

Alternating current static watt-hour meters for active energy (classes 1 and 2)

The European Standard EN 61036:1996, with the incorporation of amendment A1:2000, has the status of a British Standard

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National foreword

This British Standard is the English language version of EN 61036:1996, including amendment A1:2000. It is identical with IEC 61036:1996, including amendment 1:2000. It supersedes BS EN 61036:1993 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**. 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**.

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Summary of pages

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Alternating current static watt-hour meters for active energy (classes 1 and 2) (includes amendment A1:2000)

(IEC 61036:1996 + A1:2000)

Compteurs statiques d'énergie active pour
courant alternatif (classes 1 et 2)
(inclut l'amendement A1:2000)
(CEI 61036:1996 + A1:2000)

Elektronische
Wechselstrom-Wirkverbrauchszähler
(Genauigkeitsklassen 1 und 2)
(enthält Änderung A1:2000)
(IEC 61036:1996 + A1:2000)

This European Standard was approved by CENELEC on 1996-07-02. Amendment A1 was approved by CENELEC on 2000-06-01. 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.

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CENELEC

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

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Foreword

The text of document 13/1099/FDIS, future edition 2 of IEC 1036, prepared by the Technical Committee CENELEC TC 13, Equipment for electrical energy measurement and load control was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61036 on 1996-07-02.

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- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1997-06-01

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given for information only.

In this standard, Annex A, Annex B, Annex C, Annex D, Annex F and Annex ZA are normative and Annex E is informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 1036:1996 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document 13/1202/FDIS, future amendment 1 to IEC 61036:1996, prepared by IEC TC 13, Equipment for electrical energy measurement and load control, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 61036:1996 on 2000-06-01.

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Annexes designated “normative” are part of the body of the standard. In this standard, Annexes G and ZA are normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 1:2000 to the International Standard IEC 61036:1996 was approved by CENELEC as an amendment to the European Standard without any modification.

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Introduction

This International Standard has been prepared using IEC 60521 and IEC 60687 as reference standards. As many new requirements and tests had to be added, this new standard has been split into five clauses, namely:

- 1 Scope
- 2 Normative references
- 3 Definitions
- 4 Requirements
- 5 Tests and test conditions

For all tests which are not specified in this standard, reference must be made to existing IEC Publications.

This standard is a type test standard, in line with IEC 60521 and IEC 60687. It covers the “standard meter”, which will be used indoors and outdoors in big quantities world-wide. It does not deal with special executions (such as metering-part and display in separate housings). These will be covered in separate International Standards.

This standard distinguishes:

- between accuracy class index 1 and accuracy class index 2 meters;
- 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 to guarantee the proper functioning of the meter under normal working conditions. For special application, other test levels might be necessary and will be fixed between the user and the manufacturer.

The static meter will face the same general environmental conditions as the electromechanical meter. Therefore, the specification will implement all the requirements fixed in IEC 60521 wherever necessary, in particular the mechanical requirements.

Regarding accuracy requirements and the errors due to other influence quantities, it is expected that the electronic solutions will show a much better performance. The application of the same error limits as used in IEC 60521 makes more economical and more reliable products possible and does not require new definitions for class 1 and class 2 meters. In future revisions of this standard, the practical experience should be taken into account.

Regarding the influence of harmonics, special test procedures had to be incorporated. These tests check the functionality of the meter when the meter is exposed to large distortions in the current circuit and the accuracy of the meter with 5th harmonic in the current and voltage circuit.

To check the functionality, three practical conditions have been specified:

- half-wave rectification (d.c. and even harmonics);
- phase-fired control (odd harmonics);
- burst control (sub-harmonics).

To check if the meters accurately measure total energy in the presence of harmonics a test with 5th harmonic in both the current and voltage circuits has been specified. It is assumed that correct measurement of 5th harmonic energy indicates that measurement for other harmonics will be good.

The reliability aspects of equipment for electrical energy measurement and load control will be handled separately.

For tests and test conditions, existing tests and test levels have been taken from IEC 60521, IEC 60687 and appropriate IEC specifications. New tests had to be added with respect to EMC.

