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REDLINE VERSION

INTERNATIONAL STANDARD

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Electrical equipment for measurement, control and laboratory use – EMC requirements –
Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

IEC 61326-2-3:2020-10 RLV(en)

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

Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

This International Standard IEC 61326-2-3 has been prepared by subcommittee 65A: System aspects, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition published in 2012. This edition constitutes a technical revision.

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

– update of the document with respect to IEC 61326-1:2020.

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

FDIS	Report on voting
65A/980/FDIS	65A/991/RVD

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

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

In this document the following print types are used:

– Terms used throughout this document which have been defined in Clause 3 of this document and of IEC 61326-1:2020: SMALL CAPITALS.

This part of the IEC 61326 series is to be used in conjunction with IEC 61326-1:2020 and follows the same numbering of clauses, subclauses, tables and figures.

When a particular subclause of IEC 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 IEC 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 IEC 61326-1;

– unless notes are in a new subclause or involve notes in IEC 61326-1, they are numbered starting from 101 including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

A list of all parts of the IEC 61326 series, under the general title *Electrical equipment for measurement, control and laboratory use – EMC requirements,* 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 "http://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.

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

Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

1 Scope

In addition to the requirements of IEC 61326-1, this part of IEC 61326 specifies more detailed test configurations, operational conditions and performance criteria for transducers with integrated or remote signal conditioning.

This document applies only to transducers characterized by their ability to transform, with the aid of an auxiliary energy source, a non-electric quantity to a process-relevant electrical signal, and to output the signal at one or more PORTS. This document includes transducers for electro-chemical and biological measured quantities.

The transducers covered by this document ~~may~~ can be powered by AC or DC voltage and/or by battery or with internal power supply.

Transducers referred to by this document comprise at least the following items (see Figure 101 and Figure 102):

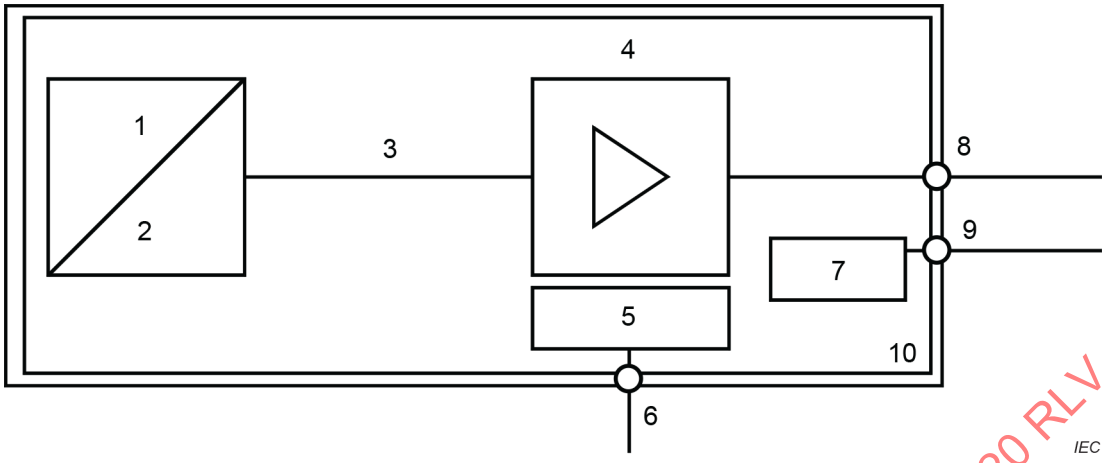
– one or more elements for transforming a non-electrical input quantity to an electrical quantity;
– a TRANSMISSION LINK for transferral of the electrical quantity to a component for signal conditioning;
– a unit for signal conditioning that converts the electrical quantity to a process-relevant electrical signal;
– an enclosure for enclosing the above-stated components fully or in parts.

Transducers referred to by this document ~~may~~ can also have the following items (see Figure 101 and Figure 102):

– a communication and control unit;
– a display unit;
– control elements such as keys, buttons, switches, etc.;
– transducer output signals (for example, switch outputs, alarm outputs) which are clearly assigned to the input signal(s);
– transducers with signal conditioning which may be integrated or remote.

The manufacturer specifies the environment for which the product is intended to be used and utilizes the corresponding test levels of IEC 61326-1.

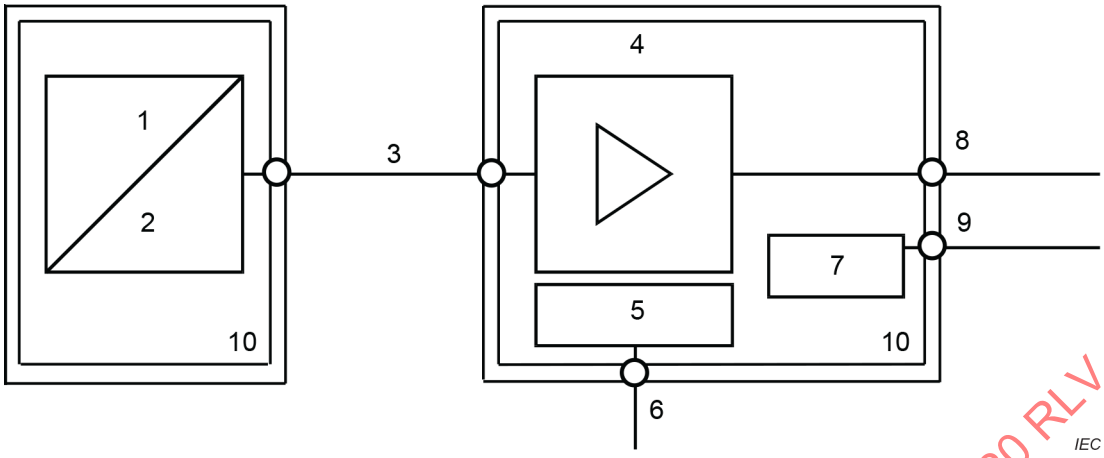
Additional requirements and exceptions for specific types of transducers are given in ~~the annexes~~ Annex AA, Annex BB and Annex CC to this document.



Key

1 non-electrical quantity
2 electrical quantity
3 TRANSMISSION LINK
4 signal conditioning
5 communication and control unit
6 input/output PORTS
7 power supply
8 signal PORT
9 AC/DC POWER PORT
10 enclosure

Figure 101 – Example of a TRANSDUCER WITH INTEGRATED SIGNAL CONDITIONING



Key

1 non-electrical quantity
2 electrical quantity
3 TRANSMISSION LINK
4 signal conditioning
5 communication and control unit
6 input/output PORTS
7 power supply
8 signal PORT
9 AC/DC POWER PORT
10 enclosure

Figure 102 – Example of a TRANSDUCER WITH REMOTE SIGNAL CONDITIONING

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.

Clause 2 of IEC 61326-1:~~2012~~2020 applies, except as follows:

Addition:

IEC 61326-1:~~2012~~2020, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 61326-1:2020 apply, except as follows.

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

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

Addition:

3.101
transducer with integrated signal conditioning
transducer in which all components for signal conditioning are integrated in the enclosure

Note 1 to entry: See Figure 101.

3.102
transducer with remote signal conditioning
transducer whose components for signal conditioning are installed in separate enclosures

Note 1 to entry: See Figure 102.

3.104
transmission link
connection between the individual components of a TRANSDUCER WITH REMOTE SIGNAL CONDITIONING

3.105
~~**(nominal)**~~ **range**
range of indications obtainable with a particular setting of the controls of a measuring instrument

Note 1 to entry: The (nominal) RANGE is normally stated in terms of its lower and upper limits. Where the lower limit is zero, the (nominal) RANGE is commonly stated solely in terms of its upper limit.

[SOURCE: IEC 60050-300:2001, 311-03-14]

3.106
measuring range (of a transducer)
range defined by two values of the measured quantity within which the relationship between the output and input signals complies with the accuracy requirements

Note 1 to entry: For a 4 mA to 20 mA system, the output current 4 mA represents the lower limit for the measured quantity and 20 mA represent the upper limit.

[SOURCE: IEC 60050-300:2001, 314-04-04, modified – "output signal" has been changed to "measured quantity" and the note to entry has been added]

3.107
span
algebraic difference between the values of the upper and lower limits of the MEASURING RANGE

[SOURCE: IEC 60050-300:2001, 311-03-13]

~~**3.108**~~
~~**intrinsic uncertainty**~~
~~uncertainty of a measuring instrument when used under reference conditions~~

~~Note 1 to entry: This term is used in the "uncertainty" approach~~

~~[SOURCE: IEC 60050-300:2001, 311-03-09]~~

4 General

Clause 4 of IEC 61326-1:~~2012~~2020 applies.

5 EMC test plan

5.1 General

Subclause 5.1 of IEC 61326-1:~~2012~~2020 applies.

5.2 Configuration of EUT during testing

Subclause 5.2 of IEC 61326-1:~~2012~~2020 applies, except as follows.

5.2.1 General

Subclause 5.2.1 of IEC 61326-1:~~2012~~2020 applies, except as follows:

Addition:

A system for monitoring the behaviour of the EUT and for registering the output values shall be designed in such a way that the electromagnetic compatibility characteristics of the EUT are not impaired. The monitoring system shall also be designed such that its response is not affected by the immunity tests. The input impedance of the monitoring system shall correspond to the terminating impedance of the transducer, specified by the manufacturer. The distance between the monitoring system and the EUT should be at least 1,5 m.

The measurement uncertainty and the bandwidth of the monitoring system shall be adapted to the characteristics of the transducer.

TRANSMISSION LINKS are considered as separate input and output lines.

The tests shall be conducted in compliance with the environmental conditions for the transducer specified by the manufacturer and using the specified supply voltage.

In the case of battery-operated transducers that can also be used when connected with a power supply, both operating modes (stand-alone and externally supplied) shall be tested.

