

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**

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

FOREWORD

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

This third edition cancels and replaces the second edition published in 2008. This third edition also cancels and replaces the following standards: IEC 60255-22-1:2007, IEC 60255-22-2:2008; IEC 60255-22-3:2007, IEC 60255-22-4:2008, IEC 60255-22-5:2008, IEC 60255-22-6:2001 and IEC 60255-22-7:2003, IEC 60255-11:2008, IEC 60255-25:2000 and IEC 60255-26:2008. This edition constitutes a technical revision.

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

- a) definition of test specifications, test procedures and acceptance criteria per phenomena and port under test in one document;
- b) extension of radiated emission measurement for frequencies above 1 GHz;
- c) limitation of radiated emission measurement at 3 m distance for small equipment only;
- d) addition of zone A and zone B test level on surge test;

- e) extension of tests on the auxiliary power supply port by a.c. and d.c. voltage dips, a.c. component in d.c. (ripple) and gradual shut-down / start-up;
- f) harmonization of acceptance criteria for immunity tests.

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

FDIS	Report on voting
95/309/FDIS	95/312/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 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 publication will remain unchanged until the maintenance result 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

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INTRODUCTION

This part of the IEC 60255 series specifies all of the requirements for electromagnetic compatibility in a single document.

As such, it is considered as an overview document for measuring relays and protection equipment. The detailed test procedures are given in other referenced standards.

This part of IEC 60255 does not include the reversal of d.c. power supply polarity test which had been provided in IEC 60255-11, because this is a safety test. This test will be covered by future IEC 60255-27.

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MEASURING RELAYS AND PROTECTION EQUIPMENT –

Part 26: Electromagnetic compatibility requirements

1 Scope

1.1 General

This part of the IEC 60255 series is applicable to measuring relays and protection equipment, taking into account combinations of devices to form schemes for power system protection including the control, monitoring, communication and process interface equipment used with those systems.

This standard specifies the requirements for electromagnetic compatibility for measuring relays and protection equipment.

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

The requirements specified in this standard are applicable to measuring relays and protection equipment in a new condition and all tests specified are type tests only.

1.2 Emission

The object of this standard is to specify limits and test methods, for measuring relays and protection equipment in relation to electromagnetic emissions which may 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 and auxiliary power supply ports.

1.3 Immunity

This standard is to specify 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 Safety considerations are not covered in this standard.

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

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 60255-1:2009, *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 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
Amendment 1:2007
Amendment 2:2010

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

IEC 61000-4-5:2005, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:2008, *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 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-16:1998, *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*
Amendment 2:2009

IEC 61000-4-17:1999, *Electromagnetic compatibility (EMC) – Part 4-17: Testing and measurement techniques – Ripple on d.c. input power port immunity test*
Amendment 1:2001
Amendment 2:2008

IEC 61000-4-18:2006, *Electromagnetic compatibility (EMC) – Part 4-18: Testing and measurement techniques – Damped oscillatory wave immunity test*
Amendment 1:2010

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 11:2009, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*
Amendment 1:2010

CISPR 22:2008, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

3 Terms and definitions

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

3.1 EUT

Equipment Under Test

equipment which may be either a measuring relay or protection equipment

3.2 small equipment

equipment, either positioned on a table top 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.

3.3 port

particular interface of the specified EUT with the external electromagnetic environment

SEE: Figure 1



Figure 1 – Ports for measuring relays and protection equipment

3.4

auxiliary power supply port

a.c. or d.c. auxiliary energizing input of the EUT

3.5

communication port

interface with a communication and/or control system permanently connected to the EUT

3.6

enclosure port

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

3.7

functional earth port

port on the EUT which is connected to earth for purposes other than electrical safety

3.8

input port

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

EXAMPLE Current and voltage transformer, binary input, etc.

3.9

output port

port through which the EUT produces predetermined changes

EXAMPLE Contacts, optocouplers, analogue output, etc.

3.10

coupling/decoupling network

CDN

electrical circuit for the purpose of transferring energy from one circuit to another/
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

3.11

common mode

CM

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

3.12

differential mode

DM

mode between any two of a specified set of active conductors

4 Definition of environmental levels

4.1 General

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 the following:

4.2 Zone A, severe electrical 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 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.

