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Industrial communication networks - Profiles - Part
3-2: Functional safety fieldbuses - Additional
specifications for CPF 2

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NATIONAL FOREWORD

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN IEC 61784-3-2

June 2021

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Supersedes EN 61784-3-2:2017 and all of its
amendments and corrigenda (if any)

English Version

Industrial communication networks - Profiles - Part 3-2:
Functional safety fieldbuses - Additional specifications for CPF 2
(IEC 61784-3-2:2021)

Réseaux de communication industriels - Profils - Partie 3-2:
Bus de terrain de sécurité fonctionnelle - Spécifications
supplémentaires pour CPF 2
(IEC 61784-3-2:2021)

Industrielle Kommunikationsnetze - Profile - Teil 3-2:
Funktional sichere Übertragung bei Feldbussen -
Zusätzliche Festlegungen für die
Kommunikationsprofilfamilie 2
(IEC 61784-3-2:2021)

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European foreword

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The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-03-23
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-06-23

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

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| IEC 61000-1-2 | NOTE | Harmonized as EN 61000-1-2 |
| IEC 61000-6-7 | NOTE | Harmonized as EN 61000-6-7 |
| IEC 61010-2-201 | NOTE | Harmonized as EN IEC 61010-2-201 |
| IEC 61131-6 | NOTE | Harmonized as EN 61131-6 |
| IEC 61158 (series) | NOTE | Harmonized as EN 61158 (series) |
| IEC 61158-5 (series) | NOTE | Harmonized as EN 61158-5 (series) |
| IEC 61496 (series) | NOTE | Harmonized as EN IEC 61496 (series) |
| IEC 61508-1:2010 | NOTE | Harmonized as EN 61508-1:2010 (not modified) |
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| IEC 61511 (series) | NOTE | Harmonized as EN 61511 (series) |
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| ISO 10218-1 | NOTE | Harmonized as EN ISO 10218-1 |
| ISO 13849 (series) | NOTE | Harmonized as EN ISO 13849 (series) |

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|--|-------------------|-------------|
| IEC 61131-2 | - | Industrial-process measurement and control - Programmable controllers - Part 2: Equipment requirements and tests | - | - |
| IEC 61131-3 | - | Programmable controllers - Part 3: Programming languages | EN 61131-3 | - |
| IEC 61158-2 | 2014 | Industrial communication networks - Fieldbus specifications - Part 2: Physical layer specification and service definition | EN 61158-2 | 2014 |
| IEC 61158-3-2 | - | Industrial communication networks - Fieldbus specifications - Part 3-2: Data-link layer service definition - Type 2 elements | EN 61158-3-2 | - |
| IEC 61158-3-19 | - | Industrial communication networks - Fieldbus specifications - Part 3-19: Data-link layer service definition - Type 19 elements | EN IEC 61158-3-19 | - |
| IEC 61158-4-2 | 2019 | Industrial communication networks - Fieldbus specifications - Part 4-2: Data-link layer protocol specification - Type 2 elements | EN IEC 61158-4-2 | 2019 |
| IEC 61158-4-19 | - | Industrial communication networks - Fieldbus specifications - Part 4-19: Data-link layer protocol specification - Type 19 elements | EN IEC 61158-4-19 | - |
| IEC 61158-5-2 | - | Industrial communication networks - Fieldbus specifications - Part 5-2: Application layer service definition - Type 2 elements | EN IEC 61158-5-2 | - |
| IEC 61158-5-19 | - | Industrial communication networks - Fieldbus specifications - Part 5-19: Application layer service definition - Type 19 elements | EN IEC 61158-5-19 | - |

