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Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Product safety requirements and tests

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 62052-31
Edition 1.0 2015-09

ELECTRICITY METERING EQUIPMENT (AC) – GENERAL REQUIREMENTS, TESTS AND TEST CONDITIONS –

Part 31: Product safety requirements and tests

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by subcommittee WG11: Electricity metering equipment, of IEC technical committee TC13: Electrical energy measurement and control.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
13/1787/DISH	13/1789/RVDISH

Full information on the voting for the approval of this interpretation sheet can be found in the report on voting indicated in the above table.

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6.7.1.3 – Requirement pertaining to classification of impulse withstand voltages (overvoltage categories)

This subclause specifies the following:

The impulse withstand voltage (overvoltage category, OVC) is used to classify equipment energized directly from the mains.

[…]

ICS 19.080; 91.140.50

IEC 62052-31:2015-09/ISH1:2019-06(en)

For metering equipment, overvoltage category III is taken as a basis for determining clearances. See also 1.4 and Annex K.

Background:

- in substations, auxiliary supply circuits of the meter may be energized from a d.c. supply, from an Uninterruptable Power Supply (UPS) or a dedicated a.c. supply that is independent of the mains to which the current and voltage circuits of the meter are connected;
- similarly, auxiliary circuits of the meter – like control circuits – may be connected to such circuits.

For equipment connected to such circuits generally OVC II applies.

This gives rise to the following question: Does OVC III apply to all HLV mains circuits and auxiliary circuits of the meter?

Interpretation

In general, meters shall be designed for OVC III. However, under the conditions described in the Background above, dimensioning the auxiliary supply and auxiliary circuits to meet OVC III requirements – as specified in 6.7.3 and 6.7.4 – is not justifiable.

They can be dimensioned to meet OVC II requirements provided that those circuits are clearly marked on the meter and identified in the Installation manual, User Manual and Maintenance manual and suitable warnings are provided.

It is then the responsibility of the installer to make sure that the circuits designed for OVC II are not connected to circuits that require OVC III or higher.

As IEC 62052-31:2015 specifies the insulation requirements and tests for OVC III only, such circuits shall be designed and tested according to the relevant clauses of IEC 61010-1.

NOTE During the upcoming revision of IEC 62052-31, requirements and tests for OVC II will be added.

6.8 – Insulation requirements between circuits and parts

This subclause specifies the following:

The following mains circuits shall be considered as hazardous live (HLV) circuits:

- *voltage and current circuits of direct connected and transformer operated meters;*

  NOTE 2 Current circuits of CT operated meters are generally earthed.
- *neutral circuits;*
- *relays / control switches switching mains voltage;*
- *auxiliary supply circuits intended for connection to the mains.*

Background: Current circuits of transformer operated meters are generally earthed.

This gives rise to the following question: According to IEC 62052-31, what insulation requirements apply between current circuits of transformer operated meters and other circuits and parts?

Interpretation

The current text is ambiguous:

- on the one hand, it says that voltage and current circuits of direct connected and transformer operated meters shall be considered as HLV circuits,
- on the other hand, Note 2 says that current circuits of CT operated meters are generally earthed. Therefore, they are not Hazardous Live circuits.

The text shall be interpreted as below:

The following mains circuits shall be considered as hazardous live (HLV) circuits:

- *voltage circuits;*
- *current circuits of direct connected meters;*
- *current circuits of current transformer operated meters unless they are earthed in which case they shall be considered as ELV non-mains circuits;*
- *neutral circuits;*
- *relays / control switches switching mains voltage;*
- *auxiliary supply circuits intended for connection to the mains.*

Consequently, Table 20 applies.

Table 20 – Insulation requirements between any two circuits

Table 20 with Note 6 specifies Functional / Basic insulation between any two SELV / PELV circuits and supplementary or basic insulation if one of the circuits is an independent circuit or is adjacent to a conductive part which may be earthed when the equipment is installed.

Part of Table 20 is reproduced below:

Table 20 – Insulation requirements between any two circuits

	HLV mains-circuit [1)]	ELV circuit	SELV circuit	PELV circuit
HLV mains-circuit [1)]	F/B [1) 6)] Table 8 Table 9	B Table 8 Table 9	D, R Table 8 Table 9	D, R Table 8 Table 9
ELV circuit	B Table 8 Table 9	F/B [6)] Table 13 Table 14	B, S Table 13 Table 14	B, S Table 13 Table 14
SELV circuit	D, R Table 8 Table 9	B, S Table 13 Table 14	F/B [6)] Table 13 Table 14	F/B [8)] Table 13 Table 14
PELV circuit [2)]	D, R Table 8 Table 9	B, S Table 13 Table 14	F/B [8)] Table 13 Table 14	F/B [6)] Table 13 Table 14

6) Supplementary or basic insulation shall be used if one of the circuits is an independent circuit or is adjacent to a conductive part which may be earthed when the equipment is installed.

