SLOVENSKI STANDARD
SIST EN 50470-3:2022

01-september-2022

Nadomešča:
SIST EN 50470-3:2007
SIST EN 50470-3:2007/A1:2019

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

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

SIST Preview
(https://ecommerce.sist.si)

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

(https://ecommerce.sist.si)
SIST EN 50470-3:2022
https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022

Equipement de comptage d'électricité - Partie 3: Exigences particulières - Compteurs statiques d'énergie active en courant alternatif (indices de classe A, B et C)

https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022

Ta slovenski standard je istoveten z: **EN 50470-3:2022**

ICS:

17.220.20	Merjenje električnih in magnetnih veličin	Measurement of electrical and magnetic quantities
91.140.50	Sistemi za oskrbo z elektriko	Electricity supply systems

SIST EN 50470-3:2022 **en,fr**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

SIST Preview
(https://ecommerce.sist.si)

SIST EN 50470-3:2022
https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022

SIST EN 50470-3:2022

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50470-3

June 2022

ICS 91.140.50

Supersedes EN 50470-3:2006 + A1:2018

English Version

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

Equipement de comptage d'électricité - Partie 3: Exigences particulières - Compteurs statiques d'énergie active en courant alternatif (indices de classe A, B et C)

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

This European Standard was approved by CENELEC on 2022-04-11. 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.

SIST Preview

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

SIST EN 50470-3:2022
https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2022 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

Ref. No. EN 50470-3:2022 E

SIST EN 50470-3:2022

Contents

Page

European foreword 4
1 Scope 5
2 Normative references 6
3 Terms and definitions 6
4 Standard electrical values 7
4.1 Voltages 7
4.2 Currents 7
4.2.1 General 7
4.2.2 Nominal current 8
4.2.3 Starting current 8
4.2.4 Minimum current 8
4.2.5 Maximum current 8
4.3 Frequencies 8
4.4 Power consumption 8
5 Construction requirements 8
6 Meter marking and documentation 9
7 Accuracy requirements 9
7.1 General test conditions 9
7.2 Methods of accuracy verification 9
7.3 Measurement uncertainty 9
7.4 Meter constant 9
7.5 Initial start-up of the meter 9
7.6 Test of no-load condition 9
7.7 Starting current test 9
7.8 Repeatability test 10
7.9 Allowable errors due to variation of the current 10
7.10 Allowable errors due to influence quantities and disturbances 11
7.11 Time-keeping accuracy 16
7.12 Accuracy tests at reference conditions 16
7.13 Error of measurement 16
8 Climatic conditions 17
8.1 General 17
8.2 Test of the effect of the climatic environments 17
9 The effects of external influences 17
10 Requirements concerning the software and protection against corruption 18
10.1 General 18
10.2 Identification of functions implemented in software 18
10.3 Identification and protection of software 18
10.4 Identification and protection of metrologically relevant parameters 18
10.5 Setting of parameters 19
10.6 Protection of measurement data 19
10.7 Protection against influence by metrologically non-relevant software 19
10.8 Protection against influence by connecting another device 19
11 Type test 19
12 Durability 19
13 Reliability 20

SIST Preview
(https://ecommerce.sist.si)
SIST EN 50470-3:2022
https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41f6-8f72-9e06dcfbba52/sist-en-50470-3-2022

SIST EN 50470-3:2022

Annex A (informative) Calculation of the error of measurement **21**

Annex B (informative) Differences between IEC and Directive 2014/32/EU **22**

Annex C (informative) Accuracy classes **25**

C.1 General **25**

C.2 Accuracy classes **25**

Annex ZZ (informative) Relationship between this European Standard and the essential requirements of Directive 2014/32/EU aimed to be covered **26**

Bibliography **29**

SIST Preview
(https://ecommerce.sist.si)

SIST EN 50470-3:2022
https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022

SIST EN 50470-3:2022

European foreword

This document (EN 50470-3:2022) 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) 2023-04-11
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2025-04-11

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

EN 50470-3:2022 includes the following significant technical changes with respect to EN 50470-3:2006: it is based on EN IEC 62052-11:2021/A11:2022 instead of EN 50470-1:2006.

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 has been prepared under a Standardization Request given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

SIST Preview
(https://ecommerce.sist.si)

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

SIST EN 50470-3:2022
https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022

This document is related to:

— EN IEC 62053-21:2021/A11:2021, Electricity metering equipment – Particular requirements – Part 21: Static meters for AC active energy (classes 0,5, 1 and 2)

— EN IEC 62053-22:2021/A11:2021, 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 in related standards (EN IEC 62053-21:2021/A11:2021 and EN IEC 62053-22:2021/A11:2021) 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).

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.

SIST EN 50470-3:2022

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.

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. EN 62052-31:2016 covers AC voltages only up to 600 V and Ed. 2 of EN IEC 62052-31 will cover AC voltages up to 1000 V.

— 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 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 EN 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.

https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022

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 61557-12:2008. However, devices compliant with EN 61557-12:2008 are not intended to be used as billing meters unless they are also compliant with the EN IEC 62052-11:2021/A11:2022 and EN 50470-3:2022 standards.

NOTE 5 Product requirements for power quality instruments (PQIs) are covered in EN 62586-1:2017. Requirements for power quality measurement techniques (functions) are covered in EN 61000-4-30:2015. Requirements for testing of the power quality measurement functions are covered in EN 62586-2:2017.

This document does not apply to:

— meters for which the line-to-neutral voltage 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;

SIST EN 50470-3:2022

— 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 to 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/A11:2022, 9.3.14.