In cases in which the manufacturer's installation instructions stipulate the use of external protective equipment or particular protective measures that are explicitly stated in the operating manual, the test requirements given in this part of the document shall be applied for use together with the external protective equipment or measures.

5.3 Operation conditions of EUT during testing

Subclause 5.3 of IEC 61326-1:~~2012~~2020 applies.

5.4 Specification of FUNCTIONAL PERFORMANCE

Subclause 5.4 of IEC 61326-1:~~2012~~2020 applies.

5.5 Test description

Subclause 5.5 of IEC 61326-1:~~2012~~2020 applies.

6 Immunity requirements

6.1 Conditions during the tests

Subclause 6.1 of IEC 61326-1:~~2012~~2020 applies except as follows:

Addition:

Transducers shall be operated during the test with all lines connected, provided the PORTS do not have functions that ~~contravene the definition of a transducer's function~~ disable the transducer's normal operation.

Configurations with alternative PORTS shall be tested separately.

Transducers shall be set to the most sensitive ranges or combination of ranges unless other ranges are known to provide worst-case immunity results within normal application.

Only operational functions compliant with the specified use under the nominal conditions are permitted. Defined functions that cannot be set under electromagnetic compatibility test conditions shall be simulated by appropriate measures. This shall be done in such a way that the electromagnetic compatibility behaviour of the transducer is not affected.

Measurement and supply circuits shall be grounded in accordance with the manufacturer's specifications. If no such specifications are given, the tests shall be carried out with the circuits grounded and with the circuits ungrounded.

6.2 Immunity test requirements

Subclause 6.2 of IEC 61326-1:~~2012~~2020 applies except as follows:

Addition:

After or during each test, the function of the transducer shall be tested.

Power inputs for voltages up to 75 V DC or voltages up to 50 V AC that are fed in a single cable together with the input and output PORTS are tested as input and output PORTS.

Power inputs for voltages up to 75 V DC or voltages up to 50 V AC with superimposed output signals (for example, 4 mA to 20 mA current loop with two-wire technology) are also tested as input/output PORTS.

The TRANSMISSION LINK of a TRANSDUCER WITH REMOTE SIGNAL CONDITIONING is tested as an input/output PORT.

~~If there are any manufacturer's specifications present to the insulation resistance then these shall be checked once again after ESD, fast transient (burst) and surge tests.~~

If insulation resistance is specified, it shall be verified after ESD, fast transient and surge immunity tests.

If the ~~manufacturer's~~ insulation's specifications are not satisfied, the transducer is deemed to have failed the EMC tests.

6.3 Random aspects

Subclause 6.3 of IEC 61326-1:~~2012~~2020 applies.

6.4 Performance criteria

Subclause 6.4 of IEC 61326-1:~~2012~~2020 applies except as follows:

Addition:

The performance criteria are used to assess the defined functions of a transducer under the effects of external electromagnetic disturbances. Since a transducer is often part of a chain of functions in a large process, effects on the overall process due to malfunctions of a transducer caused by external interference factors cannot be predicted without great difficulty. For this reason, it is particularly important that the behaviour of transducers under the influence of electromagnetic disturbances is described with performance criteria ~~by the manufacturer~~.

Table 101 describes the permissible effects of a disturbance on the different functions of a transducer with regard to the required performance criteria.

Table 101 – Performance criteria for the different functions

~~Function~~	~~Additional particular performance criteria~~		
	~~for performance criterion A~~	~~for performance criterion B~~	~~for performance criterion C~~
~~Main function~~ [a]	~~The deviations during the test are within the limit values for intrinsic uncertainty specified and documented by the manufacturer~~	~~The deviations during the test are within the limit values for additional deviations specified and documented by the manufacturer~~	~~The deviations during the test may be outside the limit values specified and documented by the manufacturer. After the test, the measured values are within the specified range.~~ ~~The manufacturer shall specify the time that is required to regain normal function after the end of the test.~~
~~Process communication~~	~~Communication as intended~~	~~Temporary interference of the communication is permitted during the test.~~	~~Interference of the communication is permitted during the test.~~ ~~The manufacturer shall specify the time that is required to regain normal function after the end of the test.~~
~~Alarm function~~	~~No malfunctions permitted~~	~~Temporary interference of the communication is permitted during the test.~~	~~Malfunctions are permitted.~~ ~~The manufacturer shall specify the time that is required to regain normal function after the end of the test.~~
~~[a] The main function of a measuring transducer is to transform a non-electrical quantity into a process-relevant signal as shown in Figures 101 and 102.~~			

Function	Additional particular performance criteria		
	for performance criterion A	for performance criterion B	for performance criterion C
Main function [a]	See 6.4.2 of IEC 61326-1:2020	See 6.4.3 of IEC 61326-1:2020	The deviations during the test may be outside the limit values specified and documented. After the test, the measured values are within the specified range. The time needed for the device to return to ready state is given in the documentation.
Process communication	Communication works as intended	Temporary interference of the communication is permitted during the test	Interference of the communication is permitted during the test. The time needed for the device to return to ready state is given in the documentation.
Alarm function	No malfunctions are permitted	Temporary malfunctions are permitted during the test	Malfunctions are permitted. The time needed for the device to return to ready state is given in the documentation.
[a] The main function of a measuring transducer is to transform a non-electrical quantity into a process-relevant signal as shown in Figure 101 and Figure 102.			

7 Emission requirements

7.1 Conditions during measurements

Subclause 7.1 of IEC 61326-1:~~2012~~2020 applies except as follows:

Addition:

The additions made in Clauses 5 and 6 shall be taken into account.

7.2 Emission limits

Subclause 7.2 of IEC 61326-1:~~2012~~2020 applies.

8 Test results and test report

Clause 8 of IEC 61326-1:~~2012~~2020 applies.

9 Instructions for use

Clause 9 of IEC 61326-1:~~2012~~2020 applies.

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~~2020 does not apply.

Additional annexes:

Annex AA
(normative)

Additional requirements and exceptions for specific types of transducers – Transducers for measurement of tension and compressive forces (force transducers)

AA.1 General considerations

In addition to the requirements of the main part of this document, this Annex AA describes particular EMC requirements for force transducers that permit static measurement quantities.

Force transducers comprise at least the following components:

- a deflection unit that records mechanical forces as input quantities;
- one or more converting elements for generating electrical signals proportional to the mechanical input quantities;
- a measurement signal amplifier for processing the electrical signals into process-relevant signals.

AA.2 Test configuration

The force transducer shall be tested in the position specified by the manufacturer (see Figure AA.1).

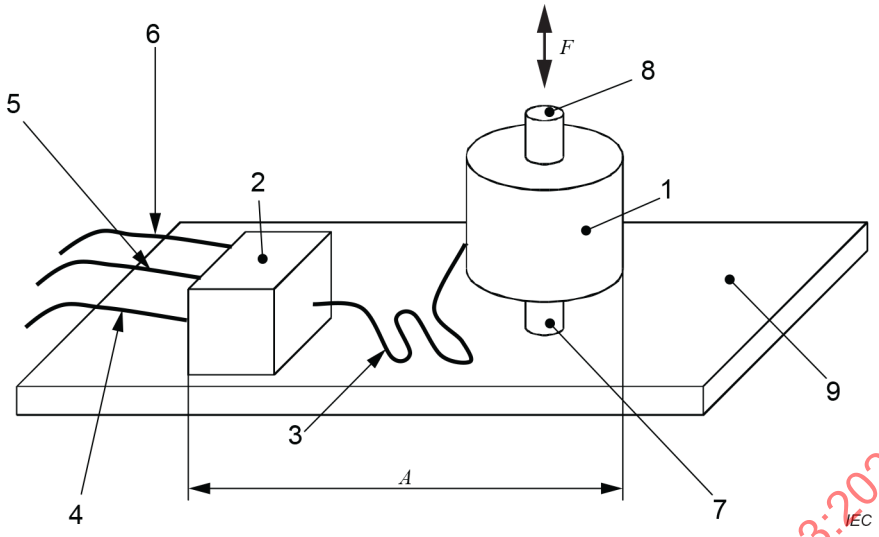
If no installation position is specified by the manufacturer, the transducer shall be positioned in such a way that the force is applied vertically.

The grounding of the power supply and force transducer shall comply with the manufacturer's specifications. If none are given, the power supply for voltages less than 70 V DC shall be grounded and the transducer shall be tested both grounded and insulated from ground.

Connections to functional earth shall be made only at terminals of the force transducer intended for that purpose.

If the PORTS are implemented in the form of plug-in connectors and if they have a terminal for a cable shield, then the shield shall be connected to the functional earth PORT. Preinstalled cable connectors with shielding shall be connected accordingly.

The mounting parts for securing the transducer in a fixed position and the mounting plate shall not be made of conductive material unless specified otherwise by the manufacturer. The outer distance A between the components should not be greater than 1 m.



Key

1 deflection unit
2 remote signal conditioning
3 TRANSMISSION LINK
4 AC/DC mains PORT
5 input/output PORT
6 measurement output PORT
7 mounting ~~part~~
8 load button
9 mounting plate
F tension/compressive force
A outer distance between deflection unit and remote signal conditioning (max. 1 m)

Figure AA.1 – Example of the configuration of a force transducer with remote signal conditioning

AA.3 Operation conditions

The EUT shall be operated with the specified rated supply voltage. If the maximum rated supply voltage differs from the minimum rated supply voltage by more than a factor of 2, the EMC tests conducted on the power input lines shall be performed at both the minimum and the maximum rated supply voltages.

Force transducers are tested under static, mechanical load.

If a mechanical load cannot be applied to the force transducer in the test environment, an output signal may be generated using suitable circuitry connected to the transducer elements. This circuitry shall be connected directly to the transducer elements in the transducer housing. The application of each circuitry action shall be described and justified in the test report.

Examples for possible circuitry actions are listed in Table AA.1.

