

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Measuring relays and protection equipment –
Part 26: Electromagnetic compatibility requirements**

**Relais de mesure et dispositifs de protection –
Partie 26: Exigences de compatibilité électromagnétique**

<https://standards.iteh.ai/catalog/standards/sist/173eb674-895b-4a87-a6a9-fb00c34fa9a1/iec-60255-26-2023>



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MEASURING RELAYS AND PROTECTION EQUIPMENT –**Part 26: Electromagnetic compatibility requirements**

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IEC 60255-26 has been prepared by IEC technical committee 95: Measuring relays and protection equipment. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) update of normative references
- b) introduction of a wired network port and signal/control port in accordance with CISPR 32;
- c) introduction of low-power instrument transformer (LPIT) and battery monitor port;
- d) expansion of the frequency range on radiated radio-frequency immunity test up to 6 GHz;
- e) updated requirements on electrostatic discharge tests;
- f) introduction of fast damped oscillatory wave test for Zone A applications;
- g) specification of higher immunity requirements on power frequency magnetic field tests;

- h) update of the spot frequency test and addition of a new annex with background information;
- i) addition of details and further guidance on the relay settings;
- j) additional test condition for AC voltage dips and interruptions;
- k) addition of an annex about EMC risk assessments;
- l) addition of an annex on radio interfaces.

The text of this International Standard is based on the following documents:

Draft	Report on voting
95/515/FDIS	95/525/RVD

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

The language used for the development of this International Standard is English

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all the parts in the IEC 60255 series, published under the general title *Measuring relays and protection equipment*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

MEASURING RELAYS AND PROTECTION EQUIPMENT –

Part 26: Electromagnetic compatibility requirements

1 Scope

1.1 General

This part of IEC 60255 specifies the requirements for electromagnetic compatibility for measuring relays and protection equipment. It is applicable to measuring relays and protection equipment and combinations of devices to form schemes for power system protection including the control, monitoring, communication and process interface equipment used with those systems.

Tests specified in this document are not required for equipment not incorporating electronic circuits, for example electromechanical relays.

The requirements specified in this document are applicable to measuring relays and protection equipment in a condition representative of how new equipment is provided by the manufacturer. All tests specified are type tests only.

1.2 Emission

This document specifies limits and test methods, for measuring relays and protection equipment in relation to electromagnetic emissions which might cause interference in other equipment.

These emission limits represent electromagnetic compatibility requirements and have been selected to ensure that the disturbances generated by measuring relays and protection equipment, operated normally in substations and power plants, do not exceed a specified level which could prevent other equipment from operating as intended.

Test requirements are specified for the enclosure, auxiliary power supply ports, input/output ports, signal/control ports and wired network ports.

1.3 Immunity

This document specifies the immunity test requirements for measuring relays and protection equipment in relation to continuous and transient, conducted and radiated disturbances, including electrostatic discharges.

These test requirements represent the electromagnetic compatibility immunity requirements and have been selected so as to ensure an adequate level of immunity for measuring relays and protection equipment, operated normally in substations and power plants.

NOTE 1 Product safety considerations are not covered in this document.

NOTE 2 In special cases, situations will arise where the levels of disturbance could exceed the levels specified in this document, for example where a hand-held transmitter or a mobile telephone is used close to measuring relays and protection equipment. In these instances, special precautions and procedures could be needed.

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.

IEC 60255-1:2022, *Measuring relays and protection equipment – Part 1: Common requirements*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2020, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11:2020, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61000-4-16:2015, *Electromagnetic compatibility (EMC) – Part 4-16: Testing and measurement techniques – Test for immunity to conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz*

IEC 61000-4-17:1999, *Electromagnetic compatibility (EMC) – Part 4-17: Testing and measurement techniques – Ripple on d.c. input power port immunity test*
IEC 61000-4-17:1999/AMD1:2001
IEC 61000-4-17:1999/AMD2:2008

IEC 61000-4-18:2019, *Electromagnetic compatibility (EMC) – Part 4-18: Testing and measurement techniques – Damped oscillatory wave immunity test*

IEC 61000-4-29:2000, *Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
CISPR 11:2015/AMD1:2016
CISPR 11:2015/AMD2:2019

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*
CISPR 32:2015/AMD1:2019

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1.1

analogue output port

port that generates an analogue output signal to drive actuators, analogue panel meters, etc.

Note 1 to entry: Typically a current or voltage less than or equal to 20 mA or 10 V DC respectively.