This gives rise to the following questions:

a) Why should basic insulation be required at all between SELV / PELV circuits?

b) What is the definition of “independent circuits”?

c) If basic insulation is needed in SELV circuits, what insulation requirements apply?

Interpretation

Answer to question a): Basic insulation or supplementary insulation is required in the cases specified in IEC 60364-4-41:2005,414.4 and in all cases where the specification requires voltage withstand capability between said circuits.

Answer to question b): The independent circuits are those which are so described by the manufacturer (See IEC 60255-27:2013, 10.6.4.2.5).

Answer to question c): As specified in Table 20:

- Table 13 applies for determining clearance and test voltages;
- Table 14 applies for creepage distances.

In specific cases, 6.7.5 applies.

The dimensioning of the insulations shall also take into account requirements specified in other applicable standards, – e.g. IEEE 802.3 for Ethernet communication ports – and may be influenced by transient voltage levels originating from the EMC requirements (such as surge, Electrical Fast Transient / burst).

6.10.3.2 – Requirement pertaining to long term overvoltage withstand

IEC 62052-31:2015 contains a requirement in pertaining to long term overvoltage withstand, as follows:

"Meters and tariff and load control equipment shall withstand the maximum withstand voltage, 1,9 U_n […]"

This has given rise to the following question:Does the long-term overvoltage test apply to the auxiliary power supply circuit of a meter?

Interpretation

The auxiliary supply generally originates from an electrical network separate from the measured mains, as it is expected to keep the meter working when the measured mains network is de-energized, or is under fault conditions. See 3.5.9:

3.5.9
auxiliary supply
a.c. or d.c. electrical power supply, other than the measurand, provided via dedicated terminals

The long-term overvoltage test (6.10.3.2) does not apply to the meter's auxiliary power supply circuit or other auxiliary circuits if these circuits are rated for connection to external networks other than the measured mains supply network.

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FOREWORD

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International Standard IEC 62052-31 has been prepared by IEC technical committee 13: Electrical energy measurement and control.

The text of this standard is based on the following documents:

FDIS	Report on voting
13/1639/FDIS	13/1645/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of IEC 62052 series, under the general title *Electricity metering equipment (AC) – General requirements, tests and test conditions*, can be found on the IEC website.

In this standard, the following print types are used:

- requirements and definitions: in roman type;
- NOTES: in smaller roman type;
- *conformity and tests: in italic type.*

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of Interpretation Sheet 1 of June 2019 have been included in this copy.

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INTRODUCTION

NOTE 1 The following text is based on IEC Guide 104, ISO/IEC Guide 51 and IEC 60255-27:2013.

The IEC addresses safety aspects by establishing *basic*, *group* and *product* safety publications.

A *basic safety publication* covers a specific safety-related matter, applicable to many electrotechnical products. It is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51. It is not intended for use by manufacturers or certification bodies. One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications in the preparation of its publications. The requirements, test methods or test conditions of basic safety publications will not apply unless specifically referred to or included in the relevant publications.

A *group safety publication* covers all safety aspects of a specific group of products within the scope of two or more product TCs. Group safety publications are primarily intended to be stand-alone product safety publications, but may also be used by TCs as source material in the preparation of their publications.

A *product safety publication* covers all safety aspects of one or more products within the scope of a single product TC.

Existing product standards established by TC 13 include a range of safety requirements, test methods and test conditions. However, an important requirement of IEC Guide 104:2010, 5.2.3 has not been met so far:

> *"Safety aspects and performance aspects should not be covered in the same publication, as this makes it difficult to assess conformity with safety requirements alone. If, exceptionally, there are reasons to cover them in the same publication, safety aspects and performance aspects shall be clearly distinguished from each other. If there are performance criteria which have safety implications, these are considered to be safety aspects and this shall be made clear in the publication."*

In addition, some important aspects of product safety, such as safety under single fault conditions, have not been covered so far.

The objectives of the development of this International Standard are the following:

- to specifically reference and include relevant requirements, test methods or test conditions of relevant basic safety publications so that they become applicable;
- to specifically reference and include – where appropriate, in a modified form – relevant requirements, test methods or test conditions of relevant group safety publications;
- to consider the latest developments in the technology used for the design and manufacture of equipment for electrical energy measurement and control;
- to remove any ambiguity resulting from the lack of a comprehensive product safety standard for products in the Scope of TC 13;
- to achieve a uniform approach to product safety throughout the international metering industry.

