

INTERNATIONAL STANDARD



Industrial ~~communication~~ networks – Profiles –
Part 5-6: Installation of fieldbuses – Installation profiles for CPF

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Industrial ~~communication~~ networks – Profiles –
Part 5-6: Installation of fieldbuses – Installation profiles for CPF

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	2
1 Scope.....	9
2 Normative references	9
3 Terms, definitions and abbreviated terms	9
4 CPF 6: Overview of installation profiles	10
5 Installation profile conventions.....	10
6 Conformance to installation profiles.....	10
Annex A (normative) CPF 6 Type 8 network specific installation profile.....	12
A.1 Installation profile scope	12
A.2 Normative references.....	12
A.3 Installation profile terms, definitions, and abbreviated terms	13
A.3.1 Terms and definitions	13
A.3.2 Abbreviated terms	14
A.3.3 Conventions for installation profiles	14
A.4 Installation planning.....	14
A.4.1 General	14
A.4.2 Planning requirements.....	15
A.4.3 Network capabilities.....	16
A.4.4 Selection and use of cabling components	20
A.4.5 Cabling planning documentation.....	29
A.4.6 Verification of cabling planning specification.....	29
A.5 Installation implementation.....	29
A.5.1 General requirements.....	29
A.5.2 Cable installation	29
A.5.3 Connector installation	32
A.5.4 Terminator installation	34
A.5.5 Device installation	34
A.5.6 Coding and labelling	34
A.5.7 Earthing and bonding of equipment and devices and shield cabling	34
A.5.8 As-implemented cabling documentation.....	34
A.6 Installation verification and installation acceptance test	34
A.6.1 General	34
A.6.2 Installation verification	34
A.6.3 Installation acceptance test	35
A.7 Installation administration	36
A.8 Installation maintenance and installation troubleshooting.....	36
Annex B (normative) CPF 6 Ethernet network specific installation profile	37
B.1 Installation profile scope	37
B.2 Normative references.....	37
B.3 Installation profile terms, definitions, and abbreviated terms	38
B.3.1 Terms and definitions	38
B.3.2 Abbreviated terms	38
B.3.3 Conventions for installation profiles	38
B.4 Installation planning.....	38
B.4.1 General	38

B.4.2	Planning requirements	39
B.4.3	Network capabilities	40
B.4.4	Selection and use of cabling components	43
B.4.5	Cabling planning documentation	49
B.4.6	Verification of cabling planning specification	49
B.5	Installation implementation	49
B.5.1	General requirements	49
B.5.2	Cable installation	49
B.5.3	Connector installation	51
B.5.4	Terminator installation	51
B.5.5	Device installation	51
B.5.6	Coding and labelling	51
B.5.7	Earthing and bonding of equipment and devices and shield cabling	51
B.5.8	As-implemented cabling documentation	52
B.6	Installation verification and installation acceptance test	52
B.6.1	General	52
B.6.2	Installation verification	52
B.6.3	Installation acceptance test	52
B.7	Installation administration	52
B.8	Installation maintenance and installation troubleshooting	52
Bibliography		53
Figure 1	Standards relationships	8
Figure A.1	Type 8 network structure example	17
Figure A.2	Example of a Type 8 network configuration	18
Figure A.3	Sub-D connector pin assignment	32
Figure A.4	M23 circular connector pin assignment	33
Figure A.5	M12 circular connector pin assignment	33
Figure A.6	Terminal connector at the device	33
Figure B.1	Terminal connector at the device	51
Table A.1	Basic network characteristics for balanced cabling not based on Ethernet	19
Table A.2	Network characteristics for optical fibre cabling	20
Table A.3	Information relevant to balanced cable: fixed cables	21
Table A.4	Information relevant to balanced cable: cords	22
Table A.5	Remote bus fibre optic cable length	24
Table A.6	Connectors for copper cabling CPs not based on Ethernet	24
Table A.7	Optical fibre connecting hardware	25
Table A.8	Relationship between FOC and fibre types (Type 8 networks)	25
Table A.9	Colour code for balanced cables used by Type 8 networks	27
Table A.10	Parameters for balanced cables	29
Table A.11	Parameters for silica optical fibre cables	30
Table A.12	Parameters for POF optical fibre cables	30
Table A.13	Parameters for hard clad silica optical fibre cables	31
Table A.14	Pin assignment of the terminal connector	33
Table B.1	Network characteristics for balanced cabling based on Ethernet	41

Table B.2 – Network characteristics for optical fibre cabling.....	42
Table B.3 – Information relevant to copper cable: fixed cables.....	43
Table B.4 – Information relevant to copper cable: cords.....	44
Table B.5 – Information relevant to optical fibre cables.....	45
Table B.6 – Connectors for balanced cabling CPs based on Ethernet.....	46
Table B.7 – Connectors for copper cabling CPs not based on Ethernet.....	46
Table B.8 – Optical fibre connecting hardware.....	47
Table B.9 – Relationship between FOC and fibre types (CP 6/2 Ethernet network).....	47
Table B.10 – Parameters for balanced cables.....	49
Table B.11 – Parameters for silica optical fibre cables.....	49
Table B.12 – Parameters for POF optical fibre cables.....	50
Table B.13 – Parameters for hard clad silica optical fibre cables.....	50

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL ~~COMMUNICATION~~ NETWORKS –
PROFILES –****Part 5-6: Installation of fieldbuses –
Installation profiles for CPF 6**

FOREWORD

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61784-5-6:2018. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61784-5-6 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 document is to be used in conjunction with IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024.

This fifth edition cancels and replaces the fourth edition published in 2018. This edition constitutes a technical revision.

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

- a) alignment with IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024;
- b) addition of new content related to Single Pair Ethernet (SPE) in Annex B, Table B.1, Table B.3, Table B.4, Table B.6.

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

Draft	Report on voting
65C/1283/FDIS	65C/1297/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 the 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/publications.

A list of all parts of IEC 61784-5 series, under the general title *Industrial networks – Profiles – Installation of 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

INTRODUCTION

This document is one of a series produced to facilitate the use of communication networks in industrial control systems.

IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024 provide the common requirements for the installation of communication networks in industrial control systems. This installation profile document provides the installation profiles of the communication profiles (CP) of a specific communication profile family (CPF) by stating which requirements of IEC 61918 fully apply and, where necessary, by supplementing, modifying, or replacing the other requirements (see Figure 1).

For general background on fieldbuses, their profiles, and relationship between the installation profiles specified in this document, see IEC 61158-1.

Each CP installation profile is specified in a separate annex of this document. Each annex is structured exactly as the reference document IEC 61918 for the benefit of the persons representing the roles in the fieldbus installation process as defined in IEC 61918 (planner, installer, verification personnel, validation personnel, maintenance personnel, administration personnel). By reading the installation profile in conjunction with IEC 61918, these persons immediately know which requirements are common for the installation of all CPs and which are modified or replaced. The conventions used to draft this document are defined in Clause 5.

The provision of the installation profiles in one document for each CPF (for example IEC 61784-5-6 for CPF 6) allows readers to work with documents of a convenient size.

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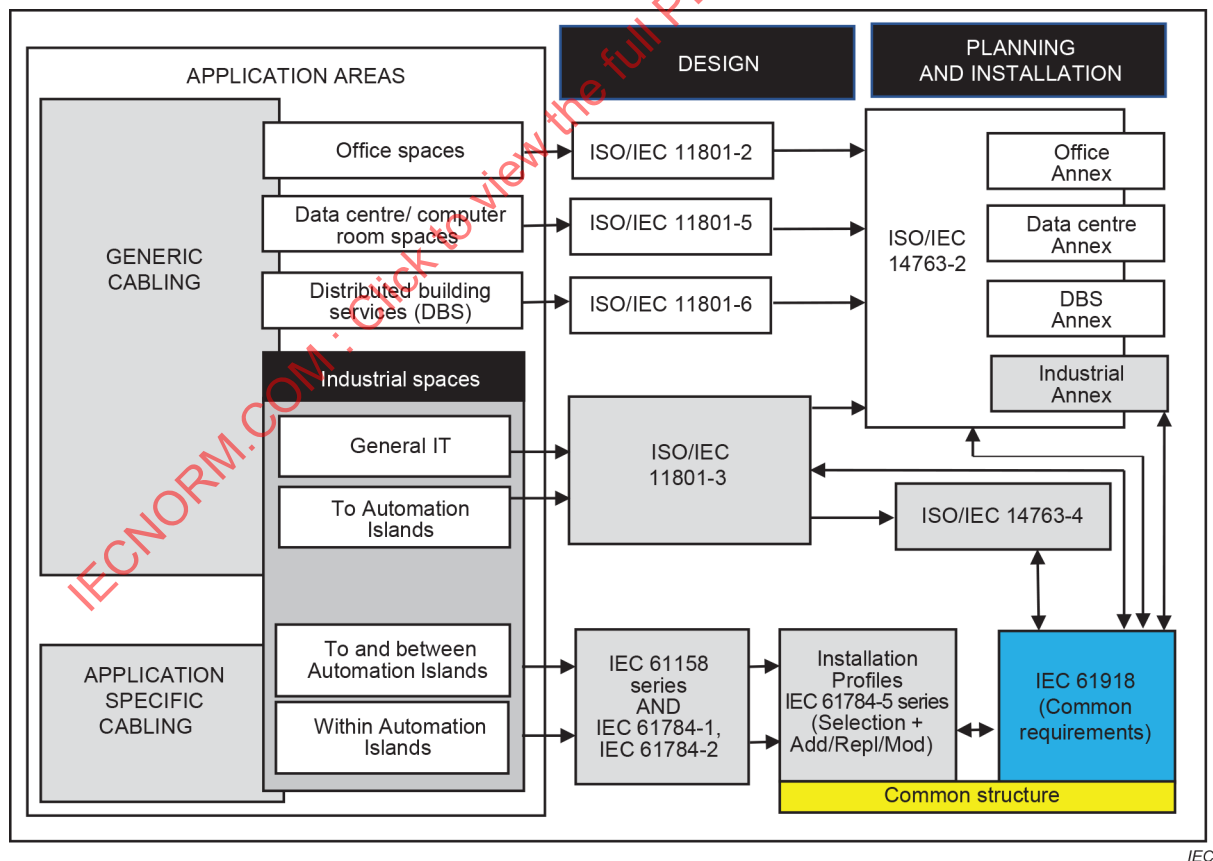
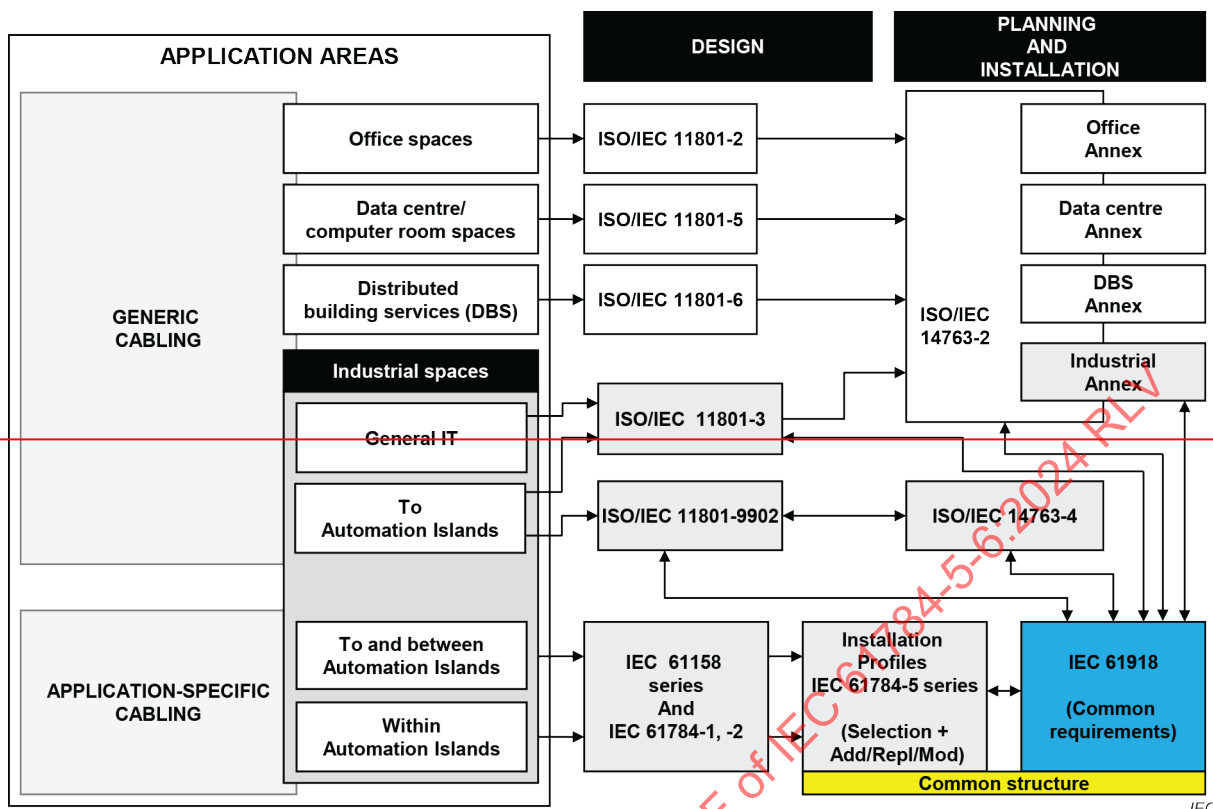


Figure 1 – Standards relationships

INDUSTRIAL ~~COMMUNICATION~~ NETWORKS – PROFILES –

Part 5-6: Installation of fieldbuses – Installation profiles for CPF 6

1 Scope

This part of IEC 61784-5 specifies the installation profiles for CPF 6 (INTERBUSTM)¹.

The installation profiles are specified in the annexes. These annexes are read in conjunction with IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024.

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 61918:2018², *Industrial communication networks – Installation of communication networks in industrial premises*

IEC 61918:2018/AMD1:2022

IEC 61918:2018/AMD2:2024

~~The normative references of IEC 61918:2018, Clause 2, apply.~~

NOTE For profile specific normative references, see Clauses A.2, B.2.

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms, definitions and abbreviated terms given in IEC 61918:2018, Clause 3, IEC 61918:2018/AMD1:2022, Clause 3, and Clauses A.3, B.3 of this document apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

~~NOTE For profile specific terms, definitions and abbreviated terms see Clauses A.3 and B.3.~~

¹ INTERBUSTM is a trade name of INTERBUS Club, an independent organisation of users and vendors of INTERBUS products. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name INTERBUS. Use of the trade name INTERBUS requires permission of the trade name holder.

² The normative references of IEC 61918:2018, Clause 2, IEC 61918:2018/AMD1:2022, Clause 2 and IEC 61918:2018/AMD2:2024, Clause 2, apply.

4 CPF 6: Overview of installation profiles

CPF 6 consists of seven communication profiles (see IEC 61784-1:— for CP 6/1, CP 6/2, CP 6/3, see IEC 61784-2:— for CP 6/4, CP 6/5, CP 6/6, see IEC 61784-3-6 for FSCP 6/7).

The CPF 6 Type 8 network (non-Ethernet-based) installation profile is specified in Annex A.

The CPF 6 Ethernet network specific installation profile is specified in Annex B.

5 Installation profile conventions

The numbering of the clauses and subclauses in the annexes of this document corresponds to the numbering of IEC 61918:2018 main clauses and subclauses.

The annex clauses and subclauses of this document supplement, modify, or replace the respective clauses and subclauses in IEC 61918.

Where there is no corresponding subclause of IEC 61918 in the normative annexes in this document, the subclause of IEC 61918 applies without modification.

The annex heading letter represents the installation profile assigned in Clause 4. The annex (sub)clause numbering following the annex letter shall represent the corresponding (sub)clause numbering of IEC 61918.

EXAMPLE "Subclause B.4.4" in IEC 61784-5-6 means that CP 6/2 specifies the Subclause 4.4 of IEC 61918.

All main clauses of IEC 61918 are cited and apply in full unless otherwise stated in each normative installation profile annex.

If all subclauses of a (sub)clause are omitted, then the corresponding IEC 61918 (sub)clause applies.

If in a (sub)clause it is written "Not applicable", then the corresponding IEC 61918 (sub)clause does not apply.

If in a (sub)clause it is written "Addition:", then the corresponding IEC 61918 (sub)clause applies with the additions written in the profile.

If in a (sub)clause it is written "Replacement:", then the text provided in the profile replaces the text of the corresponding IEC 61918 (sub)clause.

NOTE A replacement can also comprise additions.

If in a (sub)clause it is written "Modification:", then the corresponding IEC 61918 (sub)clause applies with the modifications written in the profile.

If all (sub)clauses of a (sub)clause are omitted but in this (sub)clause it is written "(Sub)clause *x* has addition:" (or "replacement:") or "(Sub)clause *x* is not applicable.", then (sub)clause *x* becomes valid as declared and all the other corresponding IEC 61918 (sub)clauses apply.

6 Conformance to installation profiles

Each installation profile within this document includes part of IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024. It may also include defined additional specifications.

A statement of compliance with an installation profile of this document shall be stated³ as either

Compliance ~~to~~ with IEC 61784-5-6:⁴2024 for CP 6/m <name> or

Compliance ~~to~~ with IEC 61784-5-6 (Ed. ⁴5.0) for CP 6/m <name>

where the name within the angle brackets < > is optional and the angle brackets are not to be included. The m within CP 6/m shall be replaced by the profile number 1 to 2.

NOTE The name can be the name of the profile, for example INTERBUS.

If the name is a trade name, then the permission of the trade name holder shall be required.

Product documents shall not include any conformity assessment aspects (including quality management provisions), neither normative nor informative, other than provisions for product testing (evaluation and examination).

³~~In accordance with ISO/IEC Directives.~~

⁴~~The date should not be used when the edition number is used.~~

Annex A (normative)

CPF 6 Type 8 network specific installation profile

A.1 Installation profile scope

Addition:

This annex specifies the installation profile for CPF 6 Type 8 networks and the related Communication Profiles:

- CP 6/1, CP 6/2, CP 6/3 – specified in IEC 61784-1;
- CP 6/4, CP 6/5, CP 6/6 – specified in IEC 61784-2;
- FSCP 6/7 – specified in IEC 61784-3-6.

A.2 Normative references

Addition:

IEC 60189-1:2007/2018, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*

IEC 60794-1-2, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures – General guidance*

~~IEC 61076-2-109 Connectors for electronic equipment – Product requirements – Part 2-109: Circular connectors – Detail specification for connectors M 12 × 1 with screw locking, for data transmissions with frequencies up to 500 MHz~~

IEC 61076-3-123, *Connectors for electronic equipment – Product requirements – Part 3-123: Rectangular connectors – Detail specification for hybrid connectors for industrial environments, for power supply and fibre optic data transmission, with push-pull locking*⁵

IEC 61156-1:2007⁶, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

~~IEC 61156-5, Multicore and symmetrical pair/quad cables for digital communications – Part 5: Symmetrical pair/quad cables with transmission characteristics up to 600 MHz – Horizontal floor wiring – Sectional specification~~

IEC 61754-24-21, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 24-21: Type SC-RJ connectors with protective housings based on IEC 61076-3-106, variant 06*

IEC 61754-27, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 27: Type M12 FO connector family*

⁵ ~~Under preparation. Stage at the time of publication: IEC/CDV 61076-3-123:2017.~~

⁶ A 2023 edition of this document exists but the listed edition applies.

A.3 Installation profile terms, definitions, and abbreviated terms

A.3.1 Terms and definitions

Addition:

A.3.1.8793

bus coupler

device that divides the Type 8 network into segments by opening the ring and integrating another ring at this point

A.3.1.8894

local bus

ring segment of a Type 8 network with alternate media specifications, which is coupled to a remote bus device via a bus coupler

A.3.1.8995

local bus device

device that operates as a slave on a local bus

A.3.1.9096

master

device that controls the data transfer on the Type 8 network and initiates the media access of the slaves by sending messages and that constitutes the interface to the control system

A.3.1.9197

remote bus

ring segment of a network

A.3.1.9298

remote bus device

device operating as a slave on a remote bus

A.3.1.9399

remote bus link

connection of two remote bus devices

A.3.1.94100

ring segment

one section of a Type 8 network

A.3.1.95101

slave

device that accesses the medium only after it has been initiated by the preceding slave or master

A.3.2 Abbreviated terms

Addition:

BC	Bus coupler
COM	Ground line
/DI	Incoming interface: send data line – Outgoing interface: receive data line –
DI	Incoming interface: send data line + Outgoing interface: receive data line +
/DO	Incoming interface: receive data line – Outgoing interface: send data line –
DO	Incoming interface: receive data line + Outgoing interface: send data line +
PELV	Protective extra low voltage
POF	Plastic optical fibre
SELV	Safety extra low voltage

A.3.3 Conventions for installation profiles

Not applicable.

A.4 Installation planning

A.4.1 General

A.4.1.1 Objective

A.4.1.2 Cabling in industrial premises

A.4.1.3 The planning process

A.4.1.4 Specific requirements for CPs

Not applicable.

A.4.1.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.2 Planning requirements

A.4.2.1 Safety

A.4.2.1.1 General

A.4.2.1.2 Electrical safety

Addition:

The power distribution system shall comply with IEC 60364-1:2005, 312.2.1 TN-S systems, i.e. earthed by bonding of enclosures with separated conductors for neutral (N) and protection earth (PE). Otherwise, there are additional efforts necessary to avoid currents on the shield, i.e. an AC earthed system on one end in a network with balanced cables or a network built with FO-cables. For networks built with OF-cables, the power distribution system should comply with IEC 60364-1:2005, 312.2.1 TN-S systems.

PELV is the default version for the power supply with extra-low voltage, but SELV may also be used. Temporary connected devices shall be powered by PELV or SELV.

A.4.2.1.3 Functional safety

A.4.2.1.4 Intrinsic safety

Not applicable.

A.4.2.1.5 Safety of optical fibre communication systems

A.4.2.2 Security

A.4.2.3 Environmental considerations and EMC

A.4.2.3.1 Description methodology

A.4.2.3.2 Use of the described environment to produce a bill of material

Addition:

To make fieldbus installation work easier for inexperienced planners, the user shall determine suitability of the components for the targeted environment through agreements with the component providers. The planner shall also observe the related technical data from the active devices. Depending on the expected environment the planner should define additional requirements. Passive optical components in the harsh industrial environment should be protected with suitable mitigation techniques or tested according to IEC 61753-1.

The planner shall take into account the mating or terminating interface of devices to be connected to the fieldbus network.

The planner shall take care about the environmental conditions of the whole Type 8 network and select suitable mitigation techniques to meet the respective requirements. ~~Products necessary for mitigation also shall be mentioned in the bill of material.~~ Specific requirements for generic cabling in accordance with ISO/IEC 11801-3.

A.4.2.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.3 Network capabilities

A.4.3.1 Network topology

A.4.3.1.1 Common description

A.4.3.1.2 Basic physical topologies for passive networks

Not applicable.

A.4.3.1.3 Basic physical topologies for active networks

Replacement:

For Type 8 networks only the ring topology specified in IEC 61158-2 shall be used.

NOTE The Type 8 ring topology is achieved with specific cables and resembles a linear tree topology. Further explanation of the physical layer of Type 8 networks can be found in IEC 61158-2.

A.4.3.1.4 Combination of basic topologies

Replacement:

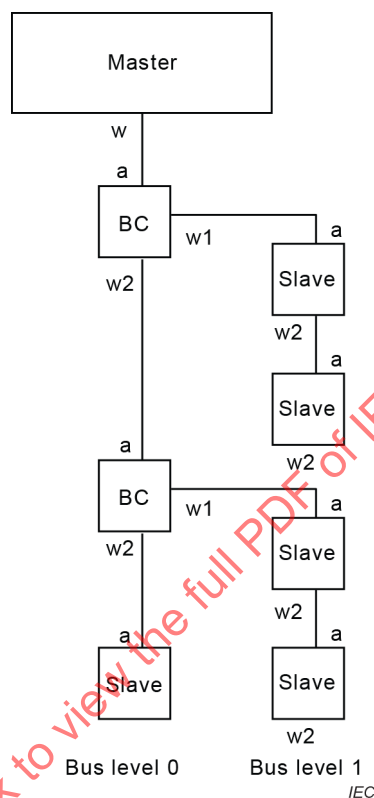
The combination of several topologies may also be used according to A.4.3.1.5.

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A.4.3.1.5 Specific requirements for CPs

Addition:

The general structure is a ring topology with special cables to build tree like configurations. Bus couplers allow a branch from the remote bus to the local bus or to a further remote bus. Figure A.1 shows a Type 8 network structure example. There is no limit for the sub-leveling of remote buses. Only one local bus can be connected to a remote bus. A maximum of 63 devices can be connected to one local bus.



Key

w outgoing interface of the master

a incoming interface of a slave

w1 first outgoing interface of a slave

w2 second outgoing interface of a slave

The ring segment level is increased when the devices are connected to w1.

Figure A.1 – Type 8 network structure example

The remote bus link length (i.e. the cable between two devices on a remote bus link) shall be between 0 m and the maximum length for the used bit rate (see Table A.1). The local bus link length (i.e. the cable between two devices on a local bus link) shall be between 0 m and 10 m. Figure A.2 shows a Type 8 network configuration example with bus length indications.

