

INTERNATIONAL STANDARD



**Electrical equipment for measurement, control and laboratory use –
EMC requirements –
Part 2-5: Particular requirements – Test configurations, operational conditions
and performance criteria for field devices with field bus interfaces according to
IEC 61784-1**

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IECNORM.COM : Click to view the full PDF IEC 60385-2-5:2020 PLV



IEC 61326-2-5

Edition 3.0 2020-10
REDLINE VERSION

INTERNATIONAL STANDARD



**Electrical equipment for measurement, control and laboratory use –
EMC requirements –
Part 2-5: Particular requirements – Test configurations, operational conditions
and performance criteria for field devices with field bus interfaces according to
IEC 61784-1**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 17.220.20; 25.040.40; 33.100.20

ISBN 978-2-8322-9017-0

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 General	6
5 EMC test plan	6
5.1 General	6
5.2 Configuration of EUT during testing	6
5.3 Operation conditions of EUT during testing	6
5.4 Specification of FUNCTIONAL PERFORMANCE	6
5.5 Test description	6
6 Immunity requirements	6
6.1 Conditions during the tests	6
6.2 Immunity test requirements	7
6.3 Random aspects	7
6.4 Performance criteria	7
7 Emission requirements	7
8 Test results and test report	7
9 Instructions for use	7
Annex A (normative) Immunity test requirements for PORTABLE TEST AND MEASUREMENT EQUIPMENT powered by battery or from the circuit being measured	8
Annex B (informative) Guide for analysis and assessment for electromagnetic compatibility	9
Annex AA (normative) Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 CP 1/1	10
AA.1 General	10
AA.2 EMC test plan	10
AA.2.1 Configuration of EUT with CP 1/1 interface during testing	10
AA.2.2 Operation conditions of EUT with CP 1/1 interface during testing	12
AA.3 Performance criteria	14
AA.4 Information on the host system	14
Annex BB (normative) Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 CP 3/2	15
BB.1 General	15
BB.2 EMC test plan	15
BB.2.1 Configuration of EUT with CP 3/2 interface during testing	15
BB.2.2 Operation conditions of EUT with CP 3/2 interface during testing	17
BB.3 Performance criteria	18
Figure AA.1 – Test set up for EUT with CP 1/1 interface	12
Figure BB.1 – Test set up for EUT with CP 3/2 interface	17

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL EQUIPMENT FOR MEASUREMENT,
CONTROL AND LABORATORY USE –
EMC REQUIREMENTS –****Part 2-5: Particular requirements –
Test configurations, operational conditions and performance criteria
for field devices with field bus interfaces according to IEC 61784-1**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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.

International Standard IEC 61326-2-5 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 change with respect to the previous edition:

- update with respect to IEC 61326-1:2020.

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

FDIS	Report on voting
65A/978/FDIS	65A/989/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.

This part of 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 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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

Part 2-5: Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1

1 Scope

In addition to the requirements of IEC 61326-1, this part of IEC 61326 treats the particular features for EMC testing of field devices with field bus interfaces. This part of IEC 61326 covers only the field bus interface of the equipment.

NOTE The other functions of the equipment remain covered by other parts of IEC 61326 series.

This part refers only to field devices intended for use in process control and process measuring.

In this document, field devices with interfaces according to IEC 61784-1:2019, CP 3/2 and CP 1/1 as defined in IEC 61784 are covered. Other field ~~buses~~ bus interfaces may be included in future editions of this document.

IEC 61784-1:2019 specifies a set of protocol specific communication profiles based on IEC 61158.

The manufacturer specifies the environment for which the product is intended to be used and/or selects the appropriate test level specifications of IEC 61326-1.

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 61158-2:~~2010~~2014, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 61158-3-3:~~2007~~2014, *Industrial communication networks – Fieldbus specifications – Part 3-3: Data-link layer service definition – Type 3 elements*

IEC 61158-5-5:~~2007~~2014, *Industrial communication networks – Fieldbus specifications – Part 5-5: Application layer service definition – Type 5 elements*

IEC 61158-6-10:~~2010~~2019, *Industrial communication networks – Fieldbus specifications – Part 6-10: Application layer protocol specification – Type 10 elements*

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

IEC 61784-1:2019, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

3 Terms and definitions

Clause 3 of IEC 61326-1:2020 applies.

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>

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:

Addition:

Additional requirements: see Annex AA and Annex BB.

5.3 Operation conditions of EUT during testing

Subclause 5.3 of IEC 61326-1:2020 applies, except as follows:

Addition:

Additional requirements: see Annex AA and Annex BB.

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.

6.2 Immunity test requirements

Subclause 6.2 of IEC 61326-1:2020 applies.

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:

Additional requirements: see Annex AA and Annex BB.

7 Emission requirements

Clause 7 of IEC 61326-1:2020 applies.

8 Test results and test report

Clause 8 of IEC 61326-1:2020 applies, except as follows:

Addition:

The type of shield connection at the EUT shall be stated in the test report.

9 Instructions for use

Clause 9 of IEC 61326-1:2020 applies.

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

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.

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

Annex B
(informative)

Guide for analysis and assessment for electromagnetic compatibility

Annex B of IEC 61326-1:2020 applies.

Additional annexes:

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

Annex AA (normative)

Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 CP 1/1

AA.1 General

In connection with the main part of this document, this Annex AA describes specific test configurations, operational conditions and performance criteria regarding the field bus interface using the communication profile CP 1/1 according to IEC 61784-1:2019.

To prevent confusion with requirements of other annexes, the equipment under test (EUT) is called “EUT with CP 1/1 interface” throughout this annex.

AA.2 EMC test plan

AA.2.1 Configuration of EUT with CP 1/1 interface during testing

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

Addition:

AA.2.1.1 Test configuration for EUT with CP 1/1 interface

In order to assign any malfunction of the communication during the EMC-test to the EUT with CP 1/1 interface, the configuration of field devices with interfaces according to IEC 61784-1:2019, CP 1/1 shall be limited to the operation of one host system and one EUT with CP 1/1 interface during EMC type tests.

Ports other than I/O ports covered by this part of the document are tested according to IEC 61326-1:2020.

The connection plan is shown in Figure AA.1.

The field device is connected via a device coupler with the power conditioner and the host system.

A standardised field bus terminator is attached at the third port of the device coupler.

The EUT with CP 1/1 interface, power conditioner, host system, device coupler(s) and terminator are connected by means of a standard type A field bus cable (foil shield, foil shield/mesh). Armoured cables or cables in conduit are not allowed for EMC testing.