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| IEC 61158-6-2 | - | Industrial communication networks - Fieldbus specifications - Part 6-2: Application layer protocol specification - Type 2 elements | EN IEC 61158-6-2 | - |
| IEC 61158-6-19 | - | Industrial communication networks - Fieldbus specifications - Part 6-19: Application layer protocol specification - Type 19 elements | EN IEC 61158-6-19 | - |
| IEC 61326-3-1 | - | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 3-1: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) & General industrial applications | EN 61326-3-1 | - |
| IEC 61326-3-2 | - | Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 3-2: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) - Industrial applications with specified electromagnetic environment | EN IEC 61326-3-2 | - |
| IEC 61508 | series | Functional safety of electrical/electronic/programmable electronic safety-related systems | EN 61508 | series |
| IEC 61784-1 | - | Industrial communication networks - Profiles Part 1: Fieldbus profiles | EN IEC 61784-1 | - |
| IEC 61784-2 | - | Industrial communication networks - Profiles - Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC/IEEE 8802-3 | EN IEC 61784-2 | - |
| IEC 61784-3 | 2021 | Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions | EN IEC 61784-3 | 2021 |
| IEC 61784-5-2 | - | Industrial communication networks - Profiles - Part 5-2: Installation of fieldbuses - Installation profiles for CPF 2 | EN IEC 61784-5-2 | - |
| IEC 61918 | - | Industrial communication networks - Installation of communication networks in industrial premises | EN IEC 61918 | - |
| IEC 62026-3 | - | Low-voltage switchgear and controlgear - Controller-device interfaces (CDIs) - Part 3: DeviceNet | - | - |
| ISO 13849-1 | 2015 | Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design | EN ISO 13849-1 | 2015 |

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|--|--------------|-------------|
| ISO 15745-2 | 2003 | Industrial automation systems and integration -- Open systems application integration framework -- Part 2: Reference description for ISO 11898-based control systems | - | - |
| ISO 15745-3 | 2003 | Industrial automation systems and integration - Open systems application integration framework -- Part 3: Reference description for IEC 61158 based control systems | - | - |
| ISO 15745-4 | 2003 | Industrial automation systems and integration - Open systems application integration framework - Part 4: Reference description for Ethernet-based control systems | - | - |

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Industrial communication networks – Profiles –
Part 3-2: Functional safety fieldbuses – Additional specifications for CPF 2**

**Réseaux de communication industriels – Profils –
Partie 3-2: Bus de terrain de sécurité fonctionnelle – Spécifications
supplémentaires pour CPF 2**





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**Industrial communication networks – Profiles –
Part 3-2: Functional safety fieldbuses – Additional specifications for CPF 2**

**Réseaux de communication industriels – Profils –
Partie 3-2: Bus de terrain de sécurité fonctionnelle – Spécifications
supplémentaires pour CPF 2**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION**INDUSTRIAL COMMUNICATION NETWORKS –
PROFILES –****Part 3-2: Functional safety fieldbuses –
Additional specifications for CPF 2****FOREWORD**

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IEC 61784-3-2 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2016. This edition constitutes a technical revision.

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

- addition of two new Safety Supervisor object states in 6.6.5.5;
- addition of Net LED behaviour requirement for the proposing TUNID process in 6.6.8, 9.1.2 and 9.1.5;
- addition of application path support for process variables in 6.3.9 and 6.3.10;
- addition of multi-port device support in 6.6.4, 6.6.5, 6.6.7 and miscellaneous places;

- correction of network reaction time equations in 9.3.3;
- addition of SIL support up to SIL 3 in 7.6, 8.7, 8.9, 9.5 and miscellaneous places;
- clean up of configuration procedure guidelines in 8.9.14 and 8.9.15;
- switch change detection in 9.1.6;
- deprecation of base format in 3.1.2, 7.1.1.1 and 6.3.3.2;
- fixing Max_Fault_Number value to 2 in 6.3.3.4, 6.8.3 and 8.8.3;
- updated network PFH calculation in 9.5.2;
- miscellaneous minor corrections made since the last publication.

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

| FDIS | Report on voting |
|---------------|------------------|
| 65C/1083/FDIS | 65C/1087/RVD |