Table AA.1 – Circuitry actions for generating an output signal for simulation of a mechanical load on the transducer

Transducer technology	Circuitry actions used for simulation
Strain gauge	Detune the measuring bridge with fixed-value resistors
Capacitive elements	Detune the measuring bridge with capacitors and/or fixed-value resistors in the case of half-bridges

The force shall be between 30 % and 70 % of the nominal force range. In the case of an expanded measurement range, the main function output signal should also be within 30 % and 70 % of the output signal operating range. In the case of a ± range, zero values – for example 0,0 mA or 0,0 V – should not be chosen.

In case that measures according to the examples given in Table AA.1 are not possible, it may be acceptable to gain an offset via software or to do measurements outside the 30 % to 70 % force range. The reason for this action shall be described and justified in the test report.

An alarm function shall be configured in such a way that the difference between the actual measuring value and the adjusted alarm value corresponds to twice of the specified accuracy allowed for the tested measurement SPAN.

Two situations shall be tested:

a) the adjusted alarm value is above the actual measuring value;

b) the adjusted alarm value is below the actual measuring value.

If the initiation threshold value of the alarm function is within 30 % to 70 % of the rated test value range, it can be tested together with the other outputs.

Annex BB
(normative)

Additional requirements and exceptions for specific types of transducers – Transducers for measurement of pressure (pressure transducers)

BB.1 General considerations

In addition to the requirements of the main part of this document, this Annex BB describes particular EMC requirements for pressure transducers.

Pressure transducers consist of at least the following:

- a process connection for pressure-sealed connection to the process;
- a sensor element for conversion of pressure to a quantity that can be electrically processed;
- a signal conditioning unit for formatting, linearizing, amplifying and converting the electrical quantity to a process-compliant signal.

This annex does not apply to pressure measurement equipment operating purely on a mechanical basis – for example, spring-tube manometers with limit switches.

BB.2 Test configuration

All tests shall be carried out in the pressure transducer position specified by the manufacturer (see Figure BB.1).

If no position is specified, the tests shall be performed in the position considered to be the least favourable and noted in the test report.

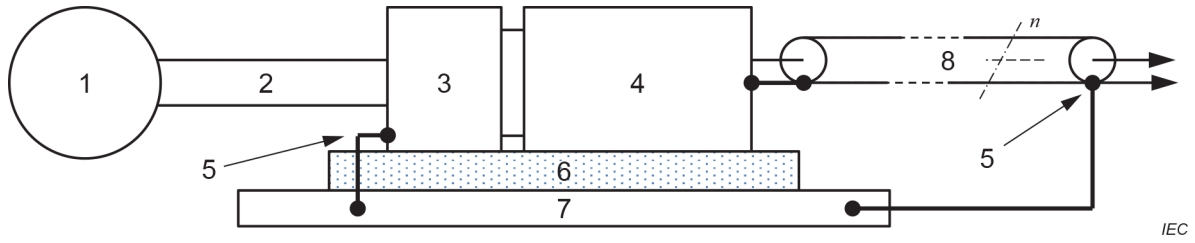
Components for pressure measurement to a test object should affect the test configuration as little as possible. For this reason, the dimensions of metallic pressure adapters should not be more than twice the size of the EUT. Pipes to pressure connection, pressure controllers and the used media should be electrically insulated if conductive pipes or media may influence the test result.

The tests shall be carried out with all the electrical connection elements specified by the manufacturer fully assembled and connected.

The grounding of the transducer and the power supply shall be in accordance with the manufacturer's specifications.

If not specified by the manufacturer, the EUT shall be prepared in the following way:

- if the process connection is made of metal, it shall be grounded. Sealants are not allowed to impair the resistance to the grounding terminal;
- if a terminal is provided for functional grounding, it shall be grounded;
- if terminals have an option for a cable shield connection, the option shall be used for connecting the shield;
- the power supply shall be insulated from the ground.



Key

1 process medium

2 pipe

3 pressure adapter

4 pressure transducer

5 ground connection

6 insulated ~~spacer~~ support

NOTE See relevant basic standards for the height of the insulated ~~spacer~~ support.

7 reference ground

8 connecting n line(s)

Figure BB.1 – Example of the configuration of a pressure transducer

BB.3 Operation conditions

The EUT shall be operated with the specified rated supply voltage. If the maximum rated supply voltage differs from the minimum rated supply voltage by more than a factor of 2, the conducted EMC tests on the power input lines shall be performed at both the minimum and the maximum rated supply voltages.

The pressure shall be between 30 % and 70 % of the nominal pressure range. In the case of an expanded measurement range, the main function output signal should also be within 30 % and 70 % of the output signal operating range. In the case of a ± range, zero values – for example, 0,0 mA or 0,0 V – should not be chosen.

In case it is not possible or practical to set the pressure between 30 % and 70 % of the nominal pressure range (e.g. safety reasons), it may be acceptable to gain an offset via software or to do measurements outside the 30 % to 70 % pressure range. The reason for this action shall be described and justified in the test report. Adjustable pressure transducers shall be set in accordance with the manufacturer's specifications. If no manufacturer specifications are given, use the following settings:

- most sensitive measurement range;
- minimum time constant/response time;
- highest data transfer rate.

Annex CC
(normative)

Additional requirements and exceptions for specific types of transducers – Transducers for measurement of temperature (temperature transducer)

CC.1 General considerations

In addition to the requirements of the main part of this document, this Annex CC describes particular EMC requirements for temperature transducers.

Temperature transducers comprise at least the following components:

- one or more temperature sensors (for example, thermocouple, PT-100);
- a signal conditioning unit for formatting, linearizing, amplifying and converting the electrical input signal to a process-compliant signal;
- a signal PORT with attached cable for signal transfer (for example, two-wire 4 mA to 20 mA link).

The temperature transducer may also have the following components:

- one or more TRANSMISSION LINKs between temperature sensor and processing unit;
- PORT for separate power supply.

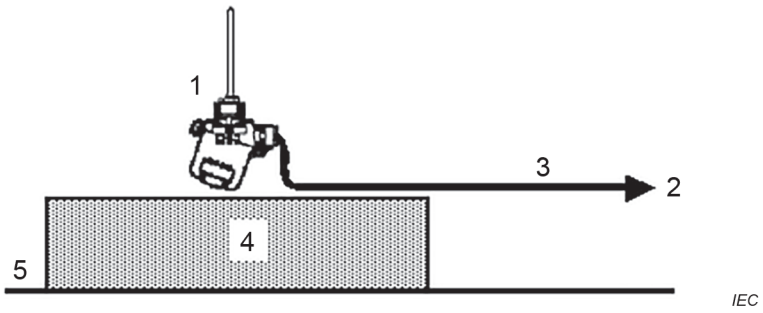
CC.2 Test configuration

The test setup shall be as close as possible to real installations. Deviations from the test set-up described in the basic standards cited that might be necessary due to special demands of temperature transducers shall be described and justified in the test report. The cable types shall be chosen according to the manufacturers' installation guides. If no special cables are prescribed, common unshielded and untwisted cables shall be used in the test setup.

For analogue output signals, a load within the specification of the manufacturer shall be connected, for which the EUT is expected to be most susceptible to EMC phenomena.

If the temperature transducer is used and delivered only as a single unit (sensor and processing unit within the same housing), it shall be tested in this configuration (see test setup in Figure CC.1). In all other cases, the test setup in Figure CC.2 shall be used. The length of the cables shall be in accordance with the basic standards. The tests shall be carried out with all electrical connection elements fully assembled and connected as specified by the manufacturer. The temperature transducer and power supply shall be connected to ground in accordance with the specifications of the manufacturer.

The room temperature should be used as the reference measurement quantity. Care shall be taken that the temperature is constant within an appropriate temperature interval to evaluate the performance of the transducer. If this is not possible (for example, due to the MEASURING RANGE of the transducer), the sensor of the transducer shall be mounted on a suitable medium representing the process temperature or the room temperature shall be taken into account via a separate temperature measurement. Simulations (networks of resistors and/or other passive components or batteries) can be used instead of a passive sensor or thermocouple, if equivalence of the high-frequency characteristics can be proved so as to ensure a similar electromagnetic behaviour.



Key

1 temperature transducer (orientation of transducer only as an example)

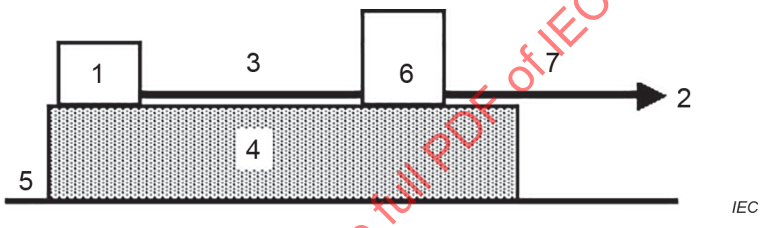
2 AUXILIARY EQUIPMENT (for example, power supply, signal evaluation, or system for transmission of the signal)

3 link cable, unshielded, untwisted, if not specified otherwise

4 insulated ~~spacer~~ support (dimension according to the relevant basic standard)

5 reference ground

Figure CC.1 – Example of the configuration of a temperature transducer with sensor and signal conditioning in the same housing



Key

1 temperature sensor

2 AUXILIARY EQUIPMENT (for example, power supply, signal evaluation)

3 link cable, unshielded, untwisted, if not specified otherwise

4 insulated ~~spacer~~ support (dimension according to the relevant basic standard)

5 reference ground

6 signal conditioning unit of the transducer

7 link cable, unshielded, untwisted, if not specified otherwise

Figure CC.2 – Example of the configuration of a temperature transducer with remote signal conditioning

CC.3 Operation conditions

The EUT shall be operated with the specified rated supply voltage. If the maximum rated supply voltage differs from the minimum rated supply voltage by more than a factor of 2, the EMC tests conducted on the power input lines shall be performed at both the minimum and the maximum rated supply voltages.

The transducer shall be adjusted so that at the applied temperature, a transducer output signal of 40 % to 60 % of the output signal range is generated (for example, 12 mA of a 4 mA to 20 mA system). In the case of a signed output range, zero values – for example, 0,0 mA or 0,0 V – shall not be chosen.

