IEC 61496-1

Edition 2.0 2007-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
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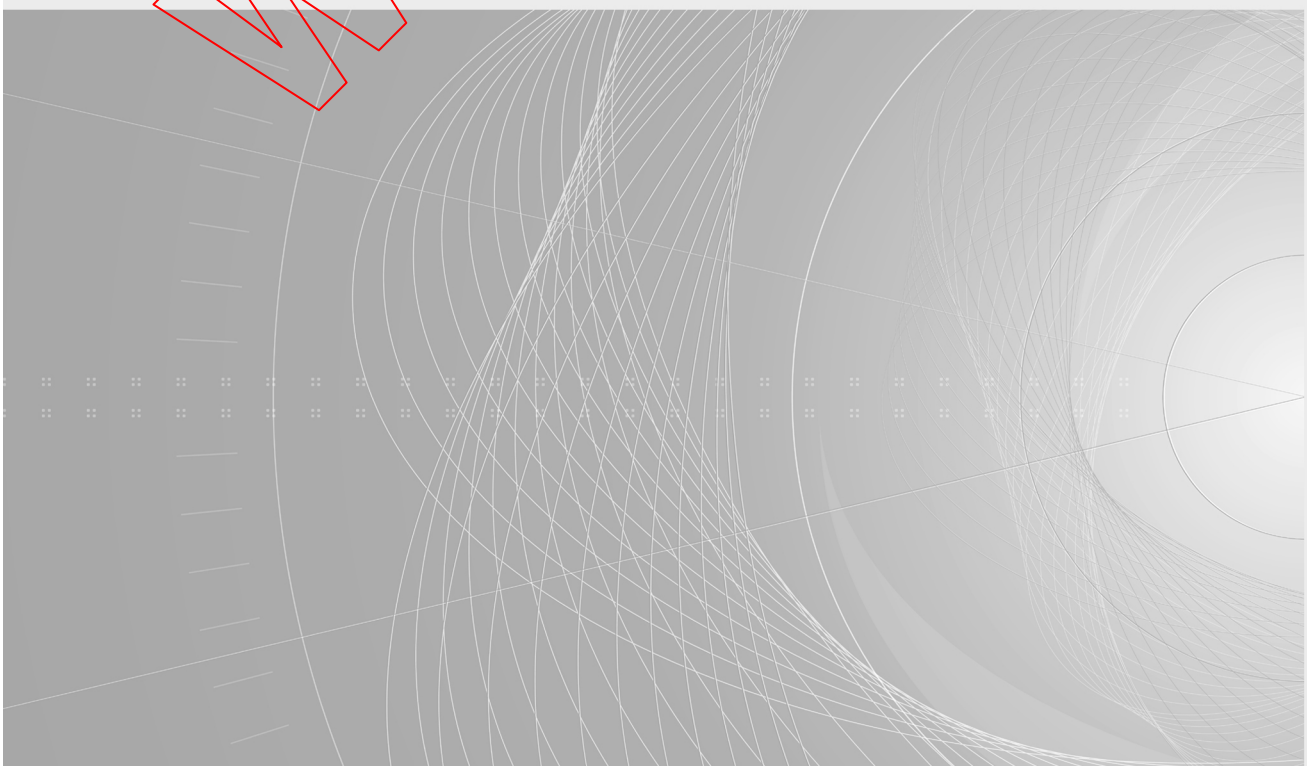
Safety of machinery – Electro-sensitive protective equipment – Part 1: General requirements and tests

Sécurité des machines – Equipements de protection électro-sensibles – Partie 1: Prescriptions générales et essais



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FOREWORD

This amendment has been prepared by IEC technical committee 44: Safety of machinery – Electrotechnical aspects.

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

FDIS	Report on voting
44/560/FDIS	44/568/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

The contents of the corrigendum of July 2008 have been included in this copy.

Page 11

1 Scope

Add, after the third paragraph, the following new paragraph:

While a data interface can be used to control optional safety-related ESPE functions (Annex A), this standard does not provide specific requirements. Requirements for these safety-related functions can be determined by consulting other standards (for example, IEC 61508, IEC/TS 62046, IEC 62061, and ISO13849-1).

2 Normative references

Add, to the existing list, the title of the following standard:

IEC 62061, *Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*

Page 15

3 Terms and definitions

Replace definition 3.5 by the following new definition:

3.5
electro-sensitive protective equipment
ESPE
assembly of devices and/or components working together for protective tripping or presence-sensing purposes and comprising as a minimum

– a sensing device;
– controlling/monitoring devices;
– output signal switching devices and/or a safety-related data interface

NOTE 1 The safety-related control system associated with the ESPE, or the ESPE itself, may further include a secondary switching device, muting functions, stopping performance monitor, etc. (see Annex A).

