BS EN 61784-5-14:2013

BSI Standards Publication

Industrial communication networks — Profiles

Part 5-14: Installation of fieldbuses — Installation profiles for CPF 14

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National foreword

This British Standard is the UK implementation of EN 61784-5-14:2013. It is identical to IEC 61784-5-14:2013. It supersedes BS EN 61784-5-14:2012 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AMT/7, Industrial communications: process measurement and control, including fieldbus.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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(IEC 61784-5-14:2013)

Réseaux de communication industriels - Profils - Partie 5-14: Installation des bus de terrain - Profils d'installation pour CPF 14 (CEI 61784-5-14:2013)

Industrielle Kommunikationsnetze - Profile - Teil 5-14: Feldbusinstallation - Installationsprofile für die Kommunikationsprofilfamilie 14 (IEC 61784-5-14:2013)

CENELEC

European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 65C/738/FDIS, future edition 2 of IEC 61784-5-14, prepared by SC 65C "Industrial networks" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61784-5-14:2013.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2014-07-18
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2016-10-18

This document supersedes EN 61784-5-14:2012.

IEC 61784-5-14:2013 includes the following significant technical changes with respect to EN 61784-5-14:2012:

- requirements for CP 14/3 have been added;
- recommendations for the applications about the linear/ring topology networks have been added;
- Table A.2 and Table A.6 have been updated.

This standard is to be used in conjunction with EN 61918:2013.

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

Endorsement notice

The text of the International Standard IEC 61784-5-14:2013 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Annex ZA of EN 61918:2013 applies, except as follows:

Publication	Year	Title	EN/HD	Year

Addition to Annex ZA of EN 61918:2013:

IEC 61918	2013	Industrial communication networks - Installation of communication networks in industrial premises	EN 61918	2013

CONTENTS

INTRODUCTION

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

IEC 61918:2013 provides the common requirements for the installation of communication networks in industrial control systems. This installation profile standard 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 standard, see IEC 61158-1.

Each CP installation profile is specified in a separate annex of this standard. Each annex is structured exactly as the reference standard 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 standard are defined in Clause 5.

The provision of the installation profiles in one standard for each CPF (for example IEC 61784-5-14 for CPF 14), allows readers to work with standards of a convenient size.