[SOURCE: IEC 60255-1:2022, 3.1.3]

3.1.2

auxiliary equipment

AE

equipment necessary to provide the equipment under test (EUT) with the signals required for normal operation and to verify the performance of the EUT

3.1.3

auxiliary power supply port

AC or DC auxiliary energizing input

Note 1 to entry: Some modern relays have a single auxiliary power supply port that can be energized with both AC and/or DC.

3.1.4

battery monitor port

port intended for connection to the station battery for the purpose of battery voltage monitoring

[SOURCE: IEC 60255-1:2022, 3.1.6]

3.1.5

binary input port

port intended for inputs which have an on or off state given by direct connection to an energizing quantity without any communications protocol

[SOURCE: IEC 60255-1:2022, 3.1.7]

3.1.6

binary output port

port intended for outputs which have an on or off state given by direct connection to an energizing quantity without any communications protocol

[SOURCE: IEC 60255-1:2022, 3.1.8]

3.1.7

common mode

CM

mode between each active conductor and a specified reference, usually earth or ground reference plane

**3.1.8
cabinet**

free-standing and self-supporting enclosure for housing electrical and/or electronic equipment

Note 1 to entry: A cabinet is usually fitted with doors and/or side panels, which may or may not be removable.

[SOURCE: IEC 60050-581:2008, 581-25-02]

**3.1.9
coupling network**

electrical circuit or device for the purpose of transferring energy from one circuit to another with a defined impedance

**3.1.10
coupling/decoupling network
CDN**

electrical circuit incorporating the functions of both the coupling and decoupling networks

**3.1.11
decoupling network**

electrical circuit for the purpose of preventing test voltages applied to the EUT from affecting other devices, equipment, or systems which are not under test

**3.1.12
differential mode
DM**

mode between any two of a specified set of active conductors

**3.1.13
earth port**

point where a cable intended for connection to earth for functional or safety purposes can be connected

**3.1.14
enclosure port**

physical boundary of the EUT through which electromagnetic fields can radiate or impinge

[SOURCE: IEC 60050-445:2010, 445-07-04, modified – The term "time relay" has been replaced by "EUT" and "can" has been replaced by "may".]

**3.1.15
equipment under test
EUT**

equipment submitted to a test, including any accessories such as communication modules, plug-in power supplies, etc. unless otherwise specified

[SOURCE: IEC 60255-1:2022, 3.1.15]

**3.1.16
highest internal frequency**

F_X

highest fundamental frequency generated or used within the EUT or highest frequency at which it operates

Note 1 to entry: This includes frequencies which are solely used within an integrated circuit.

3.1.17
input port

port through which the EUT is energized or controlled in order to perform its function(s)

EXAMPLE 1 Analogue current transformer (LPCT/CT) input, analogue voltage transformer (LPVT or VT) input, binary input, battery monitor input, etc.

[SOURCE: IEC 60255-1:2022, 3.1.18]

3.1.18
low-power instrument transformer
LPIT

arrangement, consisting of one or more current or voltage transformer(s) which may be connected to transmitting systems and secondary converters, all intended to transmit a low-power analogue or digital output signal to measuring instruments, meters and protective or control devices or similar apparatus

EXAMPLE An arrangement consisting of three current sensors, three voltage sensors connected to one merging unit delivering one digital output is considered an LPIT.

Note 1 to entry: LPITs are commonly called non-conventional instrument transformers (NCIT).

Note 2 to entry: The output power produced by these devices is typically lower or equal to 1 VA.

[SOURCE: IEC 61869-6:2016, 3.1.601]

3.1.19
low-power current transformer
LPCT

low-power instrument transformer for current measurement

[SOURCE: IEC 61869-6:2016, 3.1.602]

3.1.20
low-power voltage transformer
LPVT

low-power instrument transformer for voltage measurement

[SOURCE: IEC 61869-6:2016, 3.1.603]

3.1.21
output contact

arrangement of contact members, with their insulation, which close or open their contact circuit by their relative movement

[SOURCE: IEC 60050-444:2002, 444-04-03, modified – The term "contact" has been replaced by "output contact", the domain "for elementary relays" and the figure have been omitted.]