Except for the connection at the EUT with CP 1/1 interface itself (see AA.2.1.3), the shield shall be connected at any individual component by a low-impedance grounding strip (connection between shield and the case with a large surface).

The individual cable lengths L1, L2, L3, L5 and L6 originate from a practice-adjusted set up, preferred as given in Figure AA.1.

The cable length L4 should be $8\text{ m} \pm 1\text{ m}$, in case that the respective basic standards do not specify other lengths. The cable installation shall be in accordance with the appropriate basic standard.

The connection of the shield at the shield grounding point may be produced by partially removing the insulation of the cable shield and fixing the cable shield with a metal clamp or by means of conductive leading-in-conductors such as a metallic cable gland at the ground plane or at the shielding metal wall respectively.

The location and execution of the shield grounding point depend on the given test facility, e.g. by use of an anechoic chamber or a shielded cabin it is the metal wall penetration; and with tests on tables with ground plane the shield grounding point is on the ground plane.

AA.2.1.2 Connection cable for EUT with CP 1/1 interface

A standard bus cable type A shall be used as communication cable (see IEC 61158-2:2010/2014, 12.8.2). The cable lengths L1 to L4, are given in Figure AA.1 and additional requirement for L4 is described in AA.2.1.1. The lengths of L5 and L6 are not specified and depend on the installed equipment.

AA.2.1.3 Connections at the EUT with CP 1/1 interface

The grounding of the EUT with CP 1/1 interface shall be in accordance with the manufacturer's specification.

The shield of the cable shall be connected in the most sensitive method (for example with the shield not connected at the EUT with CP 1/1 interface) if not otherwise specified by the manufacturer.

~~NOTE—If the manufacturer specifies the shield shall be connected at the EUT with CP 1/1 interface, the EUT with CP 1/1 interface shall be tested in accordance with the manufacturer's specification.~~

AA.2.1.4 Field bus network

The field bus network shall include the terminator of the bus, device coupler(s), the host system and the EUT with CP 1/1 interface. For bus-powered devices, the field bus network includes additionally the power conditioner and the power supply. The evaluation and conditioning of the data in the host system are not the object of this part of the document. The device coupler(s) and the bus terminator are passive components only.

- b) For a transmitter type device, there shall be a Publisher Subscriber communication relationship for each process value and its status (e.g. output parameter of AI or DI) that the EUT with CP 1/1 interface offers. The EUT with CP 1/1 interface has the role 'Publisher'.
- c) For a receiver type device there shall be:
- a Publisher Subscriber communication relationship for each setpoint/input value and its status (e.g. input parameter of AO or DO) that the EUT with CP 1/1 interface accepts; in this/these relationship(s) the EUT with CP 1/1 interface has the role 'Subscriber';
 - and a Publisher Subscriber communication relationship for each output value and its status (e.g. BKCAL_OUT/BKCAL_OUT_D) that the EUT with CP 1/1 interface offers; in this/these relationship(s) the EUT with CP 1/1 interface has the role 'Publisher'.
- d) The "Stale Count Limit" has to be set to 2.
In cases where the "Stale count Limit" is not adjustable, the value (not equal to 2) shall be stated in the test report.
- e) The frequency of client-server communication ~~has to~~ shall be set to one service request (e.g. read request) every other macrocycle.

AA.2.2.2 Status for EUT with CP 1/1 interface

The host system monitors the received data of the EUT with CP 1/1 interface. The received data is of the data type QualifiedFloat32 or QualifiedUnsigned8 as defined in IEC 61158-5-5:2007/2014, 5.3.3.12 respectively 5.3.3.13. Those data types are of the format STRUCTURE and have a field named status.

For the automation system and the test evaluation, the quality in the status is significant.

In case of received data, only four qualities can appear (extract from IEC 61158-6-10:2010/2019, 5.1.1.3.2.2):

- "Good (Cascade)" means status is in the range between 192 and 255
- "Good (Non Cascade)" means status is in the range between 128 and 191
- "Uncertain" means status is in the range between 64 and 127
- "Bad" means status is in the range between 0 and 63

The equipment under test shall preferably be configured so that the value of the status is 128 or greater during normal operation without EMC disturbance.

Other values for the status are allowed if they enable the evaluation the function of the EUT with CP 1/1 interface. However, values of the status indicating a disturbed communication shall be avoided. If a status value deviating from 128 is chosen, the reasons for this decision have to be reported in the test report.

AA.2.2.3 Monitoring for EUT with CP 1/1 interface

- a) For transmitter type device:

The process value(s) and its status shall be monitored.

The requirements for pass / fail the EMC test with regard to the value(s) are given in the specification ~~of the manufacturer~~ or in an appropriate part of IEC 61326 (all parts).

- b) For receiver type device (Positioner, Displays):

The output value (e.g. BKCAL_OUT/BKCAL_OUT_D) and its status shall be monitored. For devices like positioner or valves or displays, visual confirmation is required. The requirements for pass / fail the EMC test with regard to the value(s) are given in the specification ~~of the manufacturer~~ or in an appropriate part of IEC 61326 (all parts).

- c) The number of consecutive non-responses of the client-server communications shall be counted. Any count more than 2 consecutive non-responses shall be considered as a communication failure.

d) Any overrun of the stale counter shall be considered as a failure.

AA.3 Performance criteria

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

Performance criterion A is extended by the following:

Performance ~~criteria~~ criterion A

No communication failures are detected (see AA.2.2.3). The status value chosen according to AA.2.2.2 shall remain unchanged during and after the test (see AA.2.2.2 and AA.2.2.3).

Performance criterion B is extended by the following:

Performance ~~criteria~~ criterion B

~~The status value (see AA.2.2.2 and AA.2.2.3) deviates during the test, but returns to normal afterwards and/or communication failure is detected but after test the device returns with no operator intervention to the expected operational state.~~

The status value (see AA.2.2.2 and AA.2.2.3) deviates during the test and/or communication failure is detected. After test the device returns to the intended operational modes without operator intervention.

Performance criterion C is extended by the following:

Performance ~~criteria~~ criterion C

The status value (see AA.2.2.2 and AA.2.2.3) deviates during the test, and/or communication failures are detected, ~~but~~. After test the device returns to the intended operation mode only with operator intervention.

AA.4 Information on the host system

The host system includes the following functionality:

- a) Configures the communication relationships as described in AA.2.2.1.
- b) Monitors the communication, it detects / counts communication errors and violation of status values as described in AA.2.2.3.
- c) Initiates the communication in Client Server communication relationships.
- d) Has the role of the LAS (Link Active Scheduler).

