SVENSK STANDARD SS-EN IEC 61784-3-2

Fastställd	Utgåva	Sida	Ansvarig kommitté
2021-09-22	4	1 (1+283)	SEK TK 65

Industriell processtyrning – Profiler – Del 3-2: Fältbussar i system av betydelse för säkerheten – Kompletterande specifikationer för CPF 2 (CIP)

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

Som svensk standard gäller europastandarden EN IEC 61784-3-2:2021. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 61784-3-2:2021.

Nationellt förord

Europastandarden EN IEC 61784-3-2:2021

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC

– **IEC 61784-3-2, Fourth edition, 2021 - Industrial communication networks - Profiles - Part 3-2: Functional safety fieldbuses - Additional specifications for CPF 2**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 61784-3-2, utgåva 3, 2018, gäller ej fr o m 2024-06-23.

ICS 25.040.40; 35.100.05

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61784-3-2

June 2021

ICS 25.040.40; 35.100.05

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)

This European Standard was approved by CENELEC on 2021-06-23. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN IEC 61784-3-2:2021 E

European foreword

The text of document 65C/1083/FDIS, future edition 4 of IEC 61784-3-2, prepared by SC 65C "Industrial networks" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61784-3-2:2021.

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

This document supersedes EN 61784-3-2:2017 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61784-3-2:2021 was approved by CENELEC as a European Standard without any modification.

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

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)
IEC 61508-4:2010	NOTE	Harmonized as EN 61508-4:2010 (not modified)
IEC 61508-5:2010	NOTE	Harmonized as EN 61508-5:2010 (not modified)
IEC 61511 (series)	NOTE	Harmonized as EN 61511 (series)
IEC 61784-3 (series)	NOTE	Harmonized as EN 61784-3 (series)
IEC 61784-5 (series)	NOTE	Harmonized as EN IEC 61784-5 (series)
IEC 61800-5-2	NOTE	Harmonized as EN 61800-5-2
IEC 62061	NOTE	Harmonized as EN 62061
IEC 62443 (series)	NOTE	Harmonized as EN IEC 62443 (series)
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.

Publication	Year	Title	EN/HD	Year
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-lonk 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	-

Publication	Year	Title	EN/HD	Year
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

Publication	Year	Title	EN/HD	Year
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	-	-

IEC 61784-3-2

Edition 4.0 2021-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 25.040.40; 35.100.05

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INDUSTRIAL COMMUNICATION NETWORKS – PROFILES –

Part 3-2: Functional safety fieldbuses – Additional specifications for CPF 2

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.
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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
- 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.