The following settings shall be used, if not otherwise specified by the manufacturer:

- most sensitive measurement range;
- minimum time constant/response time;
- highest data rate.

An alarm function, if available, shall be configured as defined by the manufacturer. If no definition is given by the manufacturer, the alarm function shall be configured in such a way that the difference between the actual measuring value and the adjusted alarm value corresponds to the precision of the device.

Two situations shall be tested:

1) the adjusted alarm value is above the actual measuring value;
2) the adjusted alarm value is below the actual measuring value.

If the initiation threshold value of the alarm function is within 40 % to 60 % of the chosen output signal range, the alarm function can be tested together with the other functions.

Bibliography

~~IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)~~

IEC 60050-300:2001, *International Electrotechnical Vocabulary (IEV) – Part 300: Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements – Part 312: General terms relating to electrical measurements – Part 313: Types of electrical measuring instruments – Part 314: Specific terms according to the type of instrument* (available at <http://www.electropedia.org>)

IEC 61326-2-3

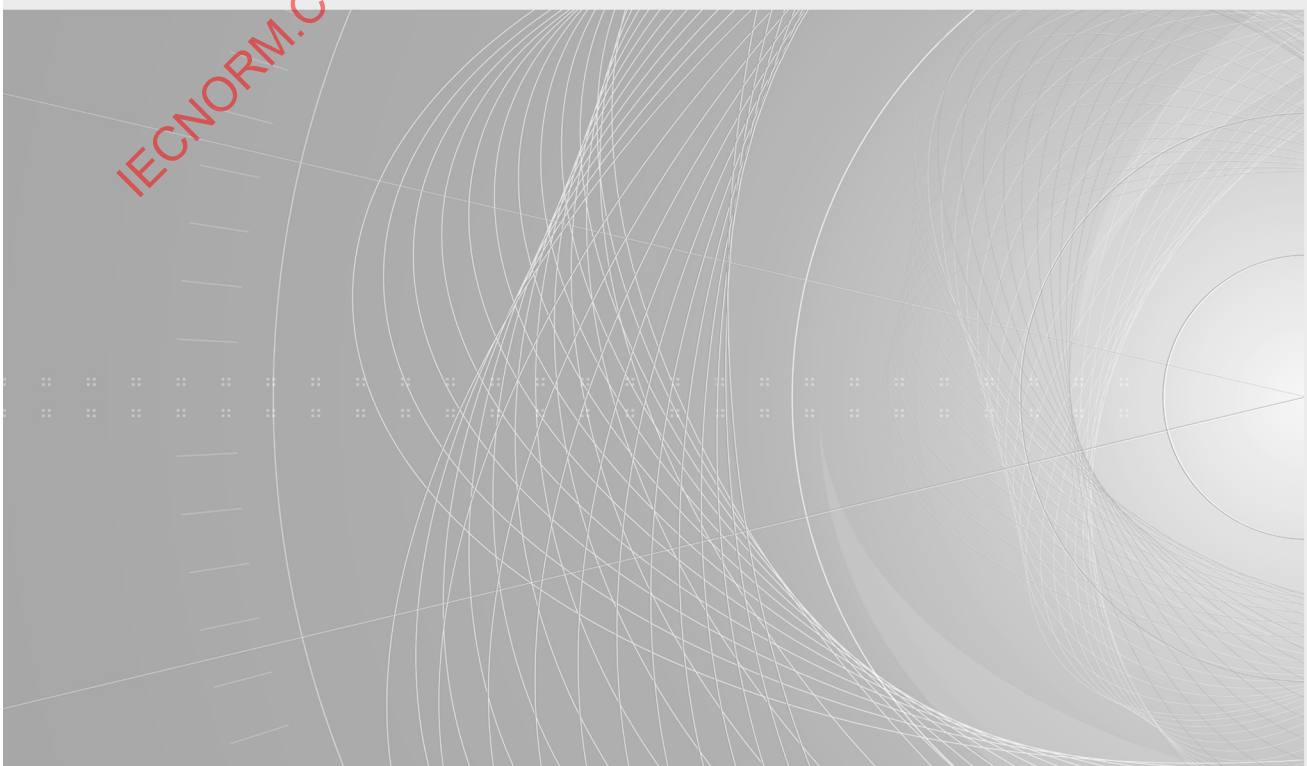
Edition 3.0 2020-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electrical equipment for measurement, control and laboratory use – EMC requirements –
Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

Matériel électrique de mesure, de commande et de laboratoire – Exigences relatives à la CEM –
Partie 2-3: Exigences particulières – Configurations d'essai, conditions de fonctionnement et critères de performance des transducteurs avec un système de conditionnement du signal intégré ou à distance



IEC 61326-2-3:2020-10(en-fr)

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

FOREWORD

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This International Standard IEC 61326-2-3 has been prepared by subcommittee 65A: System aspects, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition published in 2012. This edition constitutes a technical revision.

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

– update of the document with respect to IEC 61326-1:2020.

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

FDIS	Report on voting
65A/980/FDIS	65A/991/RVD

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

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

In this document the following print types are used:

– Terms used throughout this document which have been defined in Clause 3 of this document and of IEC 61326-1:2020: SMALL CAPITALS.

This part of the IEC 61326 series is to be used in conjunction with IEC 61326-1:2020 and follows the same numbering of clauses, subclauses, tables and figures.

When a particular subclause of IEC 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 IEC 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 IEC 61326-1;

– unless notes are in a new subclause or involve notes in IEC 61326-1, they are numbered starting from 101 including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

A list of all parts of the IEC 61326 series, under the general title *Electrical equipment for measurement, control and laboratory use – EMC requirements,* 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 "http://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.

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

Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

1 Scope

In addition to the requirements of IEC 61326-1, this part of IEC 61326 specifies more detailed test configurations, operational conditions and performance criteria for transducers with integrated or remote signal conditioning.

This document applies only to transducers characterized by their ability to transform, with the aid of an auxiliary energy source, a non-electric quantity to a process-relevant electrical signal, and to output the signal at one or more PORTS. This document includes transducers for electro-chemical and biological measured quantities.

The transducers covered by this document can be powered by AC or DC voltage and/or by battery or with internal power supply.

Transducers referred to by this document comprise at least the following items (see Figure 101 and Figure 102):

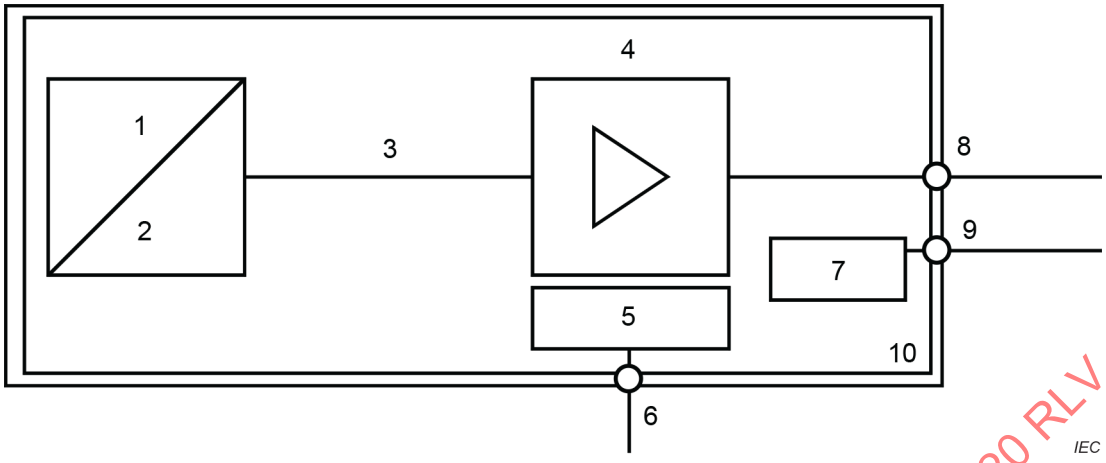
– one or more elements for transforming a non-electrical input quantity to an electrical quantity;
– a TRANSMISSION LINK for transferral of the electrical quantity to a component for signal conditioning;
– a unit for signal conditioning that converts the electrical quantity to a process-relevant electrical signal;
– an enclosure for enclosing the above-stated components fully or in parts.

Transducers referred to by this document can also have the following items (see Figure 101 and Figure 102):

– a communication and control unit;
– a display unit;
– control elements such as keys, buttons, switches, etc.;
– transducer output signals (for example, switch outputs, alarm outputs) which are clearly assigned to the input signal(s);
– transducers with signal conditioning which may be integrated or remote.

The manufacturer specifies the environment for which the product is intended to be used and utilizes the corresponding test levels of IEC 61326-1.

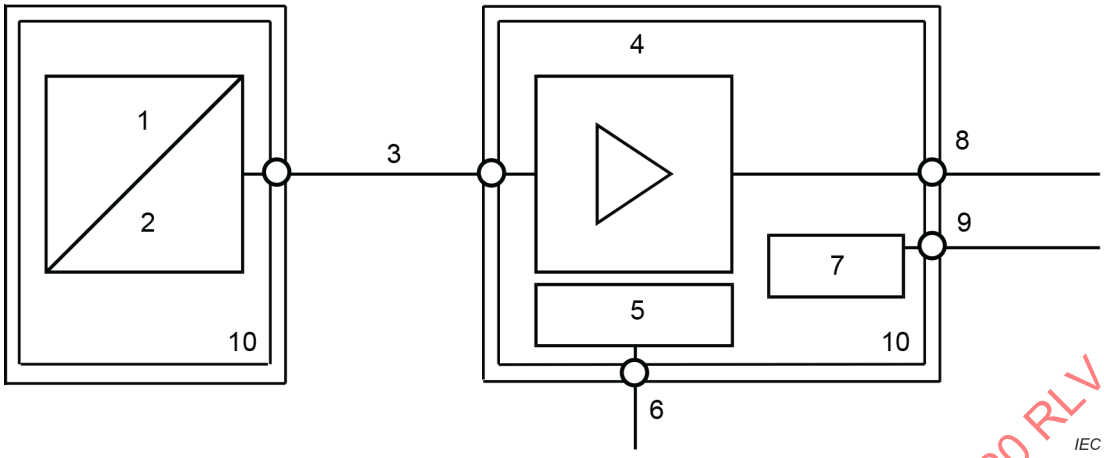
Additional requirements and exceptions for specific types of transducers are given in Annex AA, Annex BB and Annex CC to this document.



