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IEC 61784-3-12

Edition 1.0 2010-06

# INTERNATIONAL STANDARD



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**Industrial communication networks – Profiles –  
Part 3-12: Functional safety fieldbuses – Additional specifications for CPF 12**

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 12: Additional terms and definitions .....	17
3.2 Symbols and abbreviated terms.....	17
3.2.1 Common symbols and abbreviated terms .....	17
3.2.2 CPF 12: Additional symbols and abbreviated terms .....	18
3.3 Conventions .....	18
4 Overview of FSCP 12/1 (Safety-over-EtherCAT™) .....	18
5 General .....	20
5.1 External document providing specifications for the profile.....	20
5.2 Safety functional requirements .....	20
5.3 Safety measures .....	21
5.4 Safety communication layer structure .....	21
5.5 Relationships with FAL (and DLL, PhL) .....	22
5.5.1 General .....	22
5.5.2 Data types.....	22
6 Safety communication layer services .....	22
6.1 FSoE Connection .....	22
6.2 FSoE Cycle .....	22
6.3 FSoE services .....	23
7 Safety communication layer protocol .....	24
7.1 Safety PDU format .....	24
7.1.1 Safety PDU structure .....	24
7.1.2 Safety PDU command.....	25
7.1.3 Safety PDU CRC .....	25
7.2 FSCP 12/1 communication procedure.....	29
7.2.1 Message cycle.....	29
7.2.2 FSCP 12/1 node states.....	29
7.3 Reaction on communication errors .....	39
7.4 State table for FSoE Master .....	40
7.4.1 FSoE Master state machine .....	40
7.4.2 Reset state .....	44
7.4.3 Session state.....	45
7.4.4 Connection state .....	48
7.4.5 Parameter state.....	52
7.4.6 Data state.....	55
7.5 State table for FSoE Slave .....	58
7.5.1 FSoE Slave state machine.....	58
7.5.2 Reset state .....	62

7.5.3	Session state.....	64
7.5.4	Connection state .....	68
7.5.5	Parameter state.....	73
7.5.6	Data state.....	78
8	Safety communication layer management.....	81
8.1	FSCP 12/1 parameter handling.....	81
8.2	FSoE communication parameters .....	81
9	System requirements.....	82
9.1	Indicators and switches .....	82
9.1.1	Indicator states and flash rates.....	82
9.1.2	Indicators .....	83
9.2	Installation guidelines.....	84
9.3	Safety function response time .....	84
9.3.1	General .....	84
9.3.2	Determination of FSoE Watchdog time .....	85
9.3.3	Calculation of the worst case safety function response time .....	86
9.4	Duration of demands .....	87
9.5	Constraints for calculation of system characteristics.....	87
9.5.1	General .....	87
9.5.2	Probabilistic considerations .....	87
9.6	Maintenance.....	89
9.7	Safety manual .....	89
10	Assessment.....	89
Annex A (informative) Additional information for functional safety communication profiles of CPF 12.....		90
A.1	Hash function calculation.....	90
A.2	.....	94
Annex B (informative) Information for assessment of the functional safety communication profiles of CPF 12.....		95
Bibliography.....		96
Table 1	– State machine description elements .....	18
Table 2	– Communication errors and detection measures .....	21
Table 3	– General Safety PDU.....	24
Table 4	– Shortest Safety PDU .....	25
Table 5	– Safety PDU command .....	25
Table 6	– CRC_0 calculation sequence.....	26
Table 7	– CRC_i calculation sequence (i>0) .....	26
Table 8	– Example for CRC_0 inheritance .....	27
Table 9	– Example for 4 octets of safety data with interchanging of octets 1-4 with 5-8.....	28
Table 10	– Safety Master PDU for 4 octets of safety data with command = Reset after restart (reset connection) or error .....	31
Table 11	– Safety Slave PDU for 4 octets of safety data with command = Reset for acknowledging a Reset command from the FSoE Master .....	31
Table 12	– Safety Slave PDU for 4 octets of safety data with command = Reset after restart (reset connection) or error .....	32

