

ISBN 978-0-626-41459-7

SANS 62053-22:2022

Edition 2

IEC 62053-22 :2020

Edition 2

SOUTH AFRICAN NATIONAL STANDARD

Electricity metering equipment — Particular requirements

Part 22: Static meters for AC active energy (classes 0,1S, 0,2S and 0,5S)

This national standard is the identical implementation of IEC 62053-22:2020, and is adopted with the permission of the International Electrotechnical Commission.

WARNING

This document references other documents normatively.

Published by the South African Bureau of Standards
1 Dr Lategan Road Groenkloof ☒ Private Bag X191 Pretoria 0001
Tel: +27 12 428 7911 Fax: +27 12 344 1568
www.sabs.co.za
© SABS

SABS

This page has been left blank intentionally



COPYRIGHT PROTECTED DOCUMENT

© SABS

In terms of the Standards Act 8 of 2008, the copyright in all South African National Standards or any other publications published by the SABS Standards Division, vests in the SABS. Any use of South African National Standards is limited to use specifically prescribed by the SABS. In the case of a South African National Standard based on an international standard, ownership of the copyright vests in the organization from which the SABS adopted the standard, whether it be under licence or membership agreement. The SABS is obliged to protect such copyright and is authorized to make the relevant international organization aware of any misuse thereof. Unless exemption has been granted, no extract or full text of any South African National Standard may be copied, reproduced, stored in a retrieval system or transmitted in any form or by any means without prior written permission from the SABS Standards Division. This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any purpose other than implementation, prior written permission must be obtained.

Details, advice and limitations of use can be obtained from the Manager: Standards Sales and Information Services. Tel: +27 (0) 12 428 6883 email: sales@sabs.co.za

SABS – Standards Division

The objective of the SABS Standards Division is to develop, promote and maintain South African National Standards. This objective is incorporated in the Standards Act, 2008 (Act No. 8 of 2008).

The SABS continuously strives to improve the quality of its products and services and would therefore be grateful if anyone finding an inaccuracy or ambiguity while using this standard would inform the secretary of the technical committee responsible, the identity of which can be found in the foreword.

Buying Standards

Contact the Sales Office for South African and international standards, which are available in both electronic and hard copy format. Tel: +27 (0) 12 428 6883 email: sales@sabs.co.za

South African National Standards are also available online from the SABS Webstore www.store.sabs.co.za

Information on Standards

SABS Customer Services provide comprehensive standards-related information on national, regional and international standards. Tel: +27 (0) 12 428 7911 / 0861 27 7227 email: info@sabs.co.za

SANS 62053-22:2022

Edition 2

IEC 62053-22:2020

Edition 2

Table of changes

Change No.	Date	Scope

National foreword

This South African National standard was prepared by National Committee SABS/TC 062, *Electrical energy measurement and control*, in accordance with procedures of the South African Bureau of Standards, in compliance with annex 3 of the WTO/TBT agreement.

This document was approved for publication in November 2022.

This document supersedes SANS 62053-22:2018 (edition 1.1).

Compliance with this document cannot confer immunity from legal obligations.



IEC 62053-22

Edition 2.0 2020-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electricity metering equipment – Particular requirements –
Part 22: Static meters for AC active energy (classes 0,1S, 0,2S and 0,5S)**

**Équipement de comptage de l'électricité – Exigences particulières –
Partie 22: Compteurs statiques d'énergie active en courant alternatif
(classes 0,1 S, 0,2 S et 0,5 S)**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2020 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.

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 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 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.

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.

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.

Glossaire IEC - std.iec.ch/glossary

67 000 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.



