



BSI Standards Publication

Electrical equipment for measurement, control and laboratory use — EMC requirements

Part 2-4: Particular requirements — Test configurations, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8 and for equipment for insulation fault location according to IEC 61557-9 (IEC 61326-2-4:2012)

National foreword

This British Standard is the UK implementation of EN 61326-2-4:2013. It is identical to IEC 61326-2-4:2012. It supersedes BS EN 61326-2-4:2006 which will be withdrawn on 14 August 2015.

The UK participation in its preparation was entrusted by Technical Committee GEL/65, Measurement and control, to Subcommittee GEL/65/4, System considerations.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English version

**Electrical equipment for measurement, control and laboratory use -
EMC requirements -
Part 2-4: Particular requirements -
Test configurations, operational conditions and performance criteria for
insulation monitoring devices according to IEC 61557-8 and for equipment
for insulation fault location according to IEC 61557-9
(IEC 61326-2-4:2012)**

Matériel électrique de mesure, de
commande et de laboratoire -
Exigences relatives à la CEM -
Partie 2-4: Exigences particulières -
Configurations d'essai, conditions de
fonctionnement et critères de performance
pour les contrôleurs d'isolement
conformes à la CEI 61557-8 et pour les
dispositifs de localisation de défaut
d'isolement conformes à la CEI 61557-9
(CEI 61326-2-4:2012)

Elektrische Mess-, Steuer-, Regel- und
Laborgeräte -
EMV-Anforderungen -
Teil 2-4: Besondere Anforderungen -
Prüfanordnung, Betriebsbedingungen und
Leistungsmerkmale für
Isolationsüberwachungsgeräte gemäß
IEC 61557-8 und Geräte zur
Isolationsfehlerortung gemäß IEC 61557-9
(IEC 61326-2-4:2012)

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 65A/630/FDIS, future edition 2 of IEC 61326-2-4, prepared by SC 65A, "System aspects", of IEC TC 65, "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61326-2-4:2013.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-07-20
- latest date by which the national standards conflicting with the document have to be withdrawn (dvw) 2015-08-14

This document supersedes EN 61326-2-4:2006.

EN 61326-2-4:2013 includes the following significant technical changes with respect to EN 61326-2-4:2006:

– update of the document with respect to EN 61326-1:2013.

EN 61326-2-4:2013 is to be used in conjunction with EN 61326-1:2013 and follows the same numbering of clauses, subclauses, tables and figures.

When a particular subclause of EN 61326-1 is not mentioned in this part, that subclause applies as far as is reasonable. When this standard states "addition", "modification" or "replacement", the relevant text in EN 61326-1 is to be adapted accordingly.

NOTE The following numbering system is used:

- subclauses, tables and figures that are numbered starting from 101 are additional to those in EN 61326-1;
- unless notes are in a new subclause or involve notes in EN 61326-1, they are numbered starting from 101 including those in a replaced clause or subclause;
- additional annexes are lettered AA, BB, etc.

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive(s) see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 61326-2-4:2012 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61557-1:2007 NOTE Harmonized as EN 61557-1:2007 (not modified).

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Annex ZA of EN 61326-1:2013 applies, except as follows:

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61326-1	2012	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements	EN 61326-1	2013
IEC 61557-8 + corr. May	2007 2007	Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 8: Insulation monitoring devices for IT systems	EN 61557-8	2007
IEC 61557-9	2009	Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 9: Equipment for insulation fault location in IT systems	EN 61557-9	2009

Annex ZZ
(informative)

Coverage of Essential Requirements of EU Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers protection requirements of Annex I, Article 1 of the EC Directive 2004/108/EC.

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive[s] concerned.

NOTE Other requirements and other EU Directives may be applicable to the products falling within the scope of this standard.

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ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL AND LABORATORY USE – EMC REQUIREMENTS –

Part 2-4: Particular requirements – Test configurations, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8 and for equipment for insulation fault location according to IEC 61557-9

1 Scope

In addition to IEC 61326-1, this part of IEC 61326 specifies more detailed test configurations, operational conditions and performance criteria than IEC 61326-1 for equipment for

- insulation monitoring according to IEC 61557-8;
- insulation fault location according to IEC 61557-9.

This applies to insulation monitoring devices and insulation fault location systems permanently or semi-permanently connected to the distribution system.