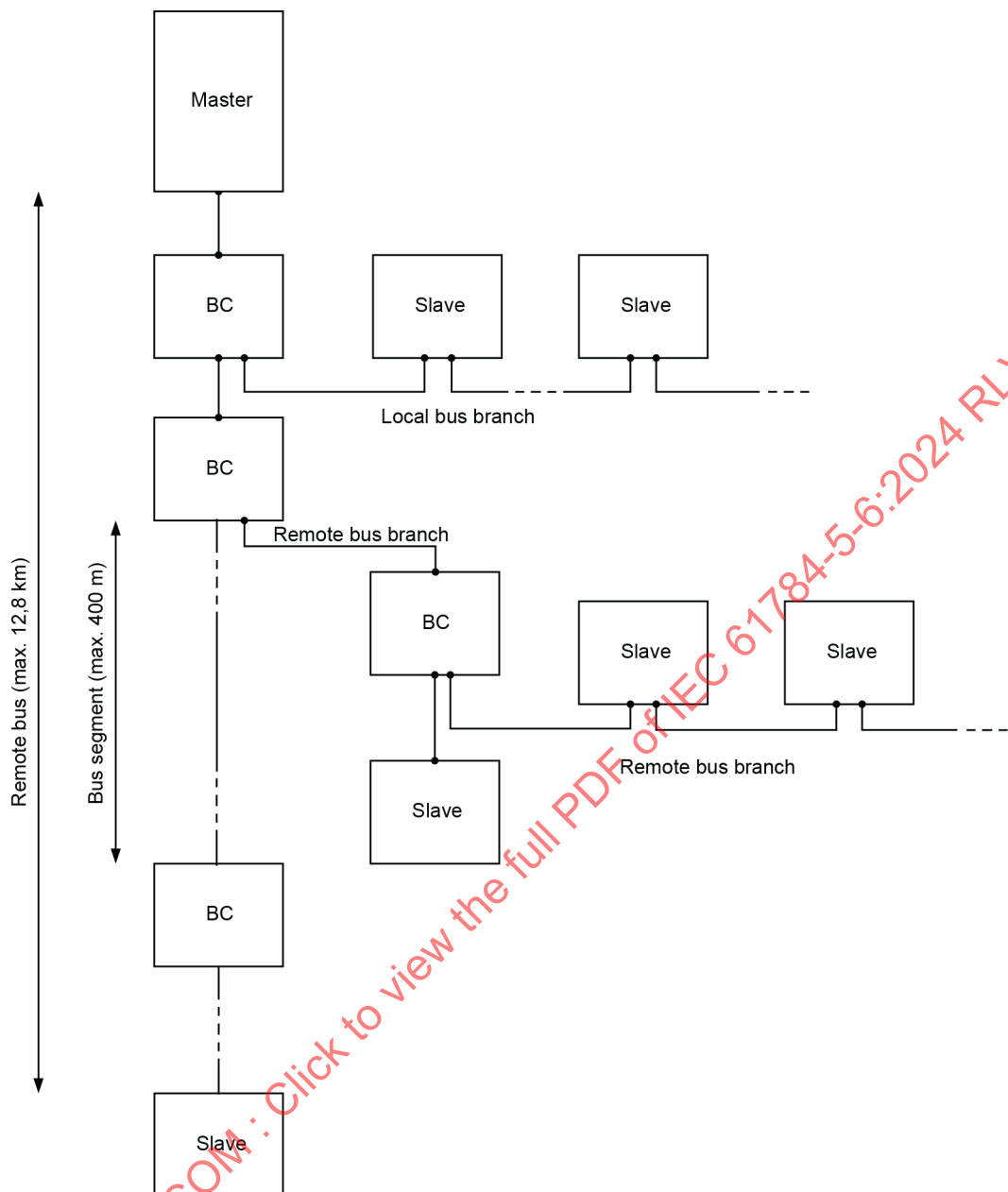


Figure A.2 – Example of a Type 8 network configuration

A.4.3.1.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.3.2 Network characteristics

A.4.3.2.1 General

A.4.3.2.2 Network characteristics for balanced cabling not based on Ethernet

Replacement:

Table A.1 provides values based on the template given in IEC 61918:2018. Table 1.

Table A.1 – Basic network characteristics for balanced cabling not based on Ethernet

Characteristic	Type 8 network
Basic transmission technology	Type 8
Length / transmission speed	Segment length m
500 kbit/s	400 m between nodes ^a
2 Mbit/s	150 m between nodes ^a
8 Mbit/s	125 m between nodes ^a
16 Mbit/s	100 m between nodes ^a
Maximum capacity	Max. No.
Devices / segment	Remote bus: 256 ^b Local bus: 63 ^b
Number of devices / networks	Remote bus: 256 ^b Local bus: 256 ^b
^a The maximum length of a Type 8 network depends on the number of devices supported by the master and could be calculated by multiplication of link length by the number of devices. ^b The maximum number of all devices in one Type 8 network is limited to 256.	

A.4.3.2.3 Network characteristics for balanced cabling based on Ethernet

Not applicable.

A.4.3.2.4 Network characteristics for optical fibre cabling

Replacement:

Table A.2 provides values based on the template given in IEC 61918:2018, Table 3.

Table A.2 – Network characteristics for optical fibre cabling

Type 8 network		
Optical fibre type	Description	
Single mode silica	Bandwidth (MHz) or equivalent at λ (nm)	1 310 nm
	Minimum length (m)	0
	Maximum length ^a (m)	15 000
	Maximum channel Insertion loss/optical power budget (dB)	See IEC 61158-2
	Connecting hardware	See A.4.4.2.5
Multimode silica	Modal bandwidth (MHz × km) at λ (nm)	1 300 nm
	Minimum length (m)	0
	Maximum length ^a (m)	3 000
	Maximum channel insertion loss/optical power budget (dB)	See IEC 61158-2
	Connecting hardware	See A.4.4.2.5
POF	Modal bandwidth (MHz × 100 m) at λ (nm)	650 nm
	Minimum length (m)	0
	Maximum length ^a (m)	70
	Maximum channel insertion loss/optical power budget (dB)	See IEC 61158-2
	Connecting hardware	See A.4.4.2.5
Hard clad silica	Modal bandwidth (MHz × km) at λ (nm)	650 nm
	Minimum length (m)	0
	Maximum length ^a (m)	400
	Maximum channel insertion loss/optical power budget (dB)	See IEC 61158-2
	Connecting hardware	See A.4.4.2.5
^a This value is reduced by connections, splices and bends in accordance with IEC 61918:2018, Formula (1) in 4.4.3.4.1.		

A.4.3.2.5 Specific network characteristics

Not applicable.

A.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4 Selection and use of cabling components**A.4.4.1 Cable selection****A.4.4.1.1 Common description****A.4.4.1.2 Copper cables****A.4.4.1.2.1 Balanced cables for Ethernet-based CPs**

Not applicable.

A.4.4.1.2.2 Copper cables for non-Ethernet-based CPs*Replacement:*

Table A.3 and Table A.4 provide values based on the template given in IEC 61918:2018, Table 4 and Table 5.

Table A.3 – Information relevant to balanced cable: fixed cables

Characteristic	Type 8 network
Nominal impedance of cable (tolerance)	120 $\Omega \pm 20\%$ at $f = 0,064$ MHz 100 $\Omega \pm 15\%$ at $f > 1$ MHz ~~Test method IEC 61156-1:2007, 6.3.1~~
DCR of conductors	max. 9,6 $\Omega / 100$ m ~~Test method IEC 60189-1:2007, 8.1~~
DCR of shield	-
Number of conductors	3 $\times$ 2, twisted pair
Shielding	Yes
Colour code for conductor	DO = yellow /DO = green DI = grey /DI = pink COM = brown
Jacket colour requirements	Green, RAL 6017
Jacket material	Application dependant
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	Cable types for different applications available
Agency ratings	Cable types with different ratings available
Cross section	Min. 0,20 mm ²
Dielectric strength	1 000 V RMS, 1 min
– Conductor/conductor	1 000 V RMS, 1 min
– Conductor/shield	Test method IEC 60189-1:20072018, 8.2
Insulation resistance (after dielectric strength test)	Min 150 M Ω for a cable of 1 km in length Test method IEC 60189-1:20072018, 8.3
Maximum transfer impedance – at 30 MHz	250 m Ω /m
Mutual capacitance (at 800 Hz)	Max. 60 nF for a cable of 1 km in length Test method IEC 60189-1:20072018, 8.4
Min. near end cross talk loss (NEXT) for a cable of 100 m	
– at 0,772 MHz	61 dB
– at 1 MHz	59 dB
– at 2 MHz	55 dB
– at 4 MHz	50 dB
– at 8 MHz	46 dB
– at 10 MHz	44 dB
– at 16 MHz	41 dB
– at 20 MHz	40 dB
	Test method IEC 61156-1:2007, 6.3.5

Characteristic	Type 8 network
Max. attenuation for a cable of 100 m	
– at 0,256 MHz	1,5 dB
– at 0,772 MHz	2,4 dB
– at 1 MHz	2,7 dB
– at 4 MHz	5,2 dB
– at 10 MHz	8,4 dB
– at 16 MHz	11,2 dB
– at 20 MHz	11,9 dB
	Test method IEC 61156-1:2007, 6.3.3

Table A.4 – Information relevant to balanced cable: cords

Characteristic	Type 8 network
Nominal impedance of cable (tolerance)	120 $\Omega \pm 20\%$ at $f = 0,064$ MHz 100 $\Omega \pm 15\%$ at $f > 1$ MHz ~~Test method IEC 61156-1:2007, 6.3.1~~
DCR of conductors	Max. 9,6 Ω / 100 m ~~Test method IEC 60189-1:2007, 8.1~~
DCR of shield	-
Number of conductors	3 $\times$ 2, twisted pair
Shielding	Yes
Colour code for conductor	DO = yellow /DO = green DI = grey /DI = pink COM = brown
Jacket colour requirements	Green, RAL 6017
Jacket material	Application dependant
Resistance to harsh environment (e.g., UV, oil resist, LS0H)	Cable types for different applications available
Agency ratings	Cable types with different ratings available
Cross section	min. 0,20 mm ²
Dielectric strength	1 000 V RMS, 1 min
– Conductor/conductor	1 000 V RMS, 1 min
– Conductor/shield	Test method IEC 60189-1:20072018, 8.2
Insulation resistance	Min 150 M Ω for a cable of 1 km in length
(After dielectric strength test)	Test method IEC 60189-1:20072018, 8.3
Maximum transfer impedance	
– at 30 MHz	250 m Ω / m
Mutual capacitance (at 800 Hz)	Max. 60 nF for a cable of 1 km in length
	Test method IEC 60189-1:20072018, 8.4

Characteristic	Type 8 network
Min. near end cross talk loss (NEXT) for a cable of 100 m	
– at 0,772 MHz	61 dB
– at 1 MHz	59 dB
– at 2 MHz	55 dB
– at 4 MHz	50 dB
– at 8 MHz	46 dB
– at 10 MHz	44 dB
– at 16 MHz	41 dB
– at 20 MHz	40 dB
	Test method IEC 61156-1:2007, 6.3.5
Max. attenuation for a cable of 100 m	
– at 0,256 MHz	1,5 dB
– at 0,772 MHz	2,4 dB
– at 1 MHz	2,7 dB
– at 4 MHz	5,2 dB
– at 10 MHz	8,4 dB
– at 16 MHz	11,2 dB
– at 20 MHz	11,9 dB
	Test method IEC 61156-1:2007, 6.3.3

A.4.4.1.3 Cables for wireless installation

A.4.4.1.4 Optical fibre cables

Replacement:

The planner shall select the appropriate optical fibre cable to support the required channel lengths and number of connections to be installed.

The cable shall be according to IEC 61158-2:2014/2023, 27.7.2 and 28.1.

Polymer optical fibre cable shall be detailed according to IEC 61158-2:2014/2023, 28.6.2.

Polymer clad optical fibre cable shall be detailed according to IEC 61158-2:2014/2023, 28.6.3.

A.4.4.1.5 Special purpose balanced and optical fibre cables

Addition:

The specification from additional mechanical data depends on the application. The electrical or optical data apply also for specific cabling (see Table A.5).

Table A.5 – Remote bus fibre optic cable length

Fibre type	Minimum length	Maximum length
Polymer optical fibre	0 m	50 m (see Notes 1, 2)
Plastic clad silica fibre	0 m	300 m (see Notes 1, 2)

NOTE 1 This does not exclude longer distances between two devices e.g. by using receive circuits with a lower minimum optical receiver sensitivity than specified.

NOTE 2 The maximum length can be reduced in cases where special cables with higher attenuation than the standard cables specified are used.

A.4.4.1.6 Specific requirements for CPs

Addition:

The specification from additional mechanical data depends on the application. The electrical or optical data apply also for specific cabling.

A.4.4.1.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.2 Connecting hardware selection

A.4.4.2.1 Common description

A.4.4.2.2 Connecting hardware for balanced cabling CPs based on Ethernet

Not applicable.

A.4.4.2.3 Connecting hardware for copper cabling CPs not based on Ethernet

Replacement:

Table A.6 provides values based on the template given in IEC 61918:2018, Table 8.

Table A.6 – Connectors for copper cabling CPs not based on Ethernet

	IEC 60807-2 or IEC 60807-3	IEC 61076-2-101			IEC 61169-8	ANSI/NFPA T3.5.29 R1-2007		Others		
	Sub-D	M12-5 A-coding	M12-5 B-coding	M12-n X-coding	Coaxial (BNC)	M 18	7/8-16 UN-2B THD	Open style	Terminal block	M23 9 pos
CPF 6 Type 8 network	Yes	No	Yes	No	No	No	No	Yes	Yes	Yes ^a

NOTE For M12-5 connectors, there are many applications using these connectors that are not compatible and when mixed can cause damage to the applications.

^a Hybrid connector as specified in IEC 61158-2:2023, Clause M.3.

A.4.4.2.4 Connecting hardware for wireless installation**A.4.4.2.5 Connecting hardware for optical fibre cabling**

Replacement:

Table A.7 provides values based on the template given in IEC 61918:2018, Table 9.

Table A.7 – Optical fibre connecting hardware

	IEC 61754-2	IEC 61754-4	IEC 61754-24	IEC 61754 -24-21	IEC 61754-20	IEC 61754-22	Others	IEC 61754-27	IEC 61076 3-123
	BFOC 2,5	SC	SC-RJ	Sealed SC-RJ	LC	F-SMA	Hybrid con- nector	M12-FO	Push- Pull- Hybrid
CPF 6 Type 8 network	Yes	No	Yes	Yes	No	Yes	Yes ^a	Yes ^b	Yes
NOTE The IEC 61754 series defines the optical fibre connector mechanical interfaces; performance specifications for optical fibre connectors terminated to specific fibre types are standardised in the IEC 61753 series.									
^a As specified in IEC 61158-2:2023, Clause M.3.									

Replacement:

Table A.8 provides values based on the template given in IEC 61918:2018, Table 10.

Table A.8 – Relationship between FOC and fibre types (Type 8 networks)

	Fibre type				
	9..10/125 µm single mode silica	50/125 µm multimode silica	62,5/125 µm multimode silica	980/1 000 µm step index POF	200/230 µm step index hard clad silica
BFOC/2,5	No	No	Yes	No	Yes
SC	No	No	No	No	No
SC-RJ	Yes	Yes	Yes	Yes	Yes
LC	No	No	No	No	No
F-SMA	No	No	No	Yes	Yes
Hybrid connector	No	No	No	Yes	Yes
M12-FO	Yes	Yes	Yes	Yes	Yes
Push-Pull-Hybrid	Yes	Yes	Yes	No	No

A.4.4.2.6 Specific requirements for CPs

Not applicable.

A.4.4.2.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.3 Connections within a channel/permanent link

A.4.4.3.1 Common description

Not applicable.

A.4.4.3.2 Balanced cabling connections and splices for CPs based on Ethernet

Not applicable.

A.4.4.3.3 Copper cabling connections and splices for CPs not based on Ethernet

A.4.4.3.3.1 Common description

Addition:

Refer to the manufacturer's data sheet regarding the number of allowed connections. The number of allowed connections, adaptors and splices relates to the maximum channel attenuation.

A.4.4.3.3.2 Connections minimum distance

A.4.4.3.3.3 Copper cabling splices

A.4.4.3.3.4 Copper cabling bulkhead connections

A.4.4.3.3.5 Copper cabling J-J couplers (J-J adaptors)

A.4.4.3.4 Optical fibre cabling connections and splices for CPs based on Ethernet

Not applicable.

A.4.4.3.5 Optical fibre cabling connections and splices for CPs not based on Ethernet

Addition:

The number of allowed connections and splices relates to the maximum channel attenuation.

A.4.4.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.4 Terminators

Not applicable.

A.4.4.5 Device location and connection

A.4.4.5.1 Common description

A.4.4.5.2 Specific requirements for CPs

Not applicable.

A.4.4.5.3 Specific requirements for wireless installation

A.4.4.5.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.6 Coding and labelling

A.4.4.6.1 Common description

A.4.4.6.2 Additional requirements for CPs

A.4.4.6.3 Specific requirements for CPs

Addition:

For balanced cables, the signal wires shall comply with the colour codes specified in Table A.9.

Table A.9 – Colour code for balanced cables used by Type 8 networks

Signal	Colour code
DO	YE
/DO	GN
DI	GY
/DI	PK
COM	BN

A.4.4.6.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.7 Earthing and bonding of equipment and devices and shielded cabling

A.4.4.7.1 Common description

A.4.4.7.1.1 Basic requirements

Replacement:

Earth potential differences between cabling end points will induce noise in the cabling system. This is especially true in shielded cabling systems. Controlling earth currents is extremely important in reducing interference caused by earth offsets. Shield currents shall be mitigated by using a proper earthing system and/or proper shield termination techniques as defined in this document and the relevant CPs. If this requirement cannot be met, then alternate media, such as optical fibre cables, or wireless, shall be considered. UTP cables shall not be used.

A.4.4.7.1.2 Planner tasks

A.4.4.7.1.3 Methods for controlling potential differences in the earth system

A.4.4.7.1.4 Selection of the earthing and bonding systems

A.4.4.7.2 Bonding and earthing of enclosures and pathways

A.4.4.7.2.1 Equalisation and earthing conductor sizing and length

A.4.4.7.2.2 Bonding straps and sizing

A.4.4.7.2.3 Surface preparation and methods

A.4.4.7.2.4 Bonding and earthing

A.4.4.7.3 Earthing methods

A.4.4.7.4 Shield earthing

A.4.4.7.4.1 Non-earthing or parallel RC

Replacement:

A parallel RC circuit is located in the devices. Otherwise, an equipotential cable between any two devices shall be installed according to IEC 61918:2018, 4.4.7.2.1.

A.4.4.7.4.2 Direct

Not applicable.

A.4.4.7.4.3 Derivatives of direct and parallel RC

Not applicable.

A.4.4.7.5 Specific requirements for CPs

Not applicable.

A.4.4.7.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.8 Storage and transportation of cables

A.4.4.9 Routing of cables

A.4.4.10 Separation of circuits

A.4.4.11 Mechanical protection of cabling components

A.4.4.11.1 Common description

A.4.4.11.2 Specific requirements for CPs

A.4.4.11.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.12 Installation in special areas

Subclause 4.4.12.3 is not applicable.

A.4.5 Cabling planning documentation**A.4.5.1 Common description****A.4.5.2 Cabling planning documentation for CPs**

Addition:

The device documentation shall be observed for additional rules.

A.4.5.3 Network certification documentation**A.4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC 11801-3**

Not applicable.

A.4.6 Verification of cabling planning specification**A.5 Installation implementation****A.5.1 General requirements****A.5.1.1 Common description****A.5.1.2 Installation of CPs****A.5.1.3 Installation of generic cabling in industrial premises**

Not applicable.

A.5.2 Cable installation**A.5.2.1 General requirements for all cabling types****A.5.2.1.1 Storage and installation****A.5.2.1.2 Protecting communication cables against potential mechanical damage**

Replacement:

Table A.10 provides values based on the template given in IEC 61918:2018, Table 18.

Table A.10 – Parameters for balanced cables

Characteristic		Type 8 network
Mechanical force	Minimum bending radius, single bending	64 mm ^a
	Bending radius, multiple bending	64 mm ^a
	Pull forces	N ^a
	Permanent tensile forces	N ^a
	Maximum lateral forces	N/cm
	Temperature range during installation	0 °C to 70 °C ^a
^a Reference value, deviations are allowed; see manufacturer's data sheet.		

Replacement:

Table A.11 provides values based on the template given in IEC 61918:2018, Table 19.

Table A.11 – Parameters for silica optical fibre cables

Characteristic		Type 8 network
Mechanical force	Minimum bending radius, single bending	30 mm ^a
	Bending radius, multiple bending	50 mm ^a
	Pull forces	800 N ^a
	Permanent tensile forces	200 N ^a
	Maximum lateral forces	100 N/cm
	Temperature range during installation	5 °C to 50 °C ^a
^a Reference value, deviations are allowed; see manufacturer's data sheet.		

Replacement:

Table A.12 provides values based on the template given in IEC 61918:2018, Table 20.

Table A.12 – Parameters for POF optical fibre cables

Characteristic		Type 8 network for permanent indoor installation	Type 8 network for indoor installations with movements
Mechanical force	Minimum bending radius, single bending	30 mm ^a	50 mm ^a
	Bending radius, multiple bending	50 mm ^a	65 mm ^a
	Pull forces	600 N ^a	300 N ^a
	Permanent tensile forces	100 N ^a	100 N ^a
	Maximum lateral forces	20 N/cm	20 N/cm
	Temperature range during installation	5 °C to 50 °C ^a	5 °C to 50 °C ^a
	Suitable for use as trailing cable	No	10 × d, at least 5 million cycles, Increase in attenuation ≤ 1 dBm
^a Reference value, deviations are allowed; see manufacturer's data sheet.			

Replacement:

Table A.13 provides values based on the template given in IEC 61918:2018, Table 21.

Table A.13 – Parameters for hard clad silica optical fibre cables

Characteristic		Type 8 network for permanent indoor installation	Type 8 network for permanent outdoor installation
Mechanical force	Minimum bending radius, single bending	30 mm ^a	150 mm ^a
	Bending radius, multiple bending	50 mm ^a	200 mm ^a
	Pull forces	800 N ^a	1 500 N ^a
	Permanent tensile forces	200 N ^a	200 N ^a
	Maximum lateral forces	100 N/cm	300 N/cm
	Temperature range during installation	5 °C to 50 °C ^a	–5 °C to 50 °C ^a
	Longitudinal water tightness	No	IEC 60794-1-2 Method F5
^a Reference value, deviations are allowed; see manufacturer's data sheet.			

A.5.2.1.3 Avoid forming loops

A.5.2.1.4 Torsion (twisting)

A.5.2.1.5 Tensile strength (on installed cables)

A.5.2.1.6 Bending radius

A.5.2.1.7 Pull force

A.5.2.1.8 Fitting strain relief

A.5.2.1.9 Installing cables in cabinet and enclosures

A.5.2.1.10 Installation on moving parts

A.5.2.1.11 Cable crush

A.5.2.1.12 Installation of continuous flexing cables

A.5.2.1.13 Additional instructions for the installation of optical fibre cables

A.5.2.2 Installation and routing

A.5.2.2.1 Common description

A.5.2.2.2 Separation of circuits

A.5.2.3 Specific requirements for CPs

Not applicable.

A.5.2.4 Specific requirements for wireless installation

A.5.2.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.5.3 Connector installation

A.5.3.1 Common description

A.5.3.2 Shielded connectors

A.5.3.3 Unshielded connectors

Not applicable.

A.5.3.4 Specific requirements for CPs

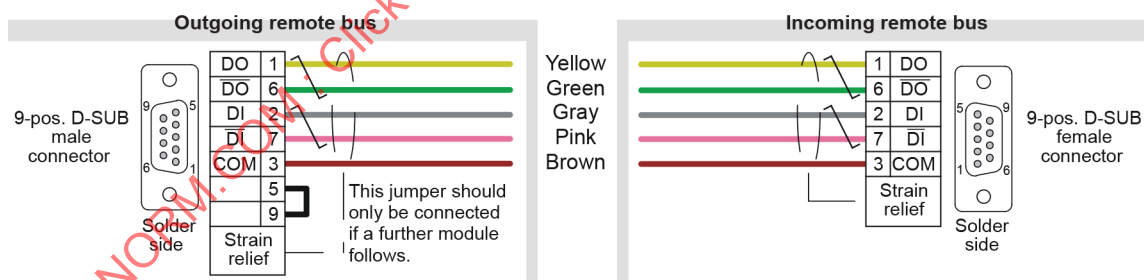
Replacement:

Deviations from the mechanical specifications are permitted for special applications if the electrical features of the cable correspond to the data specified in A.4.4 (in the event of deviations, please see the data sheet). A cable connection method should be selected, which will not cause a marked deterioration in the specified electrical data. Particular attention should be paid when selecting the connection method for the shielding. The shielding shall be connected in such a way that the conductor cross section is not reduced and the wires are covered with as much of the shielding as possible. The shielding shall be led concentrically through the threaded joint as far as possible.

The wire pairs shall be twisted up to the connection contacts. Two cables should not be connected with each other as losses can be caused by reflections at the connection point and the effectiveness of the shielding could also deteriorate. This is especially relevant if different cable types are connected with one another.

If it is not possible to avoid connection points or the electrical data cannot be achieved for a special cable, an individual test should be carried out to determine whether, for example, the cable can still be used by reducing the permissible transmission distance.

Different connectors can be applied. The wiring schemes are shown in Figure A.3, Figure A.4 and Figure A.5.