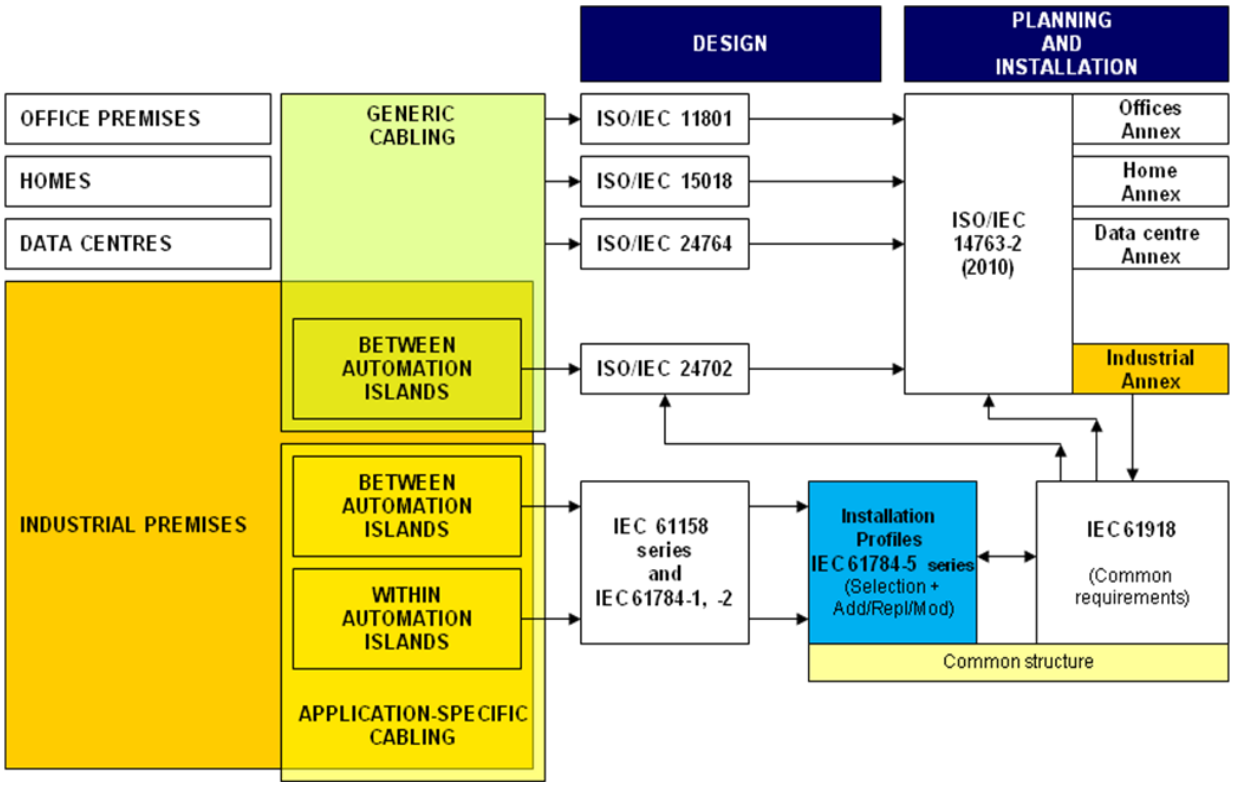

Figure 1 – Standards relationships

INDUSTRIAL COMMUNICATION NETWORKS – PROFILES –

Part 5-14: Installation of fieldbuses – Installation profiles for CPF 14

1 Scope

This part of IEC 61784-5 specifies the installation profiles for CPF 14 (EPA[1]).

The installation profiles are specified in the annex. This annex is read in conjunction with IEC 61918:2013.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61918:2013, *Industrial communication networks – Installation of communication networks in industrial premises*

The normative references of IEC 61918:2013, Clause 2, apply.

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms, definitions and abbreviated terms of IEC 61918 :2013 Clause 3, apply.

4 CPF 14: Overview of installation profiles

CPF 14 consists of three communication profiles as specified in IEC 61784-2.

The installation requirements for CP 14/1, CP 14/2 and CP 14/3 (EPA) are specified in Annex A.

5 Installation profile conventions

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

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

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1 EPA is the technology name of the CPF14. EPA is the trade name of Zhejiang SUPCON Technology Group Co. Ltd, China. 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. Use of the trade name requires permission of the trade name holder.

Where there is no corresponding subclause of IEC 61918:2013 in the normative annexes in this standard, the subclause of IEC 61918 applies without modification.

The annex heading letter represents the installation profile assigned in Clause 4. The annex heading number shall represent the corresponding numbering of IEC 61918.

EXAMPLE "Subclause A.4.4" in IEC 61784-5-14 means that CP 14/2 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 "*replacemen*t:") 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 standard includes part of IEC 61918:2013. It may also include defined additional specifications.

A statement of compliance to an installation profile of this standard shall be stated[2] as either

Compliance to IEC 61784-5-14:2013 [3] for CP 14/m<name> or

Compliance to IEC 61784-5-14 (Ed.2.0) for CP 14/m <name>

where the name within the angle brackets < > is optional and the angle brackets are not to be included. The m within CP 14/m shall be replaced by the profile number 1 to 3.

NOTE The name can be the name of the profile, for example EPA-NRT, EPA-RT, or EPA-FRT.

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

Product standards 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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2 In accordance with ISO/IEC Directives.

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

Annex A
(Normative)

CP 14/1, 14/2 and 14/3 (EPA) specific installation profile

A.1 Installation profile scope

Addition:

This standard specifies the installation profile for Communication Profile CP 14/1, CP 14/2 and CP14/3 (EPA). The CP 14/1, CP 14/2 and CP14/3 are specified in IEC 61784-2.

A.2 Normative references

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

A.3.1 Terms and definitions

A.3.2 Abbreviated terms

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 24702

A.4.2 Planning requirements

A.4.2.1 Safety

A.4.2.1.1 General

A.4.2.1.2 Electric safety

A.4.2.1.3 Functional safety

A.4.2.1.4 Intrinsic safety

Addition:

In some CP14/2 applications, intrinsic safety functionality may be required for the devices mounted in the area with flammable gases or fuels according to the relevant national or local regulations.