The IEC publications referred to in this standard are listed in clause 2.

1 Scope

This International Standard applies only to newly manufactured static watt-hour meters of accuracy classes 1 and 2, for the measurement of alternating current electrical active energy of a frequency in the range 45 Hz to 65 Hz and to their type tests only.

It applies only to static 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).

It does not apply to:

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

Where the display and/or the memory(ies) is/are external or where other elements are enclosed in the meter case (such as maximum demand indicators, telemetering, time switches or remote control, etc.) this standard applies only to the metering section.

This standard does not cover the acceptance tests and the conformity tests (both testing procedures are connected with legal requirements of the different countries and could only be taken care of partially). Regarding acceptance tests, a basic guideline is given in IEC 60514.

The reliability aspect is also not covered in this standard as there are no short-term test procedures available which would fit into type test documents to satisfactorily check this requirement.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60038:1983, *IEC standard voltages*.

Ⓐ IEC 60044-1:1996, *Instrument transformers — Part 1: Current transformers*. Ⓐ

IEC 60050(301, 302, 303):1983, *International Electrotechnical Vocabulary (IEV) — Chapter 301: General terms on measurements in electricity — Chapter 302: Electrical measuring instruments — Chapter 303: Electronic measuring instruments*.

IEC 60060, *High-voltage test techniques*.

IEC 60068-2-1:1990, *Environmental testing — Part 2: Tests — Tests A: Cold*.

IEC 60068-2-2:1974, *Environmental testing — Part 2: Tests — Tests B: Dry heat*.

IEC 60068-2-5:1975, *Environmental testing — Part 2: Tests — Test Sa: Simulated solar radiation at ground level*.

IEC 60068-2-6:1982, *Environmental testing — Part 2: Tests — Test Fc and guidance: Vibration (sinusoidal)*.

IEC 60068-2-11:1981, *Environmental testing — Part 2: Tests — Test Ka: Salt mist*.

IEC 60068-2-27:1987, *Environmental testing — Part 2: Tests — Test Ea and guidance: Shock*.

IEC 60068-2-30:1980, *Environmental testing — Part 2: Tests — Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*.

Ⓐ IEC 60068-2-75:1997, *Environmental testing — Part 2-75: Tests — Test Eh: Hammer tests*. Ⓐ

IEC 60085:1984, *Thermal evaluation and classification of electrical insulation*.

Ⓐ Text deleted Ⓐ

IEC 60186:1987, *Voltage transformers*.

A1 Text deleted **A1**

IEC 60359:1987, *Expression of the performance of electrical and electronic measuring equipment.*

IEC 60387:1992, *Symbols for alternating-current electricity meters.*

IEC 60417C:1977, *Graphical symbols for use on equipment — Index, survey and compilation of the single sheets — Third supplement.*

IEC 60514:1975, *Acceptance inspection of Class 2 alternating-current watt-hour meters.*

IEC 60521:1988, *Classes 0,5, 1 and 2 alternating-current watt-hour meters.*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code).*

IEC 60687:1992, *Alternating current static watt-hour meters for active energy (classes 0,2 S and 0,5 S).*

IEC 60695-2-1:1994, *Fire hazard testing — Part 2: Test methods — Glow-wire test methods.*

IEC 60721-3-3:1994, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 3: Stationary use at weather-protected locations.*

IEC 60736:1982, *Testing equipment for electrical energy meters.*

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test — Basic EMC publication.*

IEC 61000-4-3:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 3: Radiated, radio-frequency, electromagnetic field immunity test.*

IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 4: Electrical fast transient/burst immunity test — Basic EMC publication.*

A1 IEC 61000-4-6:1996, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 6: Immunity to conducted disturbances, induced by radio-frequency fields.*

IEC 62053-31:1998, *Electricity metering equipment (a.c.) — Particular requirements — Part 31: Pulse output devices for electromechanical and electronic meters (two wires only).* **A1**

CISPR 22:1993, *Limits and methods of measurement of radio disturbance characteristics of information technology equipment.*

ISO 75-2:1993, *Plastics — Determination of temperature of deflection under load — Part 2: Plastic and ebonite.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

The majority of the following definitions have been taken from the relevant chapters of the International Electrotechnical Vocabulary (IEV), IEC 60050(301, 302, 303). In such cases, the appropriate IEV reference is given. Certain new definitions or modifications of IEV definitions have been added in this standard in order to facilitate understanding. Expression of the performance of electrical and electronic measuring equipment has been taken from IEC 60359.

