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INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1

AMENDEMENT 1

Industrial communication networks – Profiles – Part 3-18: Functional safety fieldbuses – Additional specifications for CPF 18

Réseaux de communication industriels – Profils – Partie 3-18: Bus de terrain de sécurité fonctionnelle – Spécifications supplémentaires pour le CPF 18

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FOREWORD

This amendment has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

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

FDIS	Report on voting
65C/851/FDIS	65C/854/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 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- withdrawn,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.

5 General

5.2 Safety functional requirements

Add, in this subclause, at the end of the list, the following new items:

- For devices using protocol version 2 (see 7.1.3.4) it is required to add 10^{-9} to the PFH of the device hardware to account for the communication channel.

  NOTE In this way, the user of the device will not have to account for the number of logical connections within a safety function.

- The use of error correction mechanisms in the black channel is permitted.

7 Safety communication layer protocol

7.1.2.1 SPDO structure

Replace, in this subclause, the existing Table 4 by the following new table:

Table 4 – SPDO PDU structure

Octet offset	Data field	Description
0 to 2	PID	Packet ID
3	Length	Length of the complete packet in octets
4 to 4+*n*-1	Safety data 1	Mapped safety application process data
4+*n* to 5+*n*	SID 1	Safety ID of the sender
6+*n* to 6+*n*+*m*-1	Consecutive number 1	Consecutive number for sequencing and application monitoring where: *m* = 1 for protocol version 1 *m* = 3 for protocol version 2
7+*n*+*m* to 10+*n*+*m*	CRC 1	32 bit cyclic redundancy check covering data fields PID, safety data 1, SID 1 and consecutive number 1
11+*n*+*m* to 11+2*n*-1+*m*	Safety data 2	Copy of mapped safety application process data
11+2*n*+*m* to 12+2*n*+*m*	SID 2	Copy of SID 1
13+2*n*+*m* to 13+2*n*+2*m*-1	Consecutive number 2	Copy of consecutive number 1
14+2*n*+2*m* to 17+2*n*+2*m*	CRC 2	32 bit cyclic redundancy check covering data fields PID, safety data 2, SID 2 and consecutive number 2

NOTE 1 *n* is the length in octets of the data field safety data 1 (safety data 2).

NOTE 2 *m* is the length of the consecutive number depending on the protocol version (see 7.1.3.4).

7.1.2.4 Safety data

Replace, in this subclause, second paragraph:

"117 octets" *by* "115 octets for protocol version 2 or respectively 117 octets for protocol version 1".

7.1.2.6 SPDO consecutive number

Replace, in this subclause, "an 8 bit" *by* "a".

Add, at the end of this subclause, the following text:

The size of the consecutive number depends on the protocol version (see 7.1.3.4) and is 1 octet for protocol version 1 and 3 octets for protocol version 2.

7.1.2.7 SPDO CRC

Delete, in this subclause, first paragraph, "length".

7.1.3.1.1 SHB request PDU

Table 5 – SHB request PDU structure

Replace, in this subclause, the existing Table 5 by the following new table:

Table 5 – SHB request PDU structure

Octet offset	Data field	Description
0 to 2	PID	Packet ID
3	Length	Length of the complete packet in octets
4	SCL state 1	SALMT state (see Table 7)
5 to 5+*n*-1	Safety AP state 1	Safety application process state (implementation specific)
6+*n* to 7+*n*	SID 1	Safety ID of the sender
8+*n* to 8+*n*+*m*-1	Consecutive number 1	Consecutive number for sequencing and application monitoring where: *m* = 1 for protocol version 1 *m* = 3 for protocol version 2
9+*n*+*m* to 12+*n*+*m*	CRC 1	32 bit cyclic redundancy check covering data fields PID, SCL state 1, Safety AP state 1, SID 1 and consecutive number 1
13+*n*+*m*	SCL state 2	Copy of SALMT state 1
14+*n*+*m* to 14+2*n*+*m*-1	Safety AP state 2	Copy of safety application process state 1
15+2*n*+*m* to 16+2*n*+*m*	SID 2	Copy of SID 1
17+2*n*+*m* to 17+2*n*+2*m*-1	Consecutive number 2	Copy of consecutive number 1
18+2*n*+2*m* to 21+2*n*+2*m*	CRC 2	32 bit cyclic redundancy check covering data fields PID, SCL state 2, Safety AP state 2, SID 2 and consecutive number 2
NOTE 1 *n* is the length in octets of the data field Safety AP state. NOTE 2 *m* is the length of the consecutive number, depending on the protocol version (see 7.1.3.4).		

7.1.3.1.2 SHB response PDU

Table 6 – SHB response PDU structure

Replace, in this subclause, the existing Table 6 by the following new table:

Table 6 – SHB response PDU structure

Octet offset	Data field	Description
0 to 2	PID	Packet ID
3	Length	Length of the complete packet in octets
4 to 5	SID 1	Safety ID of the sender
6 to 6+*m*-1	Consecutive number 1	Consecutive number for sequencing and application monitoring where: *m* = 1 for protocol version 1 *m* = 3 for protocol version 2
7+*m* to 10+*m*	CRC 1	32 bit cyclic redundancy check covering data fields PID, SID 1 and consecutive number 1
11+*m* to 12+*m*	SID 2	Copy of SID 1
13+*m* to 13+2*m*-1	Consecutive number 2	Copy of consecutive number 1
14+2*m* to 17+2*m*	CRC 2	32 bit cyclic redundancy check covering data fields PID, SID 2 and consecutive number 2
NOTE *m* is the length of the consecutive number, depending on the protocol version (see 7.1.3.4).		

7.1.3.4 SHB safety communication layer state

Table 7 – SHB safety communication layer state encoding

Replace, in this subclause, the existing Table 7 by the following new table:

Table 7 – SHB safety communication layer state encoding

Value	Description	Protocol
0x00	FS FAL is in BOOTUP state	Version 1
0x04	FS FAL is in STOPPED state	Version 1
0x05	FS FAL is in OPERATIONAL state	Version 1
0x7F	FS FAL is in PRE-OPERATIONAL state	Version 1
0x10	FS FAL is in BOOTUP state	Version 2
0x14	FS FAL is in STOPPED state	Version 2
0x15	FS FAL is in OPERATIONAL state	Version 2
0x1F	FS FAL is in PRE-OPERATIONAL state	Version 2

Add, in this subclause, after Table 7, as last paragraph:

The device shall support at least one protocol version. The FS FAL state shall be encoded according to Table 7 depending on the used protocol version. It is recommended to support all protocol versions.

7.1.3.5 SHB safety AP state

Replace, in the last sentence of this subclause: “116 octets” *by* “114 octets for protocol version 2 or respectively 116 octets for protocol version 1”.

7.1.3.7 SHB consecutive number

Replace, in this subclause: “an 8 bit” *by* “a”.

Add, at the end of this subclause:

The size of the consecutive number depends on the protocol version (see 7.1.3.4) and is 1 octet for protocol version 1 and 3 octets for protocol version 2.

7.1.3.8 SHB CRC

Delete, in this subclause, first paragraph: ”length, ”.

9 System requirements

9.7 Safety manual

Add, in this subclause, at the end of the list, the following new items:

- Probability of failure on demand PFH;
- Safety integrity level SIL;
- Proof test interval T_1 (per IEC 61508-6) and/or Mission T_m (per ISO 13849-1);
- Supported protocol version(s) (see 7.1.3.4) unless only protocol version 1 is supported.