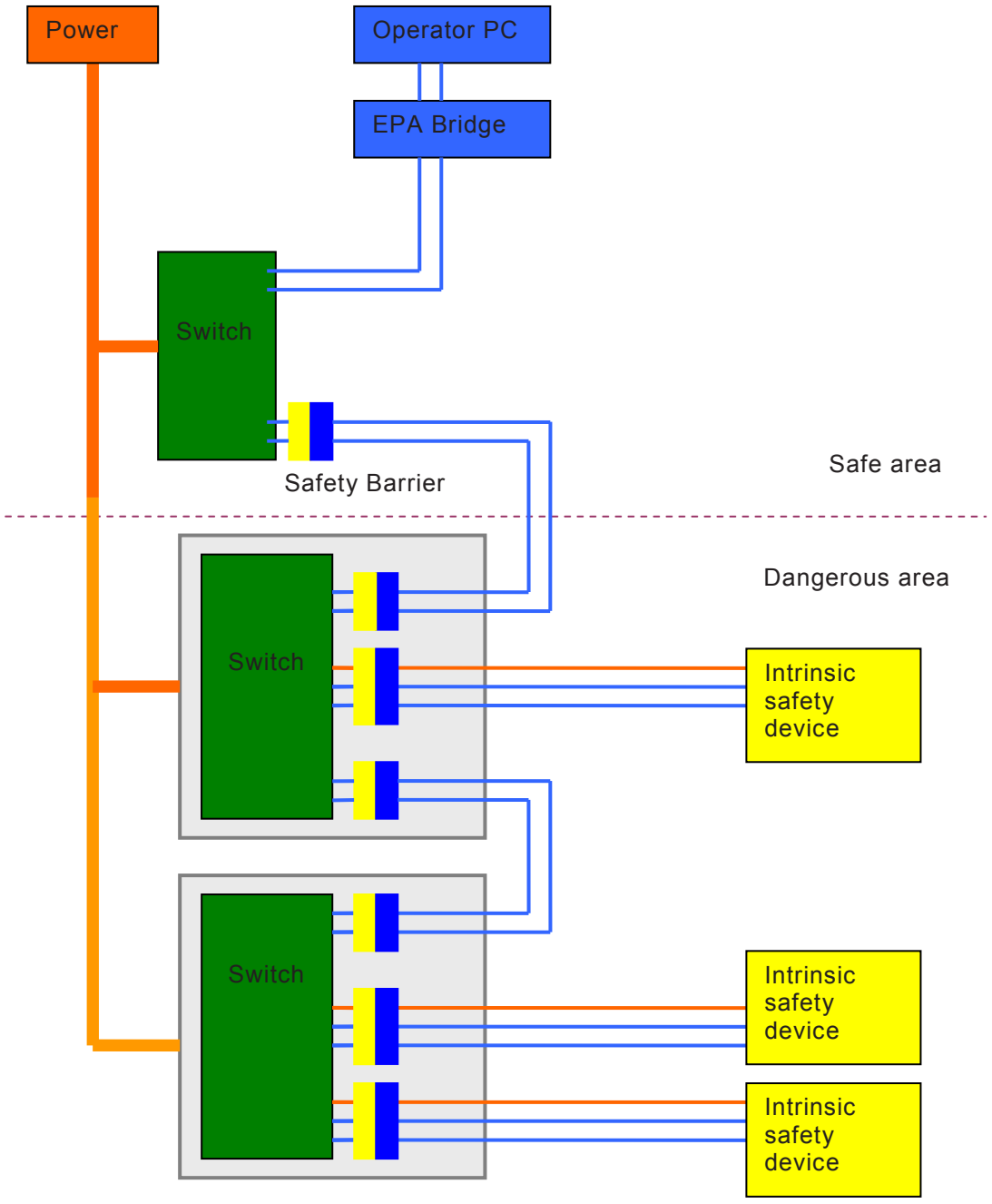

Figure A.1 – Example of EPA explosion-proof system

For example (see Figure A.1), among EPA explosion-proof systems, switches are in explosion-proof field boxes, and field devices are intrinsically safe. In an intrinsic safety system, each intrinsically safe device should be connected with three safety barriers. Two of them are connected with the sending signal pairs (TX+/TX-) and the receiving signal pairs (RX+/RX-), and the other one is connected with the power supply. The power cable to the explosion-proof field box should be protected by flexible pipes.

Intrinsic safety devices shall be connected to the normal devices in a safe area through a safety barrier. Either zener safety barriers or isolated safety barriers can be used.

If zener safety barriers are used (Figure A.2), the safety barrier and the intrinsic safety device shall be both connected to intrinsic safety earth, so that the voltage on the cable can be safely restricted. The intrinsic safety earth can be the same as the functional earth of the devices.