IEC 62053-22

Edition 2.0 2020-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electricity metering equipment – Particular requirements –
Part 22: Static meters for AC active energy (classes 0,1S, 0,2S and 0,5S)**

**Équipement de comptage de l'électricité – Exigences particulières –
Partie 22: Compteurs statiques d'énergie active en courant alternatif
(classes 0,1 S, 0,2 S et 0,5 S)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 17.220.20

ISBN 978-2-8322-8439-1

**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	6
1 Scope	8
2 Normative references	9
3 Terms and definitions	9
4 Standard electrical values.....	9
4.1 Voltages	9
4.2 Currents.....	9
4.2.1 Nominal currents	9
4.2.2 Starting current.....	10
4.2.3 Minimum current.....	10
4.2.4 Maximum current.....	10
4.3 Frequencies	10
4.4 Power consumption.....	10
5 Construction requirements.....	10
6 Meter marking and documentation	10
7 Accuracy requirements	10
7.1 General test conditions	10
7.2 Methods of accuracy verification	10
7.3 Measurement uncertainty	11
7.4 Meter constant.....	11
7.5 Initial start-up of the meter	11
7.6 Test of no-load condition.....	11
7.7 Starting current test	11
7.8 Repeatability test.....	11
7.9 Limits of error due to variation of the current.....	11
7.10 Limits of error due to influence quantities.....	12
7.11 Time-keeping accuracy	14
8 Climatic requirements	14
9 The effects of external influences	14
10 Type test	14
Annex A (informative) Comparison of acceptable percentage error limits at reference conditions for meters of classes 0,1 S, 0,2 S, and 0,5 S.....	15
Annex B (informative) Summary of changes.....	17
Figure A.1 – Comparison of acceptable percentage error limits for meters of classes 0,1 S, 0,2 S, and 0,5 S, with $I_n = 5$ A and $I_{max} = 10$ A, at PF = 1,0	15
Figure A.2 – Comparison of acceptable percentage error limits for meters of classes 0,1 S, 0,2 S, and 0,5 S, with $I_n = 5$ A and $I_{max} = 10$ A, at PF = 0,5 inductive or PF = 0,8 capacitive	16
Table 1 – Starting current	10
Table 2 – Minimum current.....	10
Table 3 – Acceptable percentage error limits (single-phase meters and poly-phase meters with balanced loads or single-phase loads)	12

Table 4 – Acceptable limits of variation in percentage error due to influence quantities..... 13

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICITY METERING EQUIPMENT – PARTICULAR REQUIREMENTS –

Part 22: Static meters for AC active energy (classes 0,1 S, 0,2 S and 0,5 S)

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 62053-22 has been prepared by IEC technical committee 13: Electrical energy measurement and control.

This second edition cancels and replaces the first edition published in 2003 and its amendment 1: 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: see Annex B.

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

FDIS	Report on voting
13/1806A/FDIS	13/1814/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 62053 series, published under the general title *Electricity metering equipment – Particular requirements*, can be found on the IEC website.

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.

NOTE The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to equip themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than 2 years from the date of publication.

INTRODUCTION

This part of IEC 62053 is to be used with relevant parts of the IEC 62052, IEC 62058 and IEC 62059 series, *Electricity metering equipment*, and with the IEC 62055 series, *Electricity metering – Payment systems*:

IEC 62052-11:2020,	<i>Electricity metering equipment – General requirements, tests and test conditions – Part 11: Metering equipment</i>
IEC 62052-31:2015,	<i>Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Product safety requirements and tests</i>
IEC 62053-11:2003,	<i>Electricity metering equipment (AC) – Particular requirements – Part 11: Electromechanical meters for active energy (classes 0,5, 1 and 2)</i>
IEC 62053-21:2020,	<i>Electricity metering equipment – Particular requirements – Part 21: Static meters for AC active energy (classes 0,5, 1 and 2)</i>
IEC 62053-23:2020,	<i>Electricity metering equipment – Particular requirements – Part 23: Static meters for reactive energy (classes 2 and 3)</i>
IEC 62053-24:2020,	<i>Electricity metering equipment – Particular requirements – Part 24: Static meters for fundamental component reactive energy (classes 0,5 S, 1S, 1, 2 and 3)</i>
IEC 62055-31:2005,	<i>Electricity metering – Payment systems – Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2)</i>
IEC 62057-1: –	<i>Test equipment, techniques and procedures for electrical energy meters – Part 1: Stationary Meter Test Units (MTU)</i>
IEC 62058-11:2008,	<i>Electricity metering equipment (AC) – Acceptance inspection – Part 11: General acceptance inspection methods</i>
IEC 62058-21:2008,	<i>Electricity metering equipment (AC) – Acceptance inspection – Part 21: Particular requirements for electromechanical meters for active energy (classes 0,5, 1 and 2)</i>
IEC 62058-31:2008,	<i>Electricity metering equipment (AC) – Acceptance inspection – Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)</i>
IEC 62059-11:2002,	<i>Electricity metering equipment – Dependability – Part 11: General concepts</i>
IEC 62059-21:2002,	<i>Electricity metering equipment – Dependability – Part 21: Collection of meter dependability data from the field</i>
IEC 62059-32-1:2011,	<i>Electricity metering equipment – Dependability – Part 32-1: Durability – Testing of the stability of metrological characteristics by applying elevated temperature</i>

This part is a standard for type testing electricity meters. It covers the particular requirements for meters, being used indoors and outdoors in large quantities worldwide. It does not deal with special implementations (such as metering-part and/or displays in separate housings).

This document is intended to be used in conjunction with IEC 62052-11:2020 and with IEC 62052-31:2015. When any requirement in this document concerns an item already covered in IEC 62052-11:2020 or in IEC 62052-31:2015, the requirements of this document take precedence over the requirements of IEC 62052-11:2020 or of IEC 62052-31:2015.

The test levels are regarded as minimum values that provide for the proper functioning of the meter under normal working conditions. For special applications, additional test levels might be necessary and are subject to an agreement between the manufacturer and the purchaser.

ELECTRICITY METERING EQUIPMENT – PARTICULAR REQUIREMENTS –

Part 22: Static meters for AC active energy (classes 0,1 S, 0,2 S and 0,5 S)

1 Scope

This part of IEC 62053 applies only to transformer operated static watt-hour meters of accuracy classes 0,1 S, 0,2 S and 0,5 S for the measurement of alternating current electrical active energy in 50 Hz or 60 Hz networks and it applies to their type tests only.

NOTE 1 For other general requirements, such as safety, dependability, etc., see the relevant IEC 62052 or IEC 62059 standards.

This document applies to electricity metering equipment designed to:

- measure and control electrical energy on electrical networks (mains) with voltage up to 1 000 V;

NOTE 2 For AC electricity meters, the voltage mentioned above is the line-to-neutral voltage derived from nominal voltages. See IEC 62052-31:2015, Table 7.

- have all functional elements, including add-on modules, enclosed in, or forming a single meter case with exception of indicating displays;
- operate with integrated or detached indicating displays, or without an indicating display;
- be installed in a specified matching socket or rack;
- optionally, provide additional functions other than those for measurement of electrical energy.

NOTE 3 Modern electricity meters typically contain additional functions such as measurement of voltage magnitude, current magnitude, power, frequency, power factor, etc.; measurement of power quality parameters; load control functions; delivery, time, test, accounting, recording functions; data communication interfaces and associated data security functions. The relevant standards for these functions may apply in addition to the requirements of this document. However, the requirements for such functions are outside the scope of this document.

NOTE 4 Product requirements for power metering and monitoring devices (PMDs) and measurement functions such as voltage magnitude, current magnitude, power, frequency, etc., are covered in IEC 61557-12. However, devices compliant with IEC 61557-12 are not intended to be used as billing meters unless they are also compliant with the IEC 62052-11:2020 and one or more relevant IEC 62053-xx accuracy class standards.

NOTE 5 Product requirements for power quality instruments (PQIs) are covered in IEC 62586-1. Requirements for power quality measurement techniques (functions) are covered in IEC 61000-4-30. Requirements for testing of the power quality measurement functions are covered in IEC 62586-2.