3.1 general definitions

3.1.1

watt-hour meter

instrument intended to measure active energy by integrating active power with respect to time [IEV 301-04-17]

3.1.2

static watt-hour meter

meter in which current and voltage act on solid-state (electronic) elements to produce an output proportional to watt-hours

3.1.3

multi-rate meter

energy meter provided with a number of registers, each becoming operative at specified time intervals corresponding to different tariffs [IEV 302-04-06]

3.1.4

meter type

term used to define a particular design of meter, manufactured by one manufacturer, having:

- a) similar metrological properties;
- b) the same uniform construction of parts determining these properties;
- c) the same ratio of the maximum current to the reference current.

the type may have several values of reference current and reference voltage

meters are designated by the manufacturer by one or more groups of letters or numbers, or a combination of letters and numbers. Each type has one designation only

NOTE The type is represented by the sample meter(s) intended for the type tests, whose characteristics (reference current and reference voltage) are chosen from the values given in the tables proposed by the manufacturer.

3.2 definitions related to the functional elements

3.2.1

measuring element

part of the meter which produces an output proportional to the energy

3.2.2 output devices

3.2.2.1

test output

device which can be used for testing the meter

3.2.2.2

operation indicator

device which gives a visible signal of the operation of the meter

3.2.2.3

pulse

wave that departs from an initial level for a limited duration of time and ultimately returns to the original level

3.2.2.4

pulse device (for electricity metering)

functional unit for emitting, transmitting, retransmitting or receiving electric pulses, representing finite quantities, such as energy normally transmitted from some form of electricity meter to a receiver unit

3.2.2.5

pulse output device (pulse output)

pulse device for emitting pulses

3.2.2.6

optical test output

optical pulse output device that is used for testing the meter

3.2.2.7

electrical test output

electrical pulse output device that is used for testing the meter

3.2.2.8

receiving head

functional unit for receiving pulses emitted by an optical pulse output 

3.2.3

memory

element which stores digital information

3.2.3.1

non-volatile memory

storage device which can retain information in the absence of power

3.2.4**display**

device which displays the content(s) of (a) memory(ies)

3.2.5**register**

electromechanical or electronic device comprising both memory and display which stores and displays information

a single display may be used with multiple electronic memories to form multiple registers

3.2.6**current circuit**

internal connections of the meter and part of the measuring element through which flows the current of the circuit to which the meter is connected

3.2.7**voltage circuit**

internal connections of the meter, part of the measuring element and power supply for the meter, supplied with the voltage of the circuit to which the meter is connected

3.2.8**auxiliary circuit**

elements (lamps, contacts, etc.) and connections of an auxiliary device within the meter case intended to be connected to an external device, for example clock, relay, impulse counter

3.2.9**constant**

value expressing the relation between the active energy registered by the meter and the corresponding value of the test output. If this value is a number of pulses, the constant should be either pulses per kilowatt-hour (imp/kWh) or watt-hours per pulse (Wh/imp)

3.3 definitions of mechanical elements**3.3.1****indoor meter**

meter which can only be used with additional protection against environmental influences (mounted in a house, in a cabinet)

3.3.2**outdoor meter**

meter which can be used without additional protection in an exposed environment

3.3.3 base

back of the meter by which it is generally fixed and to which are attached the measuring element, the terminals or the terminal block, and the cover

for a flush-mounted meter, the meter base may include the sides of the case

3.3.3.1**socket**

base with jaws to accommodate terminals of a detachable watt-hour meter and which has terminals for connection to the supply line. It may be a single-position socket for one meter or a multiple-position socket for two or more meters