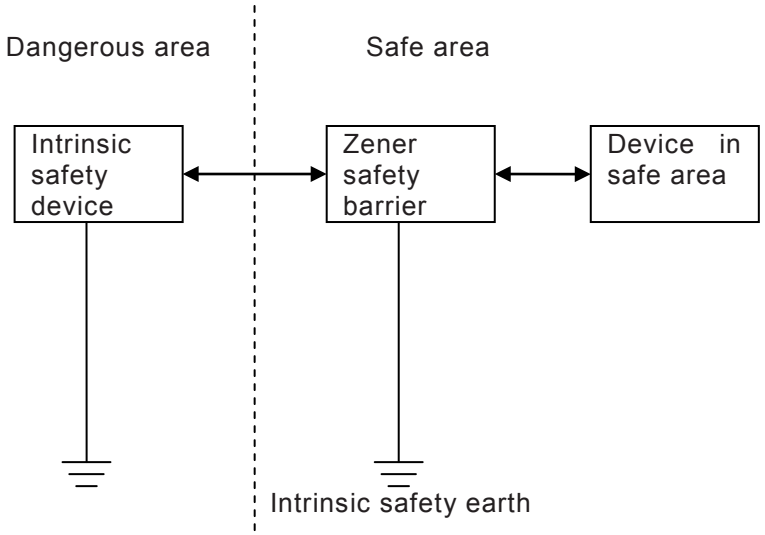

Figure A.2 – Earth of zener safety barrier

If isolated safety barriers are used (Figure A.3), the barriers do not need to be earthed. The intrinsic safety device may be earthed or not, which is up to the functional request.

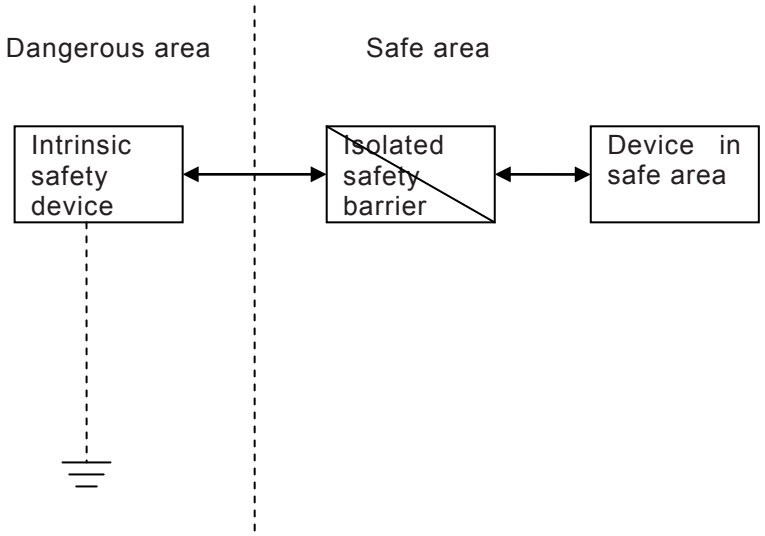

Figure A.3 – Earth of isolated safety barrier

A.4.2.1.5 Safety of optical fibre communication systems

A.4.2.2 Security

Addition:

EPA security boundary devices contain an EPA bridge and EPA devices.

Messages from the monitor layer to the field device should be checked by the EPA bridge. The EPA bridge should check the type of protocol, source IP address, source MAC address, destination IP address, destination MAC address, link object, and password, etc.

A.4.2.3 Environmental considerations and EMC

A.4.2.4 Specific requirements for generic cabling in accordance with ISO/IEC 24702

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

A.4.3.1.3 Basic physical topologies for active networks

A.4.3.1.4 Combination of basic topologies

Replacement:

A combination of basic topologies may be used.

Figure A.4 provides an example for three stars coupled to a ring topology.

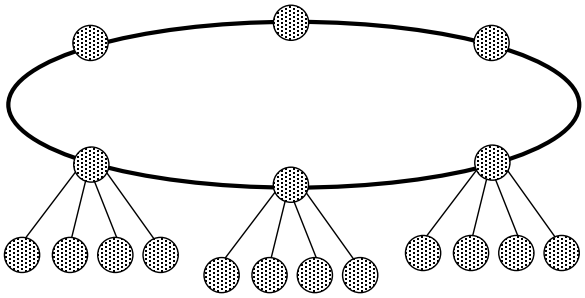

Figure A.4 – Three stars coupled to a ring topology

Figure A.5 provides an example for five daisy chain lines coupled to a ring topology.

Figure A.6 provides an example for five sub-rings coupled to a ring topology.