This document does not apply to:

- meters for which the voltage line-to-neutral derived from nominal voltages exceeds 1 000 V;
- meters intended for connection with low power instrument transformers (LPITs as defined in the IEC 61869 series) when tested without such transformers;
- metering systems comprising multiple devices physically remote from one another.
- portable meters;

NOTE 6 Portable meters are meters that are not permanently connected.

- meters used in rolling stock, vehicles, ships and airplanes;
- laboratory and meter test equipment;
- reference standard meters;
- data interfaces to the register of the meter;

- matching sockets or racks used for installation of electricity metering equipment;
- any additional functions provided in electrical energy meters.

This document does not cover measures for the detection and prevention of fraudulent attempts to compromise a meter's performance (tampering).

NOTE 7 Nevertheless, specific tampering detection and prevention requirements, and test methods, as relevant for a particular market are subject to the agreement between the manufacturer and the purchaser.

NOTE 8 Specifying requirements and test methods for fraud detection and prevention would be counterproductive, as such specifications would provide guidance for potential fraudsters.

NOTE 9 There are many types of meter tampering reported from various markets; therefore, designing meters to detect and prevent all types of tampering could lead to unjustified increase in costs of meter design, verification and validation.

NOTE 10 Billing systems, such as, smart metering systems, are capable of detecting irregular consumption patterns and irregular network losses which enable discovery of suspected meter tampering.

NOTE 11 For transformer operated meters paired with current transformers (CTs) according to IEC 61869-2:

- the standard CT measuring range is specified from $0,05 I_n$ to I_{max} for accuracy classes 0,1, 0,2, 0,5 and 1 and these CTs are used for meters of class 0,5, 1 and 2 according to IEC 62053-21;
- the special CT measuring range is specified from $0,01 I_n$ to I_{max} for accuracy classes 0,2 S and 0,5 S and these CTs are used for meters of class 0,1 S, 0,2 S and 0,5 S according to this document;
- combinations of standard CTs and meters of class 0,1 S, 0,2 S and 0,5 S are subject to an agreement between manufacturers and purchasers.

NOTE 12 This document does not specify emission requirements, these are specified in IEC 62052-11:2020, 9.3.14.

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.

IEC 62052-11:2020, *Electricity metering equipment – General requirements, tests and test conditions – Part 11: Metering equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62052-11:2020 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia website: <http://www.electropedia.org>
- ISO Online Browsing Platform website: <http://www.iso.org/obp>

4 Standard electrical values

4.1 Voltages

The values given in IEC 62052-11:2020 apply.

4.2 Currents

4.2.1 Nominal currents

The values given in IEC 62052-11:2020 apply.

4.2.2 Starting current

The requirements and acceptance criteria of IEC 62052-11:2020 apply (see Table 1).

Table 1 – Starting current

Meters for	Class of meter			Power factor $\cos \varphi$
	0,1 S	0,2 S	0,5 S	
Connection through current transformers	$0,001 I_n$	$0,001 I_n$	$0,001 I_n$	1

4.2.3 Minimum current

The requirements and acceptance criteria of IEC 62052-11:2020 apply (see Table 2).

Table 2 – Minimum current

Meters for	Minimum current I_{\min} classes 0,1 S, 0,2 S, 0,5 S
Connection through current transformers	$0,01 I_n$

4.2.4 Maximum current

The requirements and acceptance criteria of IEC 62052-11:2020 apply.

4.3 Frequencies

The values given in IEC 62052-11:2020 apply.

4.4 Power consumption

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

5 Construction requirements

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

6 Meter marking and documentation

The requirements of IEC 62052-11:2020 apply.

7 Accuracy requirements

7.1 General test conditions

The test conditions of IEC 62052-11:2020 apply.