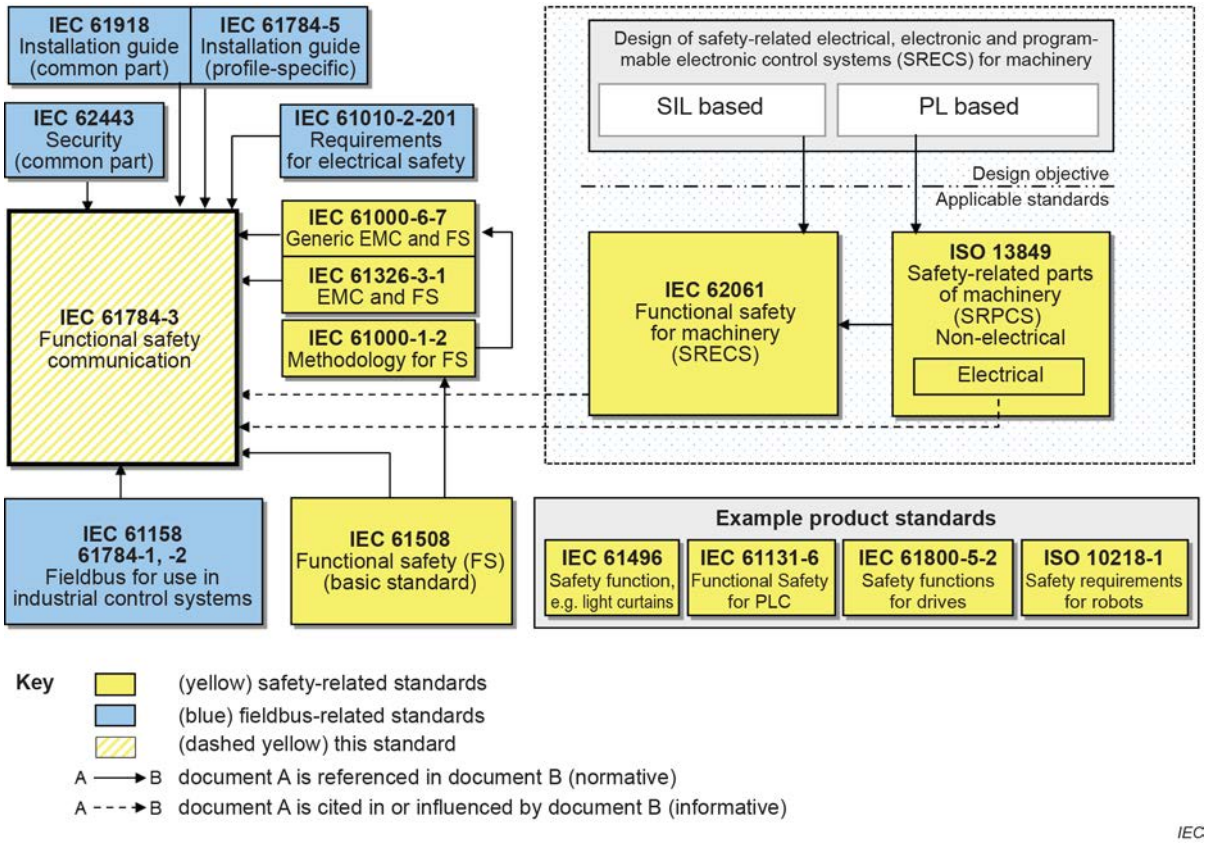
0 Introduction

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.

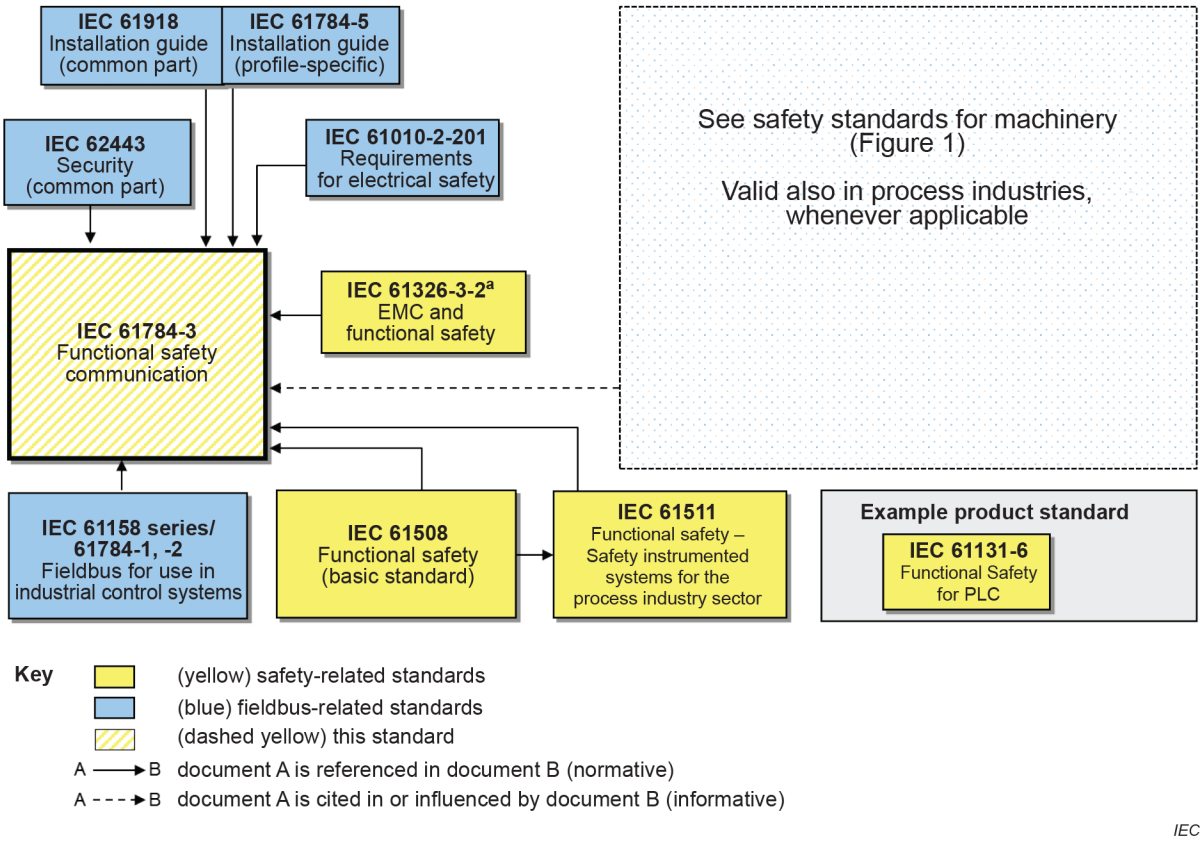
Figure 1 shows the relationships between IEC 61784-3 (all parts) and relevant safety and fieldbus standards in a machinery environment.