Key

1 non-electrical quantity
2 electrical quantity
3 TRANSMISSION LINK
4 signal conditioning
5 communication and control unit
6 input/output PORTS
7 power supply
8 signal PORT
9 AC/DC POWER PORT
10 enclosure

Figure 101 – Example of a TRANSDUCER WITH INTEGRATED SIGNAL CONDITIONING



Key

1 non-electrical quantity
2 electrical quantity
3 TRANSMISSION LINK
4 signal conditioning
5 communication and control unit
6 input/output PORTS
7 power supply
8 signal PORT
9 AC/DC POWER PORT
10 enclosure

Figure 102 – Example of a TRANSDUCER WITH REMOTE SIGNAL CONDITIONING

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.

Clause 2 of IEC 61326-1:2020 applies, except as follows:

Addition:

IEC 61326-1:2020, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions of IEC 61326-1:2020 apply, except as follows.

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

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

Addition:

3.101
transducer with integrated signal conditioning
transducer in which all components for signal conditioning are integrated in the enclosure

Note 1 to entry: See Figure 101.

3.102
transducer with remote signal conditioning
transducer whose components for signal conditioning are installed in separate enclosures

Note 1 to entry: See Figure 102.

3.104
transmission link
connection between the individual components of a TRANSDUCER WITH REMOTE SIGNAL CONDITIONING

3.105
range
range of indications obtainable with a particular setting of the controls of a measuring instrument

Note 1 to entry: The (nominal) RANGE is normally stated in terms of its lower and upper limits. Where the lower limit is zero, the (nominal) RANGE is commonly stated solely in terms of its upper limit.

[SOURCE: IEC 60050-300:2001, 311-03-14]

3.106
measuring range (of a transducer)
range defined by two values of the measured quantity within which the relationship between the output and input signals complies with the accuracy requirements

Note 1 to entry: For a 4 mA to 20 mA system, the output current 4 mA represents the lower limit for the measured quantity and 20 mA represent the upper limit.

[SOURCE: IEC 60050-300:2001, 314-04-04, modified – "output signal" has been changed to "measured quantity" and the note to entry has been added]

3.107
span
algebraic difference between the values of the upper and lower limits of the MEASURING RANGE

[SOURCE: IEC 60050-300:2001, 311-03-13]

4 General

Clause 4 of IEC 61326-1:2020 applies.

5 EMC test plan

5.1 General

Subclause 5.1 of IEC 61326-1:2020 applies.

5.2 Configuration of EUT during testing

Subclause 5.2 of IEC 61326-1:2020 applies, except as follows.

5.2.1 General

Subclause 5.2.1 of IEC 61326-1:2020 applies, except as follows:

Addition:

A system for monitoring the behaviour of the EUT and for registering the output values shall be designed in such a way that the electromagnetic compatibility characteristics of the EUT are not impaired. The monitoring system shall also be designed such that its response is not affected by the immunity tests. The input impedance of the monitoring system shall correspond to the terminating impedance of the transducer, specified by the manufacturer. The distance between the monitoring system and the EUT should be at least 1,5 m.

The measurement uncertainty and the bandwidth of the monitoring system shall be adapted to the characteristics of the transducer.

TRANSMISSION LINKS are considered as separate input and output lines.

The tests shall be conducted in compliance with the environmental conditions for the transducer specified by the manufacturer and using the specified supply voltage.

In the case of battery-operated transducers that can also be used when connected with a power supply, both operating modes (stand-alone and externally supplied) shall be tested.

In cases in which the manufacturer's installation instructions stipulate the use of external protective equipment or particular protective measures that are explicitly stated in the operating manual, the test requirements given in this part of the document shall be applied for use together with the external protective equipment or measures.

5.3 Operation conditions of EUT during testing

Subclause 5.3 of IEC 61326-1:2020 applies.

5.4 Specification of FUNCTIONAL PERFORMANCE

Subclause 5.4 of IEC 61326-1:2020 applies.

5.5 Test description

Subclause 5.5 of IEC 61326-1:2020 applies.

6 Immunity requirements

6.1 Conditions during the tests

Subclause 6.1 of IEC 61326-1:2020 applies except as follows:

Addition:

Transducers shall be operated during the test with all lines connected, provided the PORTS do not have functions that disable the transducer's normal operation.

Configurations with alternative PORTS shall be tested separately.

Transducers shall be set to the most sensitive ranges or combination of ranges unless other ranges are known to provide worst-case immunity results within normal application.

Only operational functions compliant with the specified use under the nominal conditions are permitted. Defined functions that cannot be set under electromagnetic compatibility test conditions shall be simulated by appropriate measures. This shall be done in such a way that the electromagnetic compatibility behaviour of the transducer is not affected.

Measurement and supply circuits shall be grounded in accordance with the manufacturer's specifications. If no such specifications are given, the tests shall be carried out with the circuits grounded and with the circuits ungrounded.

6.2 Immunity test requirements

Subclause 6.2 of IEC 61326-1:2020 applies except as follows:

Addition:

After or during each test, the function of the transducer shall be tested.

Power inputs for voltages up to 75 V DC or voltages up to 50 V AC that are fed in a single cable together with the input and output PORTS are tested as input and output PORTS.

Power inputs for voltages up to 75 V DC or voltages up to 50 V AC with superimposed output signals (for example, 4 mA to 20 mA current loop with two-wire technology) are also tested as input/output PORTS.

The TRANSMISSION LINK of a TRANSDUCER WITH REMOTE SIGNAL CONDITIONING is tested as an input/output PORT.

If insulation resistance is specified, it shall be verified after ESD, fast transient and surge immunity tests.

If the insulation's specifications are not satisfied, the transducer is deemed to have failed the EMC tests.

6.3 Random aspects

Subclause 6.3 of IEC 61326-1:2020 applies.

6.4 Performance criteria

Subclause 6.4 of IEC 61326-1:2020 applies except as follows:

Addition:

The performance criteria are used to assess the defined functions of a transducer under the effects of external electromagnetic disturbances. Since a transducer is often part of a chain of functions in a large process, effects on the overall process due to malfunctions of a transducer caused by external interference factors cannot be predicted without great difficulty. For this reason, it is particularly important that the behaviour of transducers under the influence of electromagnetic disturbances is described with performance criteria.

Table 101 describes the permissible effects of a disturbance on the different functions of a transducer with regard to the required performance criteria.

Table 101 – Performance criteria for the different functions

Function	Additional particular performance criteria		
	for performance criterion A	for performance criterion B	for performance criterion C
Main function [a]	See 6.4.2 of IEC 61326-1:2020	See 6.4.3 of IEC 61326-1:2020	The deviations during the test may be outside the limit values specified and documented. After the test, the measured values are within the specified range. The time needed for the device to return to ready state is given in the documentation.
Process communication	Communication works as intended	Temporary interference of the communication is permitted during the test	Interference of the communication is permitted during the test. The time needed for the device to return to ready state is given in the documentation.
Alarm function	No malfunctions are permitted	Temporary malfunctions are permitted during the test	Malfunctions are permitted. The time needed for the device to return to ready state is given in the documentation.
[a] The main function of a measuring transducer is to transform a non-electrical quantity into a process-relevant signal as shown in Figure 101 and Figure 102.			

7 Emission requirements

7.1 Conditions during measurements

Subclause 7.1 of IEC 61326-1:2020 applies except as follows:

Addition:

The additions made in Clauses 5 and 6 shall be taken into account.

7.2 Emission limits

Subclause 7.2 of IEC 61326-1:2020 applies.

8 Test results and test report

Clause 8 of IEC 61326-1:2020 applies.

9 Instructions for use

Clause 9 of IEC 61326-1:2020 applies.

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 61326-1:2020 does not apply.

Additional annexes:

Annex AA
(normative)

Additional requirements and exceptions for specific types of transducers – Transducers for measurement of tension and compressive forces (force transducers)

AA.1 General considerations

In addition to the requirements of the main part of this document, this Annex AA describes particular EMC requirements for force transducers that permit static measurement quantities.

Force transducers comprise at least the following components:

- a deflection unit that records mechanical forces as input quantities;
- one or more converting elements for generating electrical signals proportional to the mechanical input quantities;
- a measurement signal amplifier for processing the electrical signals into process-relevant signals.

AA.2 Test configuration

The force transducer shall be tested in the position specified by the manufacturer (see Figure AA.1).

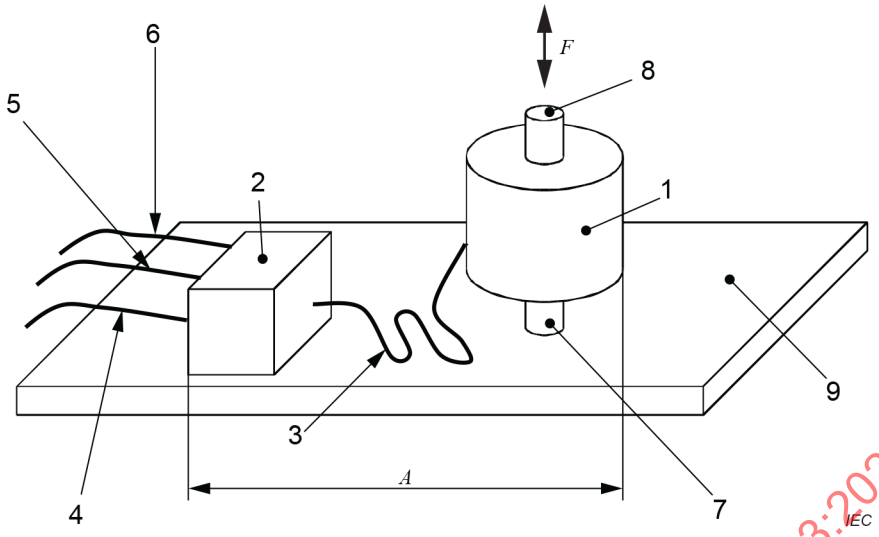
If no installation position is specified by the manufacturer, the transducer shall be positioned in such a way that the force is applied vertically.

