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**Oprema za merjenje električne energije (a.c.) - 2. del: Posebne zahteve - Elektromehanski števcji za delovno energijo (razredna indeksa A in B)**

Electricity metering equipment (a.c.) -- Part 2: Particular requirements - Electromechanical meters for active energy (class indexes A and B)

Wechselstrom-Elektrizitätszähler -- Teil 2: Besondere Anforderungen - Elektromechanische Wirkverbrauchszähler der Genauigkeitsklassen A und B

Equipement de comptage d'électricité (c.a.) -- Partie 2: Prescriptions particulières - Compteurs électromécaniques d'énergie active (classes de précision A et B)

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**Ta slovenski standard je istoveten z: EN 50470-2:2006**

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**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 50470-2:2007****en,fr**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 50470-2**

October 2006

ICS 91.140.50

English version

**Electricity metering equipment (a.c.)  
Part 2: Particular requirements -  
Electromechanical meters for active energy  
(class indexes A and B)**

Equipement de comptage  
d'électricité (c.a.)  
Partie 2: Prescriptions particulières -  
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Wirkverbrauchszähler  
der Genauigkeitsklassen A und B

**ITEH STANDARD PREVIEW**  
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SIST EN 50470-2:2007

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## CENELEC

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

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 13, Equipment for electrical energy measurement and load control.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50470-2 on 2006-05-01.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2007-05-01
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2009-05-01

This EN 50470-2 is related to EN 62053-11:2003, *Electricity metering equipment (a.c.) – Particular requirements – Part 11: Electromechanical meters for active energy (classes 0,5, 1 and 2)*.

The structure of the two standards is similar, modifications in this European Standard are provided in the perspective of compliance with the Essential Requirements of the Directive 2004/22/EC on Measuring Instruments (MID).

This standard is to be used with EN 50470-1:2006, *Electricity metering equipment (a.c.) – Part 1: General requirements, tests and test conditions – Metering equipment (class indexes A, B and C)*.

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive 2004/22/EC. See Annex ZZ.

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## 1 Scope

This European Standard applies to newly manufactured electromechanical watt-hour meters intended for residential, commercial and light industrial use, of class indexes A and B, for the measurement of alternating current electrical active energy in 50 Hz networks. It specifies particular requirements and type test methods.

It applies to electromechanical watt-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(s) 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 (multi-function meters) then this standard applies only for the active energy metering part.

This standard distinguishes between:

- meters of class indexes A and B;
- direct connected and transformer operated meters;
- meters for use in networks equipped with or without earth fault neutralizers.

It does not apply to:

- watt-hour meters where the voltage across the connection terminals exceeds 600 V (line-to-line voltage for meters for polyphase systems);
- portable meters.

Methods for acceptance testing are covered by the IEC 62058 series of standards <sup>1)</sup>.

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

## 2 Normative references

The following referenced documents are indispensable for the application 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.

Publication	Year	Title
EN 50470-1	2006	<i>Electricity metering equipment (a.c.) – Part 1: General requirements, tests and test conditions – Metering equipment (class indexes A, B and C)</i>

## 3 Terms, definitions and abbreviations

For the purposes of this document, the terms and definitions given in EN 50470-1 apply.

<sup>1)</sup> At draft stage.

## 4 Standard electrical values

The values given in EN 50470-1 apply.

## 5 Mechanical requirements

In addition to the mechanical requirements in EN 50470-1, electromechanical meters shall fulfil the following requirements.

### 5.1 General

The case of an electromechanical watt-hour meter shall be so constructed that, if mounted according to the manufacturer's instructions, the meter shall not deviate by more than 0,5° in all directions from its vertical position (see also Footnote c of Table 12).

### 5.2 Register (counting mechanism)

The register may be of the drum or the pointer type.

In drum-type registers, the principal unit in which the register records shall be marked adjacent to the set of drums.

In this type of register, only the last drum, i.e. the drum on the extreme right, may be continuously movable.

In pointer-type registers, the unit in which the register records shall be marked adjacent to the units dial in the form: 1 kWh/div, or 1 MWh/div, and the decimal multiples may be marked adjacent to the other dials. For example, in a meter registering in terms of kilowatt-hours, the units dial shall be marked: 1 kWh/div and, adjacent to the other dials to the left of the units dial, shall be marked: 10 - 100 - 1 000, etc.

