BS EN 50470-4:2023

BSI Standards Publication

Electricity metering equipment

Part 4: Particular requirements — Static meters for DC active energy (class indexes A, B and C)

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National foreword

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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 committee manager.

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English Version

Electricity metering equipment - Part 4: Particular requirements - Static meters for DC active energy (class indexes A, B and C)

Équipement de comptage de l'électricité - Partie 4: Exigences particulières - Compteurs statiques d'énergie active en courant continu (indices de classe A, B et C)

Elektrizitätszähler - Teil 4: Besondere Anforderungen - Elektronische Wirkverbrauchszähler für Gleichstrom der Genauigkeitsklassen A, B und C

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European foreword

This document (EN 50470-4:2023) has been prepared by CLC/TC 13 “Electrical energy measurement and control”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2024-07-24
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2026-07-24

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

This document is used in conjunction with EN IEC 62052-11:2021[1].

This document is related to EN IEC 62053-41:2021[2], *Electricity metering equipment - Particular requirements - Part 41: Static meters for DC energy (classes 0,5 and 1)*.

NOTE Terms differences for accuracy classes in related standard (EN IEC 62053-41:2021[2]) and Directive 2014/32/EU are listed in Annex D.

The structure of the standards is similar; modifications in this document are provided in the perspective of compliance with the Essential Requirements of Directive 2014/32/EU on Measuring Instruments (MID).

This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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

Any feedback and questions on this document should be directed to the users’ national committee. A complete listing of these bodies can be found on the CENELEC website.

[1] As impacted by EN IEC 62052-11:2021/A11:2022.
[2] To be published. Stage at the time of publication: FprEN IEC 62053-41:2021.

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1 Scope

This document applies only to static watt-hour meters of accuracy classes A, B and C for the measurement of direct current electrical active energy in DC systems and it applies to their type tests.

NOTE 1 For general requirements, such as construction, EMC, safety, dependability etc., see the relevant EN 62052 series or EN 62059 series.

This document applies to electricity metering equipment designed to:

— measure and control electrical energy on DC electrical networks with voltages up to 1 500 V;

NOTE 2 Meters for unearthed DC supplies and meters for three-wire DC networks are within the scope of this document.

— form a complete meter including the legally relevant display of measured values;

NOTE 3 Electrical energy meters constructed from separate parts as described in WELMEC Guide 11.7:2017 are included.

— operate with integrated or detached legally relevant displays;

— optionally, provide additional functions other than those for measurement of electrical energy.

They can be used for measuring DC electrical energy, amongst others, in the following application areas:

— in EV (electrical vehicle) charging stations or in EV charging infrastructure (also called EVSE, electric vehicle supply equipment), if energy is measured on the DC side;

— in solar PV (photovoltaic) systems where DC power generation is measured;

— in low voltage DC networks for residential or commercial areas, if energy is measured on the DC side, including similar applications like information technology (IT) server farms or DC supply points for communication equipment;

— in DC supply points for public transport networks (e.g. for trolleybuses);

— in mobile applications on vehicles for e-road (electric road) systems.

Meters designed for operation with external DC instrument transformers, transducers or shunts can be tested for compliance with this document only if such meters and their transformers, transducers or shunts are tested together and meet the requirements for directly connected meters. Requirements in this document and in EN IEC 62052-11:2021[1] applying to meters designed for operation with DC LPITs also apply to meters designed for operation with external instrument transformers, transducers or shunts.

NOTE 4 Modern electricity meters typically contain additional functions such as measurement of voltage magnitude, current magnitude, power, 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 could apply in addition to the requirements of this document. However, the requirements for such functions are outside the scope of this document.

NOTE 5 Product requirements for power metering and monitoring devices (PMDs) and measurement functions such as voltage magnitude, current magnitude, power, etc., are covered in EN IEC 61557-12:2022[7]. However, devices compliant with EN IEC 61557-12:2022[7] are not intended to be used as billing meters unless they are also compliant with EN IEC 62052-11:2021[1] and this document.

NOTE 6 Requirements for DC power quality (PQ) instruments, DC PQ measuring techniques, and DC PQ instrument testing are under discussion and will be specified in other standards.

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This document does not apply to:

— portable meters;

NOTE 7 Portable meters are meters that are not permanently connected.

— meters used in rolling stock (railway applications), ships and airplanes;

NOTE 8 DC meters for rolling stock are covered by other standards, e.g. by the EN 50463 series.