Table 13 – Safety Master PDU for 4 octets of safety data with command = Session.....	32
Table 14 – Safety Slave PDU for 4 octets of safety data with command = Session.....	33
Table 15 – Safety data transferred in the connection state.....	33
Table 16 – Safety Master PDU for 4 octets of safety data in Connection state .....	34
Table 17 – Safety Slave PDU for 4 octets of safety data in Connection state .....	34
Table 18 – Safety data transferred in the parameter state.....	35
Table 19 – First Safety Master PDU for 4 octets of safety data in parameter state .....	35
Table 20 – First Safety Slave PDU for 4 octets of safety data in parameter state .....	36
Table 21 – Second Safety Master PDU for 4 octets of safety data in parameter state .....	36
Table 22 – Second Safety Slave PDU for 4 octets of safety data in parameter state .....	37
Table 23 – Safety Master PDU for 4 octets of ProcessData in data state .....	37
Table 24 – Safety Slave PDU for 4 octets of ProcessData in data state .....	38
Table 25 – Safety Master PDU for 4 octets of fail-safe data in data state .....	38
Table 26 – Safety Slave PDU for 4 octets of fail-safe data in data state.....	39
Table 27 – FSoE communication error .....	39
Table 28 – FSoE communication error codes.....	40
Table 29 – States of the FSoE Master.....	40
Table 30 – Events in the FSoE Master state table.....	42
Table 31 – Functions in the FSoE Master state table .....	42
Table 32 – Variables in the FSoE Master state table.....	43
Table 33 – Macros in the FSoE Master state table .....	43
Table 34 – States of the FSoE Slave .....	58
Table 35 – Events in the FSoE Slave state table.....	60
Table 36 – Functions in the FSoE Slave state table .....	60
Table 37 – Variables in the FSoE Slave state table.....	61
Table 38 – Macros in the FSoE Slave state table .....	61
Table 39 – FSoE Communication parameters .....	82
Table 40 – Indicator States .....	82
Table 41 – FSoE STATUS indicator states.....	83
Table 42 – Definition of times .....	85
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 – Basic FSCP 12/1 system.....	19
Figure 4 – FSCP 12/1 software architecture.....	21
Figure 5 – FSoE Cycle.....	23
Figure 6 – FSCP 12/1 communication structure .....	23
Figure 7 – Safety PDU for CPF 12 embedded in Type 12 PDU.....	24
Figure 8 – FSCP 12/1 node states .....	30
Figure 9 – State diagram for FSoE Master .....	41
Figure 10 – State diagram for FSoE Slave .....	59
Figure 11 – Indicator flash rates .....	83

Figure 12 – Components of a safety function .....	84
Figure 13 – Calculation of the FSoE Watchdog times for input and output connections .....	85
Figure 14 – Calculation of the worst case safety function response time .....	86
Figure 15 – Safety PDU embedded in standard PDU .....	88
Figure 16 – Residual error rate for 8/16/24 bit safety data and up to 12 144 bit standard data.....	89

