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IEC 61784-3-14

Edition 1.0 2010-06

# INTERNATIONAL STANDARD



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**Industrial communication networks – Profiles –  
Part 3-14: Functional safety fieldbuses – Additional specifications for CPF 14**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## CONTENTS

FOREWORD.....	6
0 Introduction .....	8
0.1 General.....	8
0.2 Patent declaration .....	10
1 Scope.....	11
2 Normative references .....	11
3 Terms, definitions, symbols, abbreviated terms and conventions .....	12
3.1 Terms and definitions .....	12
3.1.1 Common terms and definitions .....	12
3.1.2 CPF 14: Additional terms and definitions .....	16
3.2 Symbols and abbreviated terms.....	16
3.2.1 Common symbols and abbreviated terms .....	16
3.2.2 CPF 14: Additional symbols and abbreviated terms .....	17
3.3 Conventions .....	17
4 Overview of FSCP 14/1 (EPASafety®).....	18
4.1 EPASafety® .....	18
4.2 Principle of EPA safety communications.....	18
4.3 Safety function processing .....	19
5 General .....	19
5.1 External documents providing specifications for the profile.....	19
5.2 Safety functional requirements .....	20
5.3 Safety measures .....	20
5.4 Safety communication layer structure .....	21
5.4.1 Combination of standard communication and safety communication systems.....	21
5.4.2 CP 14/1 safety communication structure.....	22
5.5 Relationships with FAL (and DLL, PhL) .....	23
5.5.1 Overview .....	23
5.5.2 Data types.....	23
6 Safety communication layer services .....	24
6.1 Overview .....	24
6.2 FSCP 14/1 object extensions.....	24
6.2.1 General .....	24
6.2.2 Functional safety communication management object.....	25
6.2.3 Functional Safety Link Object .....	26
6.2.4 Functional safety communication alert object.....	29
6.3 Extended services .....	30
6.3.1 General .....	30
6.3.2 SafetyCommunicationOpen .....	31
6.3.3 SafetyCommunicationClose .....	32
7 Safety communication layer protocol .....	34
7.1 Safety PDU format .....	34
7.1.1 General .....	34
7.1.2 APDU header structure.....	34
7.1.3 Functional safety PDU.....	34
7.2 Safety communication operation.....	36

7.2.1	Sequence number .....	36
7.2.2	RelationKey .....	36
7.2.3	Feedback message .....	37
7.2.4	CRC-cross-check .....	37
7.2.5	Scheduling number .....	38
7.2.6	Time stamp .....	39
7.2.7	Time expectation .....	39
7.2.8	Time synchronization monitoring .....	39
7.2.9	Communication scheduling precision monitoring .....	39
7.3	Safety communication behaviour .....	39
7.3.1	Protocol state description of periodic data transmission .....	39
7.3.2	Protocol state description of non-periodic data transmission .....	41
7.3.3	Protocol state description of alert report for communication fault .....	46
7.3.4	Function description .....	49
7.4	Code .....	51
7.4.1	Object code .....	51
7.4.2	Service code .....	53
8	Safety communication layer management .....	59
8.1	Time synchronization diagnostics .....	59
8.1.1	Time synchronization process .....	59
8.1.2	Time synchronization management .....	60
8.2	CSME diagnostics .....	60
8.2.1	General .....	60
8.2.2	CSME diagnostics management .....	60
8.3	Communication fault management .....	61
8.3.1	Configuration management .....	61
8.3.2	Communication fault report process .....	61
9	System requirements .....	64
9.1	Indicators and switches .....	64
9.2	Installation guidelines .....	64
9.3	Safety function response time .....	64
9.3.1	General .....	64
9.3.2	Calculation of the network reaction time .....	65
9.4	Duration of demands .....	66
9.5	Constraints for calculation of system characteristics .....	66
9.6	Maintenance .....	67
9.7	Safety manual .....	67
10	Assessment .....	67
Annex A (informative) Additional information for functional safety communication profiles of CPF 14 .....		68
A.1 Hash function calculation .....		68
A.2 .....		69
Annex B (informative) Information for assessment of the functional safety communication profiles of CPF 14 .....		70
Bibliography .....		71
Table 1 – Relationships between errors and safety measures .....		21
Table 2 – Data types used within FSCP 14/1 .....		24