The grounding of the power supply and force transducer shall comply with the manufacturer's specifications. If none are given, the power supply for voltages less than 70 V DC shall be grounded and the transducer shall be tested both grounded and insulated from ground.

Connections to functional earth shall be made only at terminals of the force transducer intended for that purpose.

If the PORTS are implemented in the form of plug-in connectors and if they have a terminal for a cable shield, then the shield shall be connected to the functional earth PORT. Preinstalled cable connectors with shielding shall be connected accordingly.

The mounting parts for securing the transducer in a fixed position and the mounting plate shall not be made of conductive material unless specified otherwise by the manufacturer. The outer distance A between the components should not be greater than 1 m.



Key

1 deflection unit
2 remote signal conditioning
3 TRANSMISSION LINK
4 AC/DC mains PORT
5 input/output PORT
6 measurement output PORT
7 mounting
8 load button
9 mounting plate
F tension/compressive force
A outer distance between deflection unit and remote signal conditioning (max. 1 m)

Figure AA.1 – Example of the configuration of a force transducer with remote signal conditioning

AA.3 Operation conditions

The EUT shall be operated with the specified rated supply voltage. If the maximum rated supply voltage differs from the minimum rated supply voltage by more than a factor of 2, the EMC tests conducted on the power input lines shall be performed at both the minimum and the maximum rated supply voltages.

Force transducers are tested under static, mechanical load.

If a mechanical load cannot be applied to the force transducer in the test environment, an output signal may be generated using suitable circuitry connected to the transducer elements. This circuitry shall be connected directly to the transducer elements in the transducer housing. The application of each circuitry action shall be described and justified in the test report.

Examples for possible circuitry actions are listed in Table AA.1.

Table AA.1 – Circuitry actions for generating an output signal for simulation of a mechanical load on the transducer

Transducer technology	Circuitry actions used for simulation
Strain gauge	Detune the measuring bridge with fixed-value resistors
Capacitive elements	Detune the measuring bridge with capacitors and/or fixed-value resistors in the case of half-bridges

The force shall be between 30 % and 70 % of the nominal force range. In the case of an expanded measurement range, the main function output signal should also be within 30 % and 70 % of the output signal operating range. In the case of a ± range, zero values – for example 0,0 mA or 0,0 V – should not be chosen.

In case that measures according to the examples given in Table AA.1 are not possible, it may be acceptable to gain an offset via software or to do measurements outside the 30 % to 70 % force range. The reason for this action shall be described and justified in the test report.

An alarm function shall be configured in such a way that the difference between the actual measuring value and the adjusted alarm value corresponds to twice of the specified accuracy allowed for the tested measurement SPAN.

Two situations shall be tested:

a) the adjusted alarm value is above the actual measuring value;

b) the adjusted alarm value is below the actual measuring value.

If the initiation threshold value of the alarm function is within 30 % to 70 % of the rated test value range, it can be tested together with the other outputs.

Annex BB
(normative)

Additional requirements and exceptions for specific types of transducers – Transducers for measurement of pressure (pressure transducers)

BB.1 General considerations

In addition to the requirements of the main part of this document, this Annex BB describes particular EMC requirements for pressure transducers.

Pressure transducers consist of at least the following:

- a process connection for pressure-sealed connection to the process;
- a sensor element for conversion of pressure to a quantity that can be electrically processed;
- a signal conditioning unit for formatting, linearizing, amplifying and converting the electrical quantity to a process-compliant signal.

This annex does not apply to pressure measurement equipment operating purely on a mechanical basis – for example, spring-tube manometers with limit switches.

BB.2 Test configuration

All tests shall be carried out in the pressure transducer position specified by the manufacturer (see Figure BB.1).

If no position is specified, the tests shall be performed in the position considered to be the least favourable and noted in the test report.

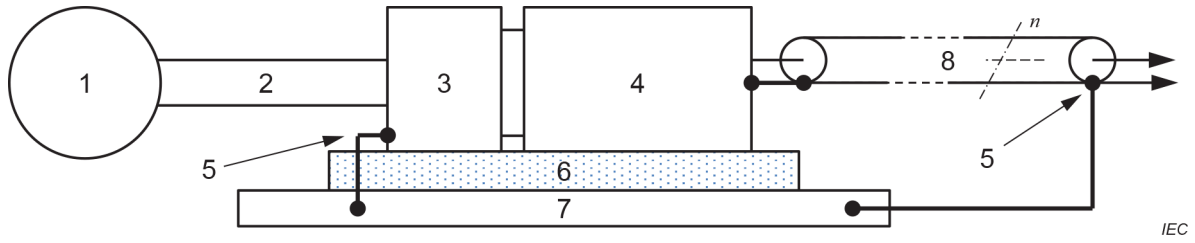
Components for pressure measurement to a test object should affect the test configuration as little as possible. For this reason, the dimensions of metallic pressure adapters should not be more than twice the size of the EUT. Pipes to pressure connection, pressure controllers and the used media should be electrically insulated if conductive pipes or media may influence the test result.

The tests shall be carried out with all the electrical connection elements specified by the manufacturer fully assembled and connected.

The grounding of the transducer and the power supply shall be in accordance with the manufacturer's specifications.

If not specified by the manufacturer, the EUT shall be prepared in the following way:

- if the process connection is made of metal, it shall be grounded. Sealants are not allowed to impair the resistance to the grounding terminal;
- if a terminal is provided for functional grounding, it shall be grounded;
- if terminals have an option for a cable shield connection, the option shall be used for connecting the shield;
- the power supply shall be insulated from the ground.



Key

1 process medium

2 pipe

3 pressure adapter

4 pressure transducer

5 ground connection

6 insulated support

NOTE See relevant basic standards for the height of the insulated support.

7 reference ground

8 connecting n line(s)

Figure BB.1 – Example of the configuration of a pressure transducer

BB.3 Operation conditions

The EUT shall be operated with the specified rated supply voltage. If the maximum rated supply voltage differs from the minimum rated supply voltage by more than a factor of 2, the conducted EMC tests on the power input lines shall be performed at both the minimum and the maximum rated supply voltages.

The pressure shall be between 30 % and 70 % of the nominal pressure range. In the case of an expanded measurement range, the main function output signal should also be within 30 % and 70 % of the output signal operating range. In the case of a ± range, zero values – for example, 0,0 mA or 0,0 V – should not be chosen.

In case it is not possible or practical to set the pressure between 30 % and 70 % of the nominal pressure range (e.g. safety reasons), it may be acceptable to gain an offset via software or to do measurements outside the 30 % to 70 % pressure range. The reason for this action shall be described and justified in the test report. Adjustable pressure transducers shall be set in accordance with the manufacturer's specifications. If no manufacturer specifications are given, use the following settings:

- most sensitive measurement range;
- minimum time constant/response time;
- highest data transfer rate.

Annex CC
(normative)

Additional requirements and exceptions for specific types of transducers – Transducers for measurement of temperature (temperature transducer)

CC.1 General considerations

In addition to the requirements of the main part of this document, this Annex CC describes particular EMC requirements for temperature transducers.

Temperature transducers comprise at least the following components:

- one or more temperature sensors (for example, thermocouple, PT-100);
- a signal conditioning unit for formatting, linearizing, amplifying and converting the electrical input signal to a process-compliant signal;
- a signal PORT with attached cable for signal transfer (for example, two-wire 4 mA to 20 mA link).

The temperature transducer may also have the following components:

- one or more TRANSMISSION LINKs between temperature sensor and processing unit;
- PORT for separate power supply.

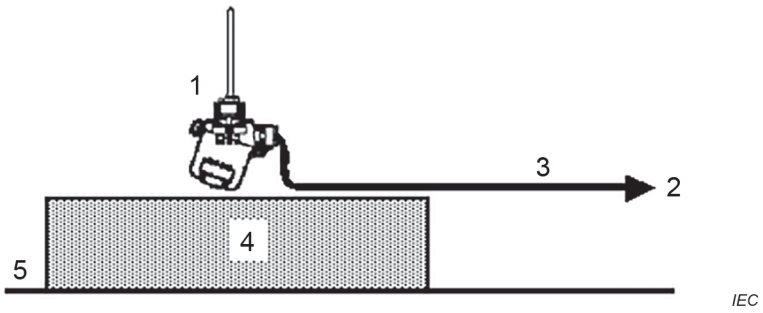
CC.2 Test configuration

The test setup shall be as close as possible to real installations. Deviations from the test set-up described in the basic standards cited that might be necessary due to special demands of temperature transducers shall be described and justified in the test report. The cable types shall be chosen according to the manufacturers' installation guides. If no special cables are prescribed, common unshielded and untwisted cables shall be used in the test setup.

For analogue output signals, a load within the specification of the manufacturer shall be connected, for which the EUT is expected to be most susceptible to EMC phenomena.

If the temperature transducer is used and delivered only as a single unit (sensor and processing unit within the same housing), it shall be tested in this configuration (see test setup in Figure CC.1). In all other cases, the test setup in Figure CC.2 shall be used. The length of the cables shall be in accordance with the basic standards. The tests shall be carried out with all electrical connection elements fully assembled and connected as specified by the manufacturer. The temperature transducer and power supply shall be connected to ground in accordance with the specifications of the manufacturer.