— 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 meter's performance (tampering).

NOTE 9 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 10 Specifying requirements and test methods for fraud detection and prevention would be counterproductive, as such specifications would provide guidance for potential fraudsters.

NOTE 11 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 12 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 13 This document does not specify emission requirements. These are specified in EN IEC 62052-11:2021[1], 9.3.14.

NOTE 14 Some aspects of meters for EVSE included in this document are expected to be covered by future documents being worked on in WG 03 of CLC/TC 13 (EN 50732), so they may be removed in future editions of this standard.

2 Normative references

The following documents are referred to in the text in such a way that some of or all 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.

EN 61000-4-19:2014, *Electromagnetic compatibility (EMC) - Part 4-19: Testing and measurement techniques - Test for immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at a.c. power ports (IEC 61000-4-19:2014)*

EN 61010-1:2010[3], *Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements (IEC 61010-1:2010)*

[3] As impacted by EN 61010-1:2010/A1:2019 and EN 61010-1:2010/A1:2019/AC:2019-04.

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EN IEC 61010-2-030:2021[4], *Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 2-030: Particular requirements for equipment having testing or measuring circuits (IEC 61010-2-030:2017)*

EN IEC 62052-11:2021[1], *Electricity metering equipment - General requirements, tests and test conditions - Part 11: Metering equipment (IEC 62052-11:2020)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN IEC 62052-11:2021[1] and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

NOTE The definitions listed in this document take precedence over those in EN IEC 62052-11:2021[1].

3.1
direct current system
DC system
electrical system wherein DC electrical quantities are of primary importance

Note 1 to entry: For the qualifier DC, see IEC 60050-151:2001, 151-15-02.

3.2
direct current
electric current that is time-independent or, by extension, periodic current the direct component of which is of primary importance

Note 1 to entry: In this context, “time-independent” means stable over periods in the range of tens of milliseconds.

[SOURCE: IEC 60050-131:2002, 131-11-22, modified – Note to entry has been deleted and a new Note 1 to entry has been added.]

3.3
direct voltage
voltage that is time-independent or, by extension, periodic voltage the direct component of which is of primary importance

Note 1 to entry: In this context, “time-independent” means stable over periods in the range of tens of milliseconds.

[SOURCE: IEC 60050-131:2002, 131-11-23, modified – Note to entry has been deleted and a new Note 1 to entry has been added.]

3.4
DC power
DC active power
product of the mean value of direct current flowing through a two-terminal circuit and the mean value of direct voltage across it

Note 1 to entry: There is no DC reactive power.

[4] As impacted by EN IEC 61010-2-030:2021/A11:2021.

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3.5
DC energy
DC active energy
time integral of DC power

Note 1 to entry: The coherent SI unit of active energy is joule, J. Another unit is watt hour. Its multiple, kilowatt hour, kWh, is commonly used for billing consumers of electrical energy and is therefore indicated on electrical energy meters.

Note 2 to entry: DC energy is a form of active energy as defined in EN IEC 62052-11:2021[1].

3.6
DC energy meter
instrument intended to measure DC (active) energy

3.7
transitional current
I_{tr}
value of the current at, and above which, up to I_{max} full accuracy requirements of this document apply

3.8
influence quantity
quantity that is not the measurand but that affects the result of measurement

3.9
disturbance
influence quantity having a value within the limits specified in the appropriate requirement but outside the specified rated operating conditions of the measuring instrument

Note 1 to entry: An influence quantity is a disturbance if for that influence quantity the rated operating conditions are not specified.

3.10
critical change value
value above which the change in the measurement result is considered unacceptable

Note 1 to entry: The critical change value specifies here the maximum change in the measurement results for all disturbances. In EN IEC 62052-11:2021[1], the critical change value has another definition and meaning and applies only for tests without any current.

3.11
rated operating condition
value for the measurand and influence quantities making up the normal working conditions of an instrument

3.12
maximum permissible error
MPE
maximum allowable error under rated operating conditions and in the absence of a disturbance

3.13
DC LPIT
LPIT for DC applications like DC current or DC voltage transformers or DC transducers (as defined in IEC 60688:2021) including combined voltage/current transducers that supply power or energy values to the meter

Note 1 to entry: Refer to EN IEC 62052-11:2021[1] for the definition of LPIT.

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