following additions:

#### 3.1 General terms and definitions

##### 3.1.1301

##### **port**

access to a device or network where electromagnetic energy or signals may be supplied or received or where the device or network variables may be observed or measured

EXAMPLE Auxiliary power supply terminals.

[SOURCE: IEC 60050-131:2002, 131-12-60, modified – Added example, deleted note.]

##### 3.1.1302

##### **digital channel**

##### **channel**

digital representation describing a single measurement quantity

EXAMPLE Phase current, phase voltage.

Note 1 to entry: Channels are individually rated and may contain a mathematical combination of multiple inputs (e.g. calculated neutral current).

Note 2 to entry: Multiple channels are grouped into a single stream and presented at the device digital output.

##### 3.1.1303

##### **digital stream**

##### **stream**

group of channels brought together into a single digital message

Note 1 to entry: All channels in the stream share a common time stamp and a common sample rate in accordance with IEC 61869-9.

**3.1.1304****channel group**

set of channels with a common specification

Note 1 to entry: For example, set of three phase voltages or currents. All channels in the group share the same set of rating plate specifications. If the neutral voltage or current channel shares the same specification as the individual phases, then it is included in the same group.

**3.1.1305****analogue input**

device input intended to be fed by the secondary circuit of an instrument transformer with analogue secondary signal

**3.2 Terms and definitions related to dielectric ratings and voltages****3.2.1301****rated input voltage**
 $U_{ir}$ 

RMS value of the voltage on which the performance of a device voltage input is based

Note 1 to entry: This value may be defined as a range.

**3.2.1302****rated voltage factor**
 $F_V$ 

multiplying factor to be applied to the rated primary voltage to determine the maximum voltage at which a transformer must comply with the relevant thermal requirements for a specified time and with the relevant accuracy requirements

Note 1 to entry: For SAMUs, the term primary voltage is understood as the input voltage.

[SOURCE: IEC 60050-321:1986, 321-03-12, modified – The symbol and the note have been added.]

**3.2.1303****rated insulation voltage**

RMS withstand voltage value assigned by the manufacturer to the equipment or to a part of it, characterizing the specified (long-term) withstand capability of its insulation

Note 1 to entry: The rated insulation voltage is not necessarily equal to the rated voltage of equipment which is primarily related to functional performance.

[SOURCE: IEC 60050-312:2014, 312-06-02, modified – Deleted "rated value of the" and the word "value" added.]

**3.3 Terms and definitions related to current ratings****3.3.1301****rated primary current**
 $I_{pr}$ 

RMS value of the primary current on which the performance of the instrument transformer is based

Note 1 to entry: A SAMU is not connected to the power system primary. For SAMUs, the term rated primary current is interpreted as rated input current.

**3.3.1302****rated short-circuit current**
 $I_{psc}$ 

RMS value of the AC component of a transient current on which the accuracy performance of the device is based

Note 1 to entry: While  $I_{th}$  is related to the thermal limit,  $I_{psc}$  is related to the accuracy limit. Usually,  $I_{psc}$  is smaller than  $I_{th}$ .

Note 2 to entry: For current transformers rated short-circuit current is applicable to the primary winding. In the case of SAMUs, the rated short-circuit current is applicable to the current input.

### 3.3.1303 rated symmetrical short-circuit current factor

$K_{ssc}$

ratio of the rated short-circuit current to the rated primary current

Note 1 to entry: SAMU inputs are not connected to the power system primary. Rated primary current in the case of SAMUs is interpreted as the rated input current.

$$K_{ssc} = \frac{I_{psc}}{I_{pr}}$$

## 3.4 Terms and definitions related to accuracy

### 3.4.1301 specified input current time constant

$T_1$

specified value of the time constant of the DC component of the rated short-circuit current  $I_{psc}$  on which the transient performance of the device is based

Note 1 to entry:  $T_1$  is typically a result of the power system primary time constant  $T_p$  combined with the CT secondary loop time constant  $T_s$  (both are defined in IEC 61869-2). An example is shown in Figure 1304.  $T_1$  is used to specify the dynamic response performance.

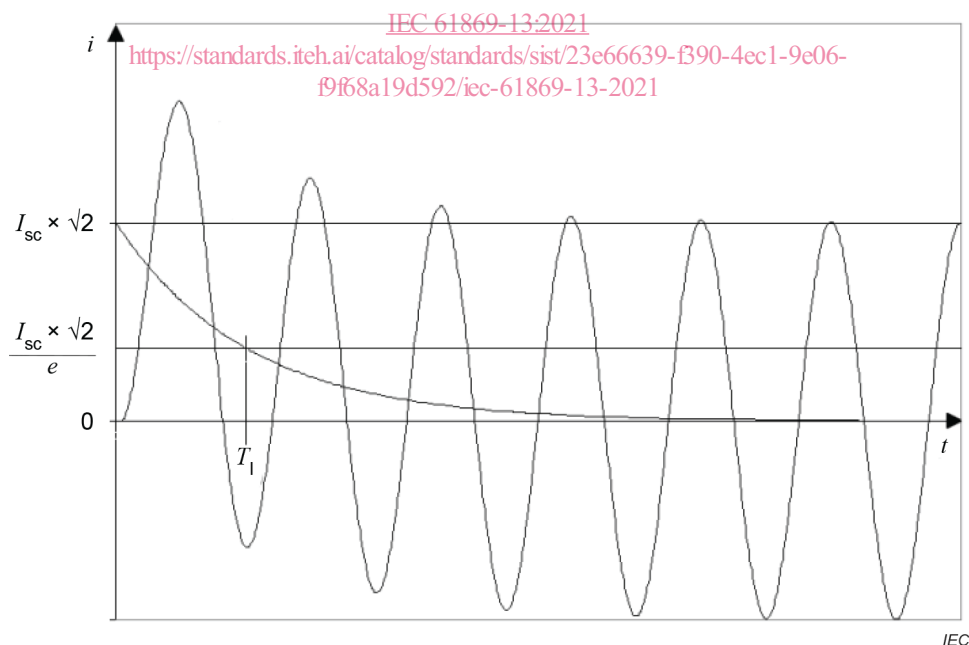


Figure 1304 – Specified input current time constant  $T_1$

### 3.4.1302 input filter time constant

$T_{sec}$

value of the device AC coupled input circuit high-pass filter cut-off frequency  $f_c$  reported in the form of a time constant