



SLOVENSKI STANDARD
oSIST prEN 50470-3:2021
01-julij-2021

Oprema za merjenje električne energije (a.c.) - 3. del: Posebne zahteve - Statični števcji za delovno energijo (razredni indeksi A, B in C)

Electricity metering equipment (AC) - Part 3: Particular requirements - Static meters for active energy (class indexes A, B and C)

Wechselstrom-Elektrizitätszähler - Teil 3: Besondere Anforderungen - Elektronische Wirkverbrauchsähler der Genauigkeitsklassen A, B und C

Équipement de comptage de l'électricité (c.a.) - Partie 3: Exigences particulières - Compteurs statiques d'énergie active (indices de classe A, B et C)

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91.140.50	Sistemi za oskrbo z elektriko	Electricity supply systems

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Will supersede EN 50470-3:2006 and all of its amendments and corrigenda (if any)

English Version

Electricity metering equipment (AC) - Part 3: Particular requirements - Static meters for active energy (class indexes A, B and C)

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Exigences particulières - Compteurs statiques d'énergie
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Wechselstrom-Elektrizitätszähler - Teil 3: Besondere
Anforderungen - Elektronische Wirkverbrauchszähler der
Genauigkeitsklassen A, B und C

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2021-07-30.

It has been drawn up by CLC/TC 13.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CENELEC 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 50470-3:2021) has been prepared by CLC/TC 13 “Electrical energy measurement and control”.

This document is currently submitted to the Enquiry.

The following dates are proposed:

- latest date by which the existence of this document has to be announced at national level (doa) dor + 6 months
- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) dor + 12 months
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) dor + 36 months (to be confirmed or modified when voting)

This document will supersede EN 50470-3:2006 and all of its amendments and corrigenda.

prEN 50470-3:2021 includes the following significant technical changes with respect to EN 50470-3:2006: it is based on EN IEC 62052-11:2021 instead of EN 50470-1:2006.

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(s).

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

prEN 50470-3:2021 is related to:

- EN IEC 62053-21:2021, Electricity metering equipment – Particular requirements – Part 21: Static meters for AC active energy (classes 0,5, 1 and 2)
- EN IEC 62053-22:2021, Electricity metering equipment – Particular requirements – Part 22: Static meters for AC active energy (classes 0,1 S, 0,2 S and 0,5 S).

NOTE Terms differences for accuracy classes and current values in related standards (EN IEC 62053-21:2021 and EN IEC 62053-22:2021) and directive 2014/32/EU are listed in Annex C.

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).

1 Scope

This document applies only to static watt-hour meters of accuracy classes A, B and C 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 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 electrical networks (mains) with voltage up to 1 000 V AC;

NOTE 2 For AC electricity meters, the voltage mentioned above is the line-to-neutral voltage derived from nominal voltages. See EN 62052-31:2016, 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;
- be installed in a specified matching sockets or racks;
- optionally, provide additional functions other than those for measurement of electrical energy.

Meters designed for operation with low power instrument transformers (LPITs as defined in the IEC 61869 series) can be tested for compliance with this document only if such meters and their LPITs are tested together and meet the requirements for directly connected meters.

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 could 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 EN 61557-12. However, devices compliant with EN 61557-12 are not intended to be used as billing meters unless they are also compliant with the EN IEC 62052-11:2021 and prEN 50470-3:2021 standards.

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

This document does not apply to:

- meters for which the voltage line-to-neutral derived from nominal voltages exceeds 1 000 V AC;
- meters intended for connection with low power instrument transformers (LPITs as defined in the EN 61869 series) when tested without such transformers;
- metering systems comprising multiple devices (except of LPITs) 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;

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- 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 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 EN 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 C, B and A according to this document.

NOTE 12 This document does not specify emission requirements, these are specified in EN IEC 62052-11:2021, 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.

EN IEC 62052-11:2021, *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 and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

NOTE The definitions listed here take precedence over those in EN IEC 62052-11:2021.

3.1 transitional current

I_{tr}

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

3.2 influence quantity

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

3.3**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.

3.4**critical change value**

value at which the change in the measurement result is considered undesirable

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, the critical change value has another definition and meaning and applies only for tests without any current.