The outdoor area of industrial process equipment, where no specific installation practice has been adopted, of power stations, open-air HV substation switchyards and gas insulated switchgear may be representative of this environment.

4.3 Zone B, typical electrical environment

The installation is characterized by the following attributes:

- no suppression of electrical fast transients/bursts in the power supply and control circuits which are switched by relays (no contactors);
- poor separation of the industrial circuits from other circuits associated with environments of higher severity levels;

- dedicated cables for power supply, control, signal and communication lines;
- poor separation between power supply, control, signal and communication cables;
- availability of earthing system represented by conductive pipes, ground conductors in the cable trays (connected to the protective earth system) and by a ground mesh.

The area of industrial process equipment, the power plants and the relay room of open-air HV substations may be representative of this environment.

5 Emission

5.1 Emission enclosure

Table 1 – Emission tests – Enclosure port

Item	Environmental phenomena	Frequency range	Limits	Basic standard	Test procedure
1.1	Radiated emission (below 1 GHz)^{ab}	30 MHz to 230 MHz	40 dB(μV/m) quasi peak at 10 m 50 dB(μV/m) quasi peak at 3 m	CISPR 11	See 7.1.2
		230 MHz to 1 000 MHz	47 dB(μV/m) quasi peak at 10 m 57 dB(μV/m) quasi peak at 3 m		
1.2	Radiated emission (above 1 GHz)	1 GHz to 3 GHz	56 dB(μV/m) average 76 dB(μV/m) peak at 3 m	CISPR 22	See 7.1.2
		3 GHz to 6 GHz	60 dB(μV/m) average 80 dB(μV/m) peak at 3 m		

^a Measuring relays and protection equipment are apparatus which satisfy the class A limits. Limits can be measured at a nominal distance of 3 m, 10 m or 30 m. A measuring distance less than 10 m is allowed only for equipment which complies with the definition given in 3.2. In case of measurements at a separation distance of 30 m an inverse proportionality factor of 20 dB per decade shall be used to normalize the measured data to the specified distance for determining compliance.

^b The limits specified for the 3 m separation distance apply only to small equipment meeting the size criterion defined in 3.2.

Conditional testing procedure

- The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.
- If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.
- If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.
- If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.
- If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

5.2 Emission auxiliary power supply port

See Table 2.

Table 2 – Emission tests – Auxiliary power supply port

Item	Environmental phenomena	Frequency range	Limits	Basic standard	Test procedure
2.1	Conducted emission	0,15 MHz to 0,50 MHz	79 dB(μ V) quasi peak 66 dB(μ V) average	CISPR 22	See 7.1.3
		0,5 MHz to 30 MHz	73 dB(μ V) quasi peak 60 dB(μ V) average		

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6 Immunity

6.1 Immunity enclosure

Table 3 – Immunity tests – Enclosure port

Item	Environmental phenomena	Test specification	Units	Basic standard	Test procedure	Acceptance criteria (see 8.2)
3.1	Radiated radiofrequency electromagnetic field					
	Frequency sweep					
	Test frequency range	80 to 1 000 1 400 to 2 700	MHz MHz			
	Test field strength (prior to modulation)	10	V/m (r.m.s.)			
	Amplitude modulated	80	% AM (1 kHz)			
	Sweep rate	≤ 1	% (of preceding frequency value)			
	Spot frequencies					
	Test spot frequencies	80 ± 0,5 % 160 ± 0,5 % 380 ± 0,5 % 450 ± 0,5 % 900 ± 5 1 850 ± 5 2 150 ± 5	MHz MHz MHz MHz MHz MHz MHz	IEC 61000-4-3	7.2.4	A
	Test field strength (prior to modulation)	10	V/m (r.m.s.)			
	Amplitude modulated	80	% AM (1 kHz)			
	Duty cycle	100	%			
3.2	Electrostatic discharge					
	Contact	2 4 6	kV (charge voltage)	IEC 61000-4-2	See 7.2.3	B
	Air	2 4 8	kV (charge voltage)			
3.3	Power frequency magnetic field					
	Continuous	30	A/m	IEC 61000-4-8	See 7.2.10	A
	1 s to 3 s	300	A/m			B