The room temperature should be used as the reference measurement quantity. Care shall be taken that the temperature is constant within an appropriate temperature interval to evaluate the performance of the transducer. If this is not possible (for example, due to the MEASURING RANGE of the transducer), the sensor of the transducer shall be mounted on a suitable medium representing the process temperature or the room temperature shall be taken into account via a separate temperature measurement. Simulations (networks of resistors and/or other passive components or batteries) can be used instead of a passive sensor or thermocouple, if equivalence of the high-frequency characteristics can be proved so as to ensure a similar electromagnetic behaviour.



Key

1 temperature transducer (orientation of transducer only as an example)

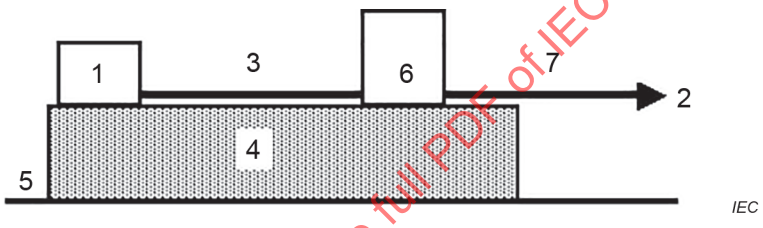
2 AUXILIARY EQUIPMENT (for example, power supply, signal evaluation, or system for transmission of the signal)

3 link cable, unshielded, untwisted, if not specified otherwise

4 insulated support (dimension according to the relevant basic standard)

5 reference ground

Figure CC.1 – Example of the configuration of a temperature transducer with sensor and signal conditioning in the same housing



Key

1 temperature sensor

2 AUXILIARY EQUIPMENT (for example, power supply, signal evaluation)

3 link cable, unshielded, untwisted, if not specified otherwise

4 insulated support (dimension according to the relevant basic standard)

5 reference ground

6 signal conditioning unit of the transducer

7 link cable, unshielded, untwisted, if not specified otherwise

Figure CC.2 – Example of the configuration of a temperature transducer with remote signal conditioning

CC.3 Operation conditions

The EUT shall be operated with the specified rated supply voltage. If the maximum rated supply voltage differs from the minimum rated supply voltage by more than a factor of 2, the EMC tests conducted on the power input lines shall be performed at both the minimum and the maximum rated supply voltages.

The transducer shall be adjusted so that at the applied temperature, a transducer output signal of 40 % to 60 % of the output signal range is generated (for example, 12 mA of a 4 mA to 20 mA system). In the case of a signed output range, zero values – for example, 0,0 mA or 0,0 V – shall not be chosen.

The following settings shall be used, if not otherwise specified by the manufacturer:

- most sensitive measurement range;
- minimum time constant/response time;
- highest data rate.

An alarm function, if available, shall be configured as defined by the manufacturer. If no definition is given by the manufacturer, the alarm function shall be configured in such a way that the difference between the actual measuring value and the adjusted alarm value corresponds to the precision of the device.

Two situations shall be tested:

1) the adjusted alarm value is above the actual measuring value;
2) the adjusted alarm value is below the actual measuring value.

If the initiation threshold value of the alarm function is within 40 % to 60 % of the chosen output signal range, the alarm function can be tested together with the other functions.

Bibliography

IEC 60050-300:2001, *International Electrotechnical Vocabulary (IEV) – Part 300: Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements – Part 312: General terms relating to electrical measurements – Part 313: Types of electrical measuring instruments – Part 314: Specific terms according to the type of instrument* (available at <http://www.electropedia.org>)

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SOMMAIRE

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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MATÉRIEL ÉLECTRIQUE DE MESURE, DE COMMANDE ET DE LABORATOIRE – EXIGENCES RELATIVES À LA CEM –

Partie 2-3: Exigences particulières – Configurations d'essai, conditions de fonctionnement et critères de performance des transducteurs avec un système de conditionnement du signal intégré ou à distance

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La Norme internationale IEC 61326-2-3 a été établie par le sous-comité 65A: Aspects systèmes, du comité d'études 65 de l'IEC: Mesure, commande et automation dans les processus industriels.

Cette troisième édition annule et remplace la deuxième édition parue en 2012. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

– mise à jour du document par rapport à l'IEC 61326-1:2020.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
65A/980/FDIS	65A/991/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

Dans le présent document, les caractères d'imprimerie suivants sont utilisés:

– Termes définis à l'Article 3 du présent document et de l'IEC 61326-1:2020 et utilisés dans tout ce document: PETITES MAJUSCULES.

La présente partie de la série IEC 61326 doit être utilisée conjointement avec l'IEC 61326-1:2020 et suit la même numérotation d'articles, de paragraphes, de tableaux et de figures.

Lorsqu'un paragraphe particulier de l'IEC 61326-1 n'est pas mentionné dans la présente partie, ce paragraphe s'applique pour autant qu'il soit raisonnable. Lorsque la présente norme spécifie "addition", "modification" ou "remplacement", le texte correspondant de l'IEC 61326-1 doit être adapté en conséquence.

NOTE Le système de numérotation suivant est utilisé:

– paragraphes, tableaux et figures: ceux qui sont numérotés à partir de 101 sont complémentaires à ceux de l'IEC 61326-1;

– à l'exception de celles qui sont dans un nouveau paragraphe ou de celles qui concernent des notes de l'IEC 61326-1, les notes sont numérotées à partir de 101, y compris celles des articles ou paragraphes qui sont modifiés ou remplacés;

– les annexes supplémentaires sont appelées AA, BB, etc.

Une liste de toutes les parties de la série IEC 61326, publiées sous le titre général *Matériel électrique de mesure, de commande et de laboratoire – Exigences relatives à la CEM*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives au document recherché. A cette date, le document sera

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- amendé.

MATÉRIEL ÉLECTRIQUE DE MESURE, DE COMMANDE ET DE LABORATOIRE – EXIGENCES RELATIVES À LA CEM –

Partie 2-3: Exigences particulières – Configurations d'essai, conditions de fonctionnement et critères de performance des transducteurs avec un système de conditionnement du signal intégré ou à distance

1 Domaine d'application

En complément aux exigences de l'IEC 61326-1, la présente partie de l'IEC 61326 spécifie de façon plus détaillée les configurations d'essai, les conditions de fonctionnement et les critères de performance des transducteurs avec un système de conditionnement du signal intégré ou à distance.

Le présent document s'applique uniquement aux transducteurs caractérisés par leur capacité à transformer, avec l'aide d'une source d'énergie auxiliaire, une grandeur non électrique en un signal électrique approprié pour un processus, et à fournir un signal sur un ou plusieurs ACCES. Le présent document inclut les transducteurs pour le mesurage de grandeurs électrochimiques et biologiques.

Les transducteurs couverts par ce document peuvent être alimentés par une tension alternative ou continue et/ou par batterie ou par une alimentation interne.

Les transducteurs auxquels il est fait référence dans le présent document comportent au moins les entités suivantes (voir la Figure 101 et la Figure 102):

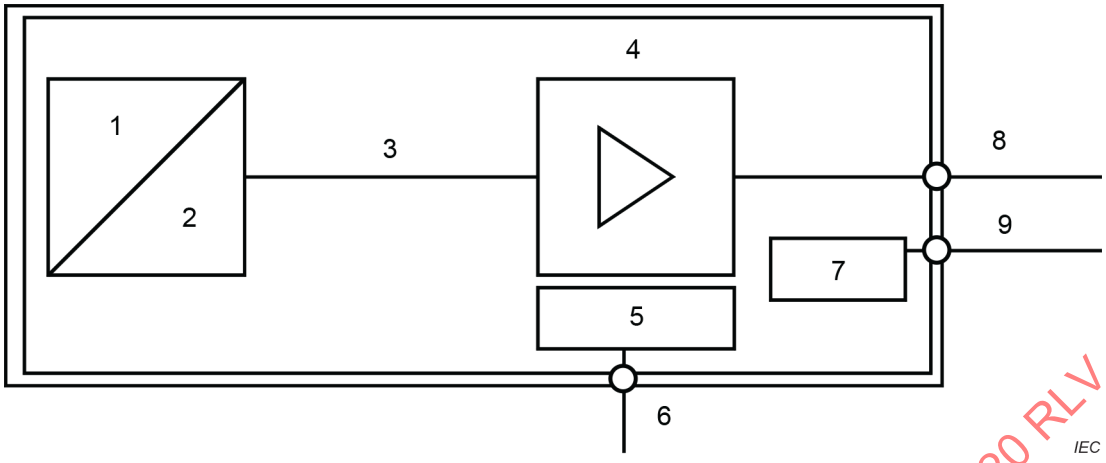
– un ou plusieurs éléments pour transformer une grandeur d'entrée non électrique en une grandeur électrique;
– une LIAISON DE TRANSMISSION pour le transfert de la grandeur électrique à un composant effectuant le conditionnement du signal;
– une unité pour le conditionnement du signal, qui convertit la grandeur électrique en un signal électrique approprié pour un processus;
– une enveloppe pour contenir complètement ou en partie les composants mentionnés ci-dessus.

Les transducteurs auxquels il est fait référence dans le présent document peuvent aussi comporter les entités suivantes (voir la Figure 101 et la Figure 102):

– une unité de communication et de commande;
– une unité d'affichage;
– des éléments de commande, tels que des clés, des boutons, des commutateurs, etc.;
– des signaux de sortie du transducteur (par exemple, des sorties de commutation, des sorties d'alarme) qui sont clairement assignés au signal ou aux signaux d'entrée;
– des transducteurs avec un conditionnement de signal qui peut être intégré ou à distance.

Le fabricant spécifie l'environnement dans lequel le produit est destiné à être utilisé et utilise les niveaux d'essai correspondants de l'IEC 61326-1.