3.5**rated operating condition**

value for the measurand and influence quantities making up the normal working conditions of an instrument

3.6**maximum permissible error****MPE**

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

4 Standard electrical values

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4.1 Voltages

The values in EN IEC 62052-11:2021, 4.1 apply. EN 50470-3:2021

4.2 Currents

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4.2.1 General

Table 1 — Preferred values of I_{tr} and I_n

Meters for	Current	Value of current A
Direct connection	I_{tr}	0,1–0,2–0,5–1–1,5–2–3–4–5– 6,3–8–10–12,5
	I_n	1–2–5–10–15–20–30–40–50– 63–80–100–125
Transformer operated	I_{tr}	0,05–0,1–0,25
	I_n	1–2–5

For meters intended for operation with LPITs, the values in Table 1 for direct connection apply to the primary ratings of the LPITs used with the meter.

NOTE 1 The values for I_n are from EN IEC 62052-11:2021, Table 3.

NOTE 2 Meters operating with external LPITs are sometimes specified for nominal current values greater than the values in Table 1, e.g. common values to be considered are 160A, 200A, 250A, 400A, 500A, 600A, 630A.

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4.2.2 Nominal current

The nominal current I_n for direct connected meters shall be $10 I_{tr}$.

The nominal current I_n for transformer operated meters shall be $20 I_{tr}$.

4.2.3 Starting current

Starting current relation to I_{tr} is shown in Table 2 below.

Table 2 — Starting current

Meters for	Meters of class index			Power factor
	A	B	C	
Direct connection	$\leq 0,05 I_{tr}$	$\leq 0,04 I_{tr}$	$\leq 0,04 I_{tr}$	1
Transformer operated	$\leq 0,06 I_{tr}$	$\leq 0,04 I_{tr}$	$\leq 0,02 I_{tr}$	1

4.2.4 Minimum current

Starting current relation to I_{min} is shown in Table 3 below.

Table 3 — Minimum current

Meters for	Minimum current I_{min}		
	Class A	Class B	Class C
Direct connection	$\leq 0,5 I_{tr}$	$\leq 0,5 I_{tr}$	$\leq 0,3 I_{tr}$
Transformer operated	$\leq 0,4 I_{tr}$	$\leq 0,2 I_{tr}$	$\leq 0,2 I_{tr}$

4.2.5 Maximum current

Starting current relation to I_{max} is shown in Table 4 below.

Table 4 — Maximum current

Meters for	Maximum current I_{max}		
	Class A	Class B	Class C
Direct connection	$\geq 50 I_{tr}$	$\geq 50 I_{tr}$	$\geq 50 I_{tr}$
Transformer operated	$\geq 24 I_{tr}$	$\geq 24 I_{tr}$	$\geq 24 I_{tr}$

4.3 Frequencies

The values given in EN IEC 62052-11:2021, 4.3 apply.

4.4 Power consumption

The values given in EN IEC 62052-11:2021, 4.4 apply.

5 Construction requirements

The requirements given in EN IEC 62052-11:2021, Clause 5 apply.

In addition to the requirements in EN IEC 62052-11:2021, 5.6, these requirements apply:

- a) The scale interval for a measured value shall be in the form $1 \times 10n$, $2 \times 10n$, or $5 \times 10n$, where n is any integer or zero. The unit of measurement or its symbol shall be shown close to the numerical value.
- b) The indication of any result shall be clear and unambiguous and accompanied by such marks and inscriptions necessary to inform the user of the significance of the result. Easy reading of the presented result shall be permitted under normal conditions of use. Additional indications may be shown provided they cannot be confused with the metrologically controlled indications.

NOTE 1 Metrologically relevant information on the display requires an unambiguous identification of the way it is defined. The user manual could provide additional details.

NOTE 2 The mechanical tests specified in EN IEC 62052-11:2021 are deemed to provide evidence for compliance with the M1 and M2 requirements, if the meter after the tests shows no damage or change of the information and operates correctly in accordance with the requirements of EN IEC 62052-11:2021. As static meters have no moving parts, it is sufficient to perform metrological tests after the mechanical tests only.

NOTE 3 In contrast to EN IEC 62052-11:2021, 5.6.2 (Meters without indicating displays), meters without indicating display are not permitted under 2014/32/EU.