NOTE 2 A safety-related communication interface can be integrated in the same enclosure as the ESPE.

3.16
muting
temporary automatic suspension of a safety function(s) by safety-related parts of the control system

NOTE For ESPE-muting, see Clause A.7.

Replace, on page 19, definitions 3.17 and 3.18 by the following new definitions:

3.17
OFF-state
state of the output(s) of the ESPE in which the machine under control is caused to stop running and is prevented from starting (for example, the output circuit is interrupted and disables the flow of current)

3.18
ON-state

state of the output(s) of the ESPE in which the machine under control is allowed to run (for example, the output circuit is complete and enables the flow of current)

3.21
response time

Add, after the text of definition 3.21, the following new notes:

NOTE 1 When an ESPE includes a safety-related data interface, the response time is defined at the output of the safety-related data interface.

NOTE 2 When a safety-related communication interface is included in the ESPE enclosure, then the response time is defined at the output of the safety-related communication interface. In this case, the response time is also dependent on the protocol and architecture of the communication network.

NOTE 3 If an ESPE has both a safety-related data interface and OSSDs, the ESPE can have a different response time for the safety-related data interface and for the OSSDs.

Add, on page 21,after definition 3.28, the following new definitions:

3.29
safety-related data interface
direct connection (peer-to-peer) interface between the output of the ESPE and the safety-related communication interface that is used to represent the status of the OSSD(s)

NOTE 1 A data interface will not have addressing capability.

NOTE 2 The safety-related data interface can be bi-directional.

3.30
safety-related communication interface
safety-related connection to a standardized communication network intended for safety-related control functions

Page 23

4 Functional, design and environmental requirements

4.1.3 Types of ESPE

Add, at the end of this subclause, the following last sentence:

When a single safety-related data interface is used to perform the functions of the OSSD(s), then the data interface and associated safety-related communication interface shall meet the requirements of 4.2.4.4. In this case, a single safety-related data interface can substitute for two OSSDs in a type 3 or type 4 ESPE.

4.2.2.1 General

Add, on page 24, at the end of the subclause, the following text:

When an ESPE uses a safety-related communication interface to perform the OSSD functions, the fault-detection requirements in 4.2.2.3 to 4.2.2.5 can be modified to include requirements given in IEC 62061/IEC 61508 in accordance with the appropriate SIL (for example, SIL 3 for Type 4, SIL 2 for Type 3 and SIL 1 for Type 2).

4.2.4.1 General

Add, on page 31, the following last paragraph:

A reference to an OSSD action (for example, go to the OFF-state) will also mean a corresponding action of a safety-related data interface. A single safety-related data interface can meet the requirements of having two OSSDs.

4.2.4.4 Data communication interfaces (I/O)

Replace, on page 33, the title and text of this subclause by the following:

4.2.4.4 Safety-related data interface and safety-related communication interface

When the sensing device is actuated during normal operation, the ESPE shall respond by sending information indicating the status of the sensing device or ESPE through a safety-related data interface. The status information is converted to a data telegram by a safety-related communication interface.

The safety-related data interface shall have the same protection against faults as is appropriate for the type of ESPE.

Depending on the ESPE design, the safety-related communication interface can either be external in a separate enclosure (Figure 1a) or it can be integrated in the same enclosure of the ESPE (Figure 1b).

The safety-related communication interface shall meet the relevant requirements of IEC 62061/IEC 61508 for an appropriate SIL (for example, SIL 3 for Type 4, SIL 2 for Type 3 and SIL 1 for Type 2) in addition to the requirements of this standard (IEC 61496-1).

When the safety-related communication interface is integrated in the ESPE, the entire ESPE shall meet the relevant requirements of IEC 62061/IEC 61508.

NOTE Because of the specific technology of communication interfaces, different standards from IEC 61496-1 apply. To avoid overlapping with other standards, functional requirements for the safety-related communication interface are not defined in this standard.