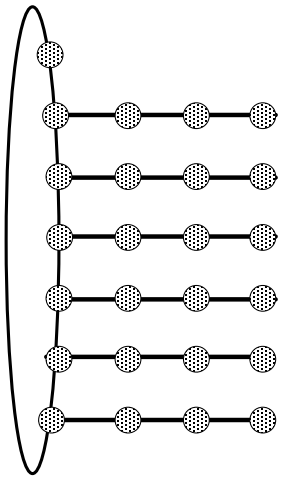

Figure A.5 – Five daisy chain lines coupled to a ring topology

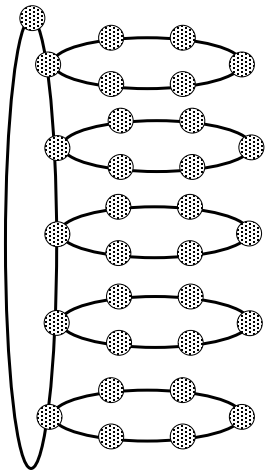

Figure A.6 – Five sub-rings coupled to a ring topology

A.4.3.1.5 Specific requirements for CPs

Not applicable.

A.4.3.1.6 Specific requirements for generic cabling in accordance with ISO/IEC 24702

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

Not applicable.

A.4.3.2.3 Network characteristics for balanced cabling based on Ethernet

Replacement:

Table A.1 provides values based on the template given in IEC 61918:2013 Table 2.

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

Characteristic	CP 14/1	CP 14/2 and CP14/3
Supported data rates (Mbit/s)	10, 100, 1 000	10, 100, 1 000[d]
Supported channel length (m) [b]	100	100
Number of connections in the channel (max.) [a,b]	4	4
Patch cord length (m) [a]	See IEC 61918:2013, Clause 4 and ISO/IEC 24702	See IEC 61918:2013, Clause 4 and ISO/IEC 24702
Channel class per ISO/IEC 24702 (min.) [b]	D	D
Cable category per ISO/IEC 24702 (min.) [c]	5	5
Connecting HW category per ISO/IEC 24702 (min.)	5	5
Cable types	–	–

[a] See A.4.4.3.2.

[b] For the purpose of this table, the channel class definitions of ISO/IEC 24702 are applicable.

[c] Additional information is available in the IEC 61156 series.

[d] If the system needs power over Ethernet or intrinsic safety, a 1 000Mbit/s data rate should not be used.

A.4.3.2.4 Network characteristics for optical fibre cabling

Replacement:

Table A.2 provides values based on the template given in IEC 61918:2013, Table 3.

Table A.2 – Network characteristics for optical fibre cabling

CP 14/1, CP14/2 and CP14/3		
Optical fibre type	**Description**	
Single mode silica	Bandwidth (MHz) or equivalent at λ (nm)	
	Minimum length (m)	0
	Maximum length[a] (m)	2 000
	Maximum channel insertion loss/optical power budget (dB)	4
	Connecting hardware	See A.4.4.2.5
Multimode silica [b]	Modal bandwidth (MHz × km) at λ (nm)	600 at 850 800 at 1 310
	Minimum length (m)	0
	Maximum length[a] (m)	550 for 850 nm 550 for 1 310 nm
	Maximum channel insertion loss/optical power budget (dB)	3,43 for 850 nm 2,33 for 1 310 nm
	Connecting hardware	See A.4.4.2.5
Multimode silica [c]	Modal bandwidth (MHz × km) at λ (nm)	250 at 850 500 at 1 310
	Minimum length (m)	0
	Maximum length[a] (m)	275 for 850 nm 550 for 1 310 nm
	Maximum channel insertion loss/optical power budget (dB)	2,46 for 850 nm 2,33 for 1 310 nm
	Connecting hardware	See A.4.4.2.5
POF	Modal bandwidth (MHz × km) at λ (nm)	3,5 at 650
	Minimum length (m)	0

CP 14/1, CP14/2 and CP14/3		
Optical fibre type	**Description**	
	Maximum length[a] (m)	50
	Maximum channel insertion loss/optical power budget (dB)	9,5
	Connecting hardware	See A.4.4.2.5
Hard clad silica	Modal bandwidth (MHz × km) at λ (nm)	70 at 650 nm
	Minimum length (m)	0
	Maximum length[a] (m)	100
	Maximum channel insertion loss/optical power budget (dB)	2,5
	Connecting hardware	See A.4.4.2.5

[a] This value is reduced by connections, splices and bends in accordance with formula(1) in 4.4.3.4.1 of IEC 61918:2013

[b] IEC 60793-2-10,Type A1a.

[c] IEC 60793-2-10,Type A1b.