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.

Clause 2 of IEC 61326-1:2012 applies, except as follows:

Addition:

IEC 61326-1:2012, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

IEC 61557-8:2007, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems*

IEC 61557-9:2009, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 9: Equipment for insulation fault location in IT systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61326-1 apply, except as follows.

Addition:

3.101**insulation resistance** R_F

resistance in the system being monitored, including the resistance of all the connected appliances to earth

[SOURCE: IEC 61557-8:2007, 3.2]

3.102**specified response value** R_{an}

value of the insulation resistance, permanently set or adjustable, on the device and monitored if the insulation resistance falls below this limit

[SOURCE: IEC 61557-8:2007, 3.3]

3.103**response sensitivity**

value of the evaluating current or insulation resistance at which the evaluator responds under specified conditions

[SOURCE: IEC 61557-9:2009, 3.4]

3.104**nominal voltage of the distribution system** U_n

voltage by which a distribution system or equipment is designated and to which certain operating characteristics are referred

[SOURCE: IEC 61557-1:2007, 3.1]

3.105**supply voltage** U_S

voltage at a point where the measuring equipment does or can accept electric energy as a supply

[SOURCE: IEC 61557-1:2007, 3.8, modified]

3.106**system leakage capacitance** C_e

maximum permissible value of the total capacitance to earth of the system to be monitored, including any connected appliances, up to which value the insulation monitoring device can work as specified

[SOURCE: IEC 61557-8:2007, 3.6]

4 General

Clause 4 of IEC 61326-1:2012 applies.

5 EMC test plan**5.1 General**

Subclause 5.1 of IEC 61326-1:2012 applies.

5.2 Configuration of EUT during testing

5.2.1 General

Subclause 5.2.1 of IEC 61326-1:2012 applies, except as follows.

Addition:

During the tests, the EUT is supplied as specified by the manufacturer.

For EUT having several ratings, the EUT shall be connected

- to the lowest nominal supply voltage U_s ;
- to the highest nominal voltage of the distribution system U_n , but not more than 400 V.

If the EUT has only a terminal for the supply voltage and the voltage of the distribution system, it shall be connected to the highest nominal voltage, but not more than 400V.

If the EUT has interfaces for remote functions, they shall be connected during the tests as specified by the manufacturer for normal installation.

Insulation monitoring devices and equipment for insulation fault location shall be tested separately.

5.2.2 Composition of EUT

Subclause 5.2.2 of IEC 61326-1:2012 applies.

5.2.3 Assembly of EUT

Subclause 5.2.3 of IEC 61326-1:2012 applies.

5.2.4 I/O ports

Subclause 5.2.4 of IEC 61326-1:2012 applies.

5.2.5 Auxiliary equipment

Subclause 5.2.5 of IEC 61326-1:2012 applies.

5.2.6 Cabling and earthing (grounding)

Subclause 5.2.6 of IEC 61326-1:2012 applies.

5.3 Operation conditions of EUT during testing

Subclause 5.3 of IEC 61326-1:2012 applies, except as follows.

Addition:

5.3.101 Operational conditions

The EUT shall be set as specified by the manufacturer for normal operation.

If the EUT has adjustable specified response values, tests shall be performed as follows:

- for insulation monitoring devices, one value shall be selected by the manufacturer among the following possibilities:
 - at the value equal or closest to the internal d.c. resistance value;
 - at the value equal or closest to the internal a.c. impedance value;
- for insulation fault location equipment at the value in the middle of the response sensitivity range;

The insulation resistance shall be simulated by a single phase insulation resistance.

If the EUT has a selectable time delay, the time delay shall be set to the minimum value.

The system leakage capacitance shall be set to the maximum value as defined by the manufacturer but not more than $1 \mu\text{F}$. The system leakage capacitance is to be installed symmetrically to all phases of V_N . For example:

- $2 \times 0,5 \mu\text{F}$ for single-phase a.c. and d.c. systems,
- $3 \times 0,33 \mu\text{F}$ for 3-phase a.c. systems.

5.4 Specification of functional performance

Subclause 5.4 of IEC 61326-1:2012 applies.

5.5 Test description

Subclause 5.5 of IEC 61326-1:2012 applies.