7.2 Methods of accuracy verification

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

7.3 Measurement uncertainty

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

7.4 Meter constant

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

7.5 Initial start-up of the meter

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

7.6 Test of no-load condition

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

7.7 Starting current test

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

7.8 Repeatability test

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

7.9 Limits of error due to variation of the current

When the meter is under the reference conditions given in IEC 62052-11:2020, 7.1, the percentage errors shall not exceed the limits for the relevant accuracy class given in Table 3.

If the meter is designed for the measurement of energy in both directions, the values in Table 3 shall apply for each direction.

If the meter is intended for multiple connection modes, the accuracy testing results are valid only for the connection modes tested and cannot be used to claim accuracy for other, untested connection modes.

**Table 3 – Acceptable percentage error limits
(single-phase meters and poly-phase meters with balanced loads or single-phase loads)**

Value of current	Power factor $\cos \varphi$	Acceptable percentage error limits for meters of class		
		0,1 S	0,2 S	0,5 S
$I_{\min} \leq I < 0,05 I_n$	1	$\pm 0,2$	$\pm 0,4$	$\pm 1,0$
$0,05 I_n \leq I \leq I_{\max}$	1	$\pm 0,1$	$\pm 0,2$	$\pm 0,5$
$0,02 I_n \leq I < 0,1 I_n$	0,5 inductive	$\pm 0,25$	$\pm 0,5$	$\pm 1,0$
	0,8 capacitive	$\pm 0,25$	$\pm 0,5$	$\pm 1,0$
$0,1 I_n \leq I \leq I_{\max}$	0,5 inductive	$\pm 0,15$	$\pm 0,3$	$\pm 0,6$
	0,8 capacitive	$\pm 0,15$	$\pm 0,3$	$\pm 0,6$
$0,1 I_n \leq I \leq I_{\max}$	0,25 inductive	$\pm 0,25^a$	$\pm 0,5^a$	$\pm 1,0^a$
	0,5 capacitive	$\pm 0,25^a$	$\pm 0,5^a$	$\pm 1,0^a$
	0,25 capacitive	$\pm 0,25^a$	-----	-----
^a When specially requested by the user.				
NOTE 1 Current transformers (CTs) according IEC 61869-2 have a lowest load point at $0,05 I_n$ for classes 0,1, 0,2, 0,5, and 1, and $0,01 I_n$ for classes 0,1 S, 0,2 S and 0,5 S. To reduce complexity and variants only meters with lowest load point $0,01 I_n$ is specified in this document;				
NOTE 2 See Annex A for an informative comparison of percentage error limits for classes 0,1 S, 0,2 S and 0,5 S.				

When testing poly-phase meters for compliance with Table 3 requirements for single phase loads, the test current shall be applied to each measuring element in sequence, while all the phase voltages shall remain balanced.

7.10 Limits of error due to influence quantities

Tests and test conditions given in IEC 62052-11:2020, 7.1 apply.

If the meter is rated for multiple connection modes, the accuracy requirements apply for each of the connection modes. All tests of effects of influence quantities shall be performed in one connection mode selected to exercise the complete metrological capability of the meter.

When the current and the phase displacement (power factor) are held constant as specified in Table 4, and any single influence quantity is applied one at a time, with the meter otherwise operated at reference conditions as specified in IEC 62052-11:2020, 7.1, the additional variation in percentage error relative to the intrinsic error shall not exceed the limits specified for the relevant class indexes given in Table 4.

The variation in percentage error induced by the influence quantities may vary depending on the value of the test current. The variation in percentage error in Table 4 is given for the specified values or ranges of the test current but the testing should be performed at the recommended values of test current given in Table 4.