IEC

Figure A.3 – Sub-D connector pin assignment

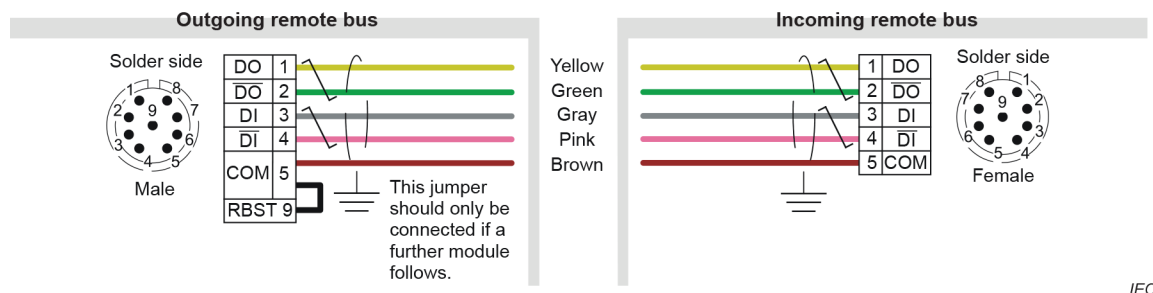


Figure A.4 – M23 circular connector pin assignment

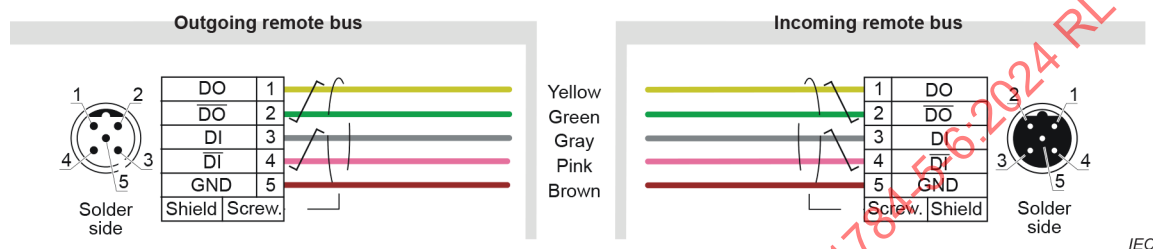


Figure A.5 – M12 circular connector pin assignment

Figure A.6 shows the terminal connector position at the device, and the pin assignments of the terminal connector are shown in Table A.14.

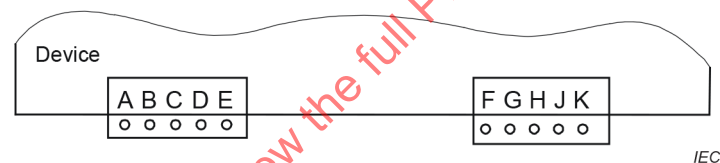


Figure A.6 – Terminal connector at the device

Table A.14 – Pin assignment of the terminal connector

Incoming interface		Outgoing interface	
Pin	Standard	Pin	Standard
A	/DO1	F	/DO2
B	DO1	G	DO2
C	/DI1	H	/DI2
D	DI1	J	DI2
E	GND1	K	GND

A separate terminal for protective earth shall be provided. The sequence of terminal points should be observed.

A.5.3.5 Specific requirements for wireless installation

A.5.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.5.4 Terminator installation

Not applicable.

A.5.5 Device installation

A.5.6 Coding and labelling

A.5.7 Earthing and bonding of equipment and devices and shield cabling

Subclause 5.7.6 is not applicable.

A.5.8 As-implemented cabling documentation

A.6 Installation verification and installation acceptance test

A.6.1 General

A.6.2 Installation verification

A.6.2.1 General

A.6.2.2 Verification according to cabling planning documentation

A.6.2.3 Verification of earthing and bonding

A.6.2.3.1 General

A.6.2.3.2 Specific requirements for earthing and bonding

Not applicable.

A.6.2.4 Verification of shield earthing

A.6.2.5 Verification of cabling system

A.6.2.6 Cable selection verification

A.6.2.6.1 Common description

A.6.2.6.2 Specific requirements for CPs

Not applicable.

A.6.2.6.3 Specific requirements for wireless installation

A.6.2.7 Connector verification

A.6.2.7.1 Common description

A.6.2.7.2 Specific requirements for CPs

Not applicable.

A.6.2.7.3 Specific requirements for wireless installation

A.6.2.8 Connection verification

A.6.2.8.1 Common description

A.6.2.8.2 Number of connections and connectors

A.6.2.8.3 Wire mapping

A.6.2.9 Terminator verification

Not applicable.

A.6.2.10 Coding and labelling verification**A.6.2.10.1 Common description****A.6.2.10.2 Specific coding and labelling verification requirements**

Not applicable.

A.6.2.11 Verification report**A.6.3 Installation acceptance test****A.6.3.1 General****A.6.3.2 Acceptance test of Ethernet-based cabling**

Not applicable.

A.6.3.3 Acceptance test of non-Ethernet-based cabling**A.6.3.3.1 Copper cabling for non-Ethernet-based CPs****A.6.3.3.1.1 Common description****A.6.3.3.1.2 Specific requirements for copper cabling for non-Ethernet-based CPs**

Addition:

The installation shall be validated with a cable tester. The Type 8 network structure shall be checked.

Software support tools should be used for the network structure validation.

A.6.3.3.2 Optical fibre cabling for non-Ethernet-based CPs**A.6.3.3.2.1 Common description****A.6.3.3.2.2 Specific requirements for non-Ethernet-based CPs**

Addition:

The Type 8 network structure and installation shall be checked.

Software support tools should be used for the network structure validation.

A.6.3.3.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.6.3.4 Specific requirements for wireless installation

A.6.3.5 Acceptance test report

Addition:

Software tools which generate test reports should be used. The test reports should be stored as a file or in a paper version.

A.7 Installation administration

Subclause 7.8 is not applicable.

A.8 Installation maintenance and installation troubleshooting

Subclause 8.4 has addition:

Inspection:

Software tools which allow a broad inspection of the system should be used for inspection.

Maintenance and repair: trained personnel shall be used.

Software tools which display the diagnostics results should be used.

Specific requirements for maintenance and troubleshooting:

Type 8 networks contain integrated diagnostic. Software tools which support a convenient presentation of the diagnostic results should be used.

Annex B (normative)

CPF 6 Ethernet network specific installation profile

B.1 Installation profile scope

Addition:

This annex specifies the installation profile for the Ethernet network of devices applying to Communication Profile CP 6/2. CP 6/2 itself is defined in IEC 61784-1.

NOTE For the Type 8 network of devices applying CP 6/2 the installation profile specified in Annex A is used.

B.2 Normative references

Addition:

IEC 60603-7-3:2010, *Connectors for electronic equipment – Part 7-3: Detail specification for 8-way, shielded, free and fixed connectors, for data transmission with frequencies up to 100 MHz*

IEC 60603-7-5:2010, *Connectors for electronic equipment – Part 7-5: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz*

IEC 60603-7-51:2010, *Connectors for electronic equipment – Part 7-51: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 500 MHz*

IEC 60793-2-30:2015, *Optical fibres – Part 2-30: Product specifications – Sectional specification for category A3 multimode fibres*

IEC 60793-2-40:2015, *Optical fibres – Part 2-40: Product specifications – Sectional specification for category A4 multimode fibres*

IEC 60793-2-50:2018, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60794-1-2, *Optical fibre cables – Part 1- 2: Generic specification – Basic optical cable test procedures – General guidance*

~~IEC 61156-1:2007, Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification~~

IEC 61156-5, *Multicore and symmetrical pair/quad cables for digital communications – Part 5: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Horizontal floor wiring – Sectional specification*

IEC 61076-2-111:2017, *Connectors for electrical and electronic equipment – Product requirements – Part 2-111: Circular connectors – Detail specification for power connectors with M12 screw-locking*

~~IEC 61076-2-114:2016, Connectors for electronic equipment – Product requirements – Part 2-114: Circular connectors – Detail specification for data and power connectors with M8 screw locking~~

IEC 61076-3-123, *Connectors for electronic equipment – Product requirements – Part 3-123: Rectangular connectors – Detail specification for hybrid connectors for industrial environments, for power supply and fibre optic data transmission, with push-pull locking*⁷

IEC 61754-24-21, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 24-21: Type SC-RJ connectors with protective housings based on IEC 61076-3-106, variant 06*

IEC 61754-27, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 27: Type M12-FO connector family*

IEC 63171 (all parts), *Connectors for electrical and electronic equipment*

B.3 Installation profile terms, definitions, and abbreviated terms

B.3.1 Terms and definitions

B.3.2 Abbreviated terms

Addition:

FO	Fibre optical
PELV	Protective extra low voltage
POF	Plastic optical fibre
SELV	Safety extra low voltage

B.3.3 Conventions for installation profiles

Not applicable.

B.4 Installation planning

B.4.1 General

B.4.1.1 Objective

B.4.1.2 Cabling in industrial premises

B.4.1.3 The planning process

B.4.1.4 Specific requirements for CPs

Not applicable.

B.4.1.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

⁷ Under preparation. Stage at the time of publication: IEC/ACDV 61076-3-123:2017.

B.4.2 Planning requirements

B.4.2.1 Safety

B.4.2.1.1 General

B.4.2.1.2 Electrical safety

Addition:

The power distribution system shall comply with IEC 60364-1:2005, 312.2.1 TN-S systems, i.e. earthed by bonding of bodies with separated conductors for neutral (N) and protection earth (PE). Otherwise, there are additional efforts necessary to avoid currents on the shield, i.e. an AC earthed system on one end in a network with balanced cables or a network built with FO-cables. For networks built with FO-cables, the power distribution system should comply with IEC 60364-1:2005, 312.2.1 TN-S systems.

PELV is the default version for the power supply with extra-low voltage, but SELV may also be used. Temporary connected devices shall be powered by PELV or SELV.

B.4.2.1.3 Functional safety

B.4.2.1.4 Intrinsic safety

Not applicable.

B.4.2.1.5 Safety of optical fibre communication systems

B.4.2.2 Security

B.4.2.3 Environmental considerations and EMC

B.4.2.3.1 Description methodology

B.4.2.3.2 Use of the described environment to produce a bill of material

Addition:

To make fieldbus installation work easier for inexperienced planners, the user shall determine suitability of the components for the targeted environment through agreements with the component providers. The planner shall also observe the related technical data from the active devices. Depending on the expected environment, the planner should define additional requirements. Passive optical components in the harsh industrial environment should be protected with suitable mitigation techniques or tested according to IEC 61753-1-3.

The planner shall take into account the mating or terminating interface of devices to be connected to the fieldbus network.

The planner shall take care about the environmental conditions of the whole network and select suitable mitigation techniques in addition to meet the respective requirements.

B.4.2.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.3 Network capabilities

B.4.3.1 Network topology

B.4.3.1.1 Common description

B.4.3.1.2 Basic physical topologies for passive networks

Not applicable.

B.4.3.1.3 Basic physical topologies for active networks

Replacement:

For the Ethernet network of devices applying CP 6/2 the following topologies are permitted:

- linear,
- star.

B.4.3.1.4 Combination of basic topologies

Not applicable.

B.4.3.1.5 Specific requirements for CPs

Not applicable.

B.4.3.1.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.3.2 Network characteristics

B.4.3.2.1 General

B.4.3.2.2 Network characteristics for balanced cabling not based on Ethernet

Not applicable.

B.4.3.2.3 Network characteristics for balanced cabling based on Ethernet

Replacement:

Table B.1 provides values based on the template given in IEC 61918:2018, Table 2.

Table B.1 – Network characteristics for balanced cabling based on Ethernet

Characteristic	CP 6/2 Ethernet network
Supported data rates (Mbit/s)	~~100~~ 1-pair: 10 two and four pair: 100, 1 000
Supported channel length (m) ^b	~~100~~ 1-pair: 1 000 two and four pair: 100
Number of connections in the channel (max.) ^{a, b}	~~4~~ 1-pair: 10 two and four pair: 4
Patch cord length (m) ^a	~~82 (AWG 24)~~ 1-pair: 990 two and four pair: 10
Channel class per ISO/IEC 11801-3 (min.) ^b	~~D~~ 1-pair: T1 two and four pair: D
Cable category per ISO/IEC 11801-3 (min.) ^c	~~5~~ 1-pair: T1 two and four pair: 5
Connecting HW category per ISO/IEC 11801-3 (min.)	~~5~~ 1-pair: A, B (according to IEC 63171) two and four pair: 5
Cable types	~~Shielded-TP, 2- or 4-pair, according to ISO/IEC 11801-1:2017, Annex E~~ 1-pair: 1-pair cable types for SPE according to IEC 61156-11, IEC 61156-12, IEC 61156-13 two and four pair: Shielded-TP, according to ISO/IEC 11801-1:2017, Annex E
^a See B.4.4.3.2. ^b For the purpose of this table, the channel definitions of ISO/IEC 11801-3, as referenced in IEC 61918:2018/AMD1:2022, Annex Q, are applicable. ^c For additional information, see IEC 61156 series.	

B.4.3.2.4 Network characteristics for optical fibre cabling*Replacement:*

Table B.2 provides values based on the template given in IEC 61918:2018, Table 3.

Table B.2 – Network characteristics for optical fibre cabling

CP 6/2 Ethernet network		
Optical fibre type	Description	
Single mode silica	Bandwidth (MHz) or equivalent at λ (nm)	1 310 nm
	Minimum length (m)	0
	Maximum length ^a (m)	14 000
	Maximum channel Insertion loss/optical power budget (dB)	See ISO/IEC 11801-1
	Connecting hardware	See B.4.4.2.5
Multimode silica	Modal bandwidth (MHz × km) at λ (nm)	850
	Minimum length (m)	0
	Maximum length ^a (m)	2 000
	Maximum channel insertion loss/optical power budget (dB)	See ISO/IEC 11801-1
	Connecting hardware	See B.4.4.2.5
POF	Modal bandwidth (MHz × 100 m) at λ (nm)	650
	Minimum length (m)	0
	Maximum length ^a (m)	50
	Maximum channel insertion loss/optical power budget (dB)	11,5
	Connecting hardware	See B.4.4.2.5
Hard clad silica	Modal bandwidth (MHz × km) at λ (nm)	650
	Minimum length (m)	0
	Maximum length ^a (m)	100
	Maximum channel insertion loss/optical power budget (dB)	4
	Connecting hardware	See B.4.4.2.5
^a This value is reduced by connections, splices and bends in accordance with IEC 61918:2018, Formula (1) in 4.4.3.4.1.		

B.4.3.2.5 Specific network characteristics*Addition:*

For CP 6/2 Ethernet networks neither patch cords / jumpers nor patch panels / outlets (TO or AO) are mandatory. CP6/2 Ethernet networks are often built with connectionless links; not more than 4 connections shall be used.

CP 6/2 Ethernet networks shall be connected to the generic cabling as defined in IEC 11801-3 via an AO with a mating interface according to IEC 61076-3-106 Variant ~~6~~ 06 or IEC 61076-2-101.

B.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.4 Selection and use of cabling components**B.4.4.1 Cable selection****B.4.4.1.1 Common description****B.4.4.1.2 Copper cables****B.4.4.1.2.1 Balanced cables for Ethernet-based CPs**

Addition:

For Ethernet networks with two or four pairs for CP 6/2, a minimum of CAT 5 according to ISO/IEC 11801-1 shall be used.

Replacement:

Table B.3 provides values based on the template given in IEC 61918:2018, Table 4.

Table B.3 – Information relevant to copper cable: fixed cables

Characteristic	CP 6/2 Ethernet network
Nominal impedance of cable (tolerance)	~~100 Ω ± 15 Ω~~ 1-pair: 100 Ω ± 5 Ω (IEC 61156-11 and -IEC 61156-13) two and four pair: 100 Ω ± 15 Ω (IEC 61156-5)
DCR of conductors	≤ 9,38 Ω / 100 m
DCR of shield	–
Number of conductors	2, 4 or 8
Shielding	S/FTP, S/FTQ, S/STP
Colour code for conductor	1-pair: BU-WH two pairs: BU-WH/BU, OG-WH/OG four pairs: BU-WH/BU, OG-WH/OG, GN-WH/GN, BN-WH/BN Or: BU-WH, OG-WH, GN-WH, BN-WH
Jacket colour requirements	~~RAL 5021~~ To meet user requirement
Jacket material	To meet user requirement
Resistance to harsh environment (e.g., UV, oil resist, LS0H)	–; To meet user requirement; Up to manufacturer's differentiation
Agency ratings	Local Government requirements
Transfer impedance	50 m Ω / m at 10 MHz
Installation type	Stationary, no movement after installation
Outer cable diameter (max)	8,5 mm
Wire cross section	Min. AWG 24 – 0,22 mm ²
Wire diameter (insulated)	≤ 1,6 mm

Replacement:

Table B.4 provides values based on the template given in IEC 61918:2018, Table 5.

Table B.4 – Information relevant to copper cable: cords

Characteristic	CP 6/2 Ethernet network
Nominal impedance of cable (tolerance)	~~100 Ω ± 15 Ω~~ 1-pair: 100 Ω ± 5 Ω (IEC 61156-12) two and four pair: 100 Ω ± 15 Ω (IEC 61156-5)
DCR of conductors	≤ 9,38 Ω / 100 m
DCR of shield	–
Number of conductors	2, 4 or 8
Length	1-pair: ≤ 1.000 m two and four pair: ≤ 100 m
Shielding	S/FTP, S/FTQ, S/STP
Colour code for conductor	1-pair: BU-WH two pairs: BU-WH/BU, OG-WH/OG four pairs: BU-WH/BU, OG-WH/OG, GN-WH/GN, BN-WH/BN Or: BU-WH, OG-WH, GN-WH, BN-WH
Jacket colour requirements	~~RAL 5021~~ To meet user requirement
Jacket material	To meet user requirement
Resistance to harsh environment (e.g., UV, oil resist, LS0H)	~~–~~ To meet user requirement; Up to manufacturer's differentiation
Agency ratings	Local Government requirements
Transfer Impedance	50 mΩ /m at 10 MHz
Installation type	Stationary or with movement after installation
Outer cable diameter (max)	8,5 mm
Wire cross section	AWG 26 to 22 – 0,14 mm ² to 0,35 mm ²
Wire diameter (insulated)	≤ 1,6 mm

B.4.4.1.2.2 Copper cables for non-Ethernet-based CPs

Not applicable.

B.4.4.1.3 Cables for wireless installation

B.4.4.1.4 Optical fibre cables

Replacement:

Table B.5 provides values based on the template given in IEC 61918:2018, Table 6.

Table B.5 – Information relevant to optical fibre cables

Characteristics for CP 6/2 Ethernet network	9..10/125 µm single mode silica	50/125 µm multimode silica	62,5/125 µm multimode silica	980/1 000 µm step index POF	200/230 µm step index hard clad silica
Document	IEC 60793-2-50; ~~Type B1~~ Types B-652.B, B-652.D	IEC 60793-2-10; ~~Type A1a~~ Types A1-OM2, A1-OM3, A1-OM4, A1-OM5	IEC 60793-2-10; Type ~~A1b~~ A1-OM1	IEC 60793-2-40; Type A4a	IEC 60793-2-30; Type A3c
Attenuation per km (650 nm)	–	–	–	280 dB	10 dB
Attenuation per km (820 nm)	–	–	–	–	14 dB
Attenuation per km (1 310 nm)	1 dB	1,5 dB	1,5 dB	–	–
Number of optical fibres	2	2	2	2	2
Jacket colour requirements	Red	Red	Red	Red	Red
Jacket material	To meet user requirements	To meet user requirements	To meet user requirements	Polyurethane	Polyurethane
Resistance to harsh environment (e.g.: UV, oil resist, LS0H)	To meet user requirements	To meet user requirements	To meet user requirements	To meet user requirements	To meet user requirements
Outer diameter	8 mm ± 0,5 mm	8 mm ± 0,5 mm	8 mm ± 0,5 m	8 mm ± 0,5 mm	8 mm ± 0,5 mm
Bandwidth × length	–	–	–	> 10 MHz × 100 m	≥ 17 MHz × km at 650 nm
Wire material	–	–	–	Polyamide	Flame retardant non corrosive
Wire colour	–	–	–	Orange, black	Red, green or grey
Wire diameter	–	–	–	2,2 mm ± 0,07 mm	2,9 mm
Strain relief	Non-metal, aramide or wool	Non-metal, aramide or wool	Non-metal, aramide or wool	Non-metal, aramide or wool	Non-metal, aramide
Bending radius	–	–	–	30 mm	30 mm

B.4.4.1.5 Special purpose balanced and optical fibre cables**B.4.4.1.6 Specific requirements for CPs****B.4.4.1.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3****B.4.4.2 Connecting hardware selection****B.4.4.2.1 Common description****B.4.4.2.2 Connecting hardware for balanced cabling CPs based on Ethernet**

Replacement:

Table B.6 provides values based on the template given in IEC 61918:2018, Table 7.

Table B.6 – Connectors for balanced cabling CPs based on Ethernet

	IEC 60603-7 series ^a		IEC 61076-3-106 ^b	IEC 61076-3-117 ^b	IEC 61076-2-101	IEC 61076-2-109	IEC 61076-2-114	IEC 63171-2		IEC 63171-5	
	Shielded	unshielded	Var. 6	Var. 14	M12-4 with D-coding	M12-8 with X-coding	M8-4 with D-coding	Shielded	Unshielded	M8	M12
CP 6/2 Ethernet network two or four pair	IEC 60603-7-3 or IEC 60603-7-5 or IEC 60603-7-51	No	Yes	No	Yes	Yes	Yes	No	No	No	No
CP 6/2 Ethernet network 1-pair	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

^a With regards to IEC 60603-7 series, the connector selection is based on the desired channel.

^b Housings to protect connectors.

B.4.4.2.3 Connecting hardware for copper cabling CPs not based on Ethernet

Replacement:

Table B.7 provides values based on the template given in IEC 61918:2018, Table 8.

Table B.7 – Connectors for copper cabling CPs not based on Ethernet

	IEC 60807-2 or IEC 60807-3	IEC 61076-2-111	Others		
	Sub-D	M12-n with L-coding	Open style	Terminal block	M23
Power supply for CP 6/2 Ethernet network devices	Yes	Yes	Yes	Yes	Yes

NOTE There are many applications using these connectors that are not compatible and when mixed ~~may~~ can cause damage to the applications.

B.4.4.2.4 Connecting hardware for wireless installation

B.4.4.2.5 Connecting hardware for optical fibre cabling

Replacement:

Table B.8 provides values based on the template given in IEC 61918:2018, Table 9.

Table B.8 – Optical fibre connecting hardware

	IEC 61754-2	IEC 61754-4	IEC 61754 -24	IEC 61754 -24-21	IEC 61754-20	IEC 61754-22	IEC 61754-27	IEC 61076 -3-123
	BFOC 2,5	SC	SC-RJ	Sealed SC-RJ	LC	F-SMA	M12-FO	Push-Pull- Hybrid
CP 6/2 Ethernet network	Yes	Yes	Yes ^a	Yes ^a	No	Yes	Yes	Yes
NOTE The IEC 61754 series defines the optical fibre connector mechanical interfaces; performance specifications for optical fibre connectors terminated to specific fibre types are standardised in the IEC 61753 series.								
^a The SC-RJ is the default connector.								

Replacement:

Table B.9 provides values based on the template given in IEC 61918:2018, Table 10.

Table B.9 – Relationship between FOC and fibre types (CP 6/2 Ethernet network)

	Fibre type				
	9..10/125 µm single mode silica	50/125 µm multimode silica	62,5/125 µm multimode silica	980/1 000 µm step index POF	200/230 µm step index hard clad silica
BFOC/2,5	No	No	Yes	No	Yes
SC	Yes	Yes	Yes	Yes	Yes
SC-RJ	Yes	Yes	Yes	Yes	Yes
Sealed SC-RJ	Yes	Yes	Yes	Yes	Yes
LC	No	No	No	No	No
F-SMA	No	No	No	Yes	Yes
M12-FO	Yes	Yes	Yes	Yes	Yes
Push-Pull-Hybrid	Yes	Yes	Yes	No	No

B.4.4.2.6 Specific requirements for CPs

Not applicable.

B.4.4.2.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

B.4.4.3 Connections within a channel/permanent link

B.4.4.3.1 Common description

B.4.4.3.2 Balanced cabling connections and splices for CPs based on Ethernet

B.4.4.3.2.1 Common description

Addition:

Refer to the manufacturer's data sheet regarding the number of allowed connections.

The number of allowed connections, adaptors and splices relates to the maximum channel attenuation.

B.4.4.3.2.2 Connections minimum distance

Replacement:

As defined in ISO/IEC 11801 series.

B.4.4.3.2.3 Balanced cabling splices

Replacement:

As defined in ISO/IEC 11801 series.

B.4.4.3.2.4 Balanced cabling bulkhead connections

Replacement:

As defined in ISO/IEC 11801 series.

B.4.4.3.2.5 Balanced cabling J-J coupler (J-J adaptor)

Replacement:

As defined in ISO/IEC 11801 series.

B.4.4.3.3 Copper cabling connections and splices for CPs not based on Ethernet

Not applicable.

B.4.4.3.4 Optical fibre cabling connections and splices for CPs based on Ethernet

B.4.4.3.5 Optical fibre cabling connections and splices for CPs not based on Ethernet

Not applicable.

B.4.4.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.4.4 Terminators

B.4.4.4.1 Common description

B.4.4.4.2 Specific requirements for CPs

Not applicable.

B.4.4.4.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.4.5 Device location and connection

B.4.4.6 Coding and labelling

B.4.4.7 Earthing and bonding of equipment and devices and shielded cabling

B.4.4.8 Storage and transportation of cables

B.4.4.9 Routing of cables**B.4.4.10 Separation of circuits****B.4.4.11 Mechanical protection of cabling components****B.4.4.12 Installation in special areas****B.4.5 Cabling planning documentation**

Addition:

The device documentation shall be observed for additional rules.

B.4.6 Verification of cabling planning specification**B.5 Installation implementation****B.5.1 General requirements****B.5.2 Cable installation****B.5.2.1 General requirements for all cabling types**

Subclause 5.2.1.2 has replacement:

Table B.10 to Table B.13 provide values based on the template given in IEC 61918:2018, Table 18 to Table 21.

Table B.10 – Parameters for balanced cables

Characteristic		CP 6/2 Ethernet network
Mechanical force	Minimum bending radius, single bending	64 mm ^a
	Bending radius, multiple bending	64 mm ^a
	Pull forces	N ^a
	Permanent tensile forces	N ^a
	Maximum lateral forces	N/cm
	Temperature range during installation	0 °C to 70 °C ^a
^a Reference value, deviations are allowed; see manufacturer's data sheet.		