A.4.3.2.5 Specific network characteristics

Replacement:

The power supply placement and voltage adjustment shall be determined by the planner based on the network loading requirements. Power with Ethernet ranges from 22,8 Vd.c. to 35 Vd.c. The minimum operating voltage for the devices is 18 Vd.c. The voltage drop is dependant on two parameters, the DCR of the cabling and the device current requirements. The current in any cable is limited to 0,2 A. If any device needs current over 0,2 A, another power supply should be used.

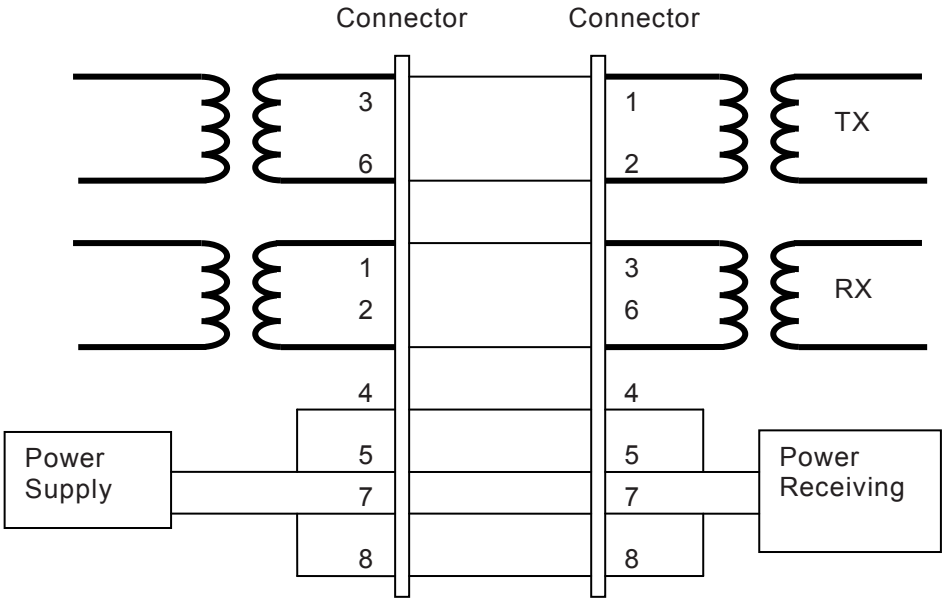

Figure A.7 – Example of power with Ethernet

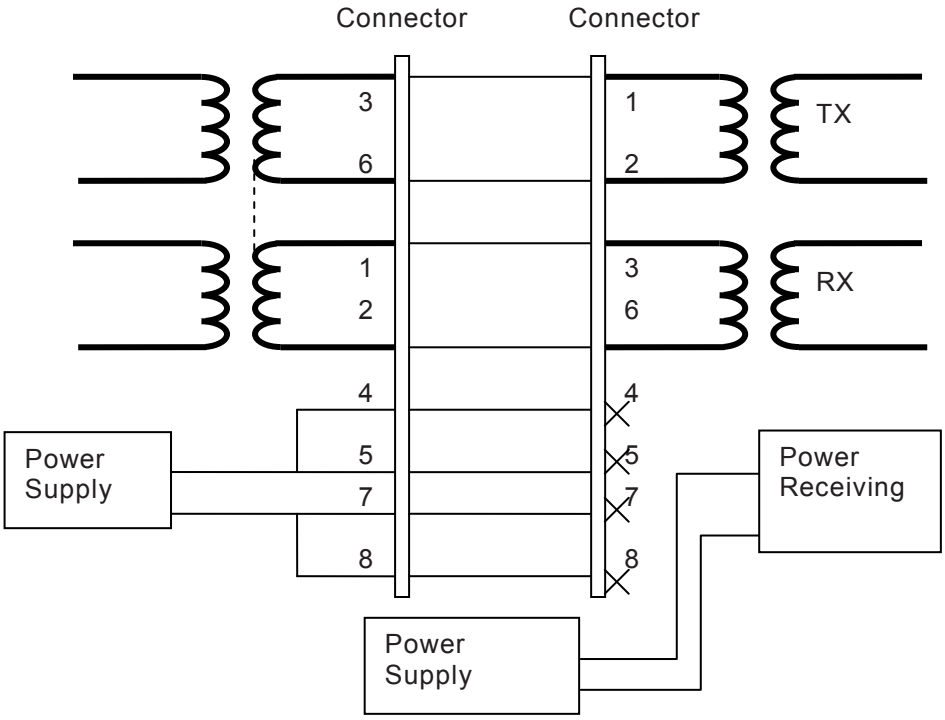

Figure A.8 – Example of power supply over 0,2 A

Table A.3 – Information relevant to copper cable

Signal name	Description
L_1	22,8 Vd.c.,~35 Vd.c., main power supply
N_1	0 Vd.c., main power supply
L_2	22,8 Vd.c.,~35 Vd.c., redundant or switched power supply
N_2	0 Vd.c., redundant or switched power supply

For the linear/ring topology networks powered with Ethernet, the voltage drop on the whole line shall not exceed 4,8 V, as shown in Figure A.9. However, a respective power supply for each device (without power with Ethernet) is recommended.