Table 4 – Acceptable limits of variation in percentage error due to influence quantities

Influence quantity	Test clause in IEC 62052-11:2020	Specified range or value and recommended value of test current (balanced unless otherwise stated)	Power factor $\cos \varphi^c$	Acceptable limits of variation in percentage error for meters of class		
				0,1 S	0,2 S	0,5 S
Radiated, radio-frequency, electromagnetic field immunity test – test with current	9.3.5	I_n	1	0,5	1,0	2,0
Electrical fast transient/burst immunity test	9.3.6	I_n	1	0,5	1,0	2,0
Immunity to conducted disturbances, induced by radio-frequency fields	9.3.7	I_n	1	0,5	1,0	2,0
Test for immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at AC power ports	9.3.8	I_n	1	0,5	0,8	2,0
Damped oscillatory wave immunity test ^d	9.3.11	I_n	1	0,5	1,0	2,0
External static magnetic fields	9.3.12	I_n	1	2,0	2,0	2,0
Power frequency magnetic field immunity test	9.3.13	I_n	1	0,25	0,5	1,0
Harmonics in the current and voltage circuits – 5 th harmonic test	9.4.2.2	$0,5 I_{max}$	1	0,2	0,4	0,5
Interharmonics in the current circuit – burst fired waveform test	9.4.2.3	$0,5 I_n$	1	0,3	0,6	1,5
Odd harmonics in the current circuit	9.4.2.4	$0,5 I_n$	1	0,3	0,6	1,5
DC and even harmonics – half-wave rectified waveform test ^f	9.4.2.5	n/a	n/a	n/a	n/a	n/a
Voltage variation	9.4.3	$I_{min} \leq I \leq I_{max}$ (I_n)	1	0,05	0,1	0,25
		$0,05 I_n \leq I \leq I_{max}$ (I_n)	0,5	0,1	0,2	0,5
Ambient temperature variation ^b	9.4.4	$I_{min} \leq I \leq I_{max}$ (I_n)	1	0,005	0,01	0,03
		$0,1 I_n \leq I \leq I_{max}$ (I_n)	0,5	0,01	0,02	0,05
Interruption of phase voltage	9.4.5	I_n	1	0,25	0,5	1,0
Frequency variation	9.4.6	$I_{min} \leq I \leq I_{max}$ (I_n)	1	0,05	0,1	0,2
		$0,05 I_n \leq I \leq I_{max}$ (I_n)	0,5	0,05	0,1	0,2
Reversed phase sequence	9.4.7	$0,1 I_n$	1	0,05	0,05	0,1
Auxiliary voltage variation	9.4.8	I_{min}	1	0,05	0,05	0,1
Operation of auxiliary devices	9.4.9	I_{min}	1	0,05	0,05	0,1
Short-time overcurrents ^e	9.4.10	I_n	1	0,05	0,1	0,2

Influence quantity	Test clause in IEC 62052-11:2020	Specified range or value and recommended value of test current (balanced unless otherwise stated)	Power factor $\cos \varphi^c$	Acceptable limits of variation in percentage error for meters of class		
				0,1 S	0,2 S	0,5 S
Self-heating ^a	9.4.11	I_{\max}	1	0,05	0,1	0,2
			0,5			
Fast load current variations	9.4.12	I_n	1	0,25	0,5	1,0
Earth fault ^e	9.4.13	I_n	1	0,05	0,1	0,25
Dry heat test ^e	8.3.3	I_n	1	0,05	0,1	0,25
Cold test ^e	8.3.4	I_n	1	0,05	0,1	0,25
Damp heat cyclic test ^e	8.3.5	I_n	1	0,05	0,1	0,25
^a The test shall be carried out for at least 1 h, or until the variation of error during 20 min does not exceed 0,05 %. ^b These values shall be considered as mean temperature coefficients %/K for meters of class. ^c Inductive ^d Voltage transformer operated meters only ^e For these tests, the meter accuracy is measured before and after the test. The difference in percentage error before and after the test shall not exceed the error limits specified in this table. These errors limits may be interpreted as allowable meter accuracy drift induced by the specified test conditions. ^f The purpose of this test is to check for current sensor saturation only. This test does not apply to transformer-operated meters.						

7.11 Time-keeping accuracy

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

8 Climatic requirements

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply.

9 The effects of external influences

The requirements, test conditions and procedures, and acceptance criteria of IEC 62052-11:2020 apply. Table 13 in IEC 62052-11:2020 gives an overview of the requirements. For tests with acceptance criteria A, Table 4 of this document shall be used.

