

Specification for

Alternating current static watt-hour meters for active energy (classes 0,2 S and 0,5 S)

The European Standard EN 60687:1992 has the status of a
British Standard

Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the national committees of the following countries:

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Belgium	Luxembourg
Denmark	Netherlands
Finland	Norway
France	Portugal
Germany	Spain
Greece	Sweden
Iceland	Switzerland
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National foreword

This British Standard has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee and is the English language version of EN 60687:1992 *Alternating current static watt-hour meters for active energy (classes 0,2 S and 0,5 S)* and its corrigendum of January 1993, published by the European Committee for Electrotechnical Standardization. It is identical with IEC 687:1992 published by the International Electrotechnical Commission (IEC).

The tests described are type tests only. The test levels are regarded as minimum values to guarantee the proper function of the meter under normal working conditions. For special applications, other test levels might be necessary and might have to be fixed between the user and the manufacturer.

The reliability aspects of equipment for electrical energy measurement and load control will be handled separately by a working group of IEC TC 13 and may be published as a separate publication.

Tests are included with respect to electromagnetic compatibility (EMC).

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 30, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

English version

Alternating current static watt-hour meters for active energy (classes 0,2 S and 0,5 S)

(IEC 687:1992)

Compteurs statiques d'énergie active pour courant alternatif (classes 0,2 S et 0,5 S)
(CEI 687:1992)

Elektronische Wechselstrom-Wirkverbrauchsähler
(Genauigkeitsklassen 0,2 S und 0,5 S)
(IEC 687:1992)

This European Standard was approved by CENELEC on 1991-12-10. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CENELEC members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

The text of document 13(CO)1013, as prepared by IEC Technical Committee No. 13: Equipment for electrical energy measurement and load control, was submitted to the IEC-CENELEC parallel vote in April 1991.

The reference document was approved by CENELEC as EN 60687 on 10 December 1991.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1993-06-01
- latest date of withdrawal of conflicting national standards (dow) 1993-06-01

For products which have complied with the relevant national standard before 1993-06-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1998-06-01.

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

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1 Scope

This International Standard applies only to newly manufactured static watt-hour meters of accuracy classes 0,2 S and 0,5 S, 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 transformer-operated static meters for indoor application consisting of one or more measuring elements and registers enclosed together in the same case.

NOTE IEC 185 describes transformers having a measuring range of $0,05 I_n$ to $1,2 I_n$, or of $0,05 I_n$ to $1,5 I_n$, or of $0,05 I_n$ to $2 I_n$ and transformers having a measuring range of $0,01 I_n$ to $1,2 I_n$ for accuracy classes 0,2 S and 0,5 S. As the measuring ranges of a meter and its associated transformers have to be matched and as only transformers of classes 0,2 S and 0,5 S have the accuracy required to operate the meters of this standard, the measuring range of the meter will be $0,01 I_n$ to $1,2 I_n$.

It also applies to operation indicators, test outputs and meters which measure energy in both directions.

This standard 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 and meters for outdoor use;
- c) data interfaces to the register of the meter;
- d) reference meters.

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).

For rack-mounted meters, the mechanical properties are not covered in this standard.

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 38:1983, *IEC standard voltages*.

IEC 50(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 60, *High-voltage test techniques*.

IEC 68-2-1:1990, *Environmental testing — Part 2: Tests — Tests A: Cold*.

IEC 68-2-2:1974, *Environmental testing — Part 2: Tests — Tests B: Dry Heat*.

IEC 68-2-6:1982, *Environmental testing — Part 2: Tests — Test Fc and guidance: Vibration (sinusoidal)*.

IEC 68-2-11:1981, *Environmental testing — Part 2: Tests — Test Ka: Salt mist*.

IEC 68-2-27:1987, *Environmental testing — Part 2: Tests — Test Ea and guidance: Shock*.

IEC 68-2-30:1980, *Environmental testing — Part 2: Tests — Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)*.

IEC 85:1984, *Thermal evaluation and classification of electrical insulation*.

IEC 185:1987, *Current transformers*.

IEC 186:1987, *Voltage transformers*.

IEC 255-4:1976, *Single input energizing quantity measuring relays with dependent specified time*.

IEC 359:1987, *Expression of the performance of electrical and electronic measuring equipment*.

IEC 387:1972, *Symbols for alternating-current electricity meters*.

IEC 417C:1977, *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets. Third supplement.*

IEC 514:1975, *Acceptance inspection of Class 2 alternating-current watt-hour meters.*

IEC 521:1988, *Classes 0,5, 1 and 2 alternating-current watt-hour meters.*

IEC 529:1989, *Degrees of protection provided by enclosures (IP Code).*

IEC 664:1980, *Insulation co-ordination within low-voltage systems including clearances and creepage distances for equipment.*

IEC 695-2-1:1980, *Fire hazard testing — Part 2: Test methods. Glow-wire test and guidance.*

IEC 721-3-3:1987, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities. Stationary use at weather protected locations.*

IEC 736:1982, *Testing equipment for electrical energy meters.*

IEC 801-1:1984, *Electromagnetic compatibility for industrial-process measurement and control equipment — Part 1: General introduction.*

IEC 801-2:1984, *Electromagnetic compatibility for industrial-process measurement and control equipment — Part 2: Electrostatic discharge requirements.*

IEC 801-3:1984, *Electromagnetic compatibility for industrial-process measurement and control equipment — Part 3: Radiated electromagnetic field requirements.*

IEC 801-4:1988, *Electromagnetic compatibility for industrial-process measurement and control equipment — Part 4: Electrical fast transient/burst requirements.*

IEC 817:1984, *Spring-operated impact-test apparatus and its calibration.*

IEC 1036:1990, *Alternating current static watt-hour meters for active energy (classes 1 and 2).*

CISPR 14:1985, *Limits and methods of measurement of radio interference characteristics of household electrical appliances, portable tools and similar electrical apparatus.*

ISO 75:1987, *Plastics and ebonite — Determination of temperature of deflection under load.*

3 Definitions

For the purpose 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 50(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 359.

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 pulse frequency 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.

the type may have several values of rated 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 (rated currents and reference voltage) are chosen from the values given in the tables proposed by the manufacturer.

3.1.5**reference meter**

a meter used to measure the unit of electric energy. It is usually designed and operated to obtain the highest accuracy and stability in a controlled laboratory environment

3.2 Definitions related to the functional elements**3.2.1****measuring element**

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

3.2.2 Output devices**3.2.2.1****test output**

device which is used for testing the meter

3.2.2.2**operation indicator**

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

3.2.3 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 (if the meter is not supplied by an external power supply) 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 or to the external power supply if needed

3.2.9**constant**

value expressing the relation between the 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 (in a house, in a cabinet)

3.3.2 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.

3.3.2.1**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

3.3.3**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

3.3.4**case**

comprises the base and the cover. The case can be common to one or more meters

3.3.5**accessible conductive part**

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

3.3.6**protective earth terminal**

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

3.3.7**terminal block**

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

3.3.8**terminal cover**

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

3.3.9**clearance**

shortest distance measured in air between conductive parts

3.3.10**creepage distance**

shortest distance measured over the surface of insulation between two 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.

3.5 Definitions of meter quantities**3.5.1****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 the measuring range, 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 0,2 S and 0,5 S.

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