6 Meter marking and documentation

The requirements of EN IEC 62052-11:2021, Clause 6 apply together with those listed here.

The current measuring range shall be marked as follows:

- for direct connected meters, the minimum current (I_{\min}), nominal current (I_n), and maximum current (I_{\max}), for example, 0,5-10(80) A;
- the rated secondary current of transformer(s) to which a transformer-operated meter should be connected, for example: /5 A or /1 A. The nominal current(s) and the maximum current(s) of the meter may be included in the type designation.

7 Accuracy requirements

7.1 General test conditions

Tests and test conditions given in EN IEC 62052-11:2021, 7.1 apply.

7.2 Methods of accuracy verification

Tests and test conditions given in EN IEC 62052-11:2021, 7.2 apply.

7.3 Measurement uncertainty

The requirements, test conditions and procedures, and acceptance criteria of EN IEC 62052-11:2021, 7.3 apply.

7.4 Meter constant

The requirements, test conditions and procedures, and acceptance criteria of EN IEC 62052-11:2021, 7.4 apply.

7.5 Initial start-up of the meter

The requirements, test conditions and procedures, and acceptance criteria of EN IEC 62052-11:2021, 7.5 apply.

7.6 Test of no-load condition

The requirements, test conditions and procedures, and acceptance criteria of EN IEC 62052-11:2021, 7.6 apply. In addition to the test at $1,1 U_n$, the test shall be executed at $0,8 U_n$.

7.7 Starting current test

The requirements, test conditions and procedures, and acceptance criteria of EN IEC 62052-11:2021, 7.7 apply.

7.8 Repeatability test

The requirements, test conditions and procedures, and acceptance criteria of EN IEC 62052-11:2021, 7.8 apply.

NOTE The result of a reproducibility assessment according to the Directive 2014/32/EU is not expected to be significantly different than for the repeatability test for static electricity meters.

7.9 Allowable errors due to variation of the current

When the meter is operated under reference conditions as specified in 7.1 of EN IEC 62052-11:2021, Table 10, and the current and the power factor are varied, the percentage errors shall not exceed the limits specified for the relevant class indexes in Table 5.

If the meter is designed for the measurement of energy in both directions, the values in Table 5 shall apply for each direction.

If the meter is rated 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 5 — Acceptable percentage error limits at reference conditions
(single-phase meters and poly-phase meters with balanced loads or single-phase loads)

Value of current for direct connected or transformer operated meters	Power factor	Acceptable percentage error limits for meters of class index		
		A	B	C
$I_{\min} \leq I < I_{tr}$	1	$\pm 2,5$	$\pm 1,5$	$\pm 1,0$
$I_{tr} \leq I \leq I_{\max}$	0,5 ind. ... 1 ... cap 0,8	$\pm 2,0$	$\pm 1,0$	$\pm 0,5$

Additionally, for currents outside of the controlled current range (i.e. between I_{\min} and I_{\max}), unduly biasing shall not occur. The percentage errors shall not exceed the limits specified for the relevant class indexes in Table 6.

Table 6 — Acceptable percentage error limits at reference conditions
(single-phase meters and poly-phase meters with balanced loads or single-phase loads)

Value of current for direct connected or transformer operated meters	Power factor	Acceptable percentage error limits for meters of class index		
		A	B	C
$I_{st} \leq I < I_{\min}$	1	$\pm 2,5 \cdot I_{\min}/I$	$\pm 1,5 \cdot I_{\min}/I$	$\pm 1,0 \cdot I_{\min}/I$

NOTE 1 The limits between $I_{st} \leq I < I_{\min}$ are from OIML R46-1/-2: 2012, section 3.3.3.

NOTE 2 Values above I_{\max} are not expected to occur in installations for longer durations normally (i.e. more than a few hours in a year). However, error limits above I_{\max} can be specified in an agreement between the manufacturer and the purchaser or according to national regulatory requirements.

NOTE 3 Alternative approaches could be acceptable to demonstrate the requirement of no unduly biasing. The specifications provided in this document represent the view of TC 13, WG 01 as the best practice to be followed.

7.10 Allowable errors due to influence quantities and disturbances

Reference conditions as specified in 7.1 of EN IEC 62052-11:2021, Table 10 apply.