Table 3 – FSCP 14/1 object extensions .....	24
Table 4 – Functional safety service extension .....	31
Table 5 – SafetyCommunicationOpen Service Parameters .....	31
Table 6 – SafetyCommunicationClose Service Parameters .....	33
Table 7 – Encoding of APDU Header .....	34
Table 8 – Structure of Functional Safety PDU (FSPDU) Header .....	35
Table 9 – CRC calculation polynomials .....	37
Table 10 – Functional safety communication state description .....	40
Table 11 – States and transitions of periodic data transmission .....	40
Table 12 – Functional safety communication states description .....	42
Table 13 – States and transitions of non-periodic data transmission .....	42
Table 14 – Communication alert state description .....	47
Table 15 – Communication alert states and transitions .....	47
Table 16 – LinkObjectType function description .....	49
Table 17 – CRCCheck function description .....	49
Table 18 – CrossCheck function description .....	50
Table 19 – TimeDelayCheck function description .....	50
Table 20 – PeriodUncomfrimedSNCheck function description .....	50
Table 21 – Non-periodicSNCheck function description .....	50
Table 22 – Functional safety communication management object encoding .....	51
Table 23 – Functional safety link object encoding .....	51
Table 24 – Functional safety communication alert object encoding .....	53
Table 25 – Encoding of SafetyCommunicationOpen request parameters .....	56
Table 26 – SafetyCommunicationOpen positive response parameters .....	56
Table 27 – SafetyCommunicationOpen negative response parameters .....	57
Table 28 – SafeCommunicationClose request parameters .....	57
Table 29 – SafeCommunicationClose positive response parameters .....	57
Table 30 – SafeCommunicationClose negative response parameters .....	57
Table 31 – Error class and code .....	58
Table 32 – Communication process of confirmed service between two devices .....	61
Table 33 – Settings for time expectation margin .....	65
Table 34 – Constraints for system characteristics at $\epsilon = 10^{-2}$ .....	67
Figure 1 – Relationships of IEC 61784-3 with other standards (machinery) .....	8
Figure 2 – Relationships of IEC 61784-3 with other standards (process) .....	9
Figure 3 – Safety communication architecture .....	19
Figure 4 – Safety function processing .....	19
Figure 5 – Standard communication and safety communication .....	22
Figure 6 – CP 14/1 protocol hierarchy .....	23
Figure 7 – Relationship between the SCL and the other layers of CP 14/1 .....	23
Figure 8 – Functional safety communication message structure .....	34
Figure 9 – Structure of Functional Safety PDU (FSPDU) .....	35
Figure 10 – Structure of Virtual Safety Check Message (VSCM) .....	35

Figure 11 – FSPDU mapping .....	36
Figure 12 – Time-sharing communication scheduling .....	38
Figure 13 – Format of EndofNonPeriodicDataSending PDU .....	39
Figure 14 – State transfer figure of periodic data transmission .....	40
Figure 15 – Functional safety communication state transfer .....	41
Figure 16 – Communication alert report state transfer figure .....	46
Figure 17 – CRC check for time synchronization process .....	59
Figure 18 – The process of communication fault report .....	63
Figure 19 – Example application for FSCP 14/1 communication .....	64
Figure 20 – Calculation of the network reaction time .....	65

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### INDUSTRIAL COMMUNICATION NETWORKS – PROFILES –

#### Part 3-14: Functional safety fieldbuses – Additional specifications for CPF 14

#### FOREWORD

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International Standard IEC 61784-3-14 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial process measurement, control and automation.

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

FDIS	Report on voting
65C/591A/FDIS	65C/603/RVD

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

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

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 publication will remain unchanged until the stability 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.

