BS EN 62053-24:2015+A1:2017



BSI Standards Publication

Electricity metering equipment (a.c.) — Particular requirements

Part 24: Static meters for reactive energy at fundamental frequency (classes 0,5 S, 1 S and 1) (IEC 62053-24:2014)

bsi.

National foreword

This British Standard is the UK implementation of EN 62053-24:2015+A1:2017. It is identical to IEC 62053-24:2014, incorporating amendment 1:2016. It supersedes BS EN 62053-24:2015 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by [A1] 〈A1〉.

The UK participation in its preparation was entrusted to Technical Committee PEL/13, Electricity Meters.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2017.
Published by BSI Standards Limited 2017

ISBN 978 0 580 91277 1

ICS 17.220.20; 91.140.50

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2015.

Amendments/corrigenda issued since publication

Date	Text affected
31 May 2017	Implementation of IEC amendment 1:2016 with CENELEC endorsement A1:2017

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62053-24:2015+A1

March 2017

ICS 17.220.20; 91.140.50

English Version

Electricity metering equipment (a.c.) - Particular requirements - Part 24: Static meters for reactive energy at fundamental frequency (classes 0,5 S, 1 S and 1) (IEC 62053-24:2014)

Équipement de comptage de l'électricité (c.a.) - Exigences particulières - Partie 24: Compteurs statiques d'énergie réactive à la fréquence fondamentale (classes 0,5 S, 1 S et 1) (IEC 62053-24:2014)

Wechselstrom-Elektrizitätszähler - Besondere Anforderungen - Teil 24: Elektronische Grundschwingungs-Blindverbrauchszähler der Genauigkeitsklassen 0,5 S, 1 S und 1 (IEC 62053-24:2014)

This European Standard was approved by CENELEC on 2014-07-24. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

© 2015 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

Ref. No. EN 62053-24:2015 E

Foreword

The text of document 13/1569/FDIS, future edition 1 of IEC 62053-24, prepared by IEC/TC 13 "Electrical energy measurement and control" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62053-24:2015.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-07-16
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2017-07-24

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive.

For the relationship with EU Directive see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 62053-24:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 61869-2:2012	NOTE	Harmonized as EN 61869-2:2012 (not modified).
IEC 62053-21:2003	NOTE	Harmonized as EN 62053-21:2003 (not modified).
IEC 62053-23:2003	NOTE	Harmonized as EN 62053-23:2003 (not modified).
IEC 62053-61:1998	NOTE	Harmonized as EN 62053-61:1998 (not modified).

Foreword to amendment A1

The text of document 13/1703/FDIS, future IEC 62053-24:2014/A1, prepared by IEC/TC 13 “Electrical energy measurement and control” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62053-24:2015/A1:2017.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2017-09-30
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2020-03-31

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 62053-24:2014/A1:2016 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 62052-11	2003	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment	EN 62052-11	2003
+A1	2016		+A1	2017
IEC 62052-31	2015	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests	EN 62052-31	2016

Annex ZZ
(informative)

Coverage of Essential Requirements of EU Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope this standard covers all relevant essential requirements as given in Annex I of the EU Directive 2004/108/EC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive concerned.

WARNING: Other requirements and other EU Directives can be applied to the products falling within the scope of this standard.

CONTENTS

INTRODUCTION 8
1 Scope 9
2 Normative references 9
3 Terms and definitions 10
4 Standard electrical values 10
5 Mechanical requirements 10
6 Climatic conditions 10
7 Electrical requirements 11
7.1 General 11
7.2 Power consumption 11
7.2.1 General 11
7.2.2 Voltage circuits 11
7.2.3 Current circuits 11
7.3 Influence of short-time overcurrents 12
7.4 Influence of self-heating 12
7.5 AC voltage test 13
8 Accuracy requirements 13
8.1 General 13
8.2 Limits of error due to variation of the current 13
8.3 Limits of error due to influence quantities 14
8.3.1 General 14
8.3.2 Tests of the influence of DC and even harmonics in the current circuit 15
8.3.3 Continuous magnetic induction of external origin 15
8.3.4 Harmonics 15
8.4 Test of starting and no-load condition 16
8.4.1 General 16
8.4.2 Initial start-up of the meter 16
8.4.3 Test of no-load condition 16
8.4.4 Starting 17
8.5 Meter constant 17
8.6 Accuracy test conditions 17
8.7 Interpretation of test results 18
Annex A (normative) Test circuit diagram for DC and even harmonics 19
Annex B (normative) Electromagnet for testing the influence of externally produced magnetic fields 21
Annex C (informative) Geometric representation of active and reactive power 22
Annex D (informative) Effect of phase displacement 24
D.1 Phase displacement and matching of current transformers and meters for reactive energy 24
Annex E (informative) Treatment of harmonics and tests for harmonics 25
E.1 Non-sinusoidal conditions and reactive power definition 25
E.2 Tests for accuracy under non-sinusoidal conditions 25
E.3 Fifth harmonic test 26
Bibliography 27

Figure A.1 – Test circuit diagram for half-wave rectification 19
Figure A.2 – Half-wave rectified waveform 20
Figure B.1 – Electromagnet for testing the influence of externally produced magnetic fields 21
Figure C.1 – Recommended geometric representation 22
Figure C.2 – Alternative geometric representation 23