10 Type test

Requirements given in IEC 62052-11:2020 apply.

Annex A
(informative)

Comparison of acceptable percentage error limits
at reference conditions for meters of classes 0,1 S, 0,2 S, and 0,5 S

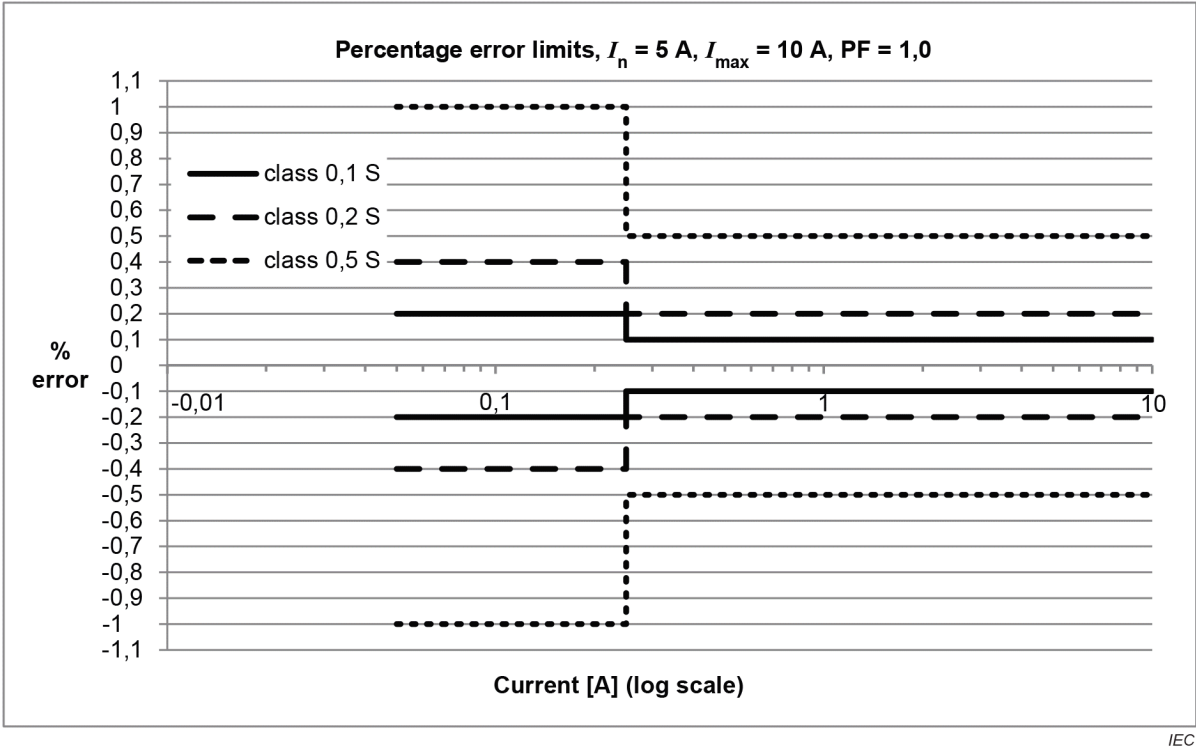


Figure A.1 – Comparison of acceptable percentage error limits for meters of classes 0,1 S, 0,2 S, and 0,5 S, with $I_n = 5\text{ A}$ and $I_{\max} = 10\text{ A}$, at $\text{PF} = 1,0$