This *product safety standard* is based on, among others, the following:

- the *basic safety standard* IEC 60664-1:2007, established by TC 109;
- standards from the IEC 60364 series related to electrical installations of buildings, established by TC 64;
- the *group safety standard* IEC 61010-1:2010 established by TC 66;

- the *group safety standard* IEC 62477-1:2012 established by TC 22;
- IEC 60255-27:2013, a *product safety standard* for measuring relays and protection equipment, established by TC 95. These products are similar in their design and to some extent in their use in equipment for electrical energy measurement and control,

To facilitate the use of this standard, an integral text has been prepared, with appropriate 539 references to source documents.

This standard cancels and replaces the safety requirements specified in earlier standards established by IEC TC 13. See also Annex L (Informative).

NOTE 2 When this standard is published, an amendment to the relevant standards affected by this standard in IEC 62052, IEC 62053 and IEC 62054 will be published, to indicate which parts of those standards are replaced / cancelled by this standard.

Being a product safety standard, this standard takes precedence over the group safety standards IEC 61010-1:2010 and IEC 62477-1:2012.

ELECTRICITY METERING EQUIPMENT (AC) – GENERAL REQUIREMENTS, TESTS AND TEST CONDITIONS –

Part 31: Product safety requirements and tests

1 Scope and object

1.1 Scope

This part of IEC 62052 specifies product safety requirements for equipment for electrical energy measurement and control.

NOTE 1 For other requirements, see the relevant standards.

This International Standard applies to newly manufactured metering equipment designed to measure and control electrical energy on 50 Hz or 60 Hz networks with a voltage up to 600 V, where all functional elements, including add-on modules are enclosed in or form a single case.

NOTE 2 The voltage mentioned above is the voltage line-to-neutral derived from nominal voltages. See Table 7.

This International Standard also applies to metering equipment containing supply and load control switches, but only those which are electromechanical in operation.

NOTE 3 For components and sub-assemblies, see Clause 13.

When such equipment is designed to be installed in a specified matching socket, then the requirements apply to, and the tests shall be performed on, equipment installed in its specified matching socket. However, requirements for sockets and inserting / removing the meters from the socket are outside the scope of this standard.

This International Standard is also applicable to auxiliary input and output circuits.

NOTE 4 Examples are impulse inputs and outputs, control inputs and outputs, circuits for meter data exchange.

In this standard distinction is made between:

- electromechanical meters, static meters and equipment for tariff and load control;
- direct connected, current transformer operated, voltage and current transformer operated meters;
- protective class I and protective class II equipment;
- wall or cabinet mounted, rack mounted and panel mounted equipment;
- equipment intended for indoor use and outdoor use.

Equipment used in conjunction with equipment for electrical energy measurement and control may need to comply with additional safety requirements. See also Clause 13.

NOTE 5 Examples are telecommunication modems and customer information units.

This International Standard does not apply to:

- equipment where the voltage line-to-neutral derived from nominal voltages exceeds 600 V;
- portable meters;

NOTE 6 Portable meters are meters that are not permanently connected.

- laboratory and mobile meter test equipment;
- reference standard meters.

The safety requirements of this standard are based on the following assumptions:

- metering equipment has been installed correctly;
- metering equipment is used generally by unskilled persons, including meter readers and consumers of electrical energy. In many cases, it is installed in a way that it is freely accessible. Its terminal covers cannot be removed and its case cannot be opened without removing seals and using a tool;
- during normal use all terminal covers, covers and barriers providing protection against accessing hazardous live parts are in place;
- for installation, configuration, maintenance and repair it may be necessary to remove terminal cover(s), (a part of) the case or barriers so that hazardous live parts may become accessible. Such activities are performed by skilled personnel, who have been suitably trained to be aware of working procedures necessary to ensure safety. Therefore, safety requirements covering these conditions are out of the Scope of this standard.

1.2 Object

1.2.1 Aspects included in scope

NOTE 1 Subclause 1.2 is based on IEC 61010-1:2010, 1.2.

The purpose of the requirements of this standard is to ensure that hazards to the user and the surrounding area are reduced to a tolerable level.

Requirements for protection against particular types of hazard are given in Clauses 6 to 12 as follows:

a) electrical shock or burn (see Clause 6);

b) mechanical hazards and stresses (see Clauses 7 and 8);

c) spread of fire from the equipment (see Clause 9);

d) excessive temperature (see Clause 10);

e) penetration of dust and water (see Clause 11);

f) liberated gases, explosion and implosion (see Clause 12).

Requirements for components and sub-assemblies are specified in Clause 13.

Requirements for protection against hazards arising from reasonably foreseeable misuse are specified in Clause 14.

Risk assessment for hazards or environments not fully covered above is specified in Clause 15.

NOTE 2 Attention is drawn to the existence of additional requirements specified by national authorities responsible for health and safety.