Table B.11 – Parameters for silica optical fibre cables

Characteristic		CP 6/2 Ethernet network
Mechanical force	Minimum bending radius, single bending	30 mm ^a
	Bending radius, multiple bending	50 mm ^a
	Pull forces	800 N ^a
	Permanent tensile forces	200 N ^a
	Maximum lateral forces	100 N/cm
	Temperature range during installation	5 °C to 50 °C ^a
^a Reference value, deviations are allowed; see manufacturer's data sheet.		

Table B.12 – Parameters for POF optical fibre cables

Characteristic		CP 6/2 Ethernet network for permanent indoor installation	CP 6/2 Ethernet network for permanent outdoor installation
Mechanical force	Minimum bending radius, single bending	30 mm ^a	50 mm ^a
	Bending radius, multiple bending	50 mm ^a	65 mm ^a
	Pull forces	600 N ^a	300 N ^a
	Permanent tensile forces	100 N ^a	100 N ^a
	Maximum lateral forces	20 N/cm	20 N/cm
	Temperature range during installation	5 °C to 50 °C ^a	5 °C to 50 °C ^a
	Suitable for use as trailing cable	No	10 × <i>d</i> , at least 5 million cycles, Increase in attenuation ≤ 1 dBm
^a Reference value, deviations are allowed; see manufacturer's data sheet.			

Table B.13 – Parameters for hard clad silica optical fibre cables

Characteristic		CP 6/2 Ethernet network for permanent indoor installation	CP 6/2 Ethernet network for permanent outdoor installation
Mechanical force	Minimum bending radius, single bending	30 mm ^a	150 mm ^a
	Bending radius, multiple bending	50 mm ^a	200 mm ^a
	Pull forces	800 N ^a	1 500 N ^a
	Permanent tensile forces	200 N ^a	200 N ^a
	Maximum lateral forces	100 N/cm	300 N/cm
	Temperature range during installation	5 °C to 50 °C ^a	–5 °C to 50 °C ^a
	Longitudinal water tightness	No	IEC 60794-1-2 Method F5
^a Reference value, deviations are allowed; see manufacturer's data sheet.			

B.5.2.2 Installation and routing**B.5.2.3 Specific requirements for CPs**

Not applicable.

B.5.2.4 Specific requirements for wireless installation**B.5.2.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**

Not applicable.

B.5.3 Connector installation**B.5.3.1 Common description****B.5.3.2 Shielded connectors****B.5.3.3 Unshielded connectors**

Not applicable.

B.5.3.4 Specific requirements for CPs

Addition:

Connectors should be equipped with a tool less assembling technique, like the examples in Figure B.1.

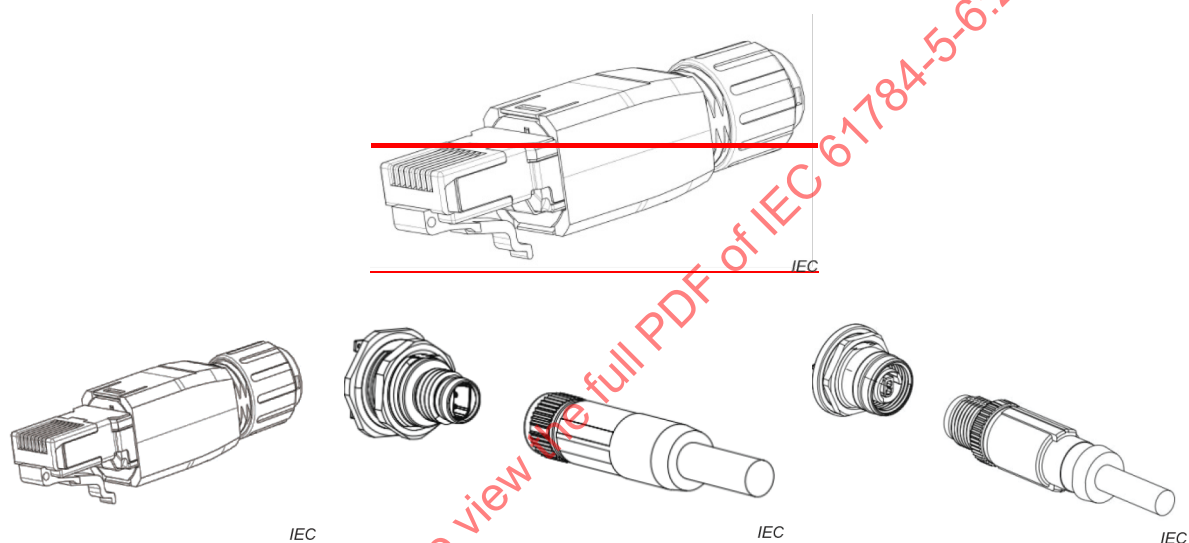


Figure B.1 – Terminal connector at the device

A crossover for changing the signal from transmitter to receiver should not be used. Network components for CP 6/2 Ethernet networks should be designed so that they carry out an automatic crossover.

B.5.3.5 Specific requirements for wireless installation**B.5.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3****B.5.4 Terminator installation**

Not applicable.

B.5.5 Device installation**B.5.6 Coding and labelling****B.5.7 Earthing and bonding of equipment and devices and shield cabling**

Modification:

Subclause 5.7.5 is not applicable.

B.5.8 As-implemented cabling documentation

B.6 Installation verification and installation acceptance test

B.6.1 General

B.6.2 Installation verification

B.6.3 Installation acceptance test

Modification:

Subclause 6.3.3 is not applicable.

B.7 Installation administration

Subclause 7.8 is not applicable.

B.8 Installation maintenance and installation troubleshooting

Subclause 8.4 has addition:

Inspection:

Software tools which allow a broad inspection of the system should be used for inspection.

Maintenance and repair: trained personnel shall be used.

Software tools which display the diagnostics results should be used.

Bibliography

Addition:

- [4041] IBS SYS PRO INST UM E, *Configuring and Installing INTERBUS™*;
Phoenix Contact GmbH & Co.KG; Prod. Id. 27 43 802
(can be downloaded from www.phoenixcontact.com) [viewed 2023-08-22]
- [4442] IBS IL SYS PRO UM E, *Configuring and Installing the INTERBUS™ Inline product range*;
Phoenix Contact GmbH & Co.KG; Prod. Id. 27 43 048
(can be downloaded from www.phoenixcontact.com) [viewed 2023-08-22]

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INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Industrial networks – Profiles –
Part 5-6: Installation of fieldbuses – Installation profiles for CPF 6**

**Réseaux industriels – Profils –
Partie 5-6: Installation des bus de terrain – Profils d'installation pour CPF 6**

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms, definitions and abbreviated terms	8
4 CPF 6: Overview of installation profiles	9
5 Installation profile conventions.....	9
6 Conformance to installation profiles.....	9
Annex A (normative) CPF 6 Type 8 network specific installation profile.....	11
A.1 Installation profile scope	11
A.2 Normative references.....	11
A.3 Installation profile terms, definitions, and abbreviated terms	11
A.3.1 Terms and definitions	11
A.3.2 Abbreviated terms	12
A.3.3 Conventions for installation profiles	13
A.4 Installation planning.....	13
A.4.1 General	13
A.4.2 Planning requirements.....	13
A.4.3 Network capabilities.....	14
A.4.4 Selection and use of cabling components	18
A.4.5 Cabling planning documentation.....	27
A.4.6 Verification of cabling planning specification.....	27
A.5 Installation implementation.....	27
A.5.1 General requirements.....	27
A.5.2 Cable installation	27
A.5.3 Connector installation	30
A.5.4 Terminator installation	32
A.5.5 Device installation	32
A.5.6 Coding and labelling	32
A.5.7 Earthing and bonding of equipment and devices and shield cabling	32
A.5.8 As-implemented cabling documentation.....	32
A.6 Installation verification and installation acceptance test	32
A.6.1 General	32
A.6.2 Installation verification	32
A.6.3 Installation acceptance test	33
A.7 Installation administration	34
A.8 Installation maintenance and installation troubleshooting.....	34
Annex B (normative) CPF 6 Ethernet network specific installation profile	35
B.1 Installation profile scope	35
B.2 Normative references.....	35
B.3 Installation profile terms, definitions, and abbreviated terms	36
B.3.1 Terms and definitions	36
B.3.2 Abbreviated terms	36
B.3.3 Conventions for installation profiles	36
B.4 Installation planning.....	36
B.4.1 General	36

B.4.2	Planning requirements	36
B.4.3	Network capabilities	37
B.4.4	Selection and use of cabling components	40
B.4.5	Cabling planning documentation	46
B.4.6	Verification of cabling planning specification	46
B.5	Installation implementation	46
B.5.1	General requirements	46
B.5.2	Cable installation	46
B.5.3	Connector installation	48
B.5.4	Terminator installation	48
B.5.5	Device installation	48
B.5.6	Coding and labelling	48
B.5.7	Earthing and bonding of equipment and devices and shield cabling	48
B.5.8	As-implemented cabling documentation	48
B.6	Installation verification and installation acceptance test	49
B.6.1	General	49
B.6.2	Installation verification	49
B.6.3	Installation acceptance test	49
B.7	Installation administration	49
B.8	Installation maintenance and installation troubleshooting	49
	Bibliography	50
	Figure 1 – Standards relationships	7
	Figure A.1 – Type 8 network structure example	15
	Figure A.2 – Example of a Type 8 network configuration	16
	Figure A.3 – Sub-D connector pin assignment	30
	Figure A.4 – M23 circular connector pin assignment	31
	Figure A.5 – M12 circular connector pin assignment	31
	Figure A.6 – Terminal connector at the device	31
	Figure B.1 – Terminal connector at the device	48
	Table A.1 – Basic network characteristics for balanced cabling not based on Ethernet	17
	Table A.2 – Network characteristics for optical fibre cabling	18
	Table A.3 – Information relevant to balanced cable: fixed cables	19
	Table A.4 – Information relevant to balanced cable: cords	20
	Table A.5 – Remote bus fibre optic cable length	22
	Table A.6 – Connectors for copper cabling CPs not based on Ethernet	22
	Table A.7 – Optical fibre connecting hardware	23
	Table A.8 – Relationship between FOC and fibre types (Type 8 networks)	23
	Table A.9 – Colour code for balanced cables used by Type 8 networks	25
	Table A.10 – Parameters for balanced cables	27
	Table A.11 – Parameters for silica optical fibre cables	28
	Table A.12 – Parameters for POF optical fibre cables	28
	Table A.13 – Parameters for hard clad silica optical fibre cables	29
	Table A.14 – Pin assignment of the terminal connector	31
	Table B.1 – Network characteristics for balanced cabling based on Ethernet	38

Table B.2 – Network characteristics for optical fibre cabling.....	39
Table B.3 – Information relevant to copper cable: fixed cables.....	40
Table B.4 – Information relevant to copper cable: cords.....	41
Table B.5 – Information relevant to optical fibre cables.....	42
Table B.6 – Connectors for balanced cabling CPs based on Ethernet.....	43
Table B.7 – Connectors for copper cabling CPs not based on Ethernet.....	43
Table B.8 – Optical fibre connecting hardware.....	44
Table B.9 – Relationship between FOC and fibre types (CP 6/2 Ethernet network).....	44
Table B.10 – Parameters for balanced cables.....	46
Table B.11 – Parameters for silica optical fibre cables.....	46
Table B.12 – Parameters for POF optical fibre cables.....	47
Table B.13 – Parameters for hard clad silica optical fibre cables.....	47

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**INDUSTRIAL NETWORKS –
PROFILES –****Part 5-6: Installation of fieldbuses –
Installation profiles for CPF 6****FOREWORD**

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IEC 61784-5-6 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 document is to be used in conjunction with IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024.

This fifth edition cancels and replaces the fourth edition published in 2018. This edition constitutes a technical revision.

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

- a) alignment with IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024;
- b) addition of new content related to Single Pair Ethernet (SPE) in Annex B, Table B.1, Table B.3, Table B.4, Table B.6.

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

Draft	Report on voting
65C/1283/FDIS	65C/1297/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 the 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/publications.

A list of all parts of IEC 61784-5 series, under the general title *Industrial networks – Profiles – Installation of 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

INTRODUCTION

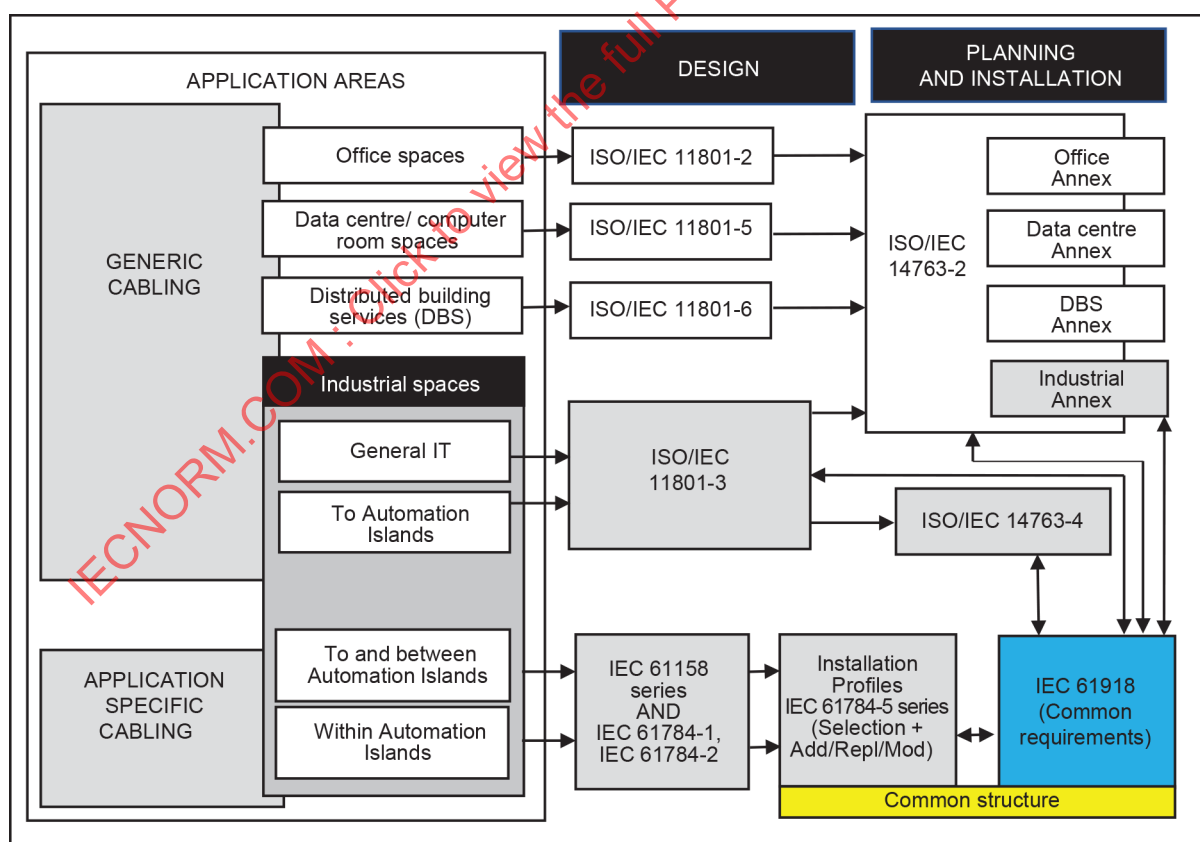
This document is one of a series produced to facilitate the use of communication networks in industrial control systems.

IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024 provide the common requirements for the installation of communication networks in industrial control systems. This installation profile document provides the installation profiles of the communication profiles (CP) of a specific communication profile family (CPF) by stating which requirements of IEC 61918 fully apply and, where necessary, by supplementing, modifying, or replacing the other requirements (see Figure 1).

For general background on fieldbuses, their profiles, and relationship between the installation profiles specified in this document, see IEC 61158-1.

Each CP installation profile is specified in a separate annex of this document. Each annex is structured exactly as the reference document IEC 61918 for the benefit of the persons representing the roles in the fieldbus installation process as defined in IEC 61918 (planner, installer, verification personnel, validation personnel, maintenance personnel, administration personnel). By reading the installation profile in conjunction with IEC 61918, these persons immediately know which requirements are common for the installation of all CPs and which are modified or replaced. The conventions used to draft this document are defined in Clause 5.

The provision of the installation profiles in one document for each CPF (for example IEC 61784-5-6 for CPF 6) allows readers to work with documents of a convenient size.



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Figure 1 – Standards relationships

INDUSTRIAL NETWORKS – PROFILES –

Part 5-6: Installation of fieldbuses – Installation profiles for CPF 6

1 Scope

This part of IEC 61784-5 specifies the installation profiles for CPF 6 (INTERBUS™)¹.

The installation profiles are specified in the annexes. These annexes are read in conjunction with IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024.

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 61918:2018², *Industrial communication networks – Installation of communication networks in industrial premises*

IEC 61918:2018/AMD1:2022

IEC 61918:2018/AMD2:2024

NOTE For profile specific normative references, see Clauses A.2, B.2.

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms, definitions and abbreviated terms given in IEC 61918:2018, Clause 3, IEC 61918:2018/AMD1:2022, Clause 3, and Clauses A.3, B.3 of this document apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

¹ INTERBUS™ is a trade name of INTERBUS Club, an independent organisation of users and vendors of INTERBUS products. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trade name INTERBUS. Use of the trade name INTERBUS requires permission of the trade name holder.

² The normative references of IEC 61918:2018, Clause 2, IEC 61918:2018/AMD1:2022, Clause 2 and IEC 61918:2018/AMD2:2024, Clause 2, apply.

4 CPF 6: Overview of installation profiles

CPF 6 consists of seven communication profiles (see IEC 61784-1:— for CP 6/1, CP 6/2, CP 6/3, see IEC 61784-2:— for CP 6/4, CP 6/5, CP 6/6, see IEC 61784-3-6 for FSCP 6/7).

The CPF 6 Type 8 network (non-Ethernet-based) installation profile is specified in Annex A.

The CPF 6 Ethernet network specific installation profile is specified in Annex B.

5 Installation profile conventions

The numbering of the clauses and subclauses in the annexes of this document corresponds to the numbering of IEC 61918:2018 main clauses and subclauses.

The annex clauses and subclauses of this document supplement, modify, or replace the respective clauses and subclauses in IEC 61918.

Where there is no corresponding subclause of IEC 61918 in the normative annexes in this document, the subclause of IEC 61918 applies without modification.

The annex heading letter represents the installation profile assigned in Clause 4. The annex (sub)clause numbering following the annex letter shall represent the corresponding (sub)clause numbering of IEC 61918.

EXAMPLE "Subclause B.4.4" in IEC 61784-5-6 means that CP 6/2 specifies the Subclause 4.4 of IEC 61918.

All main clauses of IEC 61918 are cited and apply in full unless otherwise stated in each normative installation profile annex.

If all subclauses of a (sub)clause are omitted, then the corresponding IEC 61918 (sub)clause applies.

If in a (sub)clause it is written "Not applicable", then the corresponding IEC 61918 (sub)clause does not apply.

If in a (sub)clause it is written "*Addition:*", then the corresponding IEC 61918 (sub)clause applies with the additions written in the profile.

If in a (sub)clause it is written "*Replacement:*", then the text provided in the profile replaces the text of the corresponding IEC 61918 (sub)clause.

NOTE A replacement can also comprise additions.

If in a (sub)clause it is written "*Modification:*", then the corresponding IEC 61918 (sub)clause applies with the modifications written in the profile.

If all (sub)clauses of a (sub)clause are omitted but in this (sub)clause it is written "*(Sub)clause x has addition:*" (or "*replacement:*") or "*(Sub)clause x is not applicable:*", then (sub)clause *x* becomes valid as declared and all the other corresponding IEC 61918 (sub)clauses apply.

6 Conformance to installation profiles

Each installation profile within this document includes part of IEC 61918:2018, IEC 61918:2018/AMD1:2022 and IEC 61918:2018/AMD2:2024. It may also include defined additional specifications.

A statement of compliance with an installation profile of this document shall be state as either

Compliance with IEC 61784-5-6:2024 for CP 6/m <name> or

Compliance with IEC 61784-5-6 (Ed.5.0) for CP 6/m <name>

where the name within the angle brackets < > is optional and the angle brackets are not to be included. The m within CP 6/m shall be replaced by the profile number 1 to 2.

NOTE The name can be the name of the profile, for example INTERBUS.

If the name is a trade name, then the permission of the trade name holder shall be required.

Product documents shall not include any conformity assessment aspects (including quality management provisions), neither normative nor informative, other than provisions for product testing (evaluation and examination).

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Annex A (normative)

CPF 6 Type 8 network specific installation profile

A.1 Installation profile scope

Addition:

This annex specifies the installation profile for CPF 6 Type 8 networks and the related Communication Profiles:

- CP 6/1, CP 6/2, CP 6/3 – specified in IEC 61784-1;
- CP 6/4, CP 6/5, CP 6/6 – specified in IEC 61784-2;
- FSCP 6/7 – specified in IEC 61784-3-6.

A.2 Normative references

Addition:

IEC 60189-1:2018, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*

IEC 60794-1-2, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures – General guidance*

IEC 61076-3-123, *Connectors for electronic equipment – Product requirements – Part 3-123: Rectangular connectors – Detail specification for hybrid connectors for industrial environments, for power supply and fibre optic data transmission, with push-pull locking*

IEC 61156-1:2007³, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

IEC 61754-24-21, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 24-21: Type SC-RJ connectors with protective housings based on IEC 61076-3-106, variant 06*

IEC 61754-27, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 27: Type M12 FO connector family*

A.3 Installation profile terms, definitions, and abbreviated terms

A.3.1 Terms and definitions

Addition:

A.3.1.93

bus coupler

device that divides the Type 8 network into segments by opening the ring and integrating another ring at this point

³ A 2023 edition of this document exists but the listed edition applies.

A.3.1.94

local bus

ring segment of a Type 8 network with alternate media specifications, which is coupled to a remote bus device via a bus coupler

A.3.1.95

local bus device

device that operates as a slave on a local bus

A.3.1.96

master

device that controls the data transfer on the Type 8 network and initiates the media access of the slaves by sending messages and that constitutes the interface to the control system

A.3.1.97

remote bus

ring segment of a network

A.3.1.98

remote bus device

device operating as a slave on a remote bus

A.3.1.99

remote bus link

connection of two remote bus devices

A.3.1.100

ring segment

one section of a Type 8 network

A.3.1.101

slave

device that accesses the medium only after it has been initiated by the preceding slave or master

A.3.2 Abbreviated terms

Addition:

BC	Bus coupler
COM	Ground line
/DI	Incoming interface: send data line – Outgoing interface: receive data line –
DI	Incoming interface: send data line + Outgoing interface: receive data line +
/DO	Incoming interface: receive data line – Outgoing interface: send data line –
DO	Incoming interface: receive data line + Outgoing interface: send data line +
PELV	Protective extra low voltage
POF	Plastic optical fibre
SELV	Safety extra low voltage

A.3.3 Conventions for installation profiles

Not applicable.

A.4 Installation planning

A.4.1 General

A.4.1.1 Objective

A.4.1.2 Cabling in industrial premises

A.4.1.3 The planning process

A.4.1.4 Specific requirements for CPs

Not applicable.

A.4.1.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.2 Planning requirements

A.4.2.1 Safety

A.4.2.1.1 General

A.4.2.1.2 Electrical safety

Addition:

The power distribution system shall comply with IEC 60364-1:2005, 312.2.1 TN-S systems, i.e. earthed by bonding of enclosures with separated conductors for neutral (N) and protection earth (PE). Otherwise, there are additional efforts necessary to avoid currents on the shield, i.e. an AC earthed system on one end in a network with balanced cables or a network built with FO-cables. For networks built with OF-cables, the power distribution system should comply with IEC 60364-1:2005, 312.2.1 TN-S systems.

PELV is the default version for the power supply with extra-low voltage, but SELV may also be used. Temporary connected devices shall be powered by PELV or SELV.

A.4.2.1.3 Functional safety

A.4.2.1.4 Intrinsic safety

Not applicable.

A.4.2.1.5 Safety of optical fibre communication systems

A.4.2.2 Security

A.4.2.3 Environmental considerations and EMC

A.4.2.3.1 Description methodology

A.4.2.3.2 Use of the described environment to produce a bill of material

Addition:

To make fieldbus installation work easier for inexperienced planners, the user shall determine suitability of the components for the targeted environment through agreements with the component providers. The planner shall also observe the related technical data from the active devices. Depending on the expected environment the planner should define additional requirements. Passive optical components in the harsh industrial environment should be protected with suitable mitigation techniques or tested according to IEC 61753-1.

The planner shall take into account the mating or terminating interface of devices to be connected to the fieldbus network.

The planner shall take care about the environmental conditions of the whole Type 8 network and select suitable mitigation techniques to meet the respective requirements. Specific requirements for generic cabling in accordance with ISO/IEC 11801-3.

A.4.2.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.3 Network capabilities

A.4.3.1 Network topology

A.4.3.1.1 Common description

A.4.3.1.2 Basic physical topologies for passive networks

Not applicable.

A.4.3.1.3 Basic physical topologies for active networks

Replacement:

For Type 8 networks only the ring topology specified in IEC 61158-2 shall be used.

NOTE The Type 8 ring topology is achieved with specific cables and resembles a linear tree topology. Further explanation of the physical layer of Type 8 networks can be found in IEC 61158-2.

A.4.3.1.4 Combination of basic topologies

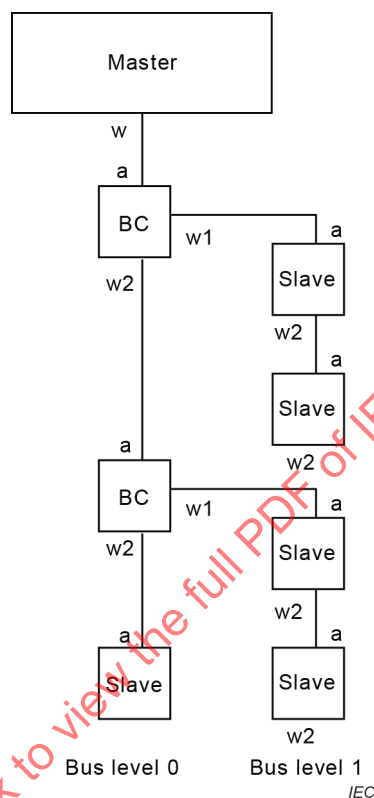
Replacement:

The combination of several topologies may also be used according to A.4.3.1.5.