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts of the IEC 61784-3 series, published under the general title *Industrial communication networks – Profiles – Functional safety fieldbuses*, 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
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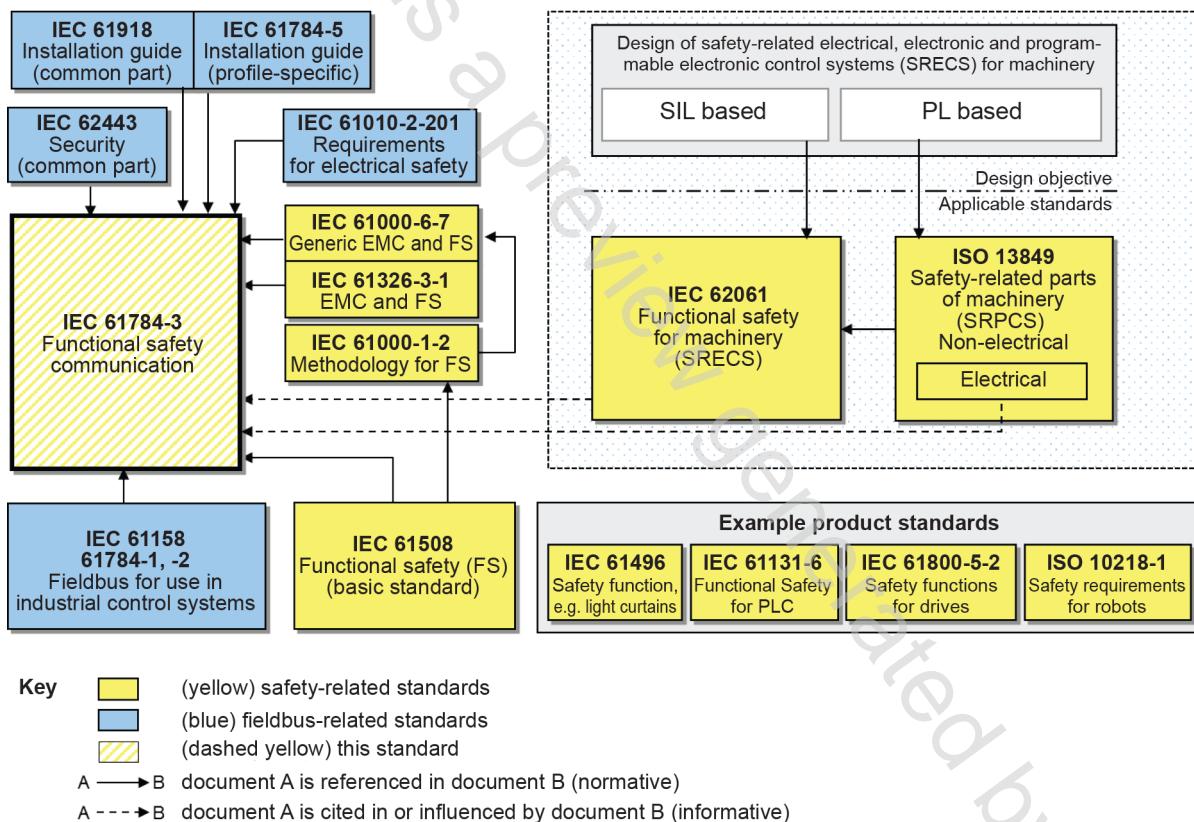
0 Introduction

0.1 General

The IEC 61158 (all parts) fieldbus standard together with its companion standards IEC 61784-1 and IEC 61784-2 defines a set of communication protocols that enable distributed control of automation applications. Fieldbus technology is now considered well accepted and well proven. Thus, fieldbus enhancements continue to emerge, addressing applications for areas such as real time and safety-related applications.

IEC 61784-3 (all parts) explains the relevant principles for functional safety communications with reference to IEC 61508 (all parts) and specifies several safety communication layers (profiles and corresponding protocols) based on the communication profiles and protocol layers of IEC 61784-1, IEC 61784-2 and IEC 61158 (all parts). It does not cover electrical safety and intrinsic safety aspects. It also does not cover security aspects, nor does it provide any requirements for security.