NOTE If the EUT with CP 1/1 interface is a transmitter type device, the host system needs to play the role of a receiver type device (see AA.2.2.3 a)). If the EUT with CP 1/1 interface is a receiver type device, then the host system needs to be the transmitter and also be able to monitor the output of the EUT with CP 1/1 interface (see AA.2.2.3 b)).

Annex BB (normative)

Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 CP 3/2

BB.1 General

In connection with the main part of this document, this Annex BB describes specific test configurations, operational conditions and performance criteria regarding the field bus interface using the communication profile CP 3/2 according to IEC 61784-1.

To prevent confusion with requirements of other annexes, the equipment under test (EUT) is called “EUT with CP 3/2 interface” throughout this annex.

BB.2 EMC test plan

BB.2.1 Configuration of EUT with CP 3/2 interface during testing

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

Addition:

BB.2.1.1 Test configuration for EUT with CP 3/2 interface

In order to assign any malfunction of the communication during the EMC-test to the EUT with CP 3/2 interface, the configuration of field devices with interfaces according to IEC 61784-1:2019, CP 3/2 shall be limited to the operation of one master and one slave (EUT with CP 3/2 interface) during EMC type tests.

Auxiliary connections for power supply or signalling are possible for the EUT with CP 3/2 interface.

The connection plan is shown in Figure BB.1.

The EUT with CP 3/2 interface is connected via a device coupler with the signal coupler. The signal coupler is connected to the Automation system.

A standardised field bus terminator is attached at the third port of the field device coupler.

The components EUT with CP 3/2 interface, signal coupler, device coupler and terminator are connected by standardised field bus cables.

The shield shall be connected at any individual component by a low-impedance grounding strip (connection between shield and the case with a large surface).

The individual cable lengths L1, L2, L3 originate from a practice-adjusted set up, preferred as given in Figure BB.1.

The cable length L4 should be $8\text{ m} \pm 1\text{ m}$, in case that the respective basic standards do not specify other lengths. The cable installation shall be in accordance with the appropriate basic standard.

The connection of the shield at the shield grounding point may be produced by partially removing the isolation of the cable shield and fixing the cable shield with a metal clamp or by means of conductive leading-in-conductors such as a metallic cable gland at the ground plane or at the shielding metal wall respectively.

The location and execution of the shield grounding point depend on the given test facility, e.g. by use of an anechoic chamber or a shielded cabin it is the metal wall penetration; and with tests on tables with ground plane the shield grounding point is on the ground plane.

BB.2.1.2 Connection cable for EUT with CP 3/2 interface

A standard bus cable type A shall be used as communication cable (see IEC 61158-2:2010/2014, 11.8.2). The cable lengths L1 to L3 are given in Figure BB.1 and L4 is described in BB.2.1.1.

BB.2.1.3 Connections at the EUT with CP 3/2 interface

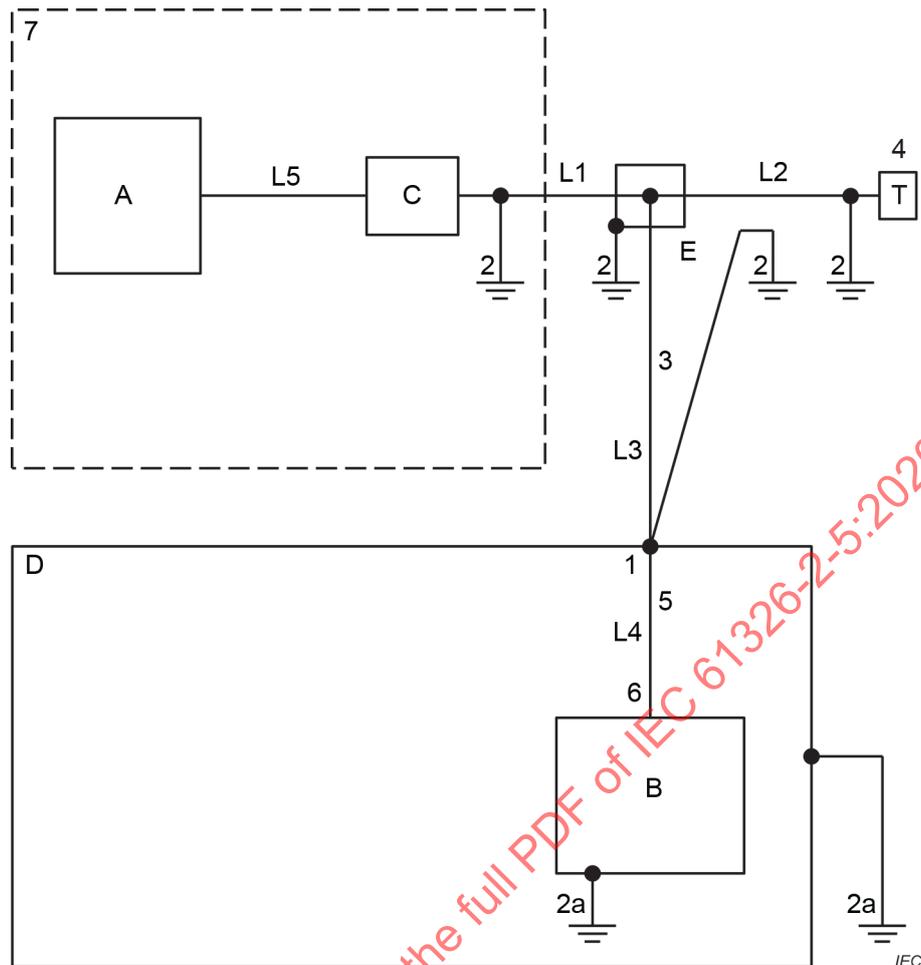
The grounding of the EUT with CP 3/2 interface and the shield connections shall be in accordance with the manufacturer's specification.

BB.2.1.4 Field bus network for EMC test for EUT with CP 3/2 interface

The field bus network includes the terminator of the bus, a device coupler, a signal coupler, the automation system and the EUT with CP 3/2 interface.

The evaluation and conditioning of the data in the signal coupler and in the automation system are not the object of this part of the document.

The device coupler and the bus terminator are passive components only.