A.4.3.1.5 Specific requirements for CPs

Addition:

The general structure is a ring topology with special cables to build tree like configurations. Bus couplers allow a branch from the remote bus to the local bus or to a further remote bus. Figure A.1 shows a Type 8 network structure example. There is no limit for the sub-leveling of remote buses. Only one local bus can be connected to a remote bus. A maximum of 63 devices can be connected to one local bus.



Key

w outgoing interface of the master

- a incoming interface of a slave

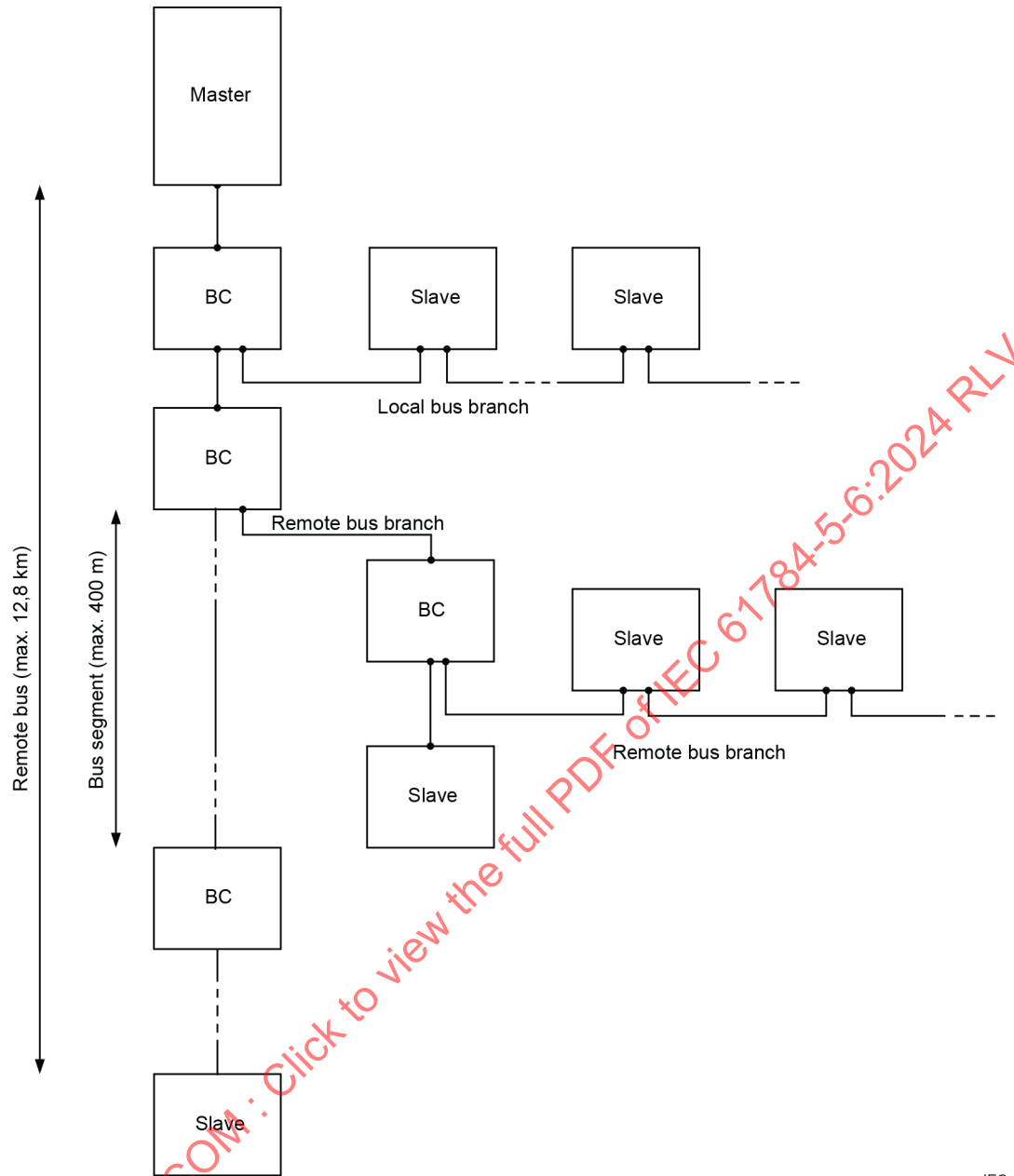
w1 first outgoing interface of a slave

w2 second outgoing interface of a slave

The ring segment level is increased when the devices are connected to w1.

Figure A.1 – Type 8 network structure example

The remote bus link length (i.e. the cable between two devices on a remote bus link) shall be between 0 m and the maximum length for the used bit rate (see Table A.1). The local bus link length (i.e. the cable between two devices on a local bus link) shall be between 0 m and 10 m. Figure A.2 shows a Type 8 network configuration example with bus length indications.



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Figure A.2 – Example of a Type 8 network configuration

A.4.3.1.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.3.2 Network characteristics

A.4.3.2.1 General

A.4.3.2.2 Network characteristics for balanced cabling not based on Ethernet

Replacement:

Table A.1 provides values based on the template given in IEC 61918:2018. Table 1.

Table A.1 – Basic network characteristics for balanced cabling not based on Ethernet

Characteristic	Type 8 network
Basic transmission technology	Type 8
Length / transmission speed	Segment length m
500 kbit/s	400 m between nodes ^a
2 Mbit/s	150 m between nodes ^a
8 Mbit/s	125 m between nodes ^a
16 Mbit/s	100 m between nodes ^a
Maximum capacity	Max. No.
Devices / segment	Remote bus: 256 ^b Local bus: 63 ^b
Number of devices / networks	Remote bus: 256 ^b Local bus: 256 ^b
^a The maximum length of a Type 8 network depends on the number of devices supported by the master and could be calculated by multiplication of link length by the number of devices. ^b The maximum number of all devices in one Type 8 network is limited to 256.	

A.4.3.2.3 Network characteristics for balanced cabling based on Ethernet

Not applicable.

A.4.3.2.4 Network characteristics for optical fibre cabling

Replacement:

Table A.2 provides values based on the template given in IEC 61918:2018, Table 3.

Table A.2 – Network characteristics for optical fibre cabling

Type 8 network		
Optical fibre type	Description	
Single mode silica	Bandwidth (MHz) or equivalent at λ (nm)	1 310 nm
	Minimum length (m)	0
	Maximum length ^a (m)	15 000
	Maximum channel Insertion loss/optical power budget (dB)	See IEC 61158-2
	Connecting hardware	See A.4.4.2.5
Multimode silica	Modal bandwidth (MHz × km) at λ (nm)	1 300 nm
	Minimum length (m)	0
	Maximum length ^a (m)	3 000
	Maximum channel insertion loss/optical power budget (dB)	See IEC 61158-2
	Connecting hardware	See A.4.4.2.5
POF	Modal bandwidth (MHz × 100 m) at λ (nm)	650 nm
	Minimum length (m)	0
	Maximum length ^a (m)	70
	Maximum channel insertion loss/optical power budget (dB)	See IEC 61158-2
	Connecting hardware	See A.4.4.2.5
Hard clad silica	Modal bandwidth (MHz × km) at λ (nm)	650 nm
	Minimum length (m)	0
	Maximum length ^a (m)	400
	Maximum channel insertion loss/optical power budget (dB)	See IEC 61158-2
	Connecting hardware	See A.4.4.2.5
^a This value is reduced by connections, splices and bends in accordance with IEC 61918:2018, Formula (1) in 4.4.3.4.1.		

A.4.3.2.5 Specific network characteristics

Not applicable.

A.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4 Selection and use of cabling components**A.4.4.1 Cable selection****A.4.4.1.1 Common description****A.4.4.1.2 Copper cables****A.4.4.1.2.1 Balanced cables for Ethernet-based CPs**

Not applicable.

A.4.4.1.2.2 Copper cables for non-Ethernet-based CPs*Replacement:*

Table A.3 and Table A.4 provide values based on the template given in IEC 61918:2018, Table 4 and Table 5.

Table A.3 – Information relevant to balanced cable: fixed cables

Characteristic	Type 8 network
Nominal impedance of cable (tolerance)	120 $\Omega \pm 20\%$ at $f = 0,064$ MHz 100 $\Omega \pm 15\%$ at $f > 1$ MHz
DCR of conductors	max. 9,6 Ω / 100 m
DCR of shield	-
Number of conductors	3 $\times$ 2, twisted pair
Shielding	Yes
Colour code for conductor	DO = yellow /DO = green DI = grey /DI = pink COM = brown
Jacket colour requirements	Green, RAL 6017
Jacket material	Application dependant
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	Cable types for different applications available
Agency ratings	Cable types with different ratings available
Cross section	Min. 0,20 mm ²
Dielectric strength	1 000 V RMS, 1 min
– Conductor/conductor	1 000 V RMS, 1 min
– Conductor/shield	Test method IEC 60189-1:2018, 8.2
Insulation resistance (after dielectric strength test)	Min 150 M Ω for a cable of 1 km in length Test method IEC 60189-1:2018, 8.3
Maximum transfer impedance	
– at 30 MHz	250 m Ω /m
Mutual capacitance (at 800 Hz)	Max. 60 nF for a cable of 1 km in length Test method IEC 60189-1:2018, 8.4
Min. near end cross talk loss (NEXT) for a cable of 100 m	
– at 0,772 MHz	61 dB
– at 1 MHz	59 dB
– at 2 MHz	55 dB
– at 4 MHz	50 dB
– at 8 MHz	46 dB
– at 10 MHz	44 dB
– at 16 MHz	41 dB
– at 20 MHz	40 dB
	Test method IEC 61156-1:2007, 6.3.5

Characteristic	Type 8 network
Max. attenuation for a cable of 100 m	
– at 0,256 MHz	1,5 dB
– at 0,772 MHz	2,4 dB
– at 1 MHz	2,7 dB
– at 4 MHz	5,2 dB
– at 10 MHz	8,4 dB
– at 16 MHz	11,2 dB
– at 20 MHz	11,9 dB
	Test method IEC 61156-1:2007, 6.3.3

Table A.4 – Information relevant to balanced cable: cords

Characteristic	Type 8 network
Nominal impedance of cable (tolerance)	120 $\Omega \pm 20\%$ at $f = 0,064$ MHz 100 $\Omega \pm 15\%$ at $f > 1$ MHz
DCR of conductors	Max. 9,6 Ω / 100 m
DCR of shield	-
Number of conductors	3 $\times$ 2, twisted pair
Shielding	Yes
Colour code for conductor	DO = yellow /DO = green DI = grey /DI = pink COM = brown
Jacket colour requirements	Green, RAL 6017
Jacket material	Application dependant
Resistance to harsh environment (e.g., UV, oil resist, LS0H)	Cable types for different applications available
Agency ratings	Cable types with different ratings available
Cross section	min. 0,20 mm ²
Dielectric strength	1 000 V RMS, 1 min
– Conductor/conductor	1 000 V RMS, 1 min
– Conductor/shield	Test method IEC 60189-1:2018, 8.2
Insulation resistance (After dielectric strength test)	Min 150 M Ω for a cable of 1 km in length Test method IEC 60189-1:2018, 8.3
Maximum transfer impedance	
– at 30 MHz	250 m Ω / m
Mutual capacitance (at 800 Hz)	Max. 60 nF for a cable of 1 km in length Test method IEC 60189-1:2018, 8.4

Characteristic	Type 8 network
Min. near end cross talk loss (NEXT) for a cable of 100 m	
– at 0,772 MHz	61 dB
– at 1 MHz	59 dB
– at 2 MHz	55 dB
– at 4 MHz	50 dB
– at 8 MHz	46 dB
– at 10 MHz	44 dB
– at 16 MHz	41 dB
– at 20 MHz	40 dB
	Test method IEC 61156-1:2007, 6.3.5
Max. attenuation for a cable of 100 m	
– at 0,256 MHz	1,5 dB
– at 0,772 MHz	2,4 dB
– at 1 MHz	2,7 dB
– at 4 MHz	5,2 dB
– at 10 MHz	8,4 dB
– at 16 MHz	11,2 dB
– at 20 MHz	11,9 dB
	Test method IEC 61156-1:2007, 6.3.3

A.4.4.1.3 Cables for wireless installation

A.4.4.1.4 Optical fibre cables

Replacement:

The planner shall select the appropriate optical fibre cable to support the required channel lengths and number of connections to be installed.

The cable shall be according to IEC 61158-2:2023, 27.7.2 and 28.1.

Polymer optical fibre cable shall be detailed according to IEC 61158-2:2023, 28.6.2.

Polymer clad optical fibre cable shall be detailed according to IEC 61158-2:2023, 28.6.3.

A.4.4.1.5 Special purpose balanced and optical fibre cables

Addition:

The specification from additional mechanical data depends on the application. The electrical or optical data apply also for specific cabling (see Table A.5).

Table A.5 – Remote bus fibre optic cable length

Fibre type	Minimum length	Maximum length
Polymer optical fibre	0 m	50 m (see Notes 1, 2)
Plastic clad silica fibre	0 m	300 m (see Notes 1, 2)

NOTE 1 This does not exclude longer distances between two devices e.g. by using receive circuits with a lower minimum optical receiver sensitivity than specified.

NOTE 2 The maximum length can be reduced in cases where special cables with higher attenuation than the standard cables specified are used.

A.4.4.1.6 Specific requirements for CPs

Addition:

The specification from additional mechanical data depends on the application. The electrical or optical data apply also for specific cabling.

A.4.4.1.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.2 Connecting hardware selection

A.4.4.2.1 Common description

A.4.4.2.2 Connecting hardware for balanced cabling CPs based on Ethernet

Not applicable.

A.4.4.2.3 Connecting hardware for copper cabling CPs not based on Ethernet

Replacement:

Table A.6 provides values based on the template given in IEC 61918:2018, Table 8.

Table A.6 – Connectors for copper cabling CPs not based on Ethernet

	IEC 60807-2 or IEC 60807-3	IEC 61076-2-101			IEC 61169-8	ANSI/NFPA T3.5.29 R1-2007		Others		
	Sub-D	M12-5 A-coding	M12-5 B-coding	M12-n X-coding	Coaxial (BNC)	M 18	7/8-16 UN-2B THD	Open style	Terminal block	M23 9 pos
CPF 6 Type 8 network	Yes	No	Yes	No	No	No	No	Yes	Yes	Yes ^a

NOTE For M12-5 connectors, there are many applications using these connectors that are not compatible and when mixed can cause damage to the applications.

^a Hybrid connector as specified in IEC 61158-2:2023, Clause M.3.

A.4.4.2.4 Connecting hardware for wireless installation**A.4.4.2.5 Connecting hardware for optical fibre cabling**

Replacement:

Table A.7 provides values based on the template given in IEC 61918:2018, Table 9.

Table A.7 – Optical fibre connecting hardware

	IEC 61754-2	IEC 61754-4	IEC 61754-24	IEC 61754 -24-21	IEC 61754-20	IEC 61754-22	Others	IEC 61754-27	IEC 61076 3-123
	BFOC 2,5	SC	SC-RJ	Sealed SC-RJ	LC	F-SMA	Hybrid con- nector	M12-FO	Push- Pull- Hybrid
CPF 6 Type 8 network	Yes	No	Yes	Yes	No	Yes	Yes ^a	Yes ^b	Yes
NOTE The IEC 61754 series defines the optical fibre connector mechanical interfaces; performance specifications for optical fibre connectors terminated to specific fibre types are standardised in the IEC 61753 series.									
^a As specified in IEC 61158-2:2023, Clause M.3.									

Replacement:

Table A.8 provides values based on the template given in IEC 61918:2018, Table 10.

Table A.8 – Relationship between FOC and fibre types (Type 8 networks)

	Fibre type				
	9..10/125 µm single mode silica	50/125 µm multimode silica	62,5/125 µm multimode silica	980/1 000 µm step index POF	200/230 µm step index hard clad silica
BFOC/2,5	No	No	Yes	No	Yes
SC	No	No	No	No	No
SC-RJ	Yes	Yes	Yes	Yes	Yes
LC	No	No	No	No	No
F-SMA	No	No	No	Yes	Yes
Hybrid connector	No	No	No	Yes	Yes
M12-FO	Yes	Yes	Yes	Yes	Yes
Push-Pull-Hybrid	Yes	Yes	Yes	No	No

A.4.4.2.6 Specific requirements for CPs

Not applicable.

A.4.4.2.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.3 Connections within a channel/permanent link

A.4.4.3.1 Common description

Not applicable.

A.4.4.3.2 Balanced cabling connections and splices for CPs based on Ethernet

Not applicable.

A.4.4.3.3 Copper cabling connections and splices for CPs not based on Ethernet

A.4.4.3.3.1 Common description

Addition:

Refer to the manufacturer's data sheet regarding the number of allowed connections. The number of allowed connections, adaptors and splices relates to the maximum channel attenuation.

A.4.4.3.3.2 Connections minimum distance

A.4.4.3.3.3 Copper cabling splices

A.4.4.3.3.4 Copper cabling bulkhead connections

A.4.4.3.3.5 Copper cabling J-J couplers (J-J adaptors)

A.4.4.3.4 Optical fibre cabling connections and splices for CPs based on Ethernet

Not applicable.

A.4.4.3.5 Optical fibre cabling connections and splices for CPs not based on Ethernet

Addition:

The number of allowed connections and splices relates to the maximum channel attenuation.

A.4.4.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.4 Terminators

Not applicable.

A.4.4.5 Device location and connection

A.4.4.5.1 Common description

A.4.4.5.2 Specific requirements for CPs

Not applicable.

A.4.4.5.3 Specific requirements for wireless installation

A.4.4.5.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.6 Coding and labelling

A.4.4.6.1 Common description

A.4.4.6.2 Additional requirements for CPs

A.4.4.6.3 Specific requirements for CPs

Addition:

For balanced cables, the signal wires shall comply with the colour codes specified in Table A.9.

Table A.9 – Colour code for balanced cables used by Type 8 networks

Signal	Colour code
DO	YE
/DO	GN
DI	GY
/DI	PK
COM	BN

A.4.4.6.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.7 Earthing and bonding of equipment and devices and shielded cabling

A.4.4.7.1 Common description

A.4.4.7.1.1 Basic requirements

Replacement:

Earth potential differences between cabling end points will induce noise in the cabling system. This is especially true in shielded cabling systems. Controlling earth currents is extremely important in reducing interference caused by earth offsets. Shield currents shall be mitigated by using a proper earthing system and/or proper shield termination techniques as defined in this document and the relevant CPs. If this requirement cannot be met, then alternate media, such as optical fibre cables, or wireless, shall be considered. UTP cables shall not be used.

A.4.4.7.1.2 Planner tasks

A.4.4.7.1.3 Methods for controlling potential differences in the earth system

A.4.4.7.1.4 Selection of the earthing and bonding systems

A.4.4.7.2 Bonding and earthing of enclosures and pathways

A.4.4.7.2.1 Equalisation and earthing conductor sizing and length

A.4.4.7.2.2 Bonding straps and sizing

A.4.4.7.2.3 Surface preparation and methods

A.4.4.7.2.4 Bonding and earthing

A.4.4.7.3 Earthing methods

A.4.4.7.4 Shield earthing

A.4.4.7.4.1 Non-earthing or parallel RC

Replacement:

A parallel RC circuit is located in the devices. Otherwise, an equipotential cable between any two devices shall be installed according to IEC 61918:2018, 4.4.7.2.1.

A.4.4.7.4.2 Direct

Not applicable.

A.4.4.7.4.3 Derivatives of direct and parallel RC

Not applicable.

A.4.4.7.5 Specific requirements for CPs

Not applicable.

A.4.4.7.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.8 Storage and transportation of cables

A.4.4.9 Routing of cables

A.4.4.10 Separation of circuits

A.4.4.11 Mechanical protection of cabling components

A.4.4.11.1 Common description

A.4.4.11.2 Specific requirements for CPs

A.4.4.11.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.4.4.12 Installation in special areas

Subclause 4.4.12.3 is not applicable.

A.4.5 Cabling planning documentation**A.4.5.1 Common description****A.4.5.2 Cabling planning documentation for CPs**

Addition:

The device documentation shall be observed for additional rules.

A.4.5.3 Network certification documentation**A.4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC 11801-3**

Not applicable.

A.4.6 Verification of cabling planning specification**A.5 Installation implementation****A.5.1 General requirements****A.5.1.1 Common description****A.5.1.2 Installation of CPs****A.5.1.3 Installation of generic cabling in industrial premises**

Not applicable.

A.5.2 Cable installation**A.5.2.1 General requirements for all cabling types****A.5.2.1.1 Storage and installation****A.5.2.1.2 Protecting communication cables against potential mechanical damage**

Replacement:

Table A.10 provides values based on the template given in IEC 61918:2018, Table 18.

Table A.10 – Parameters for balanced cables

Characteristic		Type 8 network
Mechanical force	Minimum bending radius, single bending	64 mm ^a
	Bending radius, multiple bending	64 mm ^a
	Pull forces	N ^a
	Permanent tensile forces	N ^a
	Maximum lateral forces	N/cm
	Temperature range during installation	0 °C to 70 °C ^a
^a Reference value, deviations are allowed; see manufacturer's data sheet.		

Replacement:

Table A.11 provides values based on the template given in IEC 61918:2018, Table 19.

Table A.11 – Parameters for silica optical fibre cables

Characteristic		Type 8 network
Mechanical force	Minimum bending radius, single bending	30 mm ^a
	Bending radius, multiple bending	50 mm ^a
	Pull forces	800 N ^a
	Permanent tensile forces	200 N ^a
	Maximum lateral forces	100 N/cm
	Temperature range during installation	5 °C to 50 °C ^a
^a Reference value, deviations are allowed; see manufacturer's data sheet.		

Replacement:

Table A.12 provides values based on the template given in IEC 61918:2018, Table 20.

Table A.12 – Parameters for POF optical fibre cables

Characteristic		Type 8 network for permanent indoor installation	Type 8 network for indoor installations with movements
Mechanical force	Minimum bending radius, single bending	30 mm ^a	50 mm ^a
	Bending radius, multiple bending	50 mm ^a	65 mm ^a
	Pull forces	600 N ^a	300 N ^a
	Permanent tensile forces	100 N ^a	100 N ^a
	Maximum lateral forces	20 N/cm	20 N/cm
	Temperature range during installation	5 °C to 50 °C ^a	5 °C to 50 °C ^a
	Suitable for use as trailing cable	No	10 × d, at least 5 million cycles, Increase in attenuation ≤ 1 dBm
^a Reference value, deviations are allowed; see manufacturer's data sheet.			

Replacement:

Table A.13 provides values based on the template given in IEC 61918:2018, Table 21.

Table A.13 – Parameters for hard clad silica optical fibre cables

Characteristic		Type 8 network for permanent indoor installation	Type 8 network for permanent outdoor installation
Mechanical force	Minimum bending radius, single bending	30 mm ^a	150 mm ^a
	Bending radius, multiple bending	50 mm ^a	200 mm ^a
	Pull forces	800 N ^a	1 500 N ^a
	Permanent tensile forces	200 N ^a	200 N ^a
	Maximum lateral forces	100 N/cm	300 N/cm
	Temperature range during installation	5 °C to 50 °C ^a	–5 °C to 50 °C ^a
	Longitudinal water tightness	No	IEC 60794-1-2 Method F5
^a Reference value, deviations are allowed; see manufacturer's data sheet.			

A.5.2.1.3 Avoid forming loops

A.5.2.1.4 Torsion (twisting)

A.5.2.1.5 Tensile strength (on installed cables)

A.5.2.1.6 Bending radius

A.5.2.1.7 Pull force

A.5.2.1.8 Fitting strain relief

A.5.2.1.9 Installing cables in cabinet and enclosures

A.5.2.1.10 Installation on moving parts

A.5.2.1.11 Cable crush

A.5.2.1.12 Installation of continuous flexing cables

A.5.2.1.13 Additional instructions for the installation of optical fibre cables

A.5.2.2 Installation and routing

A.5.2.2.1 Common description

A.5.2.2.2 Separation of circuits

A.5.2.3 Specific requirements for CPs

Not applicable.

A.5.2.4 Specific requirements for wireless installation

A.5.2.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.5.3 Connector installation

A.5.3.1 Common description

A.5.3.2 Shielded connectors

A.5.3.3 Unshielded connectors

Not applicable.

A.5.3.4 Specific requirements for CPs

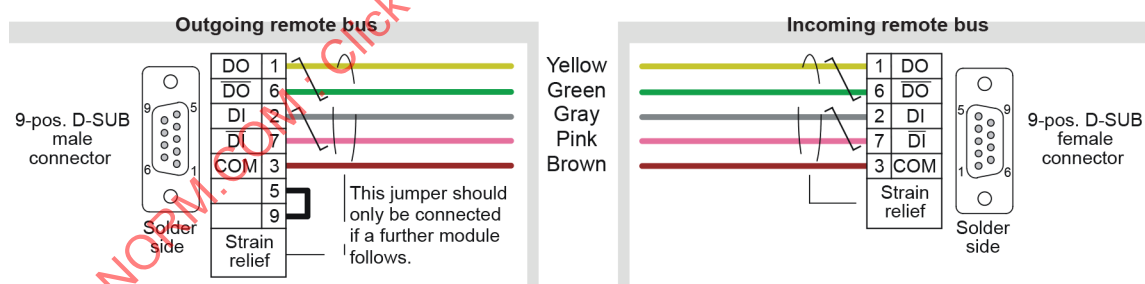
Replacement:

Deviations from the mechanical specifications are permitted for special applications if the electrical features of the cable correspond to the data specified in A.4.4 (in the event of deviations, please see the data sheet). A cable connection method should be selected, which will not cause a marked deterioration in the specified electrical data. Particular attention should be paid when selecting the connection method for the shielding. The shielding shall be connected in such a way that the conductor cross section is not reduced and the wires are covered with as much of the shielding as possible. The shielding shall be led concentrically through the threaded joint as far as possible.