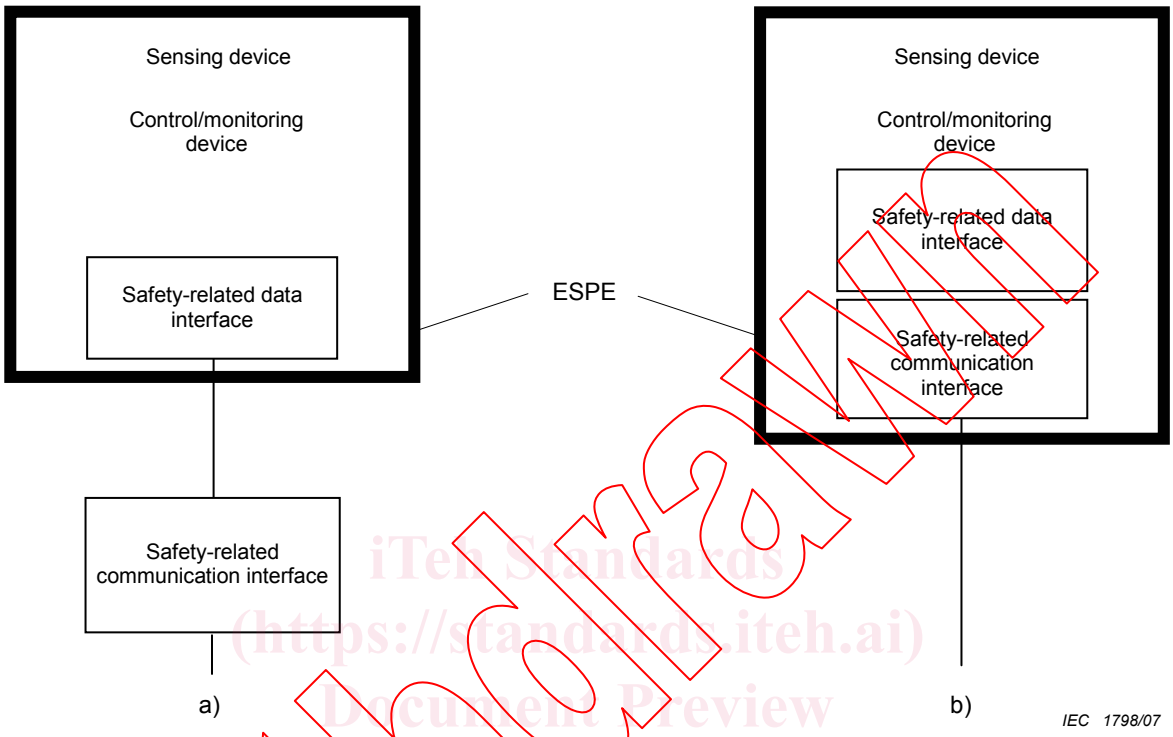

Figure 1 – Examples of ESPEs using safety-related communication interfaces

4.2.6 Adjustment means

Replace this subclause with the following text:

All adjustment means shall be so designed that a failure to danger is not possible at any point in the range of adjustment. A failure in the adjustment means shall not cause an unintended change to the configuration of the ESPE.

4.2.11.2 Requirements

Replace, on page 35, item a) of this subclause by the following new item a):

a) The software, device programme and the device function design shall be developed in accordance with IEC 61508-3 for the appropriate SIL (for example, SIL3 for Type 4, SIL2 for Type 3 or SIL1 for Type 2).

4.3.2.2 Supply voltage interruptions

Add, on page 39, at the end of the subclause, the following new paragraph:

When the ESPE is designed to be supplied from a specific type of power supply(s) (for example, supplied direct from a safety-related communication interface), the supply interruptions in this clause may be applied to the primary input of the specified power supply instead of direct to the ESPE.

Page 45

5 Testing

5.1.1.2 Operating condition

Add, at the end of the subclause, the following new paragraph:

Where a safety-related data interface is used in place of an OSSD(s), the ESPE shall be connected to a communication system in accordance with the supplier's instructions that has a means of monitoring the ESPE status.

Add, on page 47, after 5.1.2.2, the following new subclause and figure:

5.1.2.3 Environmental test conditions for an ESPE intended to be used with a safety-related communication interface

The ESPE and the safety-related communication interface shall be tested together (see Figure 2). Due to the fact that the safety-related communication interface does not show a static output signal, it is necessary to use a data receiver. The test setup consists of the equipment under test and a data receiver (for example, a PLC or monitoring device) which indicates the status of the sensing device or ESPE.

When testing for susceptibility to electrical disturbances, an appropriate test adapter which isolates the ESPE under test from the communication bus may be required.