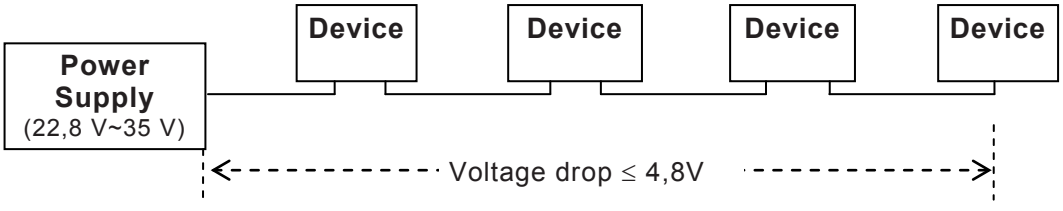

Figure A.9 – Example of power with Ethernet in linear/ring topology network

A.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC 24702

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

Replacement:

Table A.4 provides values based on the template given in IEC 61918:2013, Table 4.

Table A.4 – Information relevant to copper cable: fixed cables

Characteristic	CP 14/1	CP 14/2 and CP 14/3
Nominal impedance of cable (tolerance)	100 Ω ± 15 Ω	100 Ω ± 15 Ω
DCR of conductors	< 9,38 Ω /100 m	< 9,38 Ω /100 m
DCR of shield	–	–
Number of conductors	8	8
Shielding	Unshielded U/UTP, shielded SF/UTP or S/FTP	SF/UTP or S/FTP
Colour code for conductor	WH/OG, OG, WH/GN, BU, WH/BU, GN, WH/BN, BN	WH/OG, OG, WH/GN, BU, WH/BU, GN, WH/BN, BN
Jacket colour requirements	–	–
Jacket material	–	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–	–
Agency ratings	–	–
Transfer impedance	50 mΩ /m at 10 MHz	50 mΩ /m at 10 MHz

Replacement:

Table A.5 provides values based on the template given in IEC 61918:2013, Table 5.

Table A.5 – Information relevant to copper cable: cords

Characteristic	CP 14/1	CP 14/2 and CP 14/3
Nominal impedance of cable (tolerance)	100 Ω ± 15 Ω	100 Ω ± 15 Ω
DCR of conductors	< 9,38 Ω /100 m	< 9,38 Ω /100 m
DCR of shield	–	–
Number of conductors	4, 6 or 8	4, 6 or 8
Shielding	Unshielded U/UTP, shielded SF/UTP or S/FTP	SF/UTP or S/FTP
Colour code for conductor	2 pairs: WH/OG, OG, WH/GN, GN 3 pairs: WH/OG, OG, WH/GN, GN, BU, BN 4 pairs: WH/OG, OG, WH/GN, BU, WH/BU, GN, WH/BN, BN	2 pairs: WH/OG, OG, WH/GN, GN 3 pairs: WH/OG, OG, WH/GN, GN, BU, BN 4 pairs: WH/OG, OG, WH/GN, BU, WH/BU, GN, WH/BN, BN
Jacket colour requirements	–	–
Jacket material	–	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–	–
Agency ratings	–	–
Transfer impedance	50 mΩ /m at 10 MHz	50 mΩ /m at 10 MHz

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

Not applicable.

A.4.4.1.3 Cables for wireless installation

A.4.4.1.4 Optical fibre cables

Replacement:

Table A.6 provides values based on the template given in IEC 61918:2013, Table 6.

Table A.6 – Information relevant to optical fibre cables

Characteristic	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
Standard	IEC 60793-2-50; Type B1	IEC 60793-2-10; Type A1a	IEC 60793-2-10; Type A1b	IEC 60793-2-40; Type A4a	IEC 60793-2-30; Type A3c
Attenuation per km (650 nm)	–	–	–	≤160 dB/km	≤10 dB/km
Attenuation per km (820 nm)	–	3,5 dB/km	3,5 dB/km	–	–
Attenuation per km (1 310 nm)	1,0 dB/km	1,5 dB/km	1,5 dB/km	–	–
Number of optical fibres	2	2	2	2	2
Jacket colour requirements	YE	GN	OG	BL	RD
Jacket material	–	–	–	–	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–	–	–	–	–

A.4.4.1.5 Special purpose balanced and optical fibre cables

A.4.4.1.6 Specific requirements for CPs

Not applicable.