6 Immunity requirements

6.1 Conditions during the tests

Subclause 6.1 of IEC 61326-1:2012 applies, except as follows.

Addition:

The configuration and modes of operation during the tests shall be precisely noted in the test report.

Tests shall be applied to the relevant ports in accordance with Table 101.

The tests shall be conducted in accordance with the basic standards. The tests shall be carried out one at a time. If additional methods are required, the method and rationale shall be documented.

6.1.101 Electrostatic discharge immunity tests

The test shall only be applied to parts of the EUT which are accessible to the user in normal operations, for example, push-buttons, displays; this test does not apply to connection terminals.

Electrostatic discharges of positive and negative polarity shall be applied 10 times to each of the selected test points.

The points of application shall be stated in the report.

6.1.102 Electromagnetic field tests

The dwell time for each frequency shall be 1,5 times the longest response time of the EUT specified by the manufacturer, plus the time delay, see 5.3. The actual dwell time shall be stated in the test report

6.1.103 Burst tests

Ports for remote control functions shall be tested separately. Cables for functions not tested shall be disconnected.

The bursts shall be applied for a minimum time of 1 min, however, the time of application shall be greater than the response time of the EUT specified by the manufacturer.

6.1.104 Surge immunity tests

In deviation from the general test conditions of 5.2.1 this test is applied at the maximum supply voltage U_S .

Pulses both with positive and negative polarity shall be injected with a phase angle being 90° and 270° .

A series of five pulses is applied for each polarity and each phase angle with a time between the pulses of 1 min or less.

6.1.105 Conducted RF tests

The dwell time for each frequency shall be 1,5 times the longest response time of the EUT specified by the manufacturer, plus the time delay (see 5.3). The actual dwell time shall be stated in the test report.

6.1.106 Power frequency magnetic field tests

The test is performed only on EUT with integrated magnetic sensitive components.

6.2 Immunity test requirements

Subclause 6.2 of IEC 61326-1:2012 does not apply.

Replacement:

The immunity requirements are given in Table 101.

NOTE The required tests correspond to the required tests applicable for equipment of industrial electromagnetic environments.

Table 101 – Immunity tests

Port	Phenomenon	Basic standard	Test value	Performance criteria (as defined in IEC 61326-1)
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact discharge, 8 kV air discharge	A2 A2
Enclosure	Electromagnetic field	IEC 61000-4-3	80 MHz to 1 000 MHz, 10 V/m 1,4 GHz to 2 GHz, 3 V/m 2,0 GHz to 2,7 GHz, 1 V/m 80 % AM modulation	A1 A1 A1
AC and DC power supply, AC and DC connections to distribution system (including connection to earth) and I/O signal / control connected directly to distribution network	Fast transients (burst)	IEC 61000-4-4	2 kV (5/50 ns, 5 kHz)	A2
I/O signal / control (including functional earth lines and remote connections)			1 kV (5/50 ns, 5 kHz)	A2
AC power supply, AC connections to distribution system (including connection to earth) and I/O signal / control connected directly to distribution network	Surge	IEC 61000-4-5	2 kV line to earth 1 kV line to line	B A2
I/O signal / control (including functional earth lines and remote connections)			1 kV line to earth	B
All ports except enclosure port	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz, 10 V Common mode 80 % AM modulation	A1
Enclosure	Power frequency magnetic field	IEC 61000-4-8	30 A/m Only for EUT with integrated magnetic sensitive components	A1
AC power	Voltage dip	IEC 61000-4-11	0% during 1 cycle, 40 % during 10/12 ^a cycles 70 % during 25/30 ^a cycles	A2 C C
	Short interruptions	IEC 61000-4-11	0 % during 250/300 ^a cycles	C

^a For example "25/30 cycles" means "25 cycles for 50 Hz test" or "30 cycles for 60 Hz test".

6.3 Random aspects

Subclause 6.3 of IEC 61326-1:2012 applies.

6.4 Performance criteria

Subclause 6.4 of IEC 61326-1:2012 does not apply.

Replacement:

The performance criteria A1, A2 and B for the evaluation of the immunity test results are given in Table 102. The performance criteria C defined in IEC 61326-1:2012, 6.4.4 applies.