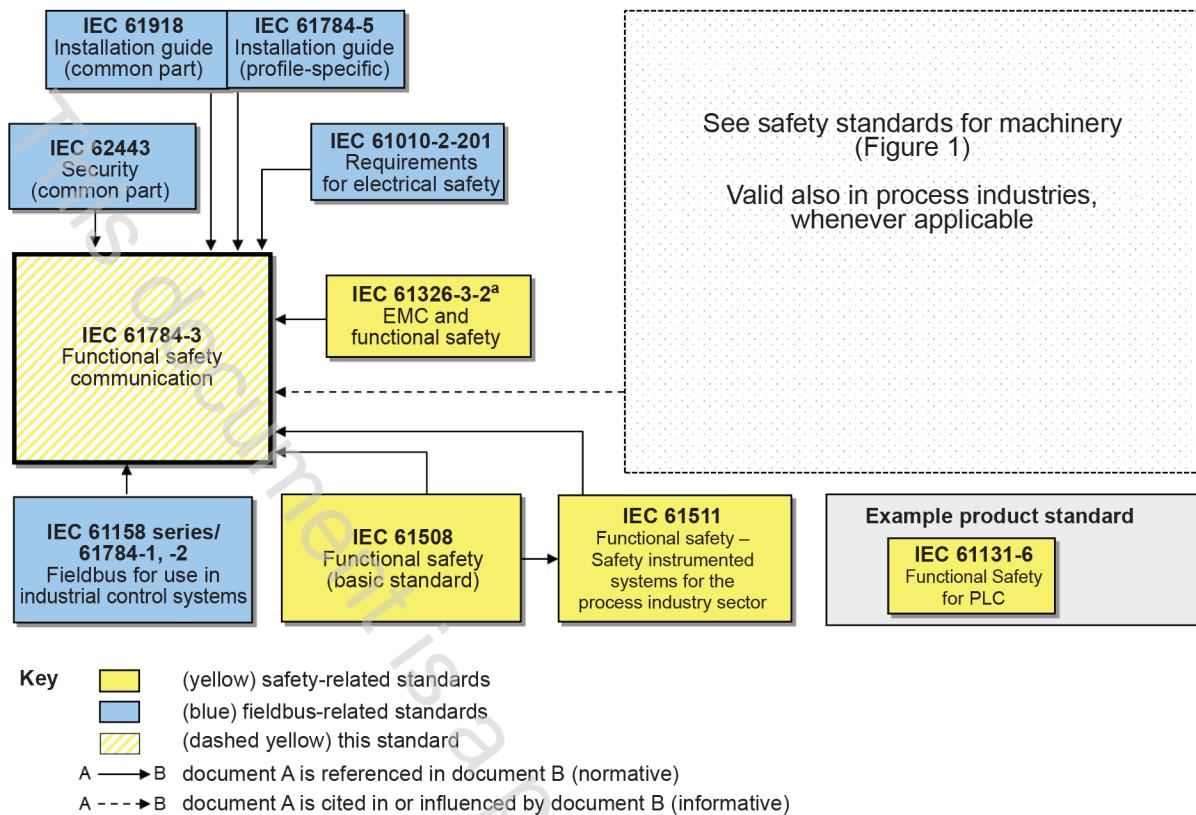
Figure 1 shows the relationships between IEC 61784-3 (all parts) and relevant safety and fieldbus standards in a machinery environment.



NOTE IEC 62061 specifies the relationship between PL (Category) and SIL.

Figure 1 – Relationships of IEC 61784-3 with other standards (machinery)

Figure 2 shows the relationships between IEC 61784-3 (all parts) and relevant safety and fieldbus standards in a process environment.



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^a For specified electromagnetic environments; otherwise IEC 61326-3-1 or IEC 61000-6-7.

Figure 2 – Relationships of IEC 61784-3 with other standards (process)

Safety communication layers which are implemented as parts of safety-related systems according to IEC 61508 (all parts) provide the necessary confidence in the transportation of messages (information) between two or more participants on a fieldbus in a safety-related system, or sufficient confidence of safe behaviour in the event of fieldbus errors or failures.

Safety communication layers specified in IEC 61784-3 (all parts) do this in such a way that a fieldbus can be used for applications requiring functional safety up to the Safety Integrity Level (SIL) specified by its corresponding functional safety communication profile.

The resulting SIL claim of a system depends on the implementation of the selected functional safety communication profile (FSCP) within this system – implementation of a functional safety communication profile in a standard device is not sufficient to qualify it as a safety device.

IEC 61784-3 (all parts) describes:

- basic principles for implementing the requirements of IEC 61508 (all parts) for safety-related data communications, including possible transmission faults, remedial measures and considerations affecting data integrity;
- functional safety communication profiles for several communication profile families in IEC 61784-1 and IEC 61784-2, including safety layer extensions to the communication service and protocols sections of IEC 61158 (all parts).

0.2 Patent declaration

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning the functional safety communication profiles for family 2. IEC takes no position concerning the evidence, validity, and scope of these patent rights.

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