### 5.3 Direction of rotation and marking of the rotor

The edge of the rotor nearest to an observer viewing a meter from the front shall move from left to right for positive registration. The direction of rotation shall be marked by a clearly visible arrow.

The edge and/or upper surface of the disk shall carry an easily visible mark to facilitate revolution counting. Other marks may be added for stroboscopic or other tests, but such marks shall be so placed as not to interfere with the use of the main visible mark for photoelectric revolution counting.

## 6 Climatic conditions

The conditions given in EN 50470-1 apply.

## 7 Electrical requirements

In addition to the electrical requirements in EN 50470-1, meters shall fulfil the following requirements.

### 7.1 Power consumption

#### 7.1.1 Measuring method

The power consumption in the voltage and current circuits shall be determined at reference conditions given in 8.7.1 by any suitable method. The overall maximum error of the measurement of the power consumption shall not exceed 5 %.



### 7.1.2 Voltage circuits

The active and apparent power loss in each voltage circuit of a meter at reference voltage, reference temperature and reference frequency shall not exceed the values shown in Table 1.

**Table 1 – Power consumption in voltage circuits**

Meters (single- and polyphase)	Class index	
	A	B
Power consumption in voltage circuit	2 W and 10 VA	3 W and 12 VA
NOTE In order to match voltage transformers to meters, the meter manufacturer should state the power factor of the burden (for transformer operated meters only).		

### 7.1.3 Current circuits

The apparent power taken by each current circuit of a meter at reference current, reference frequency and reference temperature shall not exceed the values shown in Table 2.

**Table 2 – Power consumption in current circuits**

Meters, (single- and polyphase)	Test current	Class index	
		A	B
Direct connected $I_{ref} < 30 \text{ A}$	$I_{ref} = 10 I_r$	2,5 VA	4,0 VA
Direct connected $I_{ref} \geq 30 \text{ A}$	$I_{ref} = 10 I_r$	4,0 VA	6,0 VA
Transformer operated	$I_n$	2,5 VA	4,0 VA
NOTE In order to match current transformers to meters, the meter manufacturer should state the power factor of the burden (for transformer operated meters only).			

## 7.2 AC voltage test

The a.c. voltage test shall be carried out in accordance with Table 3.

The test voltage shall be substantially sinusoidal, having a frequency between 45 Hz and 65 Hz, and applied for 1 min. The power source shall be capable of supplying at least 500 VA.

For the tests relative to earth, the auxiliary circuits with reference voltage equal to or below 40 V shall be connected to earth.

During this test no flashover, disruptive discharge or puncture shall occur.

Table 3 – AC voltage tests

Test	Test voltage r.m.s.	Points of application of the test voltage
A	2 kV for tests in Items a), b), c), d)  and  500 V for test in Item e)	<p><i>Tests which may be carried out with the cover and terminal cover removed:</i></p> <ul style="list-style-type: none"> <li>– between, on the one hand, the <i>frame</i> and,</li> <li>– on the other hand:</li> </ul> <ul style="list-style-type: none"> <li>a) each current circuit which, in normal service, is separated and suitably insulated from the other circuits <sup>a</sup>;</li> <li>b) each voltage circuit, or set of voltage circuits having a common point which, in normal service, is separated and suitably insulated from the other circuits <sup>a</sup>;</li> <li>c) each auxiliary circuit or set of auxiliary circuits having a common point, and whose reference voltage is over 40 V;</li> <li>d) each assembly of current-voltage windings of one and the same driving element which, in normal service, are connected together but separated and suitably insulated from the other circuits <sup>b</sup>;</li> <li>e) each auxiliary circuit whose reference voltage is equal to or below 40 V.</li> </ul>
B	600 V or twice the voltage applied to the voltage windings under reference conditions, when this voltage is greater than 300 V (the higher value).	<p><i>Tests which may be carried out with the terminal cover removed, but with the cover in place when it is made of metal:</i></p> <p>between the current circuit and the voltage circuit of each driving element, normally connected together, this connection being temporarily broken for the purpose of the test <sup>c</sup></p>
C	2 kV	<p><i>Tests to be carried out with the case closed, the cover and terminal cover in place:</i></p> <p>between, on the one hand, all the current and voltage circuits as well as the auxiliary circuits whose reference voltage is over 40 V, connected together, and, on the other hand, earth.</p>
D	4 kV for test in Item a)  2 kV for test in Item b)  40 V for test in Item c)	<p><i>Additional tests for insulating encased meters of protective class II:</i></p> <ul style="list-style-type: none"> <li>a) between on the one hand, all the current and voltage circuits as well as the auxiliary circuits whose reference voltage is over 40 V, connected together, and, on the other hand, earth;</li> <li>b) between the <i>frame</i> and earth;</li> <li>c) between, on the one hand, all conductive parts inside the meter case connected together and, on the other hand, all conductive parts, outside the meter case that are accessible with the test finger, connected together <sup>d</sup>.</li> </ul>