Table 102 – Performance criteria definition

Function	Criterion A1 (for permanent phenomena)	Criterion A2 (for transient phenomena)	Criterion B
Alarm functions	In Quiescent mode ^a : The alarm digital output and the visual indicators shall not switch to the alarm state during the test.	In Quiescent mode ^a : The alarm digital output and the visual indicators shall not switch to the alarm state during the test.	In Quiescent mode ^a : The alarm digital output and the visual indicators may switch to the alarm state but shall not remain in the alarm state after the test.
	In Operate mode ^a : The alarm digital output and the visual indicators shall switch to the alarm state and remain in the alarm state during the test.	In Operate mode ^a : The alarm digital output and the visual indicators shall switch to the alarm state and remain in the alarm state during the test.	In Operate mode ^a : The alarm digital output and the visual indicators need not remain in the alarm state during this test but shall switch to or remain in the alarm state after the test.
Measurement functions	When insulation fault location equipment include indicators for the insulation resistance or equivalent values, the measurement uncertainty during the immunity test shall not be greater than the specified measurement uncertainty declared by the manufacturer.	During the test, the measurement functions may be transiently influenced. After the test, the EUT shall continue to operate as intended for normal operation.	During the test, the measurement functions may be transiently influenced. After the test, the EUT shall continue to operate as intended for normal operation.
Man Machine Interface functions	Visual indicators (for example, displays, LEDs) and remote control shall work as intended.	Visual indicators (for example, displays, LEDs) and remote functions (for example, analogue or digital control interfaces) may be transiently influenced.	Visual indicators (for example, displays, LEDs) and remote functions (for example, analogue or digital control interfaces) may be transiently influenced.
^a Quiescent mode and Operate mode are defined in Table 103.			

Table 103 – Test conditions for quiescent and operate modes

Operation modes	Definition
Quiescent mode (the device is operating under conditions where – as a result of insulation resistance measurement – no alarm should be detected)	<p>For devices allowing the specified response value R_{an} to be configured within a range of values, the test shall be performed in accordance with 5.3.101.</p> <p>For devices with a fixed value for the specified response value R_{an}, the test shall be made with this specified value.</p> <p>For insulation monitoring devices, an insulation resistance R_F of $1,3 \times R_{an}$ is applied.</p> <p>For equipment for insulation fault location, the following values shall be applied:</p> <ul style="list-style-type: none"> – for equipment evaluating the insulation resistance: $1,3 \times$ (the specified response sensitivity plus uncertainty of response sensitivity declared by the manufacturer). – for equipment evaluating the current: $0,7 \times$ (the specified response sensitivity minus uncertainty of response sensitivity declared by the manufacturer).
Operate mode (the device is in a mode where an alarm should be detected)	<p>For devices allowing R_{an} to be configured within a range of values, the test shall be performed in accordance with 5.3.101.</p> <p>For devices with a fixed value for R_{an}, the test shall be made with this specified value.</p> <p>For insulation monitoring devices, an insulation resistance R_F of $0,7 \times R_{an}$ is applied.</p> <p>For equipment for insulation fault location, the following values shall be applied:</p> <ul style="list-style-type: none"> – for equipment evaluating the insulation resistance: $0,7 \times$ (the specified response sensitivity minus uncertainty of response sensitivity declared by the manufacturer). – for equipment evaluating the current: $1,3 \times$ (the specified response sensitivity plus uncertainty of response sensitivity declared by the manufacturer).

After the immunity tests, the EUT shall operate as intended in accordance with the requirements of IEC 61557-8 or IEC 61557-9.

7 Emission requirements

7.1 Conditions during measurements.

Subclause 7.1 of IEC 61326-1:2012 applies

7.2 Emission limits

Subclause 7.2 of IEC 61326-1:2012 applies, except as follows:

Addition:

In a non-domestic environment, limits according to CISPR 11, Group 1, Class A, apply.

In a domestic environment, limits according to CISPR 11, Group 1, Class B, apply.

8 Test results and test report

Clause 8 of IEC 61326-1:2012 applies.

9 Instructions for use

Clause 9 of IEC 61326-1:2012 applies.

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Annex A
(normative)

**Immunity test requirements for portable test and measurement
equipment powered by battery or from the circuit being measured**

Annex A of IEC 61326-1:2012 does not apply.

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Bibliography

IEC 61557-1:2007, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures*
Part 1: General requirements

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