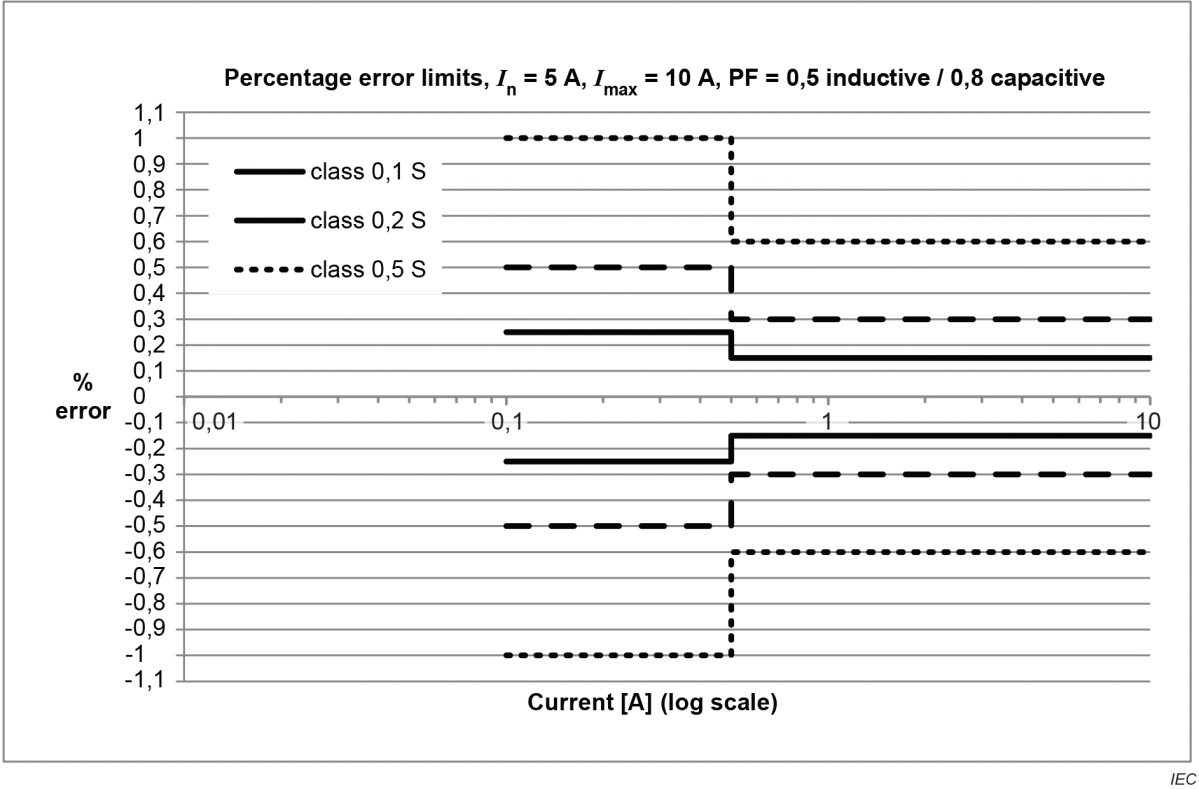


Figure A.2 – Comparison of acceptable percentage error limits for meters of classes 0,1 S, 0,2 S, and 0,5 S, with $I_n = 5\text{ A}$ and $I_{\max} = 10\text{ A}$, at PF = 0,5 inductive or PF = 0,8 capacitive

Annex B (informative)

Summary of changes

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

- a) Removed all meter safety requirements; the meter safety requirements are covered in IEC 62052-31:2015.
- b) Moved the descriptions of all general requirements and test methods from IEC 62053-21:2003, IEC 62053-22:2003, IEC 62053-23:2003, IEC 62053-24:2003 to IEC 62052-11:2020; IEC 62053-21:2020, IEC 62053-22:2020, IEC 62053-23:2020, IEC 62053-24:2020 contain only accuracy class specific requirements.
- c) Added new requirements and tests concerning:
 - 1) active energy meters of accuracy class 0,1 S;
 - 2) measurement uncertainty and repeatability (7.3, 7.8);
 - 3) influence of fast load current variations (7.10 table 4: see IEC 62052-11:2020, 9.4.12);
 - 4) immunity to conducted differential current disturbances in the 2 kHz to 150 kHz frequency range (7.10 table 4: see IEC 62052-11:2020, 9.3.8).