3.3.4**cover**

enclosure on the front of the meter, made either wholly of transparent material or opaque material provided with window(s) through which the operation indicator (if fitted) and the display can be read

3.3.5**case**

comprises the base and the cover

3.3.6

accessible conductive part

conductive part which can be touched by the standard test finger, when the meter is installed and ready for use

3.3.7

protective earth terminal

terminal connected to accessible conductive parts of a meter for safety purposes

3.3.8

terminal block

support made of insulating material on which all or some of the terminals of the meter are grouped together

3.3.9

terminal cover

cover which covers the meter terminals and, generally, the ends of the external wires or cables connected to the terminals

3.3.10

clearance

shortest distance measured in air between conductive parts

3.3.11

creepage distance

shortest distance measured over the surface of insulation between conductive parts

3.4 definitions of insulations

3.4.1

basic insulation

insulation applied to live parts to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes.

3.4.2

supplementary insulation

independent insulation applied in addition to the basic insulation, in order to provide protection against electric shock in the event of a failure of the basic insulation

3.4.3

double insulation

insulation comprising both basic insulation and supplementary insulation

3.4.4

reinforced insulation

single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation

NOTE The term "insulation system" does not imply that the insulation should be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

3.4.5

insulating encased meter of protective class I

meter in which protection against electric shock does not rely on basic insulation only but which includes an additional safety precaution in that conductive accessible parts are connected to the protective earthing conductor in the fixed wiring of the installation in such a way that conductive accessible parts cannot become live in the event of a failure of the basic insulation

NOTE This provision includes a protective earth terminal.

3.4.6**insulating encased meter of protective class II**

meter with a case of insulating material in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective earthing or reliance upon installation conditions

3.5 definitions of meter quantities**3.5.1 reference current****3.5.1.1****basic current¹⁾ (I_b)**

value of current in accordance with which the relevant performance of a direct connected meter is fixed

3.5.1.2**rated current¹⁾ (I_n)**

value of current in accordance with which the relevant performance of a transformer operated meter is fixed

3.5.2**maximum current¹⁾ (I_{max})**

highest value of current at which the meter purports to meet the accuracy requirements of this standard

3.5.3**reference voltage¹⁾ (U_n)**

value of the voltage in accordance with which the relevant performance of the meter is fixed

3.5.4**reference frequency**

value of the frequency in accordance with which the relevant performance of the meter is fixed

3.5.5**class index**

number which gives the limits of the permissible percentage error, for all values of current between 0,1 I_b and I_{max} , or between 0,05 I_n and I_{max} , for unity power factor (and in the case of polyphase meters with balanced loads) when the meter is tested under reference conditions (including permitted tolerances on the reference values) as defined in this standard

NOTE In this standard, meters are classified according to their respective class indices, i.e. 1 and 2.

3.5.6**percentage error**

percentage error is given by the following formula:

$$\text{Percentage error} = \frac{\text{energy registered by the meter} - \text{true energy}}{\text{true energy}} \times 100$$

NOTE Since the true value cannot be determined, it is approximated by a value with a stated uncertainty that can be traced to standards agreed upon between manufacturer and user or to national standards.

3.6 definitions of influence quantities**3.6.1****influence quantity**

any quantity, generally external to the meter, which may affect its working performance
[IEV 301-08-09 modified]

3.6.2**reference conditions**

appropriate set of influence quantities and performance characteristics, with reference values, their tolerances and reference ranges, with respect to which the intrinsic error is specified
[IEV 301-08-10 modified]

¹⁾ The terms "voltage" and "current" indicate r.m.s. values unless otherwise specified.