**Components**

A	automation system (master)
B	EUT with CP 3/2 interface (slave)
C	signal coupler
D	EMC test place
E	device coupler
T	bus terminator
L1	8 m cable type A
L2	2 m cable type A
L3	2 m cable type A
L5	cable type A (see BB.2.1.2)

Key

1	shield grounding point (SGP) of L4
2	shield / housing connected with low impedance
2a	enclosure connected with low impedance
3	connection (see BB.4.2.1.3)
4	terminator, either direct at device coupler or after a short cable (< 1 m)
5	cable from SGP to field device
6	connection of shield at field device (see BB.2.1.3)
7	A and C may be included in a single housing / system / device
L4	8 m cable type A (see BB.2.1.2)

Figure BB.1 – Test set up for EUT with CP 3/2 interface

BB.2.2 Operation conditions of EUT with CP 3/2 interface during testing

Subclause 5.3 of IEC 61326-1:2020 applies, except as follows:

Addition:

BB.2.2.1 Operational conditions for EUT with CP 3/2 interface

The operating conditions describe the software settings at the EUT with CP 3/2 interface and at the automation system. The master connected to the signal coupler is set as "master class 1", the EUT with CP 3/2 interface as "slave".

The cyclic operating mode shall be used.

The parameter "retry limit" shall be set to 2 at the master. This means after three consecutive transmission errors (bus-line break down or slave not working), the master (automation system) sets the status to "0".

The general bus parameters for the cyclic data exchange in IEC 61158-3-3:2007/2014, 5.5.2.3.3, Table 29 shall be taken into account.

BB.2.2.2 Status for EUT with CP 3/2 interface

The field bus controller in conjunction with the automation system monitors the received data of the EUT with CP 3/2 interface. The received data is of the data type QualifiedFloat32 or QualifiedUnsigned8 as defined in IEC 61158-5-5:2007/2014, 5.3.3.12 respectively 5.3.3.13. Those data types are of the format STRUCTURE and have a field named status.

For the automation system and the test evaluation, the quality in the status is significant.

In case of received data, only four qualities can appear (extract from IEC 61158-6-10:2019, 5.1.1.3.2.2):

- "Good (Cascade)" means status is in the range between 192 and 255
- "Good (Non Cascade)" means status is in the range between 128 and 191
- "Uncertain" means status is in the range between 64 and 127
- "Bad" means status is in the range between 0 and 63

The equipment under test shall preferably be configured so that the value of the status is 128.

Other values for the status are allowed if they enable the evaluation the function of the EUT with CP 3/2 interface. However, values of the status indicating a disturbed communication shall be avoided. If a status value deviating from 128 is chosen, the reasons for this decision have to be reported in the test report.

BB.2.2.3 Monitoring for EUT with CP 3/2 interface

- a) The status shall be monitored.
- b) The measuring value shall be monitored.

If the allowed tolerances are not specified in an appropriate part of this document, the values specified by the manufacturer given in the user documentation may be used.

BB.3 Performance criteria

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

Performance criterion A is extended by the following:

Performance criteria A

The status value as described in BB.2.2.2 shall remain unchanged during and after the test (see BB.2.2.2 and BB.2.2.3).

Performance criterion B is extended by the following:

Performance criteria B

The status value (see BB.2.2.2 and BB.2.2.3) deviates during the test but returns to the same status value as before the test without operator intervention.

Performance criterion C is extended by the following:

Performance criteria C

The status value (see BB.2.2.2 and BB.2.2.3) deviates during the test, ~~but~~. After test, the device ~~only~~ returns ~~with operator intervention~~ to the intended operation mode ~~only with~~ operator intervention.

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Electrical equipment for measurement, control and laboratory use –
EMC requirements –**

**Part 2-5: Particular requirements – Test configurations, operational conditions
and performance criteria for field devices with field bus interfaces according to
IEC 61784-1**

**Matériel électrique de mesure, de commande et de laboratoire –
Exigences relatives à la CEM –**

**Partie 2-5: Exigences particulières – Configurations d'essai, conditions de
fonctionnement et critères de performance pour les équipements de terrain avec
des interfaces utilisant des bus de terrain conformes à l'IEC 61784-1**

CONTENTS

FOREWORD	3
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 General	6
5 EMC test plan	6
5.1 General	6
5.2 Configuration of EUT during testing	6
5.3 Operation conditions of EUT during testing	6
5.4 Specification of FUNCTIONAL PERFORMANCE	6
5.5 Test description	6
6 Immunity requirements	6
6.1 Conditions during the tests	6
6.2 Immunity test requirements	7
6.3 Random aspects	7
6.4 Performance criteria	7
7 Emission requirements	7
8 Test results and test report	7
9 Instructions for use	7
Annex A (normative) Immunity test requirements for PORTABLE TEST AND MEASUREMENT EQUIPMENT powered by battery or from the circuit being measured	8
Annex B (informative) Guide for analysis and assessment for electromagnetic compatibility	9
Annex AA (normative) Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 CP 1/1	10
AA.1 General	10
AA.2 EMC test plan	10
AA.2.1 Configuration of EUT with CP 1/1 interface during testing	10
AA.2.2 Operation conditions of EUT with CP 1/1 interface during testing	12
AA.3 Performance criteria	14
AA.4 Information on the host system	14
Annex BB (normative) Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 CP 3/2	15
BB.1 General	15
BB.2 EMC test plan	15
BB.2.1 Configuration of EUT with CP 3/2 interface during testing	15
BB.2.2 Operation conditions of EUT with CP 3/2 interface during testing	17
BB.3 Performance criteria	18
Figure AA.1 – Test set up for EUT with CP 1/1 interface	12
Figure BB.1 – Test set up for EUT with CP 3/2 interface	17

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL EQUIPMENT FOR MEASUREMENT,
CONTROL AND LABORATORY USE –
EMC REQUIREMENTS –****Part 2-5: Particular requirements –
Test configurations, operational conditions and performance criteria
for field devices with field bus interfaces according to IEC 61784-1**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61326-2-5 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 change with respect to the previous edition:

- update with respect to IEC 61326-1:2020.

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

FDIS	Report on voting
65A/978/FDIS	65A/989/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.

This part of 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 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 2-5: Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1

1 Scope

In addition to the requirements of IEC 61326-1, this part of IEC 61326 treats the particular features for EMC testing of field devices with field bus interfaces. This part of IEC 61326 covers only the field bus interface of the equipment.

NOTE The other functions of the equipment remain covered by other parts of IEC 61326 series.

This part refers only to field devices intended for use in process control and process measuring.

In this document, field devices with interfaces according to IEC 61784-1:2019, CP 3/2 and CP 1/1 as defined in IEC 61784 are covered. Other field bus interfaces may be included in future editions of this document.

IEC 61784-1:2019 specifies a set of protocol specific communication profiles based on IEC 61158.