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.



[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.

The holder of these patent rights has assured IEC that s/he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of these patent rights is registered with IEC. Information may be obtained from the patent database available at http://patents.iec.ch.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those in the patent database. IEC shall not be held responsible for identifying any or all such patent rights.

INDUSTRIAL COMMUNICATION NETWORKS – PROFILES –

Part 3-2: Functional safety fieldbuses – Additional specifications for CPF 2

1 Scope

This part of IEC 61784-3 (all parts) specifies a safety communication layer (services and protocol) based on CPF 2 of IEC 61784-1, IEC 61784-2 and IEC 61158 Type 2. It identifies the principles for functional safety communications defined in IEC 61784-3 that are relevant for this safety communication layer. This safety communication layer is intended for implementation in safety devices only.

NOTE 1 It does not cover electrical safety and intrinsic safety aspects. Electrical safety relates to hazards such as electrical shock. Intrinsic safety relates to hazards associated with potentially explosive atmospheres.

This document defines mechanisms for the transmission of safety-relevant messages among participants within a distributed network using fieldbus technology in accordance with the requirements of IEC 61508 (all parts)[1] for functional safety. These mechanisms may be used in various industrial applications such as process control, manufacturing automation and machinery.

This document provides guidelines for both developers and assessors of compliant devices and systems.

NOTE 2 The resulting SIL claim of a system depends on the implementation of the selected functional safety communication profile within this system – implementation of a functional safety communication profile according to this document in a standard device is not sufficient to qualify it as a safety device.

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.

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*

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

IEC 61158-3-2, *Industrial communication networks – Fieldbus specifications – Part 3-2: Data-link layer service definition – Type 2 elements*

IEC 61158-3-19, *Industrial communication networks – Fieldbus specifications – Part 3-19: Data-link layer service definition – Type 19 elements*

[1] In the following pages of this document, "IEC 61508" will be used for "IEC 61508 (all parts) ".

IEC 61158-4-2:2019, *Industrial communication networks – Fieldbus specifications – Part 4-2: Data-link layer protocol specification – Type 2 elements*

IEC 61158-4-19, *Industrial communication networks – Fieldbus specifications – Part 4-19: Data-link layer protocol specification – Type 19 elements*

IEC 61158-5-2, *Industrial communication networks – Fieldbus specifications – Part 5-2: Application layer service definition – Type 2 elements*

IEC 61158-5-19, *Industrial communication networks – Fieldbus specifications – Part 5-19: Application layer service definition – Type 19 elements*

IEC 61158-6-2, *Industrial communication networks – Fieldbus specifications – Part 6-2: Application layer protocol specification – Type 2 elements*

IEC 61158-6-19, *Industrial communication networks – Fieldbus specifications – Part 6-19: Application layer protocol specification – Type 19 elements*

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*

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*

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

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

IEC 61784-2, *Industrial communication networks – Profiles – Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC/IEEE 8802-3*

IEC 61784-3:2021, *Industrial communication networks – Profiles – Part 3: Functional safety fieldbuses – General rules and profile definitions*

IEC 61784-5-2, *Industrial communication networks – Profiles – Part 5-2: Installation of fieldbuses – Installation profiles for CPF 2*

IEC 61918, *Industrial communication networks – Installation of communication networks in industrial premises*

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*

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*