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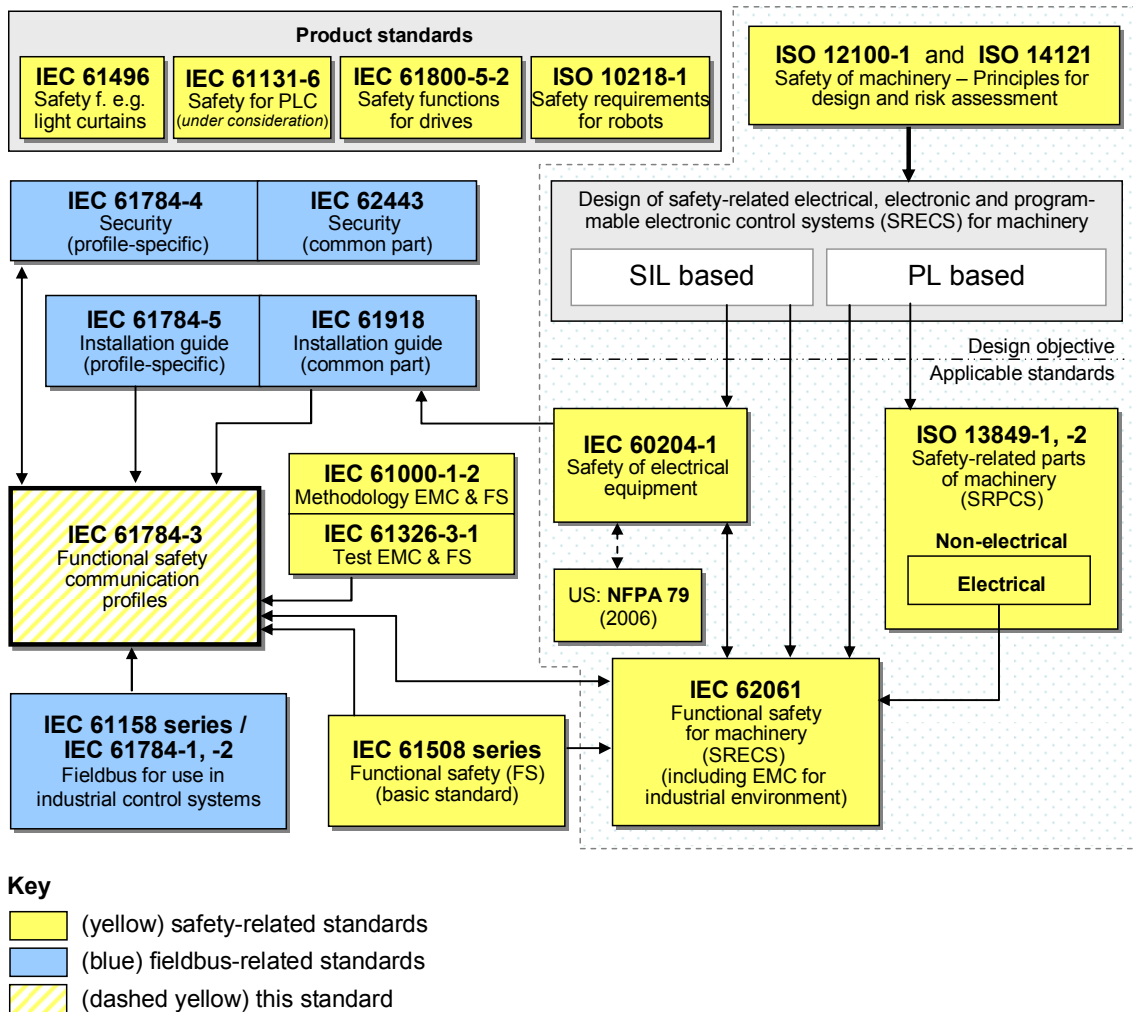
## 0 Introduction

### 0.1 General

The IEC 61158 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 many fieldbus enhancements are emerging, addressing not yet standardized areas such as real time, safety-related and security-related applications.

This standard explains the relevant principles for functional safety communications with reference to IEC 61508 series 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 the IEC 61158 series. It does not cover electrical safety and intrinsic safety aspects.

Figure 1 shows the relationships between this standard and relevant safety and fieldbus standards in a machinery environment.