The wire pairs shall be twisted up to the connection contacts. Two cables should not be connected with each other as losses can be caused by reflections at the connection point and the effectiveness of the shielding could also deteriorate. This is especially relevant if different cable types are connected with one another.

If it is not possible to avoid connection points or the electrical data cannot be achieved for a special cable, an individual test should be carried out to determine whether, for example, the cable can still be used by reducing the permissible transmission distance.

Different connectors can be applied. The wiring schemes are shown in Figure A.3, Figure A.4 and Figure A.5.



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Figure A.3 – Sub-D connector pin assignment

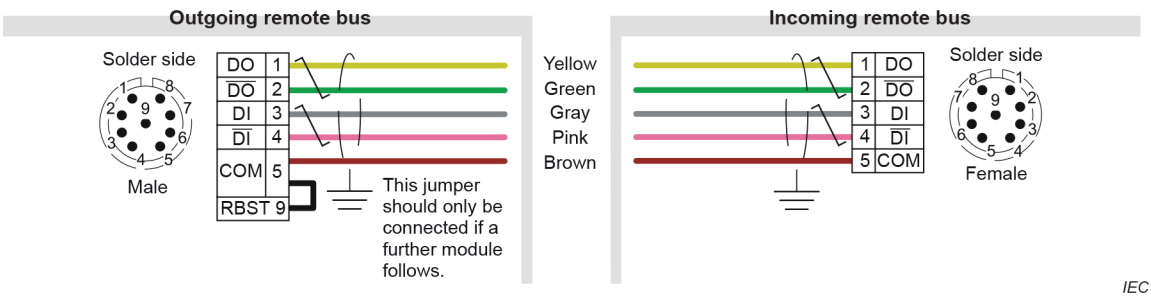


Figure A.4 – M23 circular connector pin assignment

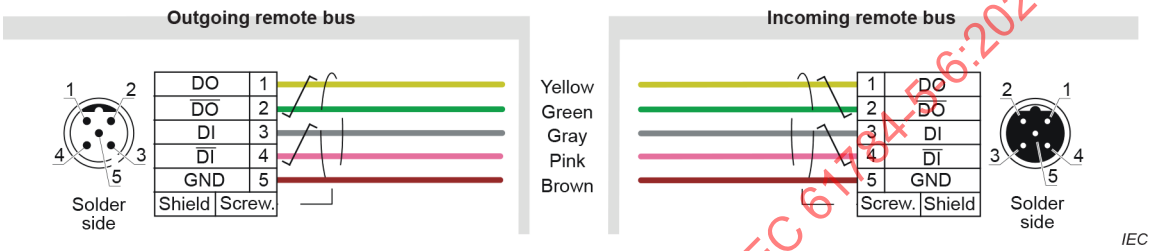


Figure A.5 – M12 circular connector pin assignment

Figure A.6 shows the terminal connector position at the device, and the pin assignments of the terminal connector are shown in Table A.14.

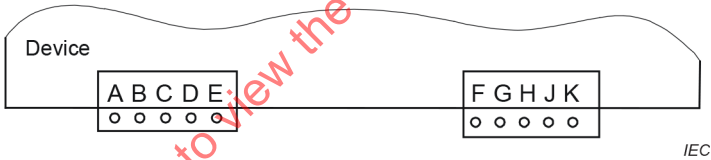


Figure A.6 – Terminal connector at the device

Table A.14 – Pin assignment of the terminal connector

Incoming interface		Outgoing interface	
Pin	Standard	Pin	Standard
A	/DO1	F	/DO2
B	DO1	G	DO2
C	/DI1	H	/DI2
D	DI1	J	DI2
E	GND1	K	GND

A separate terminal for protective earth shall be provided. The sequence of terminal points should be observed.

A.5.3.5 Specific requirements for wireless installation

A.5.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.5.4 Terminator installation

Not applicable.

A.5.5 Device installation

A.5.6 Coding and labelling

A.5.7 Earthing and bonding of equipment and devices and shield cabling

Subclause 5.7.6 is not applicable.

A.5.8 As-implemented cabling documentation

A.6 Installation verification and installation acceptance test

A.6.1 General

A.6.2 Installation verification

A.6.2.1 General

A.6.2.2 Verification according to cabling planning documentation

A.6.2.3 Verification of earthing and bonding

A.6.2.3.1 General

A.6.2.3.2 Specific requirements for earthing and bonding

Not applicable.

A.6.2.4 Verification of shield earthing

A.6.2.5 Verification of cabling system

A.6.2.6 Cable selection verification

A.6.2.6.1 Common description

A.6.2.6.2 Specific requirements for CPs

Not applicable.

A.6.2.6.3 Specific requirements for wireless installation

A.6.2.7 Connector verification

A.6.2.7.1 Common description

A.6.2.7.2 Specific requirements for CPs

Not applicable.

A.6.2.7.3 Specific requirements for wireless installation

A.6.2.8 Connection verification

A.6.2.8.1 Common description

A.6.2.8.2 Number of connections and connectors

A.6.2.8.3 Wire mapping

A.6.2.9 Terminator verification

Not applicable.

A.6.2.10 Coding and labelling verification**A.6.2.10.1 Common description****A.6.2.10.2 Specific coding and labelling verification requirements**

Not applicable.

A.6.2.11 Verification report**A.6.3 Installation acceptance test****A.6.3.1 General****A.6.3.2 Acceptance test of Ethernet-based cabling**

Not applicable.

A.6.3.3 Acceptance test of non-Ethernet-based cabling**A.6.3.3.1 Copper cabling for non-Ethernet-based CPs****A.6.3.3.1.1 Common description****A.6.3.3.1.2 Specific requirements for copper cabling for non-Ethernet-based CPs**

Addition:

The installation shall be validated with a cable tester. The Type 8 network structure shall be checked.

Software support tools should be used for the network structure validation.

A.6.3.3.2 Optical fibre cabling for non-Ethernet-based CPs**A.6.3.3.2.1 Common description****A.6.3.3.2.2 Specific requirements for non-Ethernet-based CPs**

Addition:

The Type 8 network structure and installation shall be checked.

Software support tools should be used for the network structure validation.

A.6.3.3.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

A.6.3.4 Specific requirements for wireless installation

A.6.3.5 Acceptance test report

Addition:

Software tools which generate test reports should be used. The test reports should be stored as a file or in a paper version.

A.7 Installation administration

Subclause 7.8 is not applicable.

A.8 Installation maintenance and installation troubleshooting

Subclause 8.4 has addition:

Inspection:

Software tools which allow a broad inspection of the system should be used for inspection.

Maintenance and repair: trained personnel shall be used.

Software tools which display the diagnostics results should be used.

Specific requirements for maintenance and troubleshooting:

Type 8 networks contain integrated diagnostic. Software tools which support a convenient presentation of the diagnostic results should be used.

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Annex B (normative)

CPF 6 Ethernet network specific installation profile

B.1 Installation profile scope

Addition:

This annex specifies the installation profile for the Ethernet network of devices applying to Communication Profile CP 6/2. CP 6/2 itself is defined in IEC 61784-1.

NOTE For the Type 8 network of devices applying CP 6/2 the installation profile specified in Annex A is used.

B.2 Normative references

Addition:

IEC 60603-7-3:2010, *Connectors for electronic equipment – Part 7-3: Detail specification for 8-way, shielded, free and fixed connectors, for data transmission with frequencies up to 100 MHz*

IEC 60603-7-5:2010, *Connectors for electronic equipment – Part 7-5: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 250 MHz*

IEC 60603-7-51:2010, *Connectors for electronic equipment – Part 7-51: Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 500 MHz*

IEC 60793-2-30:2015, *Optical fibres – Part 2-30: Product specifications – Sectional specification for category A3 multimode fibres*

IEC 60793-2-40:2021, *Optical fibres – Part 2-40: Product specifications – Sectional specification for category A4 multimode fibres*

IEC 60793-2-50:2018, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60794-1-2, *Optical fibre cables – Part 1 2: Generic specification – Basic optical cable test procedures – General guidance*

IEC 61156-5, *Multicore and symmetrical pair/quad cables for digital communications – Part 5: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Horizontal floor wiring – Sectional specification*

IEC 61076-2-111:2017, *Connectors for electrical and electronic equipment – Product requirements – Part 2-111: Circular connectors – Detail specification for power connectors with M12 screw-locking*

IEC 61076-3-123, *Connectors for electronic equipment – Product requirements – Part 3-123: Rectangular connectors – Detail specification for hybrid connectors for industrial environments, for power supply and fibre optic data transmission, with push-pull locking*

IEC 61754-24-21, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 24-21: Type SC-RJ connectors with protective housings based on IEC 61076-3-106, variant 06*

IEC 61754-27, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 27: Type M12-FO connector family*

IEC 63171 (all parts), *Connectors for electrical and electronic equipment*

B.3 Installation profile terms, definitions, and abbreviated terms

B.3.1 Terms and definitions

B.3.2 Abbreviated terms

Addition:

FO	Fibre optical
PELV	Protective extra low voltage
POF	Plastic optical fibre
SELV	Safety extra low voltage

B.3.3 Conventions for installation profiles

Not applicable.

B.4 Installation planning

B.4.1 General

B.4.1.1 Objective

B.4.1.2 Cabling in industrial premises

B.4.1.3 The planning process

B.4.1.4 Specific requirements for CPs

Not applicable.

B.4.1.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

B.4.2 Planning requirements

B.4.2.1 Safety

B.4.2.1.1 General

B.4.2.1.2 Electrical safety

Addition:

The power distribution system shall comply with IEC 60364-1:2005, 312.2.1 TN-S systems, i.e. earthed by bonding of bodies with separated conductors for neutral (N) and protection earth

(PE). Otherwise, there are additional efforts necessary to avoid currents on the shield, i.e. an AC earthed system on one end in a network with balanced cables or a network built with FO-cables. For networks built with FO-cables, the power distribution system should comply with IEC 60364-1:2005, 312.2.1 TN-S systems.

PELV is the default version for the power supply with extra-low voltage, but SELV may also be used. Temporary connected devices shall be powered by PELV or SELV.

B.4.2.1.3 Functional safety

B.4.2.1.4 Intrinsic safety

Not applicable.

B.4.2.1.5 Safety of optical fibre communication systems

B.4.2.2 Security

B.4.2.3 Environmental considerations and EMC

B.4.2.3.1 Description methodology

B.4.2.3.2 Use of the described environment to produce a bill of material

Addition:

To make fieldbus installation work easier for inexperienced planners, the user shall determine suitability of the components for the targeted environment through agreements with the component providers. The planner shall also observe the related technical data from the active devices. Depending on the expected environment, the planner should define additional requirements. Passive optical components in the harsh industrial environment should be protected with suitable mitigation techniques or tested according to IEC 61753-1-3.

The planner shall take into account the mating or terminating interface of devices to be connected to the fieldbus network.

The planner shall take care about the environmental conditions of the whole network and select suitable mitigation techniques in addition to meet the respective requirements.

B.4.2.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.3 Network capabilities

B.4.3.1 Network topology

B.4.3.1.1 Common description

B.4.3.1.2 Basic physical topologies for passive networks

Not applicable.

B.4.3.1.3 Basic physical topologies for active networks

Replacement:

For the Ethernet network of devices applying CP 6/2 the following topologies are permitted:

- linear,
- star.

B.4.3.1.4 Combination of basic topologies

Not applicable.

B.4.3.1.5 Specific requirements for CPs

Not applicable.

B.4.3.1.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.3.2 Network characteristics

B.4.3.2.1 General

B.4.3.2.2 Network characteristics for balanced cabling not based on Ethernet

Not applicable.

B.4.3.2.3 Network characteristics for balanced cabling based on Ethernet

Replacement:

Table B.1 provides values based on the template given in IEC 61918:2018, Table 2.

Table B.1 – Network characteristics for balanced cabling based on Ethernet

Characteristic	CP 6/2 Ethernet network
Supported data rates (Mbit/s)	1-pair: 10 two and four pair: 100, 1 000
Supported channel length (m) ^b	1-pair: 1 000 two and four pair: 100
Number of connections in the channel (max.) ^{a, b}	1-pair: 10 two and four pair: 4
Patch cord length (m) ^a	1-pair: 990 two and four pair: 10
Channel class per ISO/IEC 11801-3 (min.) ^b	1-pair: T1 two and four pair: D
Cable category per ISO/IEC 11801-3 (min.) ^c	1-pair: T1 two and four pair: 5
Connecting HW category per ISO/IEC 11801-3 (min.)	1-pair: A, B (according to IEC 63171) two and four pair: 5
Cable types	1-pair: 1-pair cable types for SPE according to IEC 61156-11, IEC 61156-12, IEC 61156-13 two and four pair: Shielded-TP, according to ISO/IEC 11801-1:2017, Annex E
^a See B.4.4.3.2. ^b For the purpose of this table, the channel definitions of ISO/IEC 11801-3, as referenced in IEC 61918:2018/AMD1:2022, Annex Q, are applicable. ^c For additional information, see IEC 61156 series.	

B.4.3.2.4 Network characteristics for optical fibre cabling

Replacement:

Table B.2 provides values based on the template given in IEC 61918:2018, Table 3.

Table B.2 – Network characteristics for optical fibre cabling

CP 6/2 Ethernet network		
Optical fibre type	Description	
Single mode silica	Bandwidth (MHz) or equivalent at λ (nm)	1 310 nm
	Minimum length (m)	0
	Maximum length ^a (m)	14 000
	Maximum channel Insertion loss/optical power budget (dB)	See ISO/IEC 11801-1
	Connecting hardware	See B.4.4.2.5
Multimode silica	Modal bandwidth (MHz × km) at λ (nm)	850
	Minimum length (m)	0
	Maximum length ^a (m)	2 000
	Maximum channel insertion loss/optical power budget (dB)	See ISO/IEC 11801-1
	Connecting hardware	See B.4.4.2.5
POF	Modal bandwidth (MHz × 100 m) at λ (nm)	650
	Minimum length (m)	0
	Maximum length ^a (m)	50
	Maximum channel insertion loss/optical power budget (dB)	11,5
	Connecting hardware	See B.4.4.2.5
Hard clad silica	Modal bandwidth (MHz × km) at λ (nm)	650
	Minimum length (m)	0
	Maximum length ^a (m)	100
	Maximum channel insertion loss/optical power budget (dB)	4
	Connecting hardware	See B.4.4.2.5
^a This value is reduced by connections, splices and bends in accordance with IEC 61918:2018, Formula (1) in 4.4.3.4.1.		

B.4.3.2.5 Specific network characteristics*Addition:*

For CP 6/2 Ethernet networks neither patch cords / jumpers nor patch panels / outlets (TO or AO) are mandatory. CP6/2 Ethernet networks are often built with connectionless links; not more than 4 connections shall be used.

CP 6/2 Ethernet networks shall be connected to the generic cabling as defined in IEC 11801-3 via an AO with a mating interface according to IEC 61076-3-106 Variant 06 or IEC 61076-2-101.

B.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.4 Selection and use of cabling components

B.4.4.1 Cable selection

B.4.4.1.1 Common description

B.4.4.1.2 Copper cables

B.4.4.1.2.1 Balanced cables for Ethernet-based CPs

Addition:

For Ethernet networks with two or four pairs for CP 6/2, a minimum of CAT 5 according to ISO/IEC 11801-1 shall be used.

Replacement:

Table B.3 provides values based on the template given in IEC 61918:2018, Table 4.

Table B.3 – Information relevant to copper cable: fixed cables

Characteristic	CP 6/2 Ethernet network
Nominal impedance of cable (tolerance)	1-pair: $100 \Omega \pm 5 \Omega$ (IEC 61156-11 and -IEC 61156-13) two and four pair: $100 \Omega \pm 15 \Omega$ (IEC 61156-5)
DCR of conductors	$\leq 9,38 \Omega / 100 \text{ m}$
DCR of shield	–
Number of conductors	2, 4 or 8
Shielding	S/FTP, S/FTQ, S/STP
Colour code for conductor	1-pair: BU-WH two pairs: BU-WH/BU, OG-WH/OG four pairs: BU-WH/BU, OG-WH/OG, GN-WH/GN, BN-WH/BN Or: BU-WH, OG-WH, GN-WH, BN-WH
Jacket colour requirements	To meet user requirement
Jacket material	To meet user requirement
Resistance to harsh environment (e.g., UV, oil resist, LS0H)	To meet user requirement; Up to manufacturer's differentiation
Agency ratings	Local Government requirements
Transfer impedance	$50 \text{ m} \Omega / \text{m}$ at 10 MHz
Installation type	Stationary, no movement after installation
Outer cable diameter (max)	8,5 mm
Wire cross section	Min. AWG 24 – $0,22 \text{ mm}^2$
Wire diameter (insulated)	$\leq 1,6 \text{ mm}$

Replacement:

Table B.4 provides values based on the template given in IEC 61918:2018, Table 5.

Table B.4 – Information relevant to copper cable: cords

Characteristic	CP 6/2 Ethernet network
Nominal impedance of cable (tolerance)	1-pair: $100 \Omega \pm 5 \Omega$ (IEC 61156-12) two and four pair: $100 \Omega \pm 15 \Omega$ (IEC 61156-5)
DCR of conductors	$\leq 9,38 \Omega / 100 \text{ m}$
DCR of shield	–
Number of conductors	2, 4 or 8
Length	1-pair: $\leq 1.000 \text{ m}$ two and four pair: $\leq 100 \text{ m}$
Shielding	S/FTP, S/FTQ, S/STP
Colour code for conductor	1-pair: BU-WH two pairs: BU-WH/BU, OG-WH/OG four pairs: BU-WH/BU, OG-WH/OG, GN-WH/GN, BN-WH/BN Or: BU-WH, OG-WH, GN-WH, BN-WH
Jacket colour requirements	To meet user requirement
Jacket material	To meet user requirement
Resistance to harsh environment (e.g., UV, oil resist, LS0H)	To meet user requirement; Up to manufacturer's differentiation
Agency ratings	Local Government requirements
Transfer Impedance	$50 \text{ m}\Omega / \text{m}$ at 10 MHz
Installation type	Stationary or with movement after installation
Outer cable diameter (max)	8,5 mm
Wire cross section	AWG 26 to 22 – $0,14 \text{ mm}^2$ to $0,35 \text{ mm}^2$
Wire diameter (insulated)	$\leq 1,6 \text{ mm}$

B.4.4.1.2.2 Copper cables for non-Ethernet-based CPs

Not applicable.

B.4.4.1.3 Cables for wireless installation**B.4.4.1.4 Optical fibre cables***Replacement:*

Table B.5 provides values based on the template given in IEC 61918:2018, Table 6.

Table B.5 – Information relevant to optical fibre cables

Characteristics for CP 6/2 Ethernet network	9..10/125 µm single mode silica	50/125 µm multimode silica	62,5/125 µm multimode silica	980/1 000 µm step index POF	200/230 µm step index hard clad silica
Document	IEC 60793-2-50; Types B-652.B, B-652.D	IEC 60793-2-10; Types A1-OM2, A1-OM3, A1-OM4, A1-OM5	IEC 60793-2-10; Type A1-OM1	IEC 60793-2-40; Type A4a	IEC 60793-2-30; Type A3c
Attenuation per km (650 nm)	–	–	–	280 dB	10 dB
Attenuation per km (820 nm)	–	–	–	–	14 dB
Attenuation per km (1 310 nm)	1 dB	1,5 dB	1,5 dB	–	–
Number of optical fibres	2	2	2	2	2
Jacket colour requirements	Red	Red	Red	Red	Red
Jacket material	To meet user requirements	To meet user requirements	To meet user requirements	Polyurethane	Polyurethane
Resistance to harsh environment (e.g.: UV, oil resist, LS0H)	To meet user requirements	To meet user requirements	To meet user requirements	To meet user requirements	To meet user requirements
Outer diameter	8 mm ± 0,5 mm	8 mm ± 0,5 mm	8 mm ± 0,5 m	8 mm ± 0,5 mm	8 mm ± 0,5 mm
Bandwidth × length	–	–	–	> 10 MHz × 100 m	≥ 17 MHz × km at 650 nm
Wire material	–	–	–	Polyamide	Flame retardant non corrosive
Wire colour	–	–	–	Orange, black	Red, green or grey
Wire diameter	–	–	–	2,2 mm ± 0,07 mm	2,9 mm
Strain relief	Non-metal, aramide or wool	Non-metal, aramide or wool	Non-metal, aramide or wool	Non-metal, aramide or wool	Non-metal, aramide
Bending radius	–	–	–	30 mm	30 mm

B.4.4.1.5 Special purpose balanced and optical fibre cables**B.4.4.1.6 Specific requirements for CPs****B.4.4.1.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3****B.4.4.2 Connecting hardware selection****B.4.4.2.1 Common description****B.4.4.2.2 Connecting hardware for balanced cabling CPs based on Ethernet**

Replacement:

Table B.6 provides values based on the template given in IEC 61918:2018, Table 7.

Table B.6 – Connectors for balanced cabling CPs based on Ethernet

	IEC 60603-7 series ^a		IEC 61076-3-106 ^b	IEC 61076-3-117 ^b	IEC 61076-2-101	IEC 61076-2-109	IEC 61076-2-114	IEC 63171-2		IEC 63171-5	
	Shielded	unshielded	Var. 6	Var. 14	M12-4 with D-coding	M12-8 with X-coding	M8-4 with D-coding	Shielded	Unshielded	M8	M12
CP 6/2 Ethernet network two or four pair	IEC 60603-7-3 or IEC 60603-7-5 or IEC 60603-7-51	No	Yes	No	Yes	Yes	Yes	No	No	No	No
CP 6/2 Ethernet network 1-pair	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

^a With regards to IEC 60603-7 series, the connector selection is based on the desired channel.

^b Housings to protect connectors.

B.4.4.2.3 Connecting hardware for copper cabling CPs not based on Ethernet

Replacement:

Table B.7 provides values based on the template given in IEC 61918:2018, Table 8.

Table B.7 – Connectors for copper cabling CPs not based on Ethernet

	IEC 60807-2 or IEC 60807-3	IEC 61076-2-111	Others		
	Sub-D	M12-n with L-coding	Open style	Terminal block	M23
Power supply for CP 6/2 Ethernet network devices	Yes	Yes	Yes	Yes	Yes

NOTE There are many applications using these connectors that are not compatible and when mixed can cause damage to the applications.

B.4.4.2.4 Connecting hardware for wireless installation**B.4.4.2.5 Connecting hardware for optical fibre cabling**

Replacement:

Table B.8 provides values based on the template given in IEC 61918:2018, Table 9.

Table B.8 – Optical fibre connecting hardware

	IEC 61754-2	IEC 61754-4	IEC 61754 -24	IEC 61754 -24-21	IEC 61754-20	IEC 61754-22	IEC 61754-27	IEC 61076 -3-123
	BFOC 2,5	SC	SC-RJ	Sealed SC-RJ	LC	F-SMA	M12-FO	Push-Pull- Hybrid
CP 6/2 Ethernet network	Yes	Yes	Yes ^a	Yes ^a	No	Yes	Yes	Yes
NOTE The IEC 61754 series defines the optical fibre connector mechanical interfaces; performance specifications for optical fibre connectors terminated to specific fibre types are standardised in the IEC 61753 series.								
^a The SC-RJ is the default connector.								

Replacement:

Table B.9 provides values based on the template given in IEC 61918:2018, Table 10.

Table B.9 – Relationship between FOC and fibre types (CP 6/2 Ethernet network)

	Fibre type				
	9..10/125 µm single mode silica	50/125 µm multimode silica	62,5/125 µm multimode silica	980/1 000 µm step index POF	200/230 µm step index hard clad silica
BFOC/2,5	No	No	Yes	No	Yes
SC	Yes	Yes	Yes	Yes	Yes
SC-RJ	Yes	Yes	Yes	Yes	Yes
Sealed SC-RJ	Yes	Yes	Yes	Yes	Yes
LC	No	No	No	No	No
F-SMA	No	No	No	Yes	Yes
M12-FO	Yes	Yes	Yes	Yes	Yes
Push-Pull-Hybrid	Yes	Yes	Yes	No	No

B.4.4.2.6 Specific requirements for CPs

Not applicable.

B.4.4.2.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

Not applicable.

B.4.4.3 Connections within a channel/permanent link

B.4.4.3.1 Common description

B.4.4.3.2 Balanced cabling connections and splices for CPs based on Ethernet

B.4.4.3.2.1 Common description

Addition:

Refer to the manufacturer's data sheet regarding the number of allowed connections.

The number of allowed connections, adaptors and splices relates to the maximum channel attenuation.

B.4.4.3.2.2 Connections minimum distance

Replacement:

As defined in ISO/IEC 11801 series.

B.4.4.3.2.3 Balanced cabling splices

Replacement:

As defined in ISO/IEC 11801 series.

B.4.4.3.2.4 Balanced cabling bulkhead connections

Replacement:

As defined in ISO/IEC 11801 series.

B.4.4.3.2.5 Balanced cabling J-J coupler (J-J adaptor)

Replacement:

As defined in ISO/IEC 11801 series.

B.4.4.3.3 Copper cabling connections and splices for CPs not based on Ethernet

Not applicable.

B.4.4.3.4 Optical fibre cabling connections and splices for CPs based on Ethernet

B.4.4.3.5 Optical fibre cabling connections and splices for CPs not based on Ethernet

Not applicable.

B.4.4.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.4.4 Terminators

B.4.4.4.1 Common description

B.4.4.4.2 Specific requirements for CPs

Not applicable.