The manufacturer specifies the environment for which the product is intended to be used and/or selects the appropriate test level specifications of IEC 61326-1.

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 61158-2:2014, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 61158-3-3:2014, *Industrial communication networks – Fieldbus specifications – Part 3-3: Data-link layer service definition – Type 3 elements*

IEC 61158-5-5:2014, *Industrial communication networks – Fieldbus specifications – Part 5-5: Application layer service definition – Type 5 elements*

IEC 61158-6-10:2019, *Industrial communication networks – Fieldbus specifications – Part 6-10: Application layer protocol specification – Type 10 elements*

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

IEC 61784-1:2019, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

3 Terms and definitions

Clause 3 of IEC 61326-1:2020 applies.

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>

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:

Addition:

Additional requirements: see Annex AA and Annex BB.

5.3 Operation conditions of EUT during testing

Subclause 5.3 of IEC 61326-1:2020 applies, except as follows:

Addition:

Additional requirements: see Annex AA and Annex BB.

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.

6.2 Immunity test requirements

Subclause 6.2 of IEC 61326-1:2020 applies.

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:

Additional requirements: see Annex AA and Annex BB.

7 Emission requirements

Clause 7 of IEC 61326-1:2020 applies.

8 Test results and test report

Clause 8 of IEC 61326-1:2020 applies, except as follows:

Addition:

The type of shield connection at the EUT shall be stated in the test report.

9 Instructions for use

Clause 9 of IEC 61326-1:2020 applies.

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

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.

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

Annex B
(informative)

Guide for analysis and assessment for electromagnetic compatibility

Annex B of IEC 61326-1:2020 applies.

Additional annexes:

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

Annex AA (normative)

Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 CP 1/1

AA.1 General

In connection with the main part of this document, this Annex AA describes specific test configurations, operational conditions and performance criteria regarding the field bus interface using the communication profile CP 1/1 according to IEC 61784-1:2019.

To prevent confusion with requirements of other annexes, the equipment under test (EUT) is called “EUT with CP 1/1 interface” throughout this annex.

AA.2 EMC test plan

AA.2.1 Configuration of EUT with CP 1/1 interface during testing

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

Addition:

AA.2.1.1 Test configuration for EUT with CP 1/1 interface

In order to assign any malfunction of the communication during the EMC-test to the EUT with CP 1/1 interface, the configuration of field devices with interfaces according to IEC 61784-1:2019, CP 1/1 shall be limited to the operation of one host system and one EUT with CP 1/1 interface during EMC type tests.

Ports other than I/O ports covered by this part of the document are tested according to IEC 61326-1:2020.

The connection plan is shown in Figure AA.1.

The field device is connected via a device coupler with the power conditioner and the host system.

A standardised field bus terminator is attached at the third port of the device coupler.

The EUT with CP 1/1 interface, power conditioner, host system, device coupler(s) and terminator are connected by means of a standard type A field bus cable (foil shield, foil shield/mesh). Armoured cables or cables in conduit are not allowed for EMC testing.

Except for the connection at the EUT with CP 1/1 interface itself (see AA.2.1.3), the shield shall be connected at any individual component by a low-impedance grounding strip (connection between shield and the case with a large surface).

The individual cable lengths L1, L2, L3, L5 and L6 originate from a practice-adjusted set up, preferred as given in Figure AA.1.

The cable length L4 should be $8\text{ m} \pm 1\text{ m}$, in case that the respective basic standards do not specify other lengths. The cable installation shall be in accordance with the appropriate basic standard.

The connection of the shield at the shield grounding point may be produced by partially removing the insulation of the cable shield and fixing the cable shield with a metal clamp or by means of conductive leading-in-conductors such as a metallic cable gland at the ground plane or at the shielding metal wall respectively.

The location and execution of the shield grounding point depend on the given test facility, e.g. by use of an anechoic chamber or a shielded cabin it is the metal wall penetration; and with tests on tables with ground plane the shield grounding point is on the ground plane.

AA.2.1.2 Connection cable for EUT with CP 1/1 interface

A standard bus cable type A shall be used as communication cable (see IEC 61158-2:2014, 12.8.2). The cable lengths L1 to L4, are given in Figure AA.1 and additional requirement for L4 is described in AA.2.1.1. The lengths of L5 and L6 are not specified and depend on the installed equipment.

AA.2.1.3 Connections at the EUT with CP 1/1 interface

The grounding of the EUT with CP 1/1 interface shall be in accordance with the manufacturer's specification.

The shield of the cable shall be connected in the most sensitive method (for example with the shield not connected at the EUT with CP 1/1 interface) if not otherwise specified by the manufacturer.

AA.2.1.4 Field bus network

The field bus network shall include the terminator of the bus, device coupler(s), the host system and the EUT with CP 1/1 interface. For bus-powered devices, the field bus network includes additionally the power conditioner and the power supply. The evaluation and conditioning of the data in the host system are not the object of this part of the document. The device coupler(s) and the bus terminator are passive components only.

- b) For a transmitter type device, there shall be a Publisher Subscriber communication relationship for each process value and its status (e.g. output parameter of AI or DI) that the EUT with CP 1/1 interface offers. The EUT with CP 1/1 interface has the role 'Publisher'.
- c) For a receiver type device there shall be:
- a Publisher Subscriber communication relationship for each setpoint/input value and its status (e.g. input parameter of AO or DO) that the EUT with CP 1/1 interface accepts; in this/these relationship(s) the EUT with CP 1/1 interface has the role 'Subscriber';
 - and a Publisher Subscriber communication relationship for each output value and its status (e.g. BKCAL_OUT/BKCAL_OUT_D) that the EUT with CP 1/1 interface offers; in this/these relationship(s) the EUT with CP 1/1 interface has the role 'Publisher'.
- d) The "Stale Count Limit" has to be set to 2.
In cases where the "Stale count Limit" is not adjustable, the value (not equal to 2) shall be stated in the test report.
- e) The frequency of client-server communication shall be set to one service request (e.g. read request) every other macrocycle.

AA.2.2.2 Status for EUT with CP 1/1 interface

The host system monitors the received data of the EUT with CP 1/1 interface. The received data is of the data type QualifiedFloat32 or QualifiedUnsigned8 as defined in IEC 61158-5-5:2014, 5.3.3.12 respectively 5.3.3.13. Those data types are of the format STRUCTURE and have a field named status.

For the automation system and the test evaluation, the quality in the status is significant.