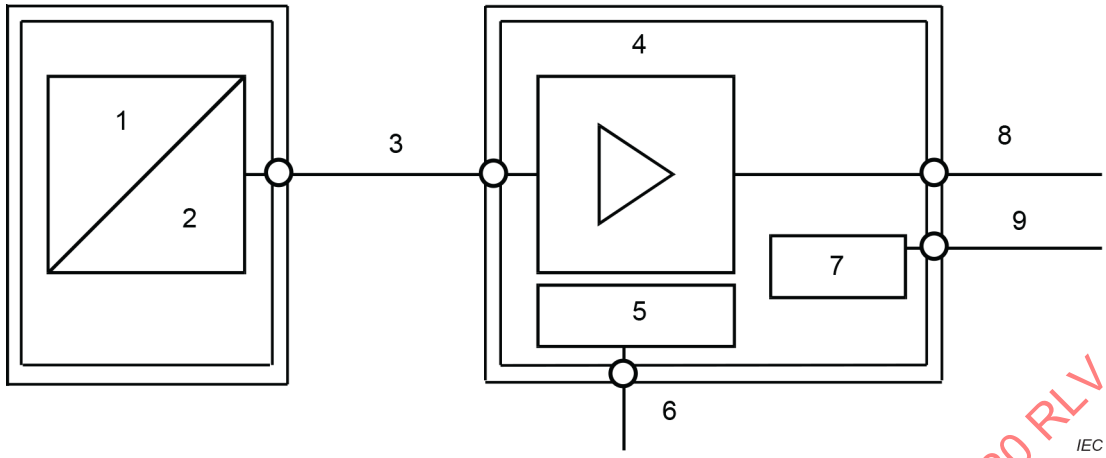
Des exigences complémentaires et des exceptions pour des types spécifiques de transducteurs sont données dans l'Annexe AA, l'Annexe BB et l'Annexe CC du présent document.



Légende

1 grandeur non électrique
2 grandeur électrique
3 LIAISON DE TRANSMISSION
4 conditionnement du signal
5 unité de communication et de commande
6 ACCES entrée/sortie
7 alimentation électrique
8 ACCES du signal
9 ACCES EN COURANT ALTERNATIF/CONTINU
10 enveloppe

Figure 101 – Exemple de TRANSDUCTEUR AVEC UN SYSTEME DE CONDITIONNEMENT DU SIGNAL INTEGRE



Légende

1 grandeur non électrique
2 grandeur électrique
3 LIAISON DE TRANSMISSION
4 conditionnement du signal
5 unité de communication et de commande
6 ACCES entrée/sortie
7 alimentation électrique
8 ACCES du signal
9 ACCES EN COURANT ALTERNATIF/CONTINU
10 enveloppe

Figure 102 – Exemple de TRANSDUCTEUR AVEC UN SYSTEME DE CONDITIONNEMENT DU SIGNAL A DISTANCE

2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

L'Article 2 de l'IEC 61326-1:2020 s'applique, avec l'exception suivante:

Addition:

IEC 61326-1:2020, *Matériel électrique de mesure, de commande et de laboratoire – Exigences relatives à la CEM – Partie 1: Exigences générales*

3 Termes et définitions

Pour les besoins du présent document, les termes et définitions donnés dans l'IEC 61326-1:2020 s'appliquent, avec les exceptions suivantes:

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

Addition:

3.101
transducteur avec système de conditionnement du signal intégré
transducteur dans lequel tous les composants pour le conditionnement du signal sont intégrés dans l'enveloppe

Note 1 à l'article: Voir la Figure 101.

3.102
transducteur avec système de conditionnement du signal à distance
transducteur dont les composants pour le conditionnement du signal sont installés dans des enveloppes séparées

Note 1 à l'article: Voir la Figure 102.

3.104
liaison de transmission
connexion entre les composants individuels d'un transducteur ayant système de conditionnement du signal à distance

3.105
plage
étendue d'échelle que l'on obtient pour une position donnée des commandes d'un appareil de mesure

Note 1 à l'article: La PLAGE (nominale) est normalement exprimée par ses limites inférieure et supérieure. Lorsque la limite inférieure est zéro, la PLAGE (nominale) est habituellement exprimée par la seule limite supérieure.

[SOURCE: IEC 60050-300:2001, 311-03-14, modifiée – "Calibre" a été remplacé par "plage"]

3.106
étendue de mesure (d'un transducteur)
plage définie par deux valeurs de la grandeur mesurée, dans laquelle la relation entre les signaux de sortie et d'entrée satisfait aux exigences d'exactitude

Note 1 à l'article: Pour un système de 4 mA à 20 mA, le courant de sortie de 4 mA représente la limite inférieure pour la grandeur mesurée, et 20 mA représente la limite supérieure.

[SOURCE: IEC 60050-300:2001, 314-04-04, modifiée – "signal de sortie" a été remplacé par "grandeur mesurée" et la note à l'article a été ajoutée]

3.107
intervalle (de mesure)
différence algébrique entre les valeurs de la limite supérieure et de la limite inférieure de l'ETENDUE DE MESURE

[SOURCE: IEC 60050-300:2001, 311-03-13]

4 Généralités

L'Article 4 de l'IEC 61326-1:2020 s'applique.

5 Plan d'essai de CEM

5.1 Généralités

Le Paragraphe 5.1 de l'IEC 61326-1:2020 s'applique.

5.2 Configuration de l'EST lors des essais

Le Paragraphe 5.2 de l'IEC 61326-1:2020 s'applique, avec l'exception suivante.

5.2.1 Généralités

Le Paragraphe 5.2.1 de l'IEC 61326-1:2020 s'applique, avec l'exception suivante:

Addition:

Pour surveiller le comportement de l'EST et pour l'enregistrement des valeurs de sortie, un système doit être conçu de telle sorte que les caractéristiques de compatibilité électromagnétique de l'EST ne soient pas affectées. Il doit également être conçu de façon à ce que ses réponses ne soient pas affectées par les essais d'immunité. L'impédance d'entrée du système de surveillance doit correspondre à l'impédance de terminaison du transducteur, spécifiée par le fabricant. Il convient que la distance entre le système de surveillance et l'EST soit d'au moins 1,5 m.

L'incertitude de mesure et la largeur de bande du système de surveillance doivent être adaptées aux caractéristiques du transducteur.

Les LIAISONS DE TRANSMISSION sont considérées comme des lignes séparées d'entrée et de sortie.

Les essais doivent être réalisés en conformité avec les conditions environnementales du transducteur spécifiées par le fabricant et en utilisant la tension d'alimentation spécifiée.

Dans le cas de transducteurs fonctionnant sur batterie et qui peuvent aussi être utilisés en étant connectés à une alimentation, les deux modes de fonctionnement (autonome et alimenté par l'extérieur) doivent être soumis aux essais.

Dans les cas où les instructions d'installation du fabricant stipulent l'utilisation d'un équipement externe de protection ou des dispositions particulières de protection qui sont explicitement établies dans le manuel d'utilisation, les exigences relatives aux essais données dans la présente partie du document doivent être appliquées pour l'utilisation avec l'équipement externe de protection ou avec des dispositions particulières de protection.

5.3 Conditions de fonctionnement de l'EST lors des essais

Le Paragraphe 5.3 de l'IEC 61326-1:2020 s'applique.

5.4 Spécification des PERFORMANCES FONCTIONNELLES

Le Paragraphe 5.4 de l'IEC 61326-1:2020 s'applique.

5.5 Description de l'essai

Le Paragraphe 5.5 de l'IEC 61326-1:2020 s'applique.

6 Exigences relatives à l'immunité

6.1 Conditions lors des essais

Le Paragraphe 6.1 de l'IEC 61326-1:2020 s'applique, avec l'exception suivante:

Addition:

Pendant l'essai, les transducteurs doivent fonctionner avec toutes leurs lignes connectées, à condition que les ACCES n'aient pas de fonctions qui désactivent le fonctionnement normal du transducteur.

Les configurations avec des ACCES autres doivent être soumises aux essais séparément.

Les transducteurs doivent être réglés dans les plages ou les combinaisons de plages les plus sensibles, à moins que d'autres plages ne soient connues pour donner les résultats d'immunité les plus défavorables dans une application normale.

Seules les fonctions opérationnelles conformes à l'utilisation spécifiée dans les conditions nominales sont admises. Les fonctions définies qui ne peuvent pas être établies dans les conditions d'essais de compatibilité électromagnétique doivent être simulées par des dispositions appropriées. Cela doit être fait de telle sorte que le comportement de compatibilité électromagnétique du transducteur ne soit pas affecté.

Les circuits de mesure et d'alimentation doivent être raccordés à la terre conformément aux spécifications du fabricant. Si de telles spécifications ne sont pas disponibles, les essais doivent être réalisés avec les circuits raccordés à la terre et non raccordés à la terre.

6.2 Exigences pour les essais d'immunité

Le Paragraphe 6.2 de l'IEC 61326-1:2020 s'applique, avec l'exception suivante:

Addition:

Après ou pendant chaque essai, la fonction du transducteur doit être soumise aux essais.

Les entrées d'alimentation, pour les tensions jusqu'à 75 V en courant continu ou les tensions jusqu'à 50 V en courant alternatif qui sont alimentées avec un câble unique possédant les ACCES d'entrée et de sortie, sont soumises aux essais comme des ACCES d'entrée et des ACCES de sortie.

Les entrées d'alimentation pour les tensions jusqu'à 75 V en courant continu ou les tensions jusqu'à 50 V en courant alternatif avec des signaux de sortie superposés (par exemple, une boucle de courant de 4 mA à 20 mA avec une technologie bifilaire), sont aussi soumises aux essais comme des ACCES d'entrée/sortie.

La LIAISON DE TRANSMISSION d'un TRANSDUCTEUR AVEC UN SYSTEME DE CONDITIONNEMENT DU SIGNAL A DISTANCE est soumise aux essais comme un ACCES d'entrée/sortie.

Dans le cas où la résistance d'isolement est spécifiée, elle doit être vérifiée après les essais d'immunité de décharges électrostatiques, de transitoires rapides et d'ondes de choc.

Si les spécifications d'isolement ne sont pas satisfaites, le transducteur est considéré comme ayant échoué aux essais de CEM.