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### INDUSTRIAL COMMUNICATION NETWORKS – PROFILES –

#### Part 3-12: Functional safety fieldbuses – Additional specifications for CPF 12

#### FOREWORD

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International Standard IEC 61784-3-12 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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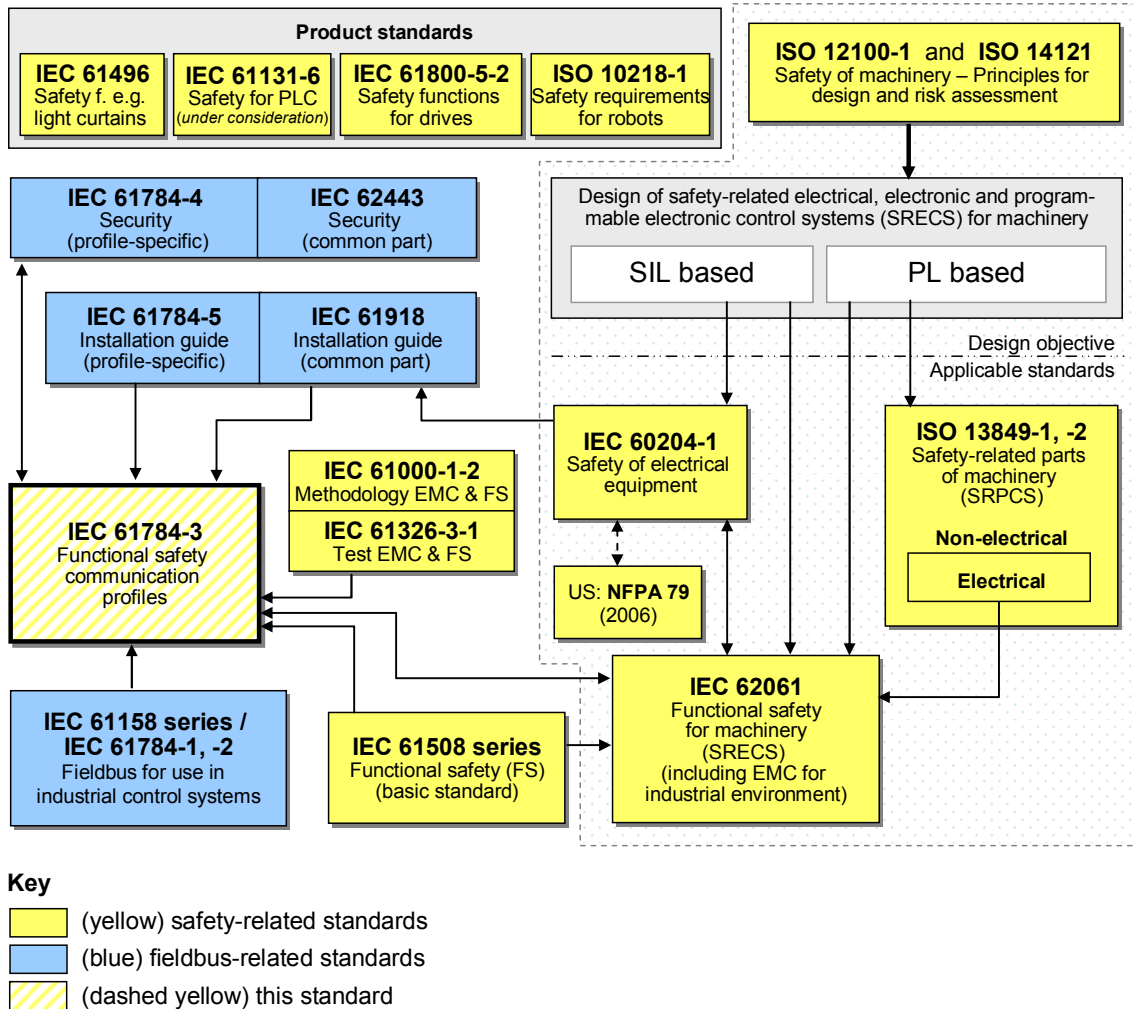
## 0 Introduction