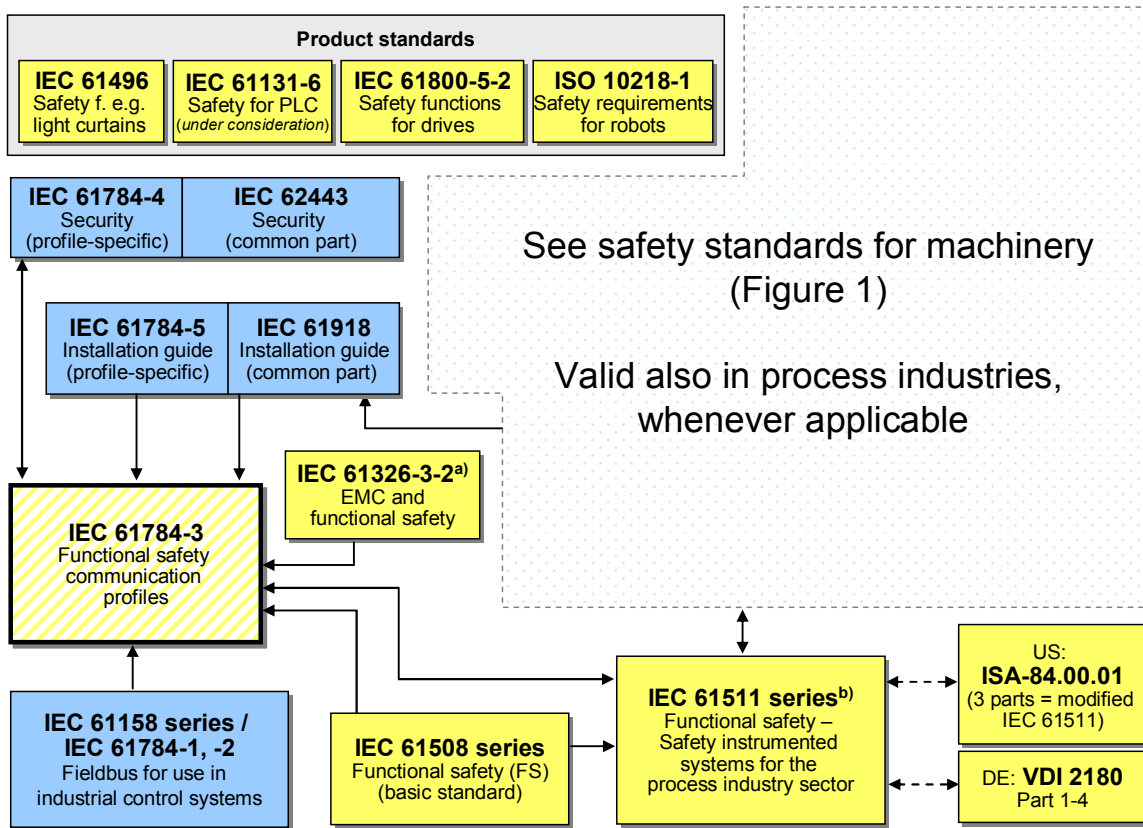


NOTE Subclauses 6.7.6.4 (high complexity) and 6.7.8.1.6 (low complexity) of IEC 62061 specify the relationship between PL (Category) and SIL.

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



Figure 2 shows the relationships between this standard and relevant safety and fieldbus standards in a process environment.



**Key**

- (yellow) safety-related standards
- (blue) fieldbus-related standards
- (dashed yellow) this standard

<sup>a</sup> For specified electromagnetic environments; otherwise IEC 61326-3-1.

<sup>b</sup> EN ratified.

**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 series 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 this standard 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 within this system – implementation of a functional safety communication profile in a standard device is not sufficient to qualify it as a safety device.

This standard describes:

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

## 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 14 as follows, where the [xx] notation indicates the holder of the patent right:

CN1960247	[SxZ]	Method of Safety communication for industrial network
CN1929373	[SxZ]	The safety communication for the safety instrument system applied in industrial process.
CN101035030	[SxZ]	The diagnosis method and the equipment for monitoring the industrial Ethernet message.

IEC takes no position concerning the evidence, validity and scope of these patent rights.

The holders of these patents rights have assured the IEC that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holders of these patent rights are registered with IEC.

Information may be obtained from:

[SxZ] SUPCON and Zhejiang university  
Dongqin FENG

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Liuhe Road 309, Bingjiang District,  
Hangzhou, CHINA 310053

(2) Zhejiang University  
Zheda Road 38,  
Hangzhou CHINA 310027

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

## INDUSTRIAL COMMUNICATION NETWORKS – PROFILES –

### Part 3-14: Functional safety fieldbuses – Additional specifications for CPF 14

#### 1 Scope

This part of the IEC 61784-3 series specifies a safety communication layer (services and protocol) based on CPF 14 of IEC 61784-2 and IEC 61158 Type 14. It identifies the principles for functional safety communications defined in IEC 61784-3 that are relevant for this safety communication layer.

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 part<sup>1</sup> 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 series<sup>2</sup> for functional safety. These mechanisms may be used in various industrial applications such as process control, manufacturing automation and machinery.

This part 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 part in a standard device is not sufficient to qualify it as a safety device.

#### 2 Normative references

The following referenced documents are indispensable for the application 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 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

IEC 61158-3-14, *Industrial communication networks – Fieldbus specifications – Part 3-14: Data-link layer service definition – Type 14 elements*

IEC 61158-4-14, *Industrial communication networks – Fieldbus specifications – Part 4-14: Data-link layer protocol specification – Type 14 elements*

IEC 61158-5-14, *Industrial communication networks – Fieldbus specifications – Part 5-14: Application layer service definition – Type 14 elements*

IEC 61158-6-14, *Industrial communication networks – Fieldbus specifications – Part 6-14: Application layer protocol specification – Type 14 elements*

<sup>1</sup> In the following pages of this standard, “this part” will be used for “this part of the IEC 61784-3 series”.

<sup>2</sup> In the following pages of this standard, “IEC 61508” will be used for “IEC 61508 series”.

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

IEC 61511 (all parts), *Functional safety – Safety instrumented systems for the process industry sector*

IEC 61588, *Precision clock synchronization protocol for networked measurement and control systems*

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

IEC 61784-3:2010<sup>3</sup>, *Industrial communication networks – Profiles – Part 3: Functional safety fieldbuses – General rules and profile definitions*

ISO/IEC 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

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<sup>3</sup> In preparation.