Table 1 – Power consumption in voltage circuits for single-phase and polyphase meters including the power supply 11
Table 2 – Power consumption in current circuits 11
Table 3 – Variations due to short-time overcurrents 12
Table 4 – Variations due to self-heating 12
Table 6 – Percentage error limits (single-phase meters and polyphase meters with balanced loads) 13
Table 7 – Percentage error limits (polyphase meters carrying a single-phase load, but with balanced polyphase voltages applied to voltage circuits) 13
Table 8 – Influence quantities 14
Table 9 – Starting current 17
Table 10 – Voltage and current balance 17
Table 11 – Reference conditions 18
Table 12 – Interpretation of test results 18
Table D.1 – Limits of phase displacement for measuring current transformers and corresponding measurement error for reactive energy measurement 24

INTRODUCTION

This part of IEC 62053 is to be used with the following relevant parts of the IEC 62052, IEC 62053 and IEC 62059 series, *Electricity metering equipment*:

〈A1〉 IEC 62052-11:2003, *Electricity metering equipment (a.c.) – General requirements, tests and test conditions – Part 11: Metering equipment*

IEC 62052-11:2003, *Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 11: Metering equipment*
Amendment 1 (2016)

IEC 62052-31:2015, *Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Product safety requirements and tests* 〈A1〉

IEC 62053-21:2003, *Electricity metering equipment (a.c.) – Particular requirements – Part 21: Static meters for active energy (classes 1 and 2)*

IEC 62053-22:2003, *Electricity metering equipment (a.c.) – Particular requirements – Part 22: Static meters for active energy (classes 0,2 S and 0,5 S)*

IEC 62053-31:1998, *Electricity metering equipment (a.c.) – Particular requirements – Part 31: Pulse output devices for electromechanical and electronic meters (two wires only)*

IEC 62053-52:2005, *Electricity metering equipment (a.c.) – Particular requirements – Part 52: Symbols*

IEC 62053-61:1998, *Electricity metering equipment (a.c.) – Particular requirements – Part 61: Power consumption and voltage requirements*

IEC 62059-11:2002, *Electricity metering equipment (a.c.) – Dependability – Part 11: General concepts*

IEC 62059-21:2002, *Electricity metering equipment (a.c.) – Dependability – Part 21: Collection of meter dependability data from the field*

IEC 62059-31-1:2008, *Electricity metering equipment – Dependability –Part 31-1: Accelerated reliability testing – Elevated temperature and humidity*

IEC 62059-32-1:2011, *Electricity metering equipment – Dependability – Part 32-1: Durability – Testing of the stability of metrological characteristics by applying elevated temperature*

IEC 62059-41:2006, *Electricity metering equipment – Dependability – Part 41: Reliability prediction*

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

This standard is intended to be used in conjunction with IEC 62052-11. When any requirement in this standard concerns an item already covered in IEC 62052-11, the requirements of this standard take precedence over the requirements of IEC 62052-11.

This standard distinguishes:

- between transformer operated meters of accuracy class index 0,5 S and 1 S and direct connected meters of accuracy class index 1;
- between protective class I and protective class II meters;
- between meters for use in networks equipped with or without earth fault neutralizers.

The test levels are regarded as minimum values that provide for the proper functioning of the meter under normal working conditions. For special application, other test levels might be necessary and should be agreed on between the user and the manufacturer.

ELECTRICITY METERING EQUIPMENT (a.c.) – PARTICULAR REQUIREMENTS –

Part 24: Static meters for reactive energy at fundamental frequency (classes 0,5 S, 1 S and 1)

1 Scope

This part of IEC 62053 applies only to newly manufactured transformer operated static var-hour meters of accuracy classes 0,5 S, and 1 S as well as direct connected static var-hour meters of accuracy class 1, for the measurement of alternating current electrical reactive energy in 50 Hz or 60 Hz networks and it applies to their type tests only.

This standard uses a conventional definition of reactive energy where the reactive power and energy is calculated from the fundamental frequency components of the currents and voltages only. See Clause 3.

NOTE 1 This differs from the approach of IEC 62053-23, where reactive power and energy is defined only for sinusoidal signals. In this standard reactive power and energy is defined for all periodic signals. Reactive power and energy is defined in this way to achieve proper reproducibility of measurements with meters of different designs. With this definition, reactive power and energy reflects the generally unnecessary current possible to compensate with capacitors rather than the total unnecessary current.

It applies only to static var-hour meters for indoor and outdoor application consisting of a measuring element and register(s) enclosed together in a meter case. It also applies to operation indicator(s) and test output(s). If the meter has a measuring element for more than one type of energy (multi-energy meters), or when other functional elements, like maximum demand indicators, electronic tariff registers, time switches, ripple control receivers, data communication interfaces, etc., are enclosed in the meter case, then the relevant standards for these elements also apply.

NOTE 2 IEC 61869-2:2012 describes transformers having a measuring range of 0,05 I_n to I_{max} for accuracy classes 0,2, 0,5, 1 and 2, and transformers having a measuring range of 0,01 I_n to I_{max} for accuracy classes 0,2 S and 0,5 S. As the measuring range of a meter and its associated transformers have to be matched and as only transformers of classes 0,2 S / 0,5 S have the current error and phase displacement characteristics suitable to operate a class 0,5 S / 1 S meter respectively as specified in this standard, the measuring range of the transformer operated meters will be 0,01 I_n to I_{max}. Reactive meters intended to be used together with non-S transformers are, therefore, not covered by this standard.

It does not apply to:

- var-hour meters where the voltage across the connection terminals exceeds 600 V (line-to-line voltage for meters for polyphase systems);
- portable meters;
- data interfaces to the register of the meter;
- reference meters.

The dependability aspect is covered by the standards of the IEC 62059 series.

[A1] The safety aspect is covered by IEC 62052-31:2015. [A1]

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.