<sup>a</sup> The simple breaking of the connection, which is normally included between current and voltage windings is not generally sufficient to ensure suitable insulation, which can withstand a test voltage of 2 kV.

Tests in part A) Items a) and b) generally apply to meters operated from instrument transformers and also to certain special meters having separate current and voltage windings.

<sup>b</sup> Circuits, which have been subjected to tests in part A) Items a) and b) are not subjected to the test in Item d). When the voltage circuits of a polyphase meter have a common point in normal service, this common point shall be maintained for the test and, in this case, all the circuits of the driving elements are subjected to a single test.

<sup>c</sup> It is not, strictly speaking, a dielectric strength test, but a means of verifying that the insulation distances are sufficient when the connecting device is open.

<sup>d</sup> The test on part D item c) is not necessary, if the visual inspection for compliance with the conditions of EN50470-1 subclause 5.7 leaves no doubt.

## 8 Accuracy requirements and tests

### 8.1 Limits of percentage error due to variation of the load

When the meter is under reference conditions given in 8.7.1, 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 4 and Table 5.

**Table 4 – Percentage error limits at reference conditions  
(single-phase meters and polyphase meters with balanced loads)**

Value of current for direct connected or transformer operated meters	Power factor	Percentage error limits for meters of class index	
		A	B
$I_{\min} \leq I < I_{tr}$	1	$\pm 2,5$	$\pm 1,5$
$I_{tr} \leq I \leq I_{\max}$	0,5 ind...1...cap 0,8	$\pm 2,0$	$\pm 1,0$
NOTE For the relationships $I_{\min} / I_{tr}$ and $I_{\max} / I_{tr}$ see EN 50470-1, Table 3.			

**Table 5 – Percentage error limits at reference conditions  
(polyphase meters carrying a single-phase load,  
but with balanced polyphase voltages applied to voltage circuits)**

Value of current for direct connected or transformer operated meters	Power factor	Percentage error limits for meters of class index	
		A	B
$5 I_{tr} \leq I \leq I_{\max}$	0,5 ind...1	$\pm 3,0$	$\pm 2,0$
NOTE For the relationship $I_{\max} / I_{tr}$ see EN 50470-1, Table 3.			

The difference between the percentage error when the meter is carrying a single-phase load and a balanced polyphase load at  $I_{ref}$  and unity power factor shall not exceed 2,5 % and 1,5 % for meters of class indexes A and B respectively.

### 8.2 Repeatability

The application of the same measurand under the same conditions of measurement shall result in the close agreement of successive measurements. The repeatability at any test point given in Table 13 shall be better than  $1/10^{\text{th}}$  of the limit of percentage error at reference conditions. The manufacturer shall state the necessary number of revolutions.

### 8.3 Limits of additional percentage error due to influence quantities

When the current and the power factor are held constant at a point within their respective specified measuring ranges, and any single influence quantity is taken from its reference value and varied within its specified operating range, with the meter otherwise operated at reference conditions as specified in 8.7.1, the additional percentage error shall not exceed the limits specified for the relevant class indexes given in Table 6 and Table 7.

Concerning additional percentage error due to temperature variation, the requirements for each sub-range within the full temperature range specified by the manufacturer apply.

NOTE For example, if the manufacturer specifies that the meter is intended for the temperature range -10 °C to +40 °C, then the requirements for the sub-ranges 5 °C to 30 °C, -10 °C to 5 °C and 30 °C to 40 °C apply.