B.4.4.4.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.4.5 Device location and connection

B.4.4.6 Coding and labelling

B.4.4.7 Earthing and bonding of equipment and devices and shielded cabling

B.4.4.8 Storage and transportation of cables

B.4.4.9 Routing of cables**B.4.4.10 Separation of circuits****B.4.4.11 Mechanical protection of cabling components****B.4.4.12 Installation in special areas****B.4.5 Cabling planning documentation**

Addition:

The device documentation shall be observed for additional rules.

B.4.6 Verification of cabling planning specification**B.5 Installation implementation****B.5.1 General requirements****B.5.2 Cable installation****B.5.2.1 General requirements for all cabling types**

Subclause 5.2.1.2 has replacement:

Table B.10 to Table B.13 provide values based on the template given in IEC 61918:2018, Table 18 to Table 21.

Table B.10 – Parameters for balanced cables

Characteristic		CP 6/2 Ethernet network
Mechanical force	Minimum bending radius, single bending	64 mm ^a
	Bending radius, multiple bending	64 mm ^a
	Pull forces	N ^a
	Permanent tensile forces	N ^a
	Maximum lateral forces	N/cm
	Temperature range during installation	0 °C to 70 °C ^a
^a Reference value, deviations are allowed; see manufacturer's data sheet.		

Table B.11 – Parameters for silica optical fibre cables

Characteristic		CP 6/2 Ethernet network
Mechanical force	Minimum bending radius, single bending	30 mm ^a
	Bending radius, multiple bending	50 mm ^a
	Pull forces	800 N ^a
	Permanent tensile forces	200 N ^a
	Maximum lateral forces	100 N/cm
	Temperature range during installation	5 °C to 50 °C ^a
^a Reference value, deviations are allowed; see manufacturer's data sheet.		

Table B.12 – Parameters for POF optical fibre cables

Characteristic		CP 6/2 Ethernet network for permanent indoor installation	CP 6/2 Ethernet network for permanent outdoor installation
Mechanical force	Minimum bending radius, single bending	30 mm ^a	50 mm ^a
	Bending radius, multiple bending	50 mm ^a	65 mm ^a
	Pull forces	600 N ^a	300 N ^a
	Permanent tensile forces	100 N ^a	100 N ^a
	Maximum lateral forces	20 N/cm	20 N/cm
	Temperature range during installation	5 °C to 50 °C ^a	5 °C to 50 °C ^a
	Suitable for use as trailing cable	No	10 × d, at least 5 million cycles, Increase in attenuation ≤ 1 dBm
^a Reference value, deviations are allowed; see manufacturer's data sheet.			

Table B.13 – Parameters for hard clad silica optical fibre cables

Characteristic		CP 6/2 Ethernet network for permanent indoor installation	CP 6/2 Ethernet network for permanent outdoor installation
Mechanical force	Minimum bending radius, single bending	30 mm ^a	150 mm ^a
	Bending radius, multiple bending	50 mm ^a	200 mm ^a
	Pull forces	800 N ^a	1 500 N ^a
	Permanent tensile forces	200 N ^a	200 N ^a
	Maximum lateral forces	100 N/cm	300 N/cm
	Temperature range during installation	5 °C to 50 °C ^a	–5 °C to 50 °C ^a
	Longitudinal water tightness	No	IEC 60794-1-2 Method F5
^a Reference value, deviations are allowed; see manufacturer's data sheet.			

B.5.2.2 Installation and routing**B.5.2.3 Specific requirements for CPs**

Not applicable.

B.5.2.4 Specific requirements for wireless installation**B.5.2.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**

Not applicable.

B.5.3 Connector installation

B.5.3.1 Common description

B.5.3.2 Shielded connectors

B.5.3.3 Unshielded connectors

Not applicable.

B.5.3.4 Specific requirements for CPs

Addition:

Connectors should be equipped with a tool less assembling technique, like the examples in Figure B.1.

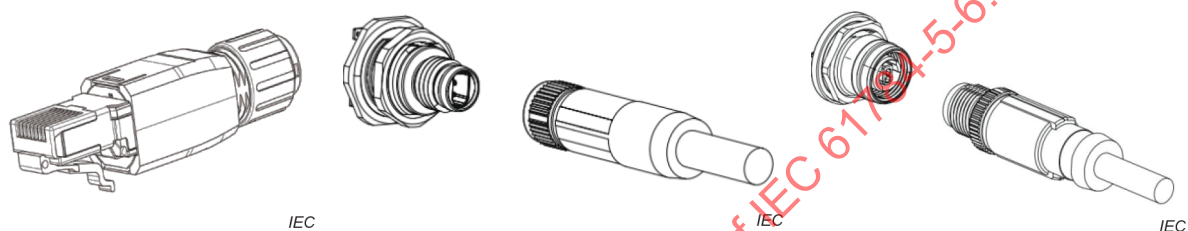


Figure B.1 – Terminal connector at the device

A crossover for changing the signal from transmitter to receiver should not be used. Network components for CP 6/2 Ethernet networks should be designed so that they carry out an automatic crossover.

B.5.3.5 Specific requirements for wireless installation

B.5.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.5.4 Terminator installation

Not applicable.

B.5.5 Device installation

B.5.6 Coding and labelling

B.5.7 Earthing and bonding of equipment and devices and shield cabling

Subclause 5.7.5 is not applicable.

B.5.8 As-implemented cabling documentation

B.6 Installation verification and installation acceptance test**B.6.1 General****B.6.2 Installation verification****B.6.3 Installation acceptance test**

Subclause 6.3.3 is not applicable.

B.7 Installation administration

Subclause 7.8 is not applicable.

B.8 Installation maintenance and installation troubleshooting

Subclause 8.4 has addition:

Inspection:

Software tools which allow a broad inspection of the system should be used for inspection.

Maintenance and repair: trained personnel shall be used.

Software tools which display the diagnostics results should be used.

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Addition:

- [41] IBS SYS PRO INST UM E, *Configuring and Installing INTERBUS™*;
Phoenix Contact GmbH & Co.KG; Prod. Id. 27 43 802
(can be downloaded from www.phoenixcontact.com) [viewed 2023-08-22]

- [42] IBS IL SYS PRO UM E, *Configuring and Installing the INTERBUS™ Inline product range*;
Phoenix Contact GmbH & Co.KG; Prod. Id. 27 43 048
(can be downloaded from www.phoenixcontact.com) [viewed 2023-08-22]

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SOMMAIRE

AVANT-PROPOS	55
INTRODUCTION.....	57
1 Domaine d'application	58
2 Références normatives	58
3 Termes, définitions et abréviations	58
4 CPF 6: Vue d'ensemble des profils d'installation.....	59
5 Conventions relatives aux profils d'installation.....	59
6 Conformité aux profils d'installation	60
Annexe A (normative) Profil d'installation spécifique à un réseau de type 8 de la CPF 6	61
A.1 Domaine d'application du profil d'installation.....	61
A.2 Références normatives	61
A.3 Termes, définitions et abréviations utilisés pour le profil d'installation	61
A.3.1 Termes et définitions	61
A.3.2 Abréviations	62
A.3.3 Conventions relatives aux profils d'installation.....	63
A.4 Planification de l'installation.....	63
A.4.1 Généralités.....	63
A.4.2 Exigences de planification	63
A.4.3 Capacités du réseau.....	64
A.4.4 Sélection et utilisation de composants de câblage	68
A.4.5 Documentation de planification du câblage	77
A.4.6 Vérification de la spécification de planification du câblage.....	77
A.5 Mise en œuvre de l'installation.....	77
A.5.1 Exigences générales	77
A.5.2 Installation des câbles	78
A.5.3 Installation de connecteur.....	80
A.5.4 Installation des terminaisons	82
A.5.5 Installation du dispositif	82
A.5.6 Codage et étiquetage	82
A.5.7 Mise à la terre et équipotentialité du matériel et des dispositifs et câblage blindé	82
A.5.8 Documentation du câblage comme exécuté	82
A.6 Installation, vérification et essai de réception de l'installation.....	83
A.6.1 Généralités	83
A.6.2 Vérification de l'installation	83
A.6.3 Essai de réception de l'installation	84
A.7 Administration de l'installation.....	84
A.8 Maintenance et dépannage de l'installation.....	85
Annexe B (normative) Profil d'installation spécifique à un réseau Ethernet de la CPF 6	86
B.1 Domaine d'application du profil d'installation.....	86
B.2 Références normatives	86
B.3 Termes, définitions et abréviations utilisés pour le profil d'installation	87
B.3.1 Termes et définitions	87
B.3.2 Abréviations	87
B.3.3 Conventions relatives aux profils d'installation.....	87

B.4	Planification de l'installation	87
B.4.1	Généralités	87
B.4.2	Exigences de planification	87
B.4.3	Capacités du réseau	88
B.4.4	Sélection et utilisation de composants de câblage	91
B.4.5	Documentation de planification du câblage	98
B.4.6	Vérification de la spécification de planification du câblage	98
B.5	Mise en œuvre de l'installation	98
B.5.1	Exigences générales	98
B.5.2	Installation des câbles	98
B.5.3	Installation de connecteur	100
B.5.4	Installation des terminaisons	101
B.5.5	Installation du dispositif	101
B.5.6	Codage et étiquetage	101
B.5.7	Mise à la terre et équipotentialité du matériel et des dispositifs et câblage blindé	101
B.5.8	Documentation du câblage comme exécuté	101
B.6	Installation, vérification et essai de réception de l'installation	101
B.6.1	Généralités	101
B.6.2	Vérification de l'installation	101
B.6.3	Essai de réception de l'installation	101
B.7	Administration de l'installation	101
B.8	Maintenance et dépannage de l'installation	102
	Bibliographie	103
	Figure 1 – Relations entre les normes	57
	Figure A.1 – Exemple de structure de réseau de Type 8	65
	Figure A.2 – Exemple de configuration de réseau de Type 8	66
	Figure A.3 – Affectation des contacts de connecteur D-Sub	81
	Figure A.4 – Affectation des broches d'un connecteur circulaire M23	81
	Figure A.5 – Affectation des broches d'un connecteur circulaire M12	81
	Figure A.6 – Connecteur à bornes au niveau de l'appareil	82
	Figure B.1 – Connecteur à bornes au niveau de l'appareil	101
	Tableau A.1 – Caractéristiques de base du réseau pour un câblage symétrique ne reposant pas sur Ethernet	67
	Tableau A.2 – Caractéristiques du réseau pour un câblage à fibres optiques	68
	Tableau A.3 – Informations applicables aux câbles symétriques: câbles fixes	69
	Tableau A.4 – Informations appropriées aux câbles en cuivre: cordons	70
	Tableau A.5 – Longueur du câble à fibres optiques du bus distant	72
	Tableau A.6 – Connecteurs pour les CP de câblage en cuivre ne reposant pas sur Ethernet	72
	Tableau A.7 – Matériel de connexion pour câblage à fibres optiques	73
	Tableau A.8 – Rapport entre le FOC et les types de fibres (réseaux de type 8)	73
	Tableau A.9 – Code de couleur des câbles à paires symétriques utilisés par les réseaux de type 8	75
	Tableau A.10 – Paramètres pour câbles symétriques	78

Tableau A.11 – Paramètres pour câbles à fibres optiques en silice	78
Tableau A.12 – Paramètres pour câbles à fibres optiques en plastique	79
Tableau A.13 – Paramètres pour des câbles en fibres optiques de silice à gaine rigide	79
Tableau A.14 – Affectation des broches du connecteur à bornes	82
Tableau B.1 – Caractéristiques du réseau pour un câblage symétrique reposant sur Ethernet	89
Tableau B.2 – Caractéristiques du réseau pour un câblage à fibres optiques	90
Tableau B.3 – Informations applicables aux câbles en cuivre: câbles fixes	92
Tableau B.4 – Informations applicables aux câbles en cuivre: cordons	93
Tableau B.5 – Informations applicables aux câbles à fibres optiques	94
Tableau B.6 – Connecteurs pour les CP de câblage symétrique reposant sur Ethernet	95
Tableau B.7 – Connecteurs pour les CP de câblage en cuivre ne reposant pas sur Ethernet	95
Tableau B.8 – Matériel de connexion pour câblage à fibres optiques	96
Tableau B.9 – Rapport entre le FOC et les types de fibres (réseau Ethernet CP 6/2)	96
Tableau B.10 – Paramètres pour câbles symétriques	99
Tableau B.11 – Paramètres pour câbles à fibres optiques en silice	99
Tableau B.12 – Paramètres pour câbles à fibres optiques en plastique	99
Tableau B.13 – Paramètres pour des câbles en fibres optiques de silice à gaine rigide	100

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

RÉSEAUX INDUSTRIELS –
PROFILS –Partie 5-6: Installation des bus de terrain –
Profils d'installation pour la CPF 6

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L'IEC 61784-5-6 a été établie par le sous-comité 65C: Réseaux industriels, du comité d'études 65 de l'IEC: Mesure, commande et automation dans les processus industriels. Il s'agit d'une Norme internationale.

Le présent document est à utiliser conjointement avec l'IEC 61918:2018, l'IEC 61918:2018/AMD1:2022 et l'IEC 61918:2018/AMD2:2024.

Cette cinquième édition annule et remplace la quatrième édition parue en 2018. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) alignement sur l'IEC 61918:2018, l'IEC 61918:2018/AMD1:2022 et l'IEC 61918:2018/AMD2:2024;
- b) ajout d'un nouveau contenu relatif à l'Ethernet à paire unique (SPE) à l'Annexe B, Tableau B.1, Tableau B.3, Tableau B.4 et Tableau B.6.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
65C/1283/FDIS	65C/1297/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/publications.

Une liste de toutes les parties de la série IEC 61784-5, publiées sous le titre général *Réseaux industriels – Profils – Installation des bus de terrain*, se trouve sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site Web de l'IEC sous webstore.iec.ch dans les données relatives au document recherché. À cette date, le document sera:

- reconduit,
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- révisé.

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INTRODUCTION

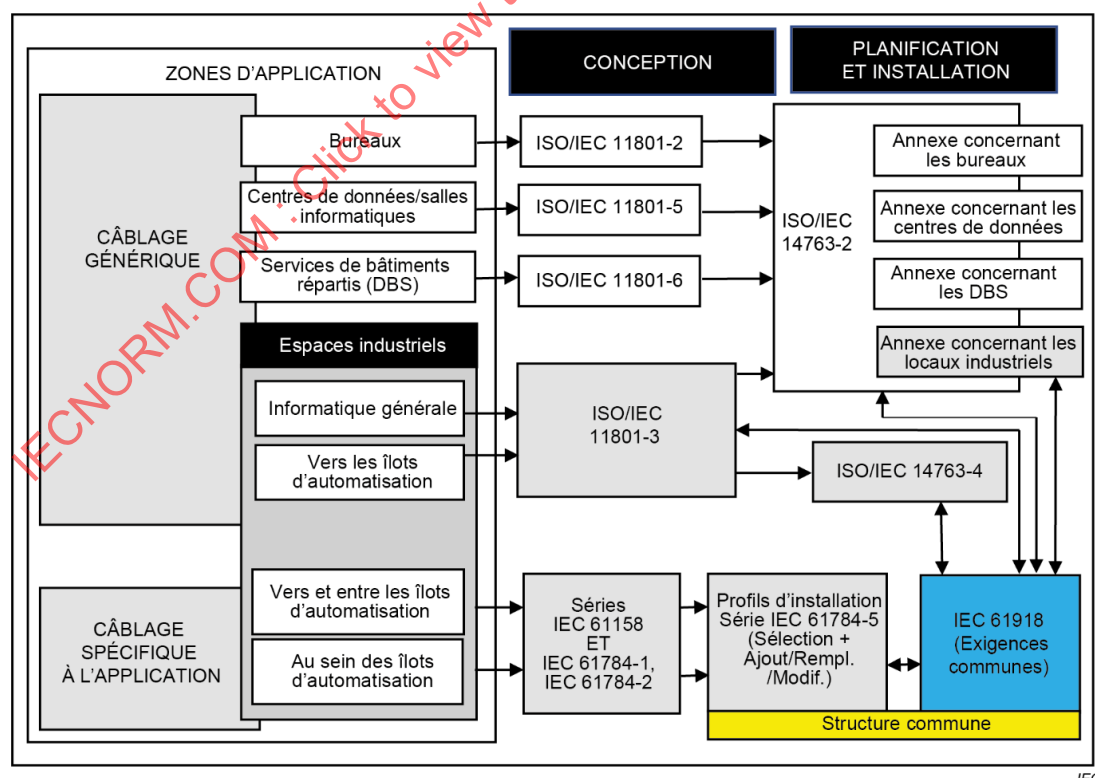
Le présent document fait partie d'une série élaborée pour faciliter l'utilisation des réseaux de communication dans des systèmes de contrôle-commande industriels.

L'IEC 61918:2018, l'IEC 61918:2018/AMD1:2022 et l'IEC 61918:2018/AMD2:2024 spécifient les exigences communes relatives à l'installation de réseaux de communication dans des systèmes de contrôle-commande industriels. La présente norme décrit les profils d'installation des profils de communication (CP) d'une famille spécifique de profils de communication (CPF) en indiquant les exigences de l'IEC 61918 qui s'appliquent pleinement et, si nécessaire, en complétant, en modifiant ou en remplaçant les autres exigences (voir la Figure 1).

Se reporter à l'IEC 61158-1 pour un contexte général sur les bus de terrain, leurs profils et la relation entre les profils d'installation spécifiés dans le présent document.

Chaque profil d'installation de CP est spécifié dans une annexe séparée du présent document. Chaque annexe est structurée exactement de la même manière que la norme de référence IEC 61918 compte tenu des rôles des différentes personnes impliquées dans le processus d'installation des bus de terrain, tels que définis dans l'IEC 61918 (planificateur, installateur, vérificateur, valideur, personnel chargé de la maintenance, personnel chargé de l'administration). Ces personnes, par la lecture du profil d'installation conjointement avec l'IEC 61918, déterminent immédiatement quelles sont les exigences communes relatives à l'installation de tous les CP et quelles exigences font l'objet d'une modification ou d'un remplacement. Les conventions utilisées pour la rédaction du présent document sont définies à l'Article 5.

La définition d'une norme de profils d'installation pour chaque CPF (par exemple l'IEC 61784-5-6 pour la CPF 6) permet aux utilisateurs de travailler avec des documents de taille raisonnable.



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Figure 1 – Relations entre les normes

RÉSEAUX INDUSTRIELS – PROFILS –

Partie 5-6: Installation des bus de terrain – Profils d'installation pour la CPF 6

1 Domaine d'application

La présente partie de l'IEC 61784-5 spécifie les profils d'installation pour la CPF 6 (INTERBUS™)¹.

Les profils d'installation sont spécifiés dans les annexes. Ces annexes sont à lire conjointement avec l'IEC 61918:2018, l'IEC 61918:2018/AMD1:2022 et l'IEC 61918:2018/AMD2:2024.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 61918:2018², *Réseaux de communication industriels – Installation de réseaux de communication dans des locaux industriels*
IEC 61918:2018/AMD1:2022
IEC 61918:2018/AMD2:2024

NOTE Pour les références normatives spécifiques aux profils, voir les Articles A.2 et B.2.

3 Termes, définitions et abréviations

Pour les besoins du présent document, les termes, définitions et abréviations donnés dans l'IEC 61918:2018, Article 3, l'IEC 61918:2018/AMD1:2022, Article 3, et les Articles A.3 et B.3 du présent document s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse <https://www.electropedia.org/>
- ISO Online browsing platform: disponible à l'adresse <https://www.iso.org/obp>

¹ INTERBUS™ est une marque de INTERBUS Club, organisation indépendante d'utilisateurs et de fournisseurs de produits INTERBUS. Cette information est donnée à l'intention des utilisateurs du présent document et ne signifie nullement que l'IEC approuve l'emploi du produit ainsi désigné. La conformité à ce profil n'exige pas l'utilisation de la marque INTERBUS. L'utilisation de la marque INTERBUS exige l'autorisation de son détenteur.

² Les références normatives de l'IEC 61918:2018, Article 2, de l'IEC 61918:2018/AMD1:2022, Article 2 et de l'IEC 61918:2018/AMD2:2024, Article 2, s'appliquent.

4 CPF 6: Vue d'ensemble des profils d'installation

La CPF 6 comprend sept profils de communication (voir l'IEC 61784-1:— pour les CP 6/1, CP 6/2, CP 6/3, voir l'IEC 61784-2:— pour les CP 6/4, CP 6/5, CP 6/6 et voir l'IEC 61784-3-6 pour le FSCP 6/7).

Le profil d'installation de réseau de type 8 de la CPF 6 (non Ethernet) est spécifié à l'Annexe A.

Le profil d'installation spécifique Ethernet CPF 6 est spécifié à l'Annexe B.

5 Conventions relatives aux profils d'installation

La numérotation des articles et paragraphes des annexes de la présente Norme correspond à celle des principaux articles et paragraphes de l'IEC 61918:2018.

Les articles et paragraphes des annexes du présent document complètent, modifient ou remplacent les articles et paragraphes correspondants de l'IEC 61918.

En l'absence d'un paragraphe correspondant de l'IEC 61918 dans les annexes normatives du présent document, le paragraphe pertinent de l'IEC 61918 s'applique sans modification.

La lettre d'en-tête d'annexe représente le profil d'installation qui lui est attribué à l'Article 4. La numérotation des articles (ou paragraphes) après la lettre d'en-tête d'annexe doit correspondre à la numérotation de l'article (ou paragraphe) concerné de l'IEC 61918.

EXEMPLE "Le paragraphe B.4.4" dans l'IEC 61784-5-6 signifie que le CP 6/2 est spécifié dans le paragraphe 4.4 de l'IEC 61918.

Tous les articles principaux de l'IEC 61918 sont cités et s'appliquent pleinement, sauf indication contraire dans chaque annexe normative de profil d'installation.

Si tous les paragraphes d'un article (paragraphe) sont omis, l'article (paragraphe) correspondant de l'IEC 61918 s'applique.

Si un article (paragraphe) indique "Non applicable", l'article (paragraphe) correspondant de l'IEC 61918 ne s'applique pas.

Si un article (ou paragraphe) indique "*Ajout:*", l'article (ou paragraphe) correspondant de l'IEC 61918 s'applique en incluant les ajouts indiqués pour le profil.

Si un article (ou paragraphe) indique "*Remplacement:*", le texte donné dans le profil remplace le texte de l'article (ou paragraphe) correspondant de l'IEC 61918.

NOTE Un remplacement peut également comprendre des ajouts.

Si un article (paragraphe) indique "*Modification:*", l'article (paragraphe) correspondant de l'IEC 61918 s'applique en incluant les modifications indiquées pour le profil.

Si tous les paragraphes d'un article (ou paragraphe) sont omis alors que, dans ledit article (ou paragraphe), il est indiqué "*l'Article (ou le paragraphe) x comporte un ajout:*" (ou "*remplacement:*") ou "*l'Article (ou le paragraphe) x ne s'applique pas*", dans ce cas l'Article (ou paragraphe) x est valide tel que déclaré et tous les autres articles (ou paragraphes) correspondants de l'IEC 61918 s'appliquent.

6 Conformité aux profils d'installation

Chaque profil d'installation dans le présent document inclut une partie de l'IEC 61918:2018, de l'IEC 61918:2018/AMD1:2022 et de l'IEC 61918:2018/AMD2:2024. Il peut également comprendre la définition de spécifications supplémentaires.

Une déclaration de conformité à un profil d'installation du présent document doit être stipulée comme suit:

la conformité à l'IEC 61784-5-6:2024 pour le CP 6/m <nom> ou

la conformité à l'IEC 61784-5-6 (Éd.5.0) pour le CP 6/m <nom>

Le nom placé entre guillemets simples < > est facultatif, lesdits guillemets simples ne doivent pas être inclus. Le "m" dans CP 6/m doit être remplacé par le numéro de profil 1 à 2.

NOTE Le nom peut être celui du profil, par exemple INTERBUS.

Si le nom est une marque commerciale, l'autorisation du détenteur du nom commercial doit être exigée.

Les normes de produits ne doivent comporter aucun aspect relatif à l'évaluation de conformité (y compris les dispositions de management de la qualité), que ce soit à titre normatif ou informatif, autre que les dispositions applicables aux essais des produits (évaluation et examen).

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Annexe A (normative)

Profil d'installation spécifique à un réseau de type 8 de la CPF 6

A.1 Domaine d'application du profil d'installation

Ajout:

La présente norme spécifie le profil d'installation des réseaux de type 8 CPF 6 et les profils de communication associés:

- CP 6/1, CP 6/2, CP 6/3 – spécifiés dans l'IEC 61784-1,
- CP 6/4, CP 6/5, CP 6/6 – spécifiés dans l'IEC 61784-2,
- FSCP 6/7 – spécifiés dans l'IEC 61784-3-6.

A.2 Références normatives

Ajout:

IEC 60189-1:2018, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods* (disponible en anglais seulement)

IEC 60794-1-2, *Câbles à fibres optiques – Partie 1-2: Spécification générique – Procédures fondamentales d'essais des câbles optiques – Recommandations générales*

IEC 61076-3-123, *Connecteurs pour équipements électriques et électroniques – Exigences de produit – Partie 3-123: Connecteurs rectangulaires – Spécification particulière relative aux connecteurs hybrides dans des environnements industriels pour l'alimentation et la transmission de données fibronique, avec verrouillage de type pousser-tirer*

IEC 61156-1:2007³, *Câbles multiconducteurs à paires symétriques et quarts pour transmissions numériques – Partie 1: Spécification générique*

IEC 61754-24-21, *Dispositifs d'interconnexion et composants passifs à fibres optiques – Interfaces de connecteurs à fibres optiques – Partie 24-21: Connecteurs de type SC-RJ équipés de boîtiers de protection selon la CEI 61076-3-106, variante 06*

IEC 61754-27, *Dispositifs d'interconnexion et composants passifs à fibres optiques – Interfaces de connecteurs pour fibres optiques – Partie 27: Famille de connecteurs de type M12-FO*

A.3 Termes, définitions et abréviations utilisés pour le profil d'installation

A.3.1 Termes et définitions

Ajout:

A.3.1.93

coupleur de bus

dispositif qui divise le réseau de type 8 en segments par l'ouverture de l'anneau et l'intégration d'un autre anneau en ce point

³ Il existe une édition 2023 du présent document, mais l'édition indiquée s'applique.