In case of received data, only four qualities can appear (extract from IEC 61158-6-10:2019):

- "Good (Cascade)" means status is in the range between 192 and 255
- "Good (Non Cascade)" means status is in the range between 128 and 191
- "Uncertain" means status is in the range between 64 and 127
- "Bad" means status is in the range between 0 and 63

The equipment under test shall preferably be configured so that the value of the status is 128 or greater during normal operation without EMC disturbance.

Other values for the status are allowed if they enable the evaluation the function of the EUT with CP 1/1 interface. However, values of the status indicating a disturbed communication shall be avoided. If a status value deviating from 128 is chosen, the reasons for this decision have to be reported in the test report.

AA.2.2.3 Monitoring for EUT with CP 1/1 interface

- a) For transmitter type device:

The process value(s) and its status shall be monitored.

The requirements for pass / fail the EMC test with regard to the value(s) are given in the specification or in an appropriate part of IEC 61326 (all parts).

- b) For receiver type device (Positioner, Displays):

The output value (e.g. BKCAL_OUT/BKCAL_OUT_D) and its status shall be monitored. For devices like positioner or valves or displays, visual confirmation is required. The requirements for pass / fail the EMC test with regard to the value(s) are given in the specification or in an appropriate part of IEC 61326 (all parts).

- c) The number of consecutive non-responses of the client-server communications shall be counted. Any count more than 2 consecutive non-responses shall be considered as a communication failure.
- d) Any overrun of the stale counter shall be considered as a failure.

AA.3 Performance criteria

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

Performance criterion A is extended by the following:

Performance criterion A

No communication failures are detected (see AA.2.2.3). The status value chosen according to AA.2.2.2 shall remain unchanged during and after the test (see AA.2.2.2 and AA.2.2.3).

Performance criterion B is extended by the following:

Performance criterion B

The status value (see AA.2.2.2 and AA.2.2.3) deviates during the test and/or communication failure is detected. After test the device returns to the intended operational modes without operator intervention.

Performance criterion C is extended by the following:

Performance criterion C

The status value (see AA.2.2.2 and AA.2.2.3) deviates during the test, and/or communication failures are detected. After test the device returns to the intended operation mode only with operator intervention.

AA.4 Information on the host system

The host system includes the following functionality:

- a) Configures the communication relationships as described in AA.2.2.1.
- b) Monitors the communication, it detects / counts communication errors and violation of status values as described in AA.2.2.3.
- c) Initiates the communication in Client Server communication relationships.
- d) Has the role of the LAS (Link Active Scheduler).

NOTE If the EUT with CP 1/1 interface is a transmitter type device, the host system needs to play the role of a receiver type device (see AA.2.2.3 a)). If the EUT with CP 1/1 interface is a receiver type device, then the host system needs to be the transmitter and also be able to monitor the output of the EUT with CP 1/1 interface (see AA.2.2.3 b)).

Annex BB (normative)

Particular requirements – Test configurations, operational conditions and performance criteria for field devices with field bus interfaces according to IEC 61784-1 CP 3/2

BB.1 General

In connection with the main part of this document, this Annex BB describes specific test configurations, operational conditions and performance criteria regarding the field bus interface using the communication profile CP 3/2 according to IEC 61784-1.

To prevent confusion with requirements of other annexes, the equipment under test (EUT) is called “EUT with CP 3/2 interface” throughout this annex.

BB.2 EMC test plan

BB.2.1 Configuration of EUT with CP 3/2 interface during testing

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

Addition:

BB.2.1.1 Test configuration for EUT with CP 3/2 interface

In order to assign any malfunction of the communication during the EMC-test to the EUT with CP 3/2 interface, the configuration of field devices with interfaces according to IEC 61784-1:2019, CP 3/2 shall be limited to the operation of one master and one slave (EUT with CP 3/2 interface) during EMC type tests.

Auxiliary connections for power supply or signalling are possible for the EUT with CP 3/2 interface.

The connection plan is shown in Figure BB.1.

The EUT with CP 3/2 interface is connected via a device coupler with the signal coupler. The signal coupler is connected to the Automation system.

A standardised field bus terminator is attached at the third port of the field device coupler.

The components EUT with CP 3/2 interface, signal coupler, device coupler and terminator are connected by standardised field bus cables.

The shield shall be connected at any individual component by a low-impedance grounding strip (connection between shield and the case with a large surface).

The individual cable lengths L1, L2, L3 originate from a practice-adjusted set up, preferred as given in Figure BB.1.

The cable length L4 should be $8\text{ m} \pm 1\text{ m}$, in case that the respective basic standards do not specify other lengths. The cable installation shall be in accordance with the appropriate basic standard.

The connection of the shield at the shield grounding point may be produced by partially removing the isolation of the cable shield and fixing the cable shield with a metal clamp or by means of conductive leading-in-conductors such as a metallic cable gland at the ground plane or at the shielding metal wall respectively.

The location and execution of the shield grounding point depend on the given test facility, e.g. by use of an anechoic chamber or a shielded cabin it is the metal wall penetration; and with tests on tables with ground plane the shield grounding point is on the ground plane.

BB.2.1.2 Connection cable for EUT with CP 3/2 interface

A standard bus cable type A shall be used as communication cable (see IEC 61158-2:2014, 11.8.2). The cable lengths L1 to L3 are given in Figure BB.1 and L4 is described in BB.2.1.1.

