

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

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



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
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 It also gives information on projects, replaced and withdrawn publications.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 online collection - 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.

Electropedia - 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.

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 online collection - 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.

Electropedia - 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.

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

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 length62

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.