A.4.4.1.7 Specific requirements for generic cabling in accordance with ISO/IEC 24702

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

Replacement:

Table A.7 provides values based on the template given in IEC 61918:2013, Table 7.

Table A.7 – 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
	shielded	unshielded	Var. 1	Var. 6	Var. 14	M12-4 with D-coding	M12-8 with X-coding
CP 14/1	IEC 60603-7-3 IEC 60603-7-5 IEC 60603-7-51 IEC 60603-7-7 IEC 60603-7-71	IEC 60603-7-2 IEC 60603-7-4 IEC 60603-7-41	No	No	Yes	Yes	Yes
CP 14/2 and CP 14/3	IEC 60603-7-3 IEC 60603-7-5 IEC 60603-7-51 IEC 60603-7-7 IEC 60603-7-71	No	No	No	Yes	Yes	Yes

[a] For IEC 60603-7 series, the connector selection is based on the desired channel performance.

[b] Housings to protect connectors.

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

Not applicable.

A.4.4.2.4 Connecting hardware for wireless installation

A.4.4.2.5 Connecting hardware for optical fibre cabling

Replacement:

Table A.8 provides values based on the template given in IEC 61918:2013, Table 9.

Table A.8 – Optical fibre connecting hardware

	IEC 61754-2	IEC 61754-4	IEC 61754-24	IEC 61754-20	IEC 61754-22	IEC 61754-24-11
	BFOC/2,5 (ST)	SC	SC-RJ	LC	F-SMA	IP67 Sealed SC-RJ Duplex connector
CP 14/1, CP 14/2 and CP 14/3	Yes	Yes	Yes	Yes[a]	No	Yes
NOTE 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 60874 series.						
[a] The LC duplex connector shall only be used in an environment according to M1I1C1Ex. See 4.2.3 of IEC 61918:2013 for further guidance.						

Replacement:

Table A.9 provides values based on the template given in IEC 61918:2013, Table 10.

Table A.9 – Relationship between FOC and fibre type (CP 14/1, CP 14/2 and CP 14/3)

FOC	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	Others
BFOC/2,5	Yes	Yes	Yes	No	No	No
SC	Yes	Yes	Yes	No	No	No
SC-RJ	Yes	Yes	Yes	Yes	Yes	No
LC	Yes	Yes	Yes	No	No	No
F-SMA	No	No	No	No	No	No
IP67 Sealed SC-RJ	Yes	Yes	Yes	Yes	Yes	No

A.4.4.2.6 Specific requirements for CPs

Addition:

Table A.10 and Table A.11 offer two kinds of connectors for optional internal connections inside devices which can be used additionally to the connectors specified in A.4.4.2.2. The pitch of the open style connector shall be 3,81 mm or less. The usage of these connectors may have significant detrimental effects on the network performance. Therefore, their compatibility with the cabling system and equipment shall be considered before use.

Table A.10 – Specific connectors for balanced cabling based on Ethernet

	IEC 60807-2 or IEC 60807-3	Open style connector		
	Sub-D	4-pin	6-+pin	8-pin
CP 14/1, CP 14/2 and CP 14/3	Yes	Yes	Yes	Yes
The connection performance of the open style connector shall be considered by the user. Attention should especially be paid to a proper shielding connection and to avoid untwist of the wire pairs.				

Table A.11 – Requirements of sub-D and open style connector

Characteristic	CP 14/1, CP 14/2 and CP 14/3
Return loss	See ISO/IEC 11801
Insertion loss	See ISO/IEC 11801
Near end crosstalk (NEXT)	See ISO/IEC 11801
Power sum near end crosstalk (PS NEXT)	See ISO/IEC 11801
Far end crosstalk (FEXT)	See ISO/IEC 11801
Power sum far end crosstalk (PS FEXT)	See ISO/IEC 11801
Maximum input to output resistance (mΩ)	200
Minimum current carrying capacity (A)	0,75
Propagation delay (ns)	2,5
Delay skew (ns)	1,25
Transverse conversion loss (TCL)	See ISO/IEC 11801
Transfer impedance	See ISO/IEC