3.6.3

variation of error due to an influence quantity

difference between the percentage errors of the meter when only one influence quantity assumes successively two specified values, one of them being the reference value

3.6.4

distortion factor

ratio of the r.m.s. value of the harmonic content (obtained by subtracting from a non-sinusoidal alternating quantity its fundamental term) to the r.m.s. value of the non-sinusoidal quantity. The distortion factor is usually expressed in percentage

3.6.5

electromagnetic disturbance

conducted or radiated electromagnetic interferences which may affect functionally or metrologically the operation of the meter

3.6.6

reference temperature

ambient temperature specified for reference conditions

3.6.6.1

mean temperature coefficient

ratio of the variation of the percentage error to the change of temperature which produces this variation

3.6.7

rated operating conditions

set of specified measuring ranges for performance characteristics and specified operating ranges for influence quantities, within which the variations or operating errors of a meter are specified and determined

3.6.8

specified measuring range

set of values of a measured quantity for which the error of a meter is intended to lie within specified limits

3.6.9

specified operating range

range of values of a single influence quantity which forms a part of the rated operating conditions

3.6.10

limit range of operation

extreme conditions which an operating meter can withstand without damage and without degradation of its metrological characteristics when it is subsequently operated under its rated operating conditions

3.6.11

storage and transport conditions

extreme conditions which a non-operating meter can withstand without damage and without degradation of its metrological characteristics when it is subsequently operated under its rated operating conditions

3.6.12

normal working position

position of the meter defined by the manufacturer for normal service

3.6.13

thermal stability

thermal stability is considered to be reached when the change in error as a consequence of thermal effects is during 20 min less than 0,1 times the maximum permissible error for the measurement under consideration

3.7 definition of tests

3.7.1

type test

procedure according to which the series of tests is carried out on one meter or on a small number of meters of the same type having identical characteristics, selected by the manufacturer, to verify that the respective type of meter complies with all the requirements of this standard for the relevant class of meters

4 Requirements

4.1 Standard electrical values

4.1.1 Standard reference voltages

Table 1 — Standard reference voltages

Meters for	Standard values V	Exceptional values V
Direct connection	120-230-277-400-480 (IEC 60038)	100-127-200-220-240-380-415
Connection through voltage transformer(s)	57,7-63,5-100-110-115-120-200 (IEC 60186)	173-190-220

4.1.2 Standard currents

Table 2 — Standard reference currents

Meters for	Standard values A	Exceptional values A
Direct connection (I_b)	5-10-15-20-30-40-50	80
Connection through current transformer(s) (I_n)	1-2-5 (IEC 60185)	2,5

4.1.2.1 Maximum current

The maximum current for direct connected meters shall be preferably an integral multiple of the basic current (e.g. four times the basic current).

When the meter is operated from (a) current transformer(s), attention is drawn to the need to match the current range of the meter in relation to that of the secondary of the current transformer(s). The maximum current of the meter is $1,2 I_n$, $1,5 I_n$ or $2 I_n$.

4.1.3 Standard reference frequencies

Standard values for reference frequencies are 50 Hz and 60 Hz.

4.2 Mechanical requirements

4.2.1 General mechanical requirements

Meters shall be designed and constructed in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:

- personal safety against electric shock;
- personal safety against effects of excessive temperature;
- protection against spread of fire;
- protection against penetration of solid objects, dust and water.

All parts which are subject to corrosion under normal working conditions shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling nor damage due to exposure to air, under normal working conditions. Outdoor meters shall withstand solar radiation.

NOTE For meters for special use in corrosive atmospheres, additional requirements shall be fixed in the purchase contract (e.g. salt mist test according to IEC 60068-2-11).

4.2.2 Case

The meter shall have a case which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seal(s).

The cover shall not be removable without the use of a tool.

The case shall be so constructed and arranged that any non-permanent deformation cannot prevent the satisfactory operation of the meter.

Unless otherwise specified, meters intended to be connected to a supply mains where the voltage under reference conditions exceeds 250 V to earth, and whose case is wholly or partially made of metal, shall be provided with a protective earth terminal.

4.2.3 Window

If the cover is not transparent, one or more windows shall be provided for reading the display and observation of the operation indicator, if fitted. These windows shall be of transparent material which cannot be removed undamaged without breaking the seal(s).

4.2.4 Terminals — Terminal block(s) — Protective earth terminal

Terminals may be grouped in (a) terminal block(s) having adequate insulating properties and mechanical strength. In order to satisfy such requirements when choosing insulating materials for the terminal block(s), adequate testing of materials shall be taken into account.