A.3.1.94

bus local

segment d'anneau d'un réseau de type 8 avec spécifications de support alternatif, couplé à un dispositif de bus distant par l'intermédiaire d'un coupleur de bus

A.3.1.95

dispositif de bus local

dispositif intervenant comme appareil subordonné sur un bus local

A.3.1.96

appareil principal

dispositif qui contrôle le transfert de données sur le réseau de type 8 et déclenche l'accès au support des appareils subordonnés par la transmission de messages, et qui constitue l'interface au système de commande

A.3.1.97

bus distant

segment d'anneau d'un réseau

A.3.1.98

dispositif de bus distant

dispositif intervenant comme appareil subordonné sur un bus distant

A.3.1.99

liaison de bus distant

connexion de deux dispositifs de bus distants

A.3.1.100

segment d'anneau

section d'un réseau de type 8

A.3.1.101

appareil subordonné

dispositif qui accède au support uniquement après son déclenchement par l'appareil subordonné ou l'appareil principal précédent

A.3.2 Abréviations

Ajout:

BC	Bus Coupler (coupleur de bus)
COM	Ligne de terre
/DI	Interface entrante: ligne de données de transmission – Interface sortante: ligne de données de réception –
DI	Interface entrante: ligne de données de transmission + Interface sortante: ligne de données de réception +
/DO	Interface entrante: ligne de données de réception – Interface sortante: ligne de données de transmission –
DO	Interface entrante: ligne de données de réception + Interface sortante: ligne de données de transmission +
TBTP	Très Basse Tension de Protection
POF	Plastic Optical Fibre (fibre optique en plastique)
TBTS	Très Basse Tension de Sécurité

A.3.3 Conventions relatives aux profils d'installation

Non applicable.

A.4 Planification de l'installation

A.4.1 Généralités

A.4.1.1 Objectif

A.4.1.2 Câblage dans les locaux industriels

A.4.1.3 Processus de planification

A.4.1.4 Exigences spécifiques pour les CP

Non applicable.

A.4.1.5 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

Non applicable.

A.4.2 Exigences de planification

A.4.2.1 Sûreté

A.4.2.1.1 Généralités

A.4.2.1.2 Sécurité électrique

Ajout:

Le réseau de distribution d'énergie doit satisfaire à l'IEC 60364-1:2005, 312.2.1, Systèmes TN-S, c'est-à-dire mis à la terre par liaison équipotentielle des enveloppes avec des conducteurs séparés pour le neutre (N) et la terre de protection (PE). Dans le cas contraire, des efforts supplémentaires sont nécessaires pour éviter la présence de courants sur le blindage, c'est-à-dire un système mis à la terre en courant alternatif à une extrémité sur un réseau comportant des câbles à paires symétriques ou un réseau constitué de câbles FO. Pour les réseaux constitués de câbles FO, il convient que le réseau de distribution d'énergie soit conforme à l'IEC 60364-1:2005, 312.2.1, Systèmes TN-S.

La TBTP est la version par défaut pour l'alimentation à très basse tension, mais la TBTS peut également être utilisée. Les dispositifs à connexion provisoire doivent être alimentés par TBTP ou TBTS.

A.4.2.1.3 Sécurité fonctionnelle

A.4.2.1.4 Sécurité intrinsèque

Non applicable.

A.4.2.1.5 Sécurité des systèmes de communication par fibres optiques

A.4.2.2 Sécurité

A.4.2.3 Considérations environnementales et compatibilité électromagnétique

A.4.2.3.1 Méthodologie de description

A.4.2.3.2 Utilisation de l'environnement décrit pour produire une nomenclature

Ajout:

Afin de faciliter aux planificateurs inexpérimentés le travail d'installation des bus de terrain, l'utilisateur doit déterminer le caractère approprié des composants pour l'environnement ciblé, et ce, par le truchement d'accords avec les fournisseurs des composants. Le planificateur doit également observer les données techniques associées des dispositifs actifs. Il convient que le planificateur définisse également des exigences supplémentaires selon l'environnement attendu. Il convient que les composants optiques passifs situés dans un environnement industriel sévère soient protégés par des techniques de réduction adaptées ou soient soumis aux essais conformément à l'IEC 61753-1.

Le planificateur doit tenir compte de l'interface de jonction ou de terminaison des dispositifs devant être connectés au réseau de bus de terrain.

Le planificateur doit se soucier des conditions environnementales du réseau de type 8 dans son ensemble, et choisir les techniques de réduction adaptées pour répondre aux exigences respectives. Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

A.4.2.4 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

Non applicable.

A.4.3 Capacités du réseau

A.4.3.1 Topologie du réseau

A.4.3.1.1 Description commune

A.4.3.1.2 Topologies physiques de base des réseaux passifs

Non applicable.

A.4.3.1.3 Topologies physiques de base des réseaux actifs

Remplacement:

Pour les réseaux de type 8, seule la topologie en anneau spécifiée dans l'IEC 61158-2 doit être utilisée.

NOTE La topologie en anneau de type 8 est réalisée avec des câbles spécifiques et s'apparente à une topologie arborescente linéaire. L'IEC 61158-2 fournit une explication supplémentaire de la couche physique des réseaux de type 8.

A.4.3.1.4 Combinaison de topologies de base

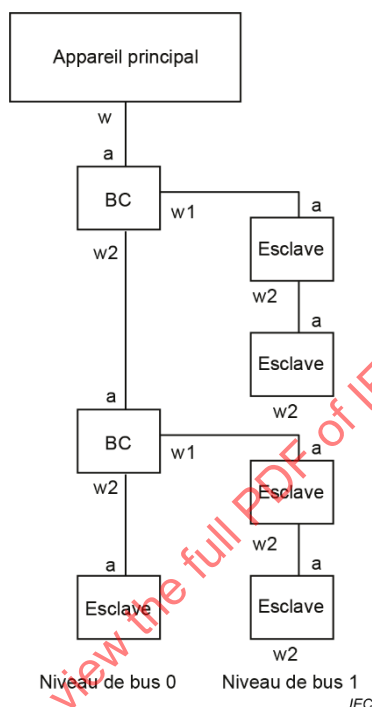
Remplacement:

La combinaison de plusieurs topologies peut également être utilisée selon A.4.3.1.5.

A.4.3.1.5 Exigences spécifiques pour les CP

Ajout:

La structure générale est une topologie en anneau comportant des câbles spécifiques permettant d'établir des configurations arborescentes. Les coupleurs de bus permettent la présence d'une branche entre le bus distant et le bus local ou un autre bus distant. La Figure A.1 représente un exemple de structure de réseau de type 8. Il n'existe aucune limite pour le classement en sous-niveaux des bus distants. Seul un bus local peut être connecté à un bus distant. 63 dispositifs au maximum peuvent être connectés à un bus local.



Légende

w interface sortante de l'appareil principal

- a interface entrante d'un appareil subordonné

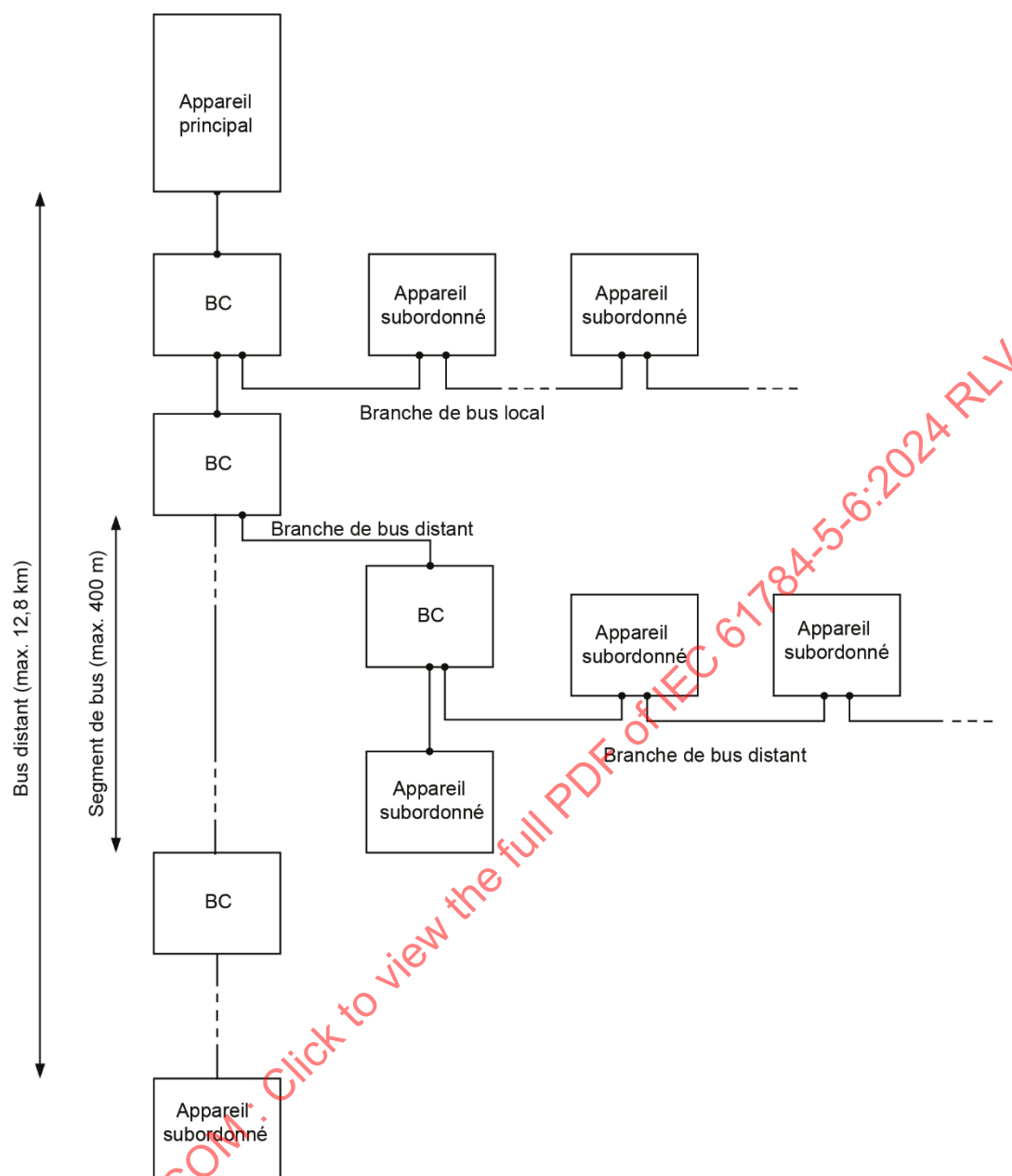
w1 première interface sortante d'un appareil subordonné

w2 seconde interface sortante d'un appareil subordonné

Le niveau de segment en anneau augmente lorsque les dispositifs sont connectés à w1.

Figure A.1 – Exemple de structure de réseau de Type 8

La longueur de liaison du bus distant (c'est-à-dire le câble entre deux dispositifs sur une liaison de bus distant) doit être comprise entre 0 m et la longueur maximale pour le débit binaire utilisé (voir Tableau A.1). La longueur de liaison de bus local (c'est-à-dire le câble entre deux dispositifs sur une liaison de bus local) doit être comprise entre 0 m et 10 m. La Figure A.2 représente un exemple de configuration de réseau de type 8 avec des indications de longueur de bus.



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Figure A.2 – Exemple de configuration de réseau de Type 8

A.4.3.1.6 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

Non applicable.

A.4.3.2 Caractéristiques du réseau

A.4.3.2.1 Généralités

A.4.3.2.2 Caractéristiques du réseau pour un câblage symétrique ne reposant pas sur Ethernet

Remplacement:

Le Tableau A.1 fournit des valeurs fondées sur le modèle de l'IEC 61918:2018, Tableau 1.

**Tableau A.1 – Caractéristiques de base du réseau
pour un câblage symétrique ne reposant pas sur Ethernet**

Caractéristique	Réseau de type 8
Technologie de transmission de base	Type 8
Longueur / vitesse de transmission	Longueur de segment m
500 kbit/s	400 m entre nœuds ^a
2 Mbit/s	150 m entre nœuds ^a
8 Mbit/s	125 m entre nœuds ^a
16 Mbit/s	100 m entre nœuds ^a
Capacité maximale	Nbre max.
Dispositifs / segment	Bus distant: 256 ^b Bus local: 63 ^b
Nombre de dispositifs / réseaux	Bus distant: 256 ^b Bus local: 256 ^b
^a La longueur maximale d'un réseau de type 8 dépend du nombre de dispositifs pris en charge par l'appareil principal et peut être calculée en multipliant la longueur de liaison par le nombre de dispositifs. ^b Le nombre maximal de dispositifs quels qu'ils soient dans un réseau de type 8 est limité à 256.	

A.4.3.2.3 Caractéristiques du réseau pour un câblage symétrique reposant sur Ethernet

Non applicable.

A.4.3.2.4 Caractéristiques du réseau pour un câblage à fibres optiques

Remplacement:

Le Tableau A.2 fournit des valeurs fondées sur le modèle donné dans l'IEC 61918:2018, Tableau 3.

Tableau A.2 – Caractéristiques du réseau pour un câblage à fibres optiques

Réseau de type 8		
Type de fibres optiques	Description	
Fibre silice unimodale	Largeur de bande (MHz) ou équivalente à λ (nm)	1 310 nm
	Longueur minimale (m)	0
	Longueur maximale ^a (m)	15 000
	Perte d'insertion maximale du canal/bilan de puissance optique (dB)	Voir l'IEC 61158-2
	Matériel de connexion	Voir A.4.4.2.5
Fibre silice multimodale	Largeur de bande modale (MHz × km) à λ (nm)	1 300 nm
	Longueur minimale (m)	0
	Longueur maximale ^a (m)	3 000
	Perte d'insertion maximale du canal/bilan de puissance optique (dB)	Voir l'IEC 61158-2
	Matériel de connexion	Voir A.4.4.2.5
POF	Largeur de bande modale (MHz × 100 m) à λ (nm)	650 nm
	Longueur minimale (m)	0
	Longueur maximale ^a (m)	70
	Perte d'insertion maximale du canal/bilan de puissance optique (dB)	Voir l'IEC 61158-2
	Matériel de connexion	Voir A.4.4.2.5
Fibre silice à gaine rigide	Largeur de bande modale (MHz × km) à λ (nm)	650 nm
	Longueur minimale (m)	0
	Longueur maximale ^a (m)	400
	Perte d'insertion maximale du canal/bilan de puissance optique (dB)	Voir l'IEC 61158-2
	Matériel de connexion	Voir A.4.4.2.5
^a Cette valeur est réduite par les connexions, épissures et courbures conformément à l'IEC 61918:2018, Formule (1) en 4.4.3.4.1.		

A.4.3.2.5 Caractéristiques spécifiques du réseau

Non applicable.

A.4.3.2.6 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

Non applicable.

A.4.4 Sélection et utilisation de composants de câblage

A.4.4.1 Sélection du câble

A.4.4.1.1 Description commune

A.4.4.1.2 Câbles en cuivre

A.4.4.1.2.1 Câbles symétriques pour les CP reposant sur Ethernet

Non applicable.

A.4.4.1.2.2 Câbles en cuivre pour les CP ne reposant pas sur Ethernet*Remplacement:*

Le Tableau A.3 et le Tableau A.4 fournissent des valeurs basées sur le modèle de l'IEC 61918:2018, Tableau 4 et Tableau 5.

Tableau A.3 – Informations applicables aux câbles symétriques: câbles fixes

Caractéristique	Réseau de type 8
Impédance nominale du câble et tolérance	120 $\Omega \pm 20\%$ à $f = 0,064$ MHz (100 ± 15) Ω à $f > 1$ MHz
DCR des conducteurs	9,6 Ω / 100 m max.
DCR du blindage	-
Nombre de conducteurs	3 $\times$ 2 paires torsadées
Blindage	Oui
Code de couleur du conducteur	DO = jaune /DO = vert DI = gris /DI = rose COM = brun
Exigences de couleur de gaine extérieure	Vert, RAL 6017
Matériau de gaine extérieure	En fonction de l'application
Résistance aux environnements rigoureux (par exemple UV, résistance à l'huile, LSOH)	Types de câble pour différentes applications disponibles
Évaluation par les organismes de certification	Types de câble avec différentes caractéristiques assignées disponibles
Section	0,20 mm ² min.
Résistance diélectrique	1 000 V _{eff} , 1 min
– Conducteur/conducteur	1 000 V _{eff} , 1 min
– Conducteur/blindage	Méthode d'essai de l'IEC 60189-1:2018, 8.2
Résistance d'isolement (après l'épreuve de rigidité diélectrique)	150 M Ω min. pour un câble de 1 km de longueur Méthode d'essai de l'IEC 60189-1:2018, 8.3
Impédance de transfert maximale – à 30 MHz	250 m Ω /m
Capacité mutuelle (à 800 Hz)	60 nF max. pour un câble de 1 km de longueur Méthode d'essai de l'IEC 60189-1:2018, 8.4
Perte paradiaphonique min. (NEXT) pour un câble d'une longueur de 100 m	
– à 0,772 MHz	61 dB
– à 1 MHz	59 dB
– à 2 MHz	55 dB
– à 4 MHz	50 dB
– à 8 MHz	46 dB
– à 10 MHz	44 dB
– à 16 MHz	41 dB
– à 20 MHz	40 dB
	Méthode d'essai de l'IEC 61156-1:2007, 6.3.5

Caractéristique	Réseau de type 8
Affaiblissement acoustique max. pour un câble d'une longueur de 100 m:	
– à 0,256 MHz	1,5 dB
– à 0,772 MHz	2,4 dB
– à 1 MHz	2,7 dB
– à 4 MHz	5,2 dB
– à 10 MHz	8,4 dB
– à 16 MHz	11,2 dB
– à 20 MHz	11,9 dB
	Méthode d'essai de l'IEC 61156-1:2007, 6.3.3

Tableau A.4 – Informations appropriées aux câbles en cuivre: cordons

Caractéristique	Réseau de type 8
Impédance nominale du câble et tolérance	120 $\Omega \pm 20\%$ à $f = 0,064$ MHz (100 ± 15) Ω à $f > 1$ MHz
DCR des conducteurs	9,6 Ω / 100 m max.
DCR du blindage	-
Nombre de conducteurs	3 $\times$ 2 paires torsadées
Blindage	Oui
Code de couleur du conducteur	DO = jaune /DO = vert DI = gris /DI = rose COM = brun
Exigences de couleur de gaine extérieure	Vert, RAL 6017
Matériau de gaine extérieure	En fonction de l'application
Résistance aux environnements rigoureux (par exemple UV, résistance à l'huile, LSOH)	Types de câble pour différentes applications disponibles
Évaluation par les organismes de certification	Types de câble avec différentes caractéristiques assignées disponibles
Section	0,20 mm ² min.
Résistance diélectrique	1 000 V _{eff} , 1 min
– Conducteur/conducteur	1 000 V _{eff} , 1 min
– Conducteur/blindage	Méthode d'essai de l'IEC 60189-1:2018, 8.2
Résistance d'isolement (après l'épreuve de rigidité diélectrique)	150 M Ω min. pour un câble de 1 km de longueur Méthode d'essai de l'IEC 60189-1:2018, 8.3
Impédance de transfert maximale	
– à 30 MHz	250 m Ω /m
Capacité mutuelle (à 800 Hz)	60 nF max. pour un câble de 1 km de longueur Méthode d'essai de l'IEC 60189-1:2018, 8.4

Caractéristique	Réseau de type 8
Perte paradiaphonique min. (NEXT) pour un câble d'une longueur de 100 m	
– à 0,772 MHz	61 dB
– à 1 MHz	59 dB
– à 2 MHz	55 dB
– à 4 MHz	50 dB
– à 8 MHz	46 dB
– à 10 MHz	44 dB
– à 16 MHz	41 dB
– à 20 MHz	40 dB
	Méthode d'essai de l'IEC 61156-1:2007, 6.3.5
Affaiblissement acoustique max. pour un câble d'une longueur de 100 m:	
– à 0,256 MHz	1,5 dB
– à 0,772 MHz	2,4 dB
– à 1 MHz	2,7 dB
– à 4 MHz	5,2 dB
– à 10 MHz	8,4 dB
– à 16 MHz	11,2 dB
– à 20 MHz	11,9 dB
	Méthode d'essai de l'IEC 61156-1:2007, 6.3.3

A.4.4.1.3 Câbles pour installation sans fil

A.4.4.1.4 Câbles à fibres optiques

Remplacement:

Le planificateur doit sélectionner le câble à fibres optiques approprié afin de prendre en charge les longueurs de canal exigées et le nombre de connexions à installer.

Le câble doit être conforme à l'IEC 61158-2:2023, 27.7.2 et 28.1.

Le câble à fibres optiques en plastique doit être détaillé selon l'IEC 61158-2:2023, 28.6.2.

Le câble à fibres optiques à gaine plastique doit être détaillé selon l'IEC 61158-2:2023, 28.6.3.

A.4.4.1.5 Câbles symétriques et à fibres optiques spéciaux

Ajout:

La spécification issue des données mécaniques supplémentaires dépend de l'application. Les données électriques ou optiques s'appliquent également pour le câblage spécifique (voir Tableau A.5).

Tableau A.5 – Longueur du câble à fibres optiques du bus distant

Type de fibre	Longueur minimale	Longueur maximale
Fibres optiques en plastique	0 m	50 m (voir Notes 1, 2)
Fibre de silice à gaine de plastique	0 m	300 m (voir Notes 1, 2)

NOTE 1 Cela n'exclut pas de plus longues distances entre deux dispositifs, par exemple, en utilisant des circuits de réception avec une sensibilité de récepteur optique minimale plus faible que spécifié.

NOTE 2 La longueur maximale peut être réduite dans les cas où des câbles spéciaux avec un affaiblissement acoustique plus important que dans le cas des câbles normaux spécifiés sont utilisés.

A.4.4.1.6 Exigences spécifiques pour les CP

Ajout:

La spécification issue des données mécaniques supplémentaires dépend de l'application. Les données électriques ou optiques s'appliquent également pour le câblage spécifique.

A.4.4.1.7 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

Non applicable.

A.4.4.2 Sélection du matériel de connexion

A.4.4.2.1 Description commune

A.4.4.2.2 Matériel de connexion pour les CP de câblage symétrique reposant sur Ethernet

Non applicable.

A.4.4.2.3 Matériel de connexion pour les CP de câblage en cuivre ne reposant pas sur Ethernet

Remplacement:

Le Tableau A.6 fournit des valeurs fondées sur le modèle donné dans l'IEC 61918:2018, Tableau 8.

Tableau A.6 – Connecteurs pour les CP de câblage en cuivre ne reposant pas sur Ethernet

IEC 6080 7-2 ou IEC 6080 7-3	IEC 61076-2-101				IEC 611 69-8	ANSI/NFPA T3.5.29 R1-2007		Autres		
	D-Sub	M12-5 à codage A	M12-5 à codage B	M12-n à codage X	Coaxial (BNC)	M 18	7/8-16 UN-2B THD	Type ouvert	Bornier	M23, 9 pos
Réseau de type 8 CPF 6	Oui	Non	Oui	Non	Non	Non	Non	Oui	Oui	Oui ^a

NOTE De nombreuses applications utilisant les connecteurs M12-5 ne sont pas compatibles et, lorsqu'elles sont mélangées, peuvent endommager les applications.

^a Connecteur hybride tel que spécifié dans l'IEC 61158-2:2023, Article M.3.

A.4.4.2.4 Matériel de connexion des installations sans fil**A.4.4.2.5 Matériel de connexion pour câblage à fibres optiques**

Remplacement:

Le Tableau A.7 fournit des valeurs fondées sur le modèle donné dans l'IEC 61918:2018, Tableau 9.

Tableau A.7 – Matériel de connexion pour câblage à fibres optiques

	IEC 61754-2	IEC 61754-4	IEC 61754-24	IEC 61754-24 -21	IEC 61754-20	IEC 61754-22	Autres	IEC 61754-27	IEC 61076-3- 123
	BFOC 2,5	SC	SC-RJ	SC-RJ étanche	LC	F-SMA	Connec- teur hybride	M12-FO	Hybride de type pousser- tirer
Réseau de type 8 CPF 6	Oui	Non	Oui	Oui	Non	Oui	Oui ^a	Oui ^b	Oui
NOTE Les interfaces mécaniques de connecteurs à fibres optiques sont définies dans la série de normes IEC 61754; les spécifications de performances des connecteurs à fibres optiques montés sur des types de fibres spécifiques sont normalisées dans la série de normes IEC 61753.									
^a Tel que spécifié dans l'IEC 61158-2:2023, Article M.3.									

Remplacement:

Le Tableau A.8 fournit des valeurs fondées sur le modèle donné dans l'IEC 61918:2018, Tableau 10.

Tableau A.8 – Rapport entre le FOC et les types de fibres (réseaux de type 8)

	Type de fibre				
	Fibre silice unimodale 9 à 10/125 µm	Fibre silice multimodale 50 µm/125 µm	Fibre silice multimodale 62,5 µm/125 µm	Fibre optique plastique à saut d'indice 980 µm/1 000 µm	Fibre silice à gaine rigide à saut d'indice 200 µm/230 µm
BFOC/2,5	Non	Non	Oui	Non	Oui
SC	Non	Non	Non	Non	Non
SC-RJ	Oui	Oui	Oui	Oui	Oui
LC	Non	Non	Non	Non	Non
F-SMA	Non	Non	Non	Oui	Oui
Connecteur hybride	Non	Non	Non	Oui	Oui
M12-FO	Oui	Oui	Oui	Oui	Oui
Hybride de type pousser-tirer	Oui	Oui	Oui	Non	Non

A.4.4.2.6 Exigences spécifiques pour les CP

Non applicable.