### 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.

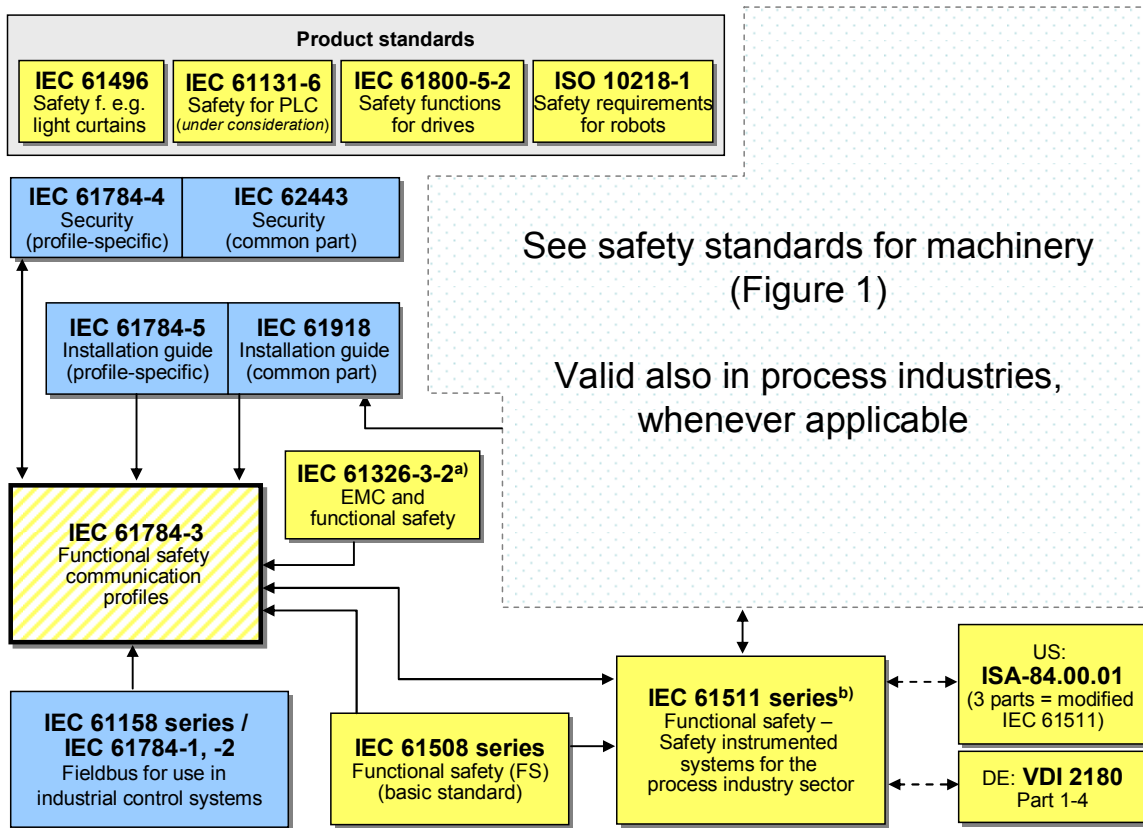


NOTE Subclauses 6.7.6.4 (high complexity) and 6.7.8.1.6 (low complexity) of IEC 62061 specify the relationship between PL (Category) and SIL.

**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 12 as follows, where the [xx] notation indicates the holder of the patent right:

DE 10 2004 044 764.0 [BE] Datenübertragungsverfahren und Automatisierungssystem zum Einsatz eines solchen Datenübertragungsverfahrens

EP 05 733 921.0 [BE] Sicherheitssteuerung

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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:

[BE] Beckhoff Automation GmbH  
Eiserstrasse 5, 33415 Verl  
GERMANY

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 3-12: Functional safety fieldbuses – Additional specifications for CPF 12

#### 1 Scope

This part of the IEC 61784-3 series specifies a safety communication layer (services and protocol) based on CPF 12 of IEC 61784-2 and IEC 61158 Type 12. 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 60204-1, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

IEC 61131-2, *Programmable controllers – Part 2: Equipment requirements and tests*

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

IEC 61158-3-12, *Industrial communication networks – Fieldbus specifications – Part 3-12: Data-link layer service definition – Type 12 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 61158-4-12, *Industrial communication networks – Fieldbus specifications – Part 4-12: Data-link layer protocol specification – Type 12 elements*

IEC 61158-5-12, *Industrial communication networks – Fieldbus specifications – Part 5-12: Application layer service definition – Type 12 elements*

IEC 61158-6-12, *Industrial communication networks – Fieldbus specifications – Part 6-12: Application layer protocol specification – Type 12 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 61784-2, *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*

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

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<sup>3</sup> In preparation.