1.2.2 Aspects excluded from scope

This standard does not cover:

a) performance, reliability or other properties of the equipment not related to safety;

b) EMC requirements, which are covered by the relevant type testing standards;

NOTE 1 For EMC requirements and test methods, see IEC 62052-11:2003, IEC 62052-21:2004 and IEC 62055-31:2005

c) protective measures for explosive atmospheres (see IEC 60079-0);

d) functional safety requirements;

e) effectiveness of transport packaging;

f) safety requirements of installations.

NOTE 2 The latter is generally subject to national regulation.

1.3 Verification

NOTE This subclause reproduces IEC 61010-1:2010, 1.3.

This standard also specifies methods of verifying that the equipment meets the requirements of this standard, through inspection, type tests, risk assessment and routine tests. See Clauses 4, 15 and Annex I respectively.

1.4 Environmental conditions

1.4.1 Normal environmental conditions

NOTE 1 Subclause 1.4 is based on IEC 61010-1:2010, 1.4.

This standard applies to metering equipment designed to be safe at least under the following conditions:

a) indoor use;

b) altitude up to 2 000 m;

c) climatic conditions according to 3K5, but with low air temperature -10 °C; see IEC 60721-3-3:1994;

NOTE 2 3K5 specifies low air temperature -5 °C, high air temperature +45 °C, low relative humidity 5 %, high relative humidity 95 %. See the climatogram in IEC 60721-3-3:1994, Figure B.5.

d) voltage fluctuations up to -20…15 % of the nominal voltage;

The equipment may have several nominal voltages.

e) transient overvoltages up to the levels of overvoltage category III;

f) transient overvoltages occurring on the mains supply (see 6.7.1.1);

g) applicable pollution degree of the intended environment (pollution degree 2 in most cases).

Manufacturers may specify more restricted environmental conditions for operation; nevertheless, the equipment shall be safe within these normal environmental conditions.

1.4.2 Extended environmental conditions

This standard applies to metering equipment designed to be safe not only under the environmental conditions specified in 1.4.1, but also under any of the following conditions for which the equipment is rated by the manufacturer:

a) outdoor use;

b) altitude above 2 000 m;

c) climatic conditions according to 3K6; see IEC 60721-3-3:1994;

NOTE 1 3K6 specifies low air temperature -25 °C, high air temperature +55 °C, low relative humidity 10 %, high relative humidity 100 %. See the climatogram in IEC 60721-3-3:1994, Figure B.6.

d) transient overvoltages higher than what is required for overvoltage category III.

NOTE 2 Under such circumstances, additional protection can be provided by external overvoltage protection elements. However, this is beyond the Scope of this standard. Information on the effects of installing varistors in large quantities on the network can be found in IEC TR 61000-2-3:1992, 6.6.1.

1.4.3 Extreme environmental conditions

NOTE 1 The following text is based on IEC 60721-3-0:1984, 5.2.

It is recognized that extreme environmental conditions may exist.

Elements determining the environmental conditions may occur with any of their severities in combination with other elements and their respective severities. An assumption that each element may occur with its highest severity would lead to unnecessary overdesign and cost. Therefore, specifications for products to operate under such extreme environmental conditions are a matter for negotiation between the manufacturer and the purchaser.

NOTE 2 For specific climatic conditions, see IEC 60721-3-3:1994.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60027-1, *Letter symbols to be used in electrical technology – Part 1: General*

IEC 60068-2-75:2014, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60068-2-78, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60269-3, *Low-voltage fuses – Part 3: Supplementary requirements for fuses for use by unskilled persons (fuses mainly for household or similar applications) – Examples of standardized systems of fuses A to F*

IEC 60332-1-2:2004, *Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable – Procedure for 1 kW pre-mixed flame*

IEC 60332-2-2:2004, *Tests on electric and optical fibre cables under fire conditions – Part 2-2: Test for vertical flame propagation for a single small insulated wire or cable – Procedure for diffusion flame*

IEC 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60417-DB-12M, *Graphical symbols for use on equipment*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
Amd1:1999
Amd2: 2013

IEC 60617-DB-12M, *Graphical symbols for diagrams*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*
Amd 1: 2009
Amd 2: 2013

IEC 61032:1997, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61180-2, *High-voltage test techniques for low voltage equipment – Part 2: Test equipment*

IEC 62053-52, *Electricity metering equipment (a.c.) – Particular requirements – Part 52: Symbols*

ISO 75-2, *Plastics – Determination of temperature of deflection under load – Part 2: Plastics and ebonite*

ISO 306, *Plastics – Thermoplastic materials – Determination of Vicat softening temperature (VST)*

ISO 3864-1, *Graphical symbols, Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings*

ISO 7000:2004, *Graphical symbols for use on equipment – Registered symbols*