SIST Preview
(https://ecommerce.sist.si)

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/A11:2022, *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 EN IEC 62052-11:2021/A11:2022 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 https://www.electropedia.org/

NOTE The definitions listed here take precedence over those in EN IEC 62052-11:2021/A11:2022.

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

SIST EN 50470-3:2022

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. This definition is the same definition as in the Directive 2014/32/EU. In EN IEC 62052-11:2021/A11:2022, 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

SIST Preview
(https://ecommerce.sist.si)

4 Standard electrical values

4.1 Voltages

SIST EN 50470-3:2022
https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022

The values in EN IEC 62052-11:2021/A11:2022, 4.1 apply.

4.2 Currents

4.2.1 General

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

Meters	Current	Value of current A
For 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/A11:2022, Table 3.

SIST EN 50470-3:2022

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 160 A, 200 A, 250 A, 400 A, 500 A, 600 A, 630 A.

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

Table 2 — Starting current

Meters	Meters of class index			Power factor
	A	B	C	
For direct connection	≤ 0,05 I_{tr}	≤ 0,04 I_{tr}	≤ 0,04 I_{tr}	1
Transformer operated	≤ 0,06 I_{tr}	≤ 0,04 I_{tr}	≤ 0,02 I_{tr}	1

4.2.4 Minimum current

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

Table 3 — Minimum current

Meters	Meters of class index		
	A	B	C
For direct connection	≤ 0,5 I_{tr}	≤ 0,5 I_{tr}	≤ 0,3 I_{tr}
Transformer operated	≤ 0,4 I_{tr}	≤ 0,2 I_{tr}	≤ 0,2 I_{tr}

SIST Preview
(https://ecommerce.sist.si)
SIST EN 50470-3:2022
https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022

4.2.5 Maximum current

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

Table 4 — Maximum current

Meters	Meters of class index		
	A	B	C
For direct connection	≥ 50 I_{tr}	≥ 50 I_{tr}	≥ 50 I_{tr}
Transformer operated	≥ 24 I_{tr}	≥ 24 I_{tr}	≥ 24 I_{tr}

4.3 Frequencies

The values given in EN IEC 62052-11:2021/A11:2022, 4.3 apply.

4.4 Power consumption

The values given in EN IEC 62052-11:2021/A11:2022, 4.4 apply.

5 Construction requirements

The requirements given in EN IEC 62052-11:2021/A11:2022, Clause 5 apply.

SIST EN 50470-3:2022

In addition to the requirements in EN IEC 62052-11:2021/A11:2022, 5.6, these requirements apply:

a) The scale interval for a measured value shall be in the form 1×10^n, 2×10^n, or 5×10^n, 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/A11:2022 are deemed to provide evidence for compliance with the M1 and M2 requirements (see 2014/32/EU, Measuring Instruments Directive), 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/A11:2022. As static meters have no moving parts, it is sufficient to perform metrological tests after the mechanical tests only.

6 Meter marking and documentation

The requirements of EN IEC 62052-11:2021/A11:2022, Clause 6 apply.

7 Accuracy requirements

7.1 General test conditions

Tests and test conditions given in EN IEC 62052-11:2021/A11:2022, 7.1 apply.

SIST Preview
(https://ecommerce.sist.si)

7.2 Methods of accuracy verification

Tests and test conditions given in EN IEC 62052-11:2021/A11:2022, 7.2 apply.

SIST EN 50470-3:2022
https://ecommerce.sist.si/catalog/standards/sist/9b87cbe5-5d0f-41fc-8f72-9e06dcfbba52/sist-en-50470-3-2022

7.3 Measurement uncertainty

The requirements, test conditions and procedures, and acceptance criteria of EN IEC 62052-11:2021/A11:2022, 7.3 apply.

7.4 Meter constant

The requirements, test conditions and procedures, and acceptance criteria of EN IEC 62052-11:2021/A11:2022, 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/A11:2022, 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/A11:2022, 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/A11:2022, 7.7 apply.

SIST EN 50470-3:2022

7.8 Repeatability test

The requirements, test conditions and procedures, and acceptance criteria of EN IEC 62052-11:2021/A11:2022, 7.8 apply.

NOTE For static meters the results of the repeatability test are deemed to be sufficient for the reproducibility requirement as stated in Annex I, Clause 2 of Directive 2014/32/EU.

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/A11:2022, 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 directly connected or transformer operated meters	Power factor	Acceptable percentage error limits for meters of class index		
		A	B	C
$I_{min} \le I < I_{tr}$	1	±2,5	±1,5	±1,0
$I_{tr} \le I \le I_{max}$	0,5 ind…1…cap 0,8	±2,0	±1,0	±0,5

SIST Preview (https://ecommerce.sist.si)

NOTE 1 The requirements for poly-phase meters operating with single-phase loads are exceeding requirements of Directive 2014/32/EU, and non-compliance with Table 5 requirements does not necessarily imply non-compliance with Directive 2014/32/EU for this specific test.

SIST EN 50470-3:2022

Additionally, for currents outside of the controlled current range (i.e. for currents below I_{min} or above 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 directly connected or transformer operated meters	Power factor	Acceptable percentage error limits for meters of class index		
		A	B	C
$I_{st} \le I < I_{min}$	1	$\pm 2{,}5 \cdot \frac{I_{min}}{I}$	$\pm 1{,}5 \cdot \frac{I_{min}}{I}$	$\pm 1{,}0 \cdot \frac{I_{min}}{I}$

NOTE 2 The limits between $I_{st} \le I < I_{min}$ are from OIML R 46-1/-2:2012, section 3.3.3.

NOTE 3 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 4 Alternative approaches could be acceptable to demonstrate the requirement of no unduly biasing. The specifications provided in this document represent the view of CLC/TC 13, WG 01 as the best practice to be followed.