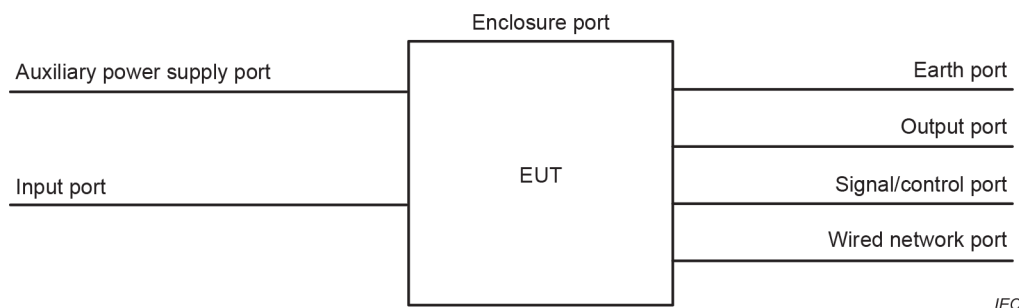
3.1.22
output port

port through which the EUT produces predetermined changes

[SOURCE: IEC 60255-1:2022, 3.1.27]

3.1.23
port

particular interface of the specified EUT with the external electromagnetic environment



3.1.24 rated value

value of a quantity used for specification purposes, established for a specified set of operating conditions of a component, device, equipment, or system

[SOURCE: IEC 60050-447:2020, 447-03-11]

3.1.25 signal/control port

port intended for the interconnection of components of an EUT, or between an EUT and local AE and used in accordance with relevant functional specifications (for example, for the maximum length of cable connected to it)

Note 1 to entry: Examples include EIA-232, Universal Serial Bus (USB), High-Definition Multimedia Interface (HDMI®), IEEE Standard 1394 ("FireWire"), IRIG-B Interface.

3.1.26 small equipment

equipment, either positioned on a tabletop or standing on the floor which, including its cables, fits in a cylindrical test volume of 1,2 m in diameter and 1,5 m above the ground plane

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Note 1 to entry: For small equipment, emission testing at distances under 10 m is accepted.

3.1.27 wired network port

port for the connection of voice, data and signalling transfers intended to interconnect widely dispersed systems by direct connection to a single-user or multi-user communication network

Note 1 to entry: Examples of these ports include CATV, PSTN, ISDN, xDSL, LAN, EIA-485 and similar networks.

Note 2 to entry: These ports may support screened or unscreened cables and may also carry AC or DC power (e.g. PoE) where this is an integral part of the telecommunication specification.

Note 3 to entry: A port generally intended for interconnection of components of a system under test (e.g. EIA-232, IEEE Standard 1284 (parallel printer), Universal Serial Bus (USB), IEEE Standard 1394 ("Fire Wire"), etc.) and used in accordance with its functional specifications (e.g. for the maximum length of cable connected to it), is not considered to be a wired network port.

3.2 Abbreviated terms

AAN	Asymmetric artificial network
AE	Auxiliary equipment
AMN	Artificial mains network
CATV	Communal (broadcasting) antenna/cable TV network
CDN	Coupling/decoupling network
CCC	Capacitive coupling clamp
CM	Common mode
CVP	Capacitive voltage probe
DM	Differential mode

EMC	Electromagnetic compatibility
ESD	Electrostatic discharge
EUT	Equipment under test
FW	Firmware
HW	Hardware
IED	Intelligent electronic device
ISDN	Integrated services digital network
LAN	Local area network
LPCT	Low-power current transformer
LPIT	Low-power instrument transformer
LPVT	Low-power voltage transformer
PCBA	Printed circuit board assembly
PCB	Printed circuit board
PSTN	Public switched telephone network
RF	Radio frequency
RTD	Resistance temperature detector
UFA	Uniform field area
USB	Universal serial bus
xDSL	Generic term for all types of DSL (digital subscriber line) technology

4 Electromagnetic environmental levels

4.1 General

[IEC 60255-26:2023](https://standards.iteh.ai/catalog/standards/sist/173eb674-895b-4a87-a6a9-fb00c3469a1/iec-60255-26-2023)

The environmental levels shall be selected in accordance with the most realistic installation and environmental conditions in which the EUT is expected to operate.

Based on common installation practices, the recommended selection of test levels is given in 4.2 and 4.3.

4.2 Zone A, severe electromagnetic environment

The installation is characterized by the following attributes:

- no suppression of electrical fast transients/bursts in the power supply and control and power circuits which are switched by relays and high-power contactors;
- no separation of the industrial circuits from other circuits associated with environments of higher severity levels;
- no separation between power supply, control, signal and communication cables;
- use of common multi-core cables for control and signal lines;
- interconnections that are running as outdoor cables along with power cables, even to the high voltage equipment; a special case of this environment is when the electronic equipment is connected to the telecommunication network within a densely populated area. There is no systematically constructed grounding network outside the electronic equipment, and the grounding system consists only of pipes, cables, etc.

The outdoor area of industrial process equipment, power stations, open-air HV substation switchyards and gas insulated switchgear may be representative of this environment.