BB.2.1.3 Connections at the EUT with CP 3/2 interface

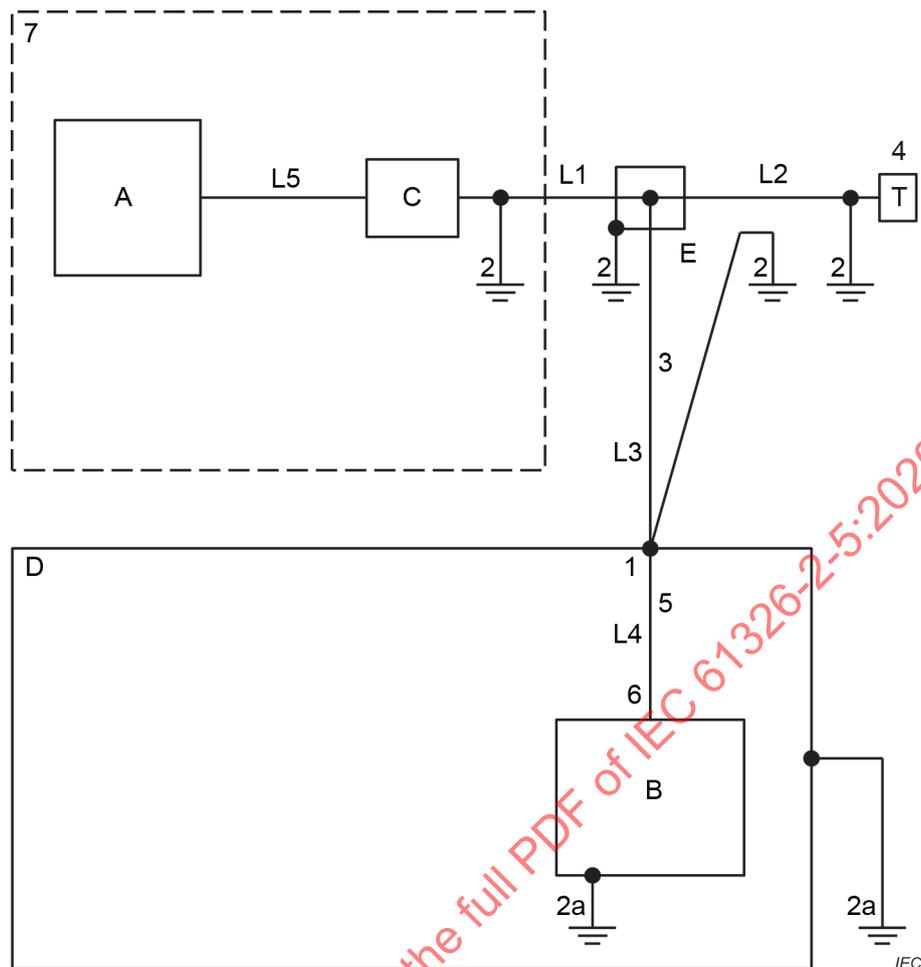
The grounding of the EUT with CP 3/2 interface and the shield connections shall be in accordance with the manufacturer's specification.

BB.2.1.4 Field bus network for EMC test for EUT with CP 3/2 interface

The field bus network includes the terminator of the bus, a device coupler, a signal coupler, the automation system and the EUT with CP 3/2 interface.

The evaluation and conditioning of the data in the signal coupler and in the automation system are not the object of this part of the document.

The device coupler and the bus terminator are passive components only.

**Components**

A	automation system (master)
B	EUT with CP 3/2 interface (slave)
C	signal coupler
D	EMC test place
E	device coupler
T	bus terminator
L1	8 m cable type A
L2	2 m cable type A
L3	2 m cable type A
L5	cable type A (see BB.2.1.2)

Key

1	shield grounding point (SGP) of L4
2	shield / housing connected with low impedance
2a	enclosure connected with low impedance
3	connection (see BB.2.1.3)
4	terminator, either direct at device coupler or after a short cable (< 1 m)
5	cable from SGP to field device
6	connection of shield at field device (see BB.2.1.3)
7	A and C may be included in a single housing / system / device
L4	8 m cable type A (see BB.2.1.2)

Figure BB.1 – Test set up for EUT with CP 3/2 interface

BB.2.2 Operation conditions of EUT with CP 3/2 interface during testing

Subclause 5.3 of IEC 61326-1:2020 applies, except as follows:

Addition:

BB.2.2.1 Operational conditions for EUT with CP 3/2 interface

The operating conditions describe the software settings at the EUT with CP 3/2 interface and at the automation system. The master connected to the signal coupler is set as "master class 1", the EUT with CP 3/2 interface as "slave".

The cyclic operating mode shall be used.

The parameter "retry limit" shall be set to 2 at the master. This means after three consecutive transmission errors (bus-line break down or slave not working), the master (automation system) sets the status to "0".

The general bus parameters for the cyclic data exchange in IEC 61158-3-3:2014, 5.5.2.3.3, Table 29 shall be taken into account.

BB.2.2.2 Status for EUT with CP 3/2 interface

The field bus controller in conjunction with the automation system monitors the received data of the EUT with CP 3/2 interface. The received data is of the data type QualifiedFloat32 or QualifiedUnsigned8 as defined in IEC 61158-5-5:2014, 5.3.3.12 respectively 5.3.3.13. Those data types are of the format STRUCTURE and have a field named status.

For the automation system and the test evaluation, the quality in the status is significant.

In case of received data, only four qualities can appear (extract from IEC 61158-6-10:2019):

- "Good (Cascade)" means status is in the range between 192 and 255
- "Good (Non Cascade)" means status is in the range between 128 and 191
- "Uncertain" means status is in the range between 64 and 127
- "Bad" means status is in the range between 0 and 63

The equipment under test shall preferably be configured so that the value of the status is 128.

Other values for the status are allowed if they enable the evaluation the function of the EUT with CP 3/2 interface. However, values of the status indicating a disturbed communication shall be avoided. If a status value deviating from 128 is chosen, the reasons for this decision have to be reported in the test report.

BB.2.2.3 Monitoring for EUT with CP 3/2 interface

- a) The status shall be monitored.
- b) The measuring value shall be monitored.

If the allowed tolerances are not specified in an appropriate part of this document, the values given in the user documentation may be used.

BB.3 Performance criteria

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

Performance criterion A is extended by the following:

Performance criteria A

The status value as described in BB.2.2.2 shall remain unchanged during and after the test (see BB.2.2.2 and BB.2.2.3).

Performance criterion B is extended by the following:

Performance criteria B

The status value (see BB.2.2.2 and BB.2.2.3) deviates during the test but returns to the same status value as before the test without operator intervention.

Performance criterion C is extended by the following:

Performance criteria C

The status value (see BB.2.2.2 and BB.2.2.3) deviates during the test. After test, the device returns to the intended operation mode only with operator intervention.

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

SOMMAIRE

AVANT-PROPOS	21
1 Domaine d'application	23
2 Références normatives	23
3 Termes et définitions	24
4 Généralités	24
5 Plan d'essai de CEM	24
5.1 Généralités	24
5.2 Configuration de l'EST lors des essais	24
5.3 Conditions de fonctionnement de l'EST lors des essais	24
5.4 Spécification des PERFORMANCES FONCTIONNELLES	24
5.5 Description de l'essai	24
6 Exigences relatives à l'immunité	25
6.1 Conditions lors des essais	25
6.2 Exigences pour les essais d'immunité	25
6.3 Aspects aléatoires	25
6.4 Critères de performance	25
7 Exigences relatives à l'émission	25
8 Résultats d'essai et rapport d'essai	25
9 Instructions d'utilisation	25
Annexe A (normative) Exigences concernant les essais d'immunité pour le MATERIEL D'ESSAI ET DE MESURE PORTABLE alimenté par batterie ou par le circuit mesuré	26
Annexe B (informative) Guide destiné à l'analyse et à l'évaluation de la compatibilité électromagnétique	27
Annexe AA (normative) Exigences particulières – Configurations d'essai, conditions de fonctionnement et critères de performance pour les équipements de terrain utilisant des interfaces de bus de terrain conformes à l'IEC 61784-1 CP 1/1	28
AA.1 Généralités	28
AA.2 Plan d'essai de CEM	28
AA.2.1 Configuration de l'EST avec interface CP 1/1 pendant les essais	28
AA.2.2 Conditions de fonctionnement de l'EST avec interface CP 1/1 pendant les essais	31
AA.3 Critères de performance	32
AA.4 Informations concernant le système hôte	32
Annexe BB (normative) Exigences particulières – Configurations d'essai, conditions de fonctionnement et critères de performance pour les équipements de terrain avec des interfaces de bus de terrain conformes à l'IEC 61784-1, CP 3/2	34
BB.1 Généralités	34
BB.2 Plan d'essai de CEM	34
BB.2.1 Configuration de l'EST avec interface CP 3/2 pendant les essais	34
BB.2.2 Conditions de fonctionnement de l'EST avec interface CP 3/2 pendant les essais	36
BB.3 Critères de performance	38
Figure AA.1 – Montage d'essai pour EST avec interface CP 1/1	30
Figure BB.1 – Montage d'essai pour EST avec interface CP 3/2	36

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**MATÉRIEL ÉLECTRIQUE DE MESURE, DE COMMANDE ET DE
LABORATOIRE – EXIGENCES RELATIVES À LA CEM –****Partie 2-5: Exigences particulières –
Configurations d'essai, conditions de fonctionnement et critères
de performance pour les équipements de terrain avec des interfaces
utilisant des bus de terrain conformes à l'IEC 61784-1**

AVANT-PROPOS

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. À cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme Internationale IEC 61326-2-5 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 la modification technique majeure suivante par rapport à l'édition précédente:

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

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

FDIS	Rapport de vote
65A/978/FDIS	65A/989/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.

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. À cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

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

Partie 2-5: Exigences particulières – Configurations d'essai, conditions de fonctionnement et critères de performance pour les équipements de terrain avec des interfaces utilisant des bus de terrain conformes à l'IEC 61784-1

1 Domaine d'application

En plus des exigences de l'IEC 61326-1, la présente partie de l'IEC 61326 traite des caractéristiques particulières pour les essais de CEM des équipements de terrain avec des interfaces utilisant des bus de terrain. La présente partie de l'IEC 61326 couvre uniquement l'interface utilisant le bus de terrain du matériel.

NOTE Les autres fonctions du matériel sont toujours couvertes par les autres parties de la série IEC 61326.

La présente partie fait uniquement référence aux équipements de terrain destinés à être utilisés pour les commandes et les mesurages des processus.

Le présent document traite des équipements de terrain utilisant des interfaces conformes à l'IEC 61784-1:2019, CP 3/2 et CP 1/1 telles qu'elles sont définies dans l'IEC 61784. D'autres interfaces de bus de terrain peuvent être incluses dans les futures éditions du présent document.

L'IEC 61784-1:2019 spécifie un ensemble de profils de communication spécifiques en fonction des protocoles fondé sur l'IEC 61158.

Le fabricant spécifie l'environnement auquel le produit est destiné et/ou sélectionne les spécifications pertinentes du niveau d'essai de l'IEC 61326-1.

2 Références normatives

Les documents suivants sont cités en référence de manière normative, en intégralité ou en partie, dans le présent document et sont indispensables pour son application. 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 61158-2:2014, *Réseaux de communication industriels – Spécifications des bus de terrain – Partie 2: Spécification et définition des services de la couche physique*

IEC 61158-3-3:2014, *Réseaux de communication industriels – Spécifications des bus de terrain – Partie 3-3: Définition des services de la couche liaison de données – Éléments de type 3*

IEC 61158-5-5:2014, *Réseaux de communication industriels – Spécifications des bus de terrain – Partie 5-5: Définition des services de la couche application – Éléments de type 5*

IEC 61158-6-10:2019, *Réseaux de communication industriels – Spécifications des bus de terrain – Partie 6-10: Spécification du protocole de la couche application – Éléments de type 10*

IEC 61326-1:2020, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements* (disponible en anglais seulement)

IEC 61784-1:2019, *Réseaux de communication industriels – Profils – Partie 1: Profils de bus de terrain*

3 Termes et définitions

L'Article 3 de l'IEC 61326-1:2020 s'applique.

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>

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:

Addition:

Exigences supplémentaires: voir l'Annexe AA et l'Annexe BB.

5.3 Conditions de fonctionnement de l'EST lors des essais

Le Paragraphe 5.3 de l'IEC 61326-1:2020 s'applique avec l'exception suivante:

Addition:

Exigences supplémentaires: voir l'Annexe AA et l'Annexe BB.

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.

6.2 Exigences pour les essais d'immunité

Le Paragraphe 6.2 de l'IEC 61326-1:2020 s'applique.

6.3 Aspects aléatoires

Le Paragraphe 6.3 de l'IEC 61326-1:2020 s'applique.

6.4 Critères de performance

Le Paragraphe 6.4 de l'IEC 61326-1:2020 s'applique avec l'exception suivante:

Addition:

Exigences supplémentaires: voir l'Annexe AA et l'Annexe BB.

7 Exigences relatives à l'émission

L'Article 7 de l'IEC 61326-1:2020 s'applique.

8 Résultats d'essai et rapport d'essai

L'Article 8 de l'IEC 61326-1:2020 s'applique avec l'exception suivante:

Addition:

Le type de connexion de blindage au niveau de l'EST doit être indiqué dans le rapport d'essai.

9 Instructions d'utilisation

L'Article 9 de l'IEC 61326-1:2020 s'applique.

Annexe A
(normative)

**Exigences concernant les essais d'immunité pour le MATERIEL D'ESSAI
ET DE MESURE PORTABLE alimenté par batterie ou par le circuit mesuré**

L'Annexe A de l'IEC 61326-1:2020 ne s'applique pas.

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV

Annexe B
(informative)

**Guide destiné à l'analyse et à l'évaluation
de la compatibilité électromagnétique**

L'Annexe B de l'IEC 61326-1:2020 s'applique.

Annexes supplémentaires:

IECNORM.COM : Click to view the full PDF of IEC 61326-2-5:2020 RLV