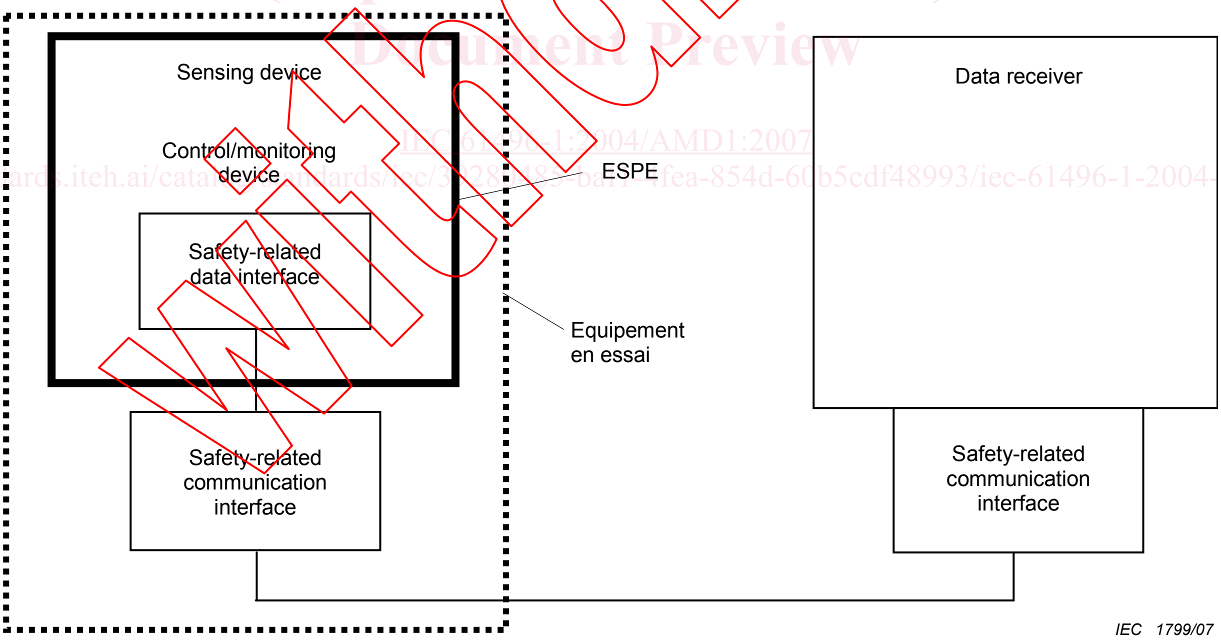

Figure 2 – Test setup for the EMC test of ESPEs with safety-related communication interfaces

5.2.3.1 General

Replace, on page 49, the note at the end of the subclause by the following new paragraph:

When using a safety-related communication interface, in the following limited functional tests, OSSDs going to the ON-state or OFF-state are replaced by a safety-related message (for example, a data telegram) indicating the corresponding status of the sensing device or ESPE.

5.2.3.4 Limited functional test C (C test)

Add, at the end of the subclause, the following new paragraph and note:

If the ESPE cannot resume normal operation due to a permanent component failure, it is acceptable if it is verified that the failure was only in components of the communication interface and that the OSSD(s) remain in the OFF-state.

NOTE Under extreme electrical disturbances (as in the fail-to-danger tests), it is possible that some components of the communication interface will fail permanently and will not allow the ESPE to resume normal operation.

Add, after 5.2.8.3, the following new subclause :

5.2.8.4 Safety-related data interface and safety-related communication interface

It shall be verified by test that disconnection of components does not lead to a failure to danger.

Electrical tests specified in 5.2.8.1 (shorts, opens, improper loading) which would be applied to OSSD(s) may be excluded if not applicable.

The safety integrity of an integrated communication interface shall be verified by tests, systematic analysis and by reference to data sheets and test reports in accordance with the requirements of 4.2.4.4.

Page 69

7 Accompanying documents

Add to item g) the following new text:

When a safety-related communication interface is used, procedures for determining overall system response time shall be explained.

Add, on page 71, to item kk) the following new text:

When a communications interface (4.2.4.4) is integrated into the ESPE, the operating limitations and timing characteristics necessary for proper integration shall be provided.

Page 73

Annex A

A.1 General

Add, at the end of this clause, the following new text:

Where signals for optional functions are provided via a safety-related data interface, the requirement for hard-wired connections at the ESPE can be excluded if the equivalent functions are performed by a safety-related communication system which has a SIL claim limit that is appropriate for the type of ESPE or safety function. Other requirements do not change.

NOTE SIL claim limit of 3 is appropriate for a Type 4 ESPE, SIL2 for a Type 3 ESPE and SIL1 for a Type 2 ESPE.

Page 99

Bibliography

Add the following reference to the existing list:

IEC/TS 62046, Safety *of machinery – Application of protective equipment to detect the presence of persons*