The material of which the terminal block is made shall be capable of passing the tests given in ISO 75 for a temperature of 135 °C and a pressure of 1,8 MPa (Method A).

The holes in the insulating material which form an extension of the terminal holes shall be of sufficient size to accommodate also the insulation of the conductors.

The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating. Screw connections transmitting contact force and screw fixings which may be loosened and tightened several times during the life of the meter shall screw into a metal nut.

All parts of each terminal shall be such that the risk of corrosion resulting from contact with any other metal part is minimized.

Electrical connections shall be so designed that contact pressure is not transmitted through insulating material.

For current circuits, the voltage is considered to be the same as for the related voltage circuit.

Terminals with different potentials which are grouped close together shall be protected against accidental short-circuiting. Protection may be obtained by insulating barriers. Terminals of one current circuit are considered to be at the same potential.

The terminals, the conductor fixing screws, or the external or internal conductors shall not be liable to come into contact with metal terminal covers.

The protective earth terminal, if any:

- a) shall be electrically bonded to the accessible metal parts;
- b) should, if possible, form part of the meter base;
- c) should preferably be located adjacent to its terminal block;
- d) shall accommodate a conductor having a cross-section at least equivalent to the main current conductors but with a lower limit of 6 mm² and an upper limit of 16 mm² (these dimensions apply only when copper conductors are used);
- e) shall be clearly identified by the earthing symbol (see IEC 60417C, No. 5019).

After installation, it shall not be possible to loosen the protective earth terminal without the use of a tool.

4.2.5 Terminal cover(s)

The terminals of a meter, if grouped in a terminal block and if not protected by any other means, shall have a separate cover which can be sealed independently of the meter cover. The terminal cover shall enclose the actual terminals, the conductor fixing screws and, unless otherwise specified, a suitable length of the external conductors and their insulation.

When the meter is panel-mounted, no access to the terminals shall be possible without breaking the seal(s) of the terminal cover(s).

4.2.6 Clearance and creepage distances

The clearance and creepage distances between

- a) any terminal of a circuit with a reference voltage over 40 V; and
- b) earth, together with terminals of auxiliary circuits with reference voltages below or equal to 40 V;

shall not be less than stated in

- Table 3a for meters of protective class I;
- Table 3b for meters of protective class II.

The clearance and creepage distances between terminals of circuits with reference voltages over 40 V shall not be less than stated in Table 3a.

The clearance between the terminal cover, if made of metal, and the upper surface of the screws when screwed down to the maximum applicable conductor fitted shall be not less than the relevant values indicated in Table 3a and Table 3b.

Table 3a — Clearances and creepage distances for insulating encased meter of protective class I

Voltage phase-to-earth derived from rated system voltage V	Rated impulse voltage V	Minimum clearances		Minimum creepage distance	
		Indoor meter mm	Outdoor meter mm	Indoor meter mm	Outdoor meter mm
≤ 50	800	0,2	0,8	1,2	1,9
≤ 100	1 500	0,5	1,0	1,4	2,2
≤ 150	2 500	1,5	1,5	1,6	2,5
≤ 300	4 000	3,0	3,0	3,2	5,0
≤ 600	6 000	5,5	5,5	6,3	10,0

Table 3b — Clearances and creepage distances for insulating encased meter of protective class II

Voltage phase-to-earth derived from rated system voltage V	Rated impulse voltage V	Minimum clearances		Minimum creepage distance	
		Indoor meter mm	Outdoor meter mm	Indoor meter mm	Outdoor meter mm
≤ 50	1 500	0,5	1,0	1,4	2,2
≤ 100	2 500	1,5	1,5	2,0	3,2
≤ 150	4 000	3,0	3,0	3,2	5,0
≤ 300	6 000	5,5	5,5	6,3	10,0
≤ 600	8 000	8,0	8,0	12,5	20,0

The requirement of the impulse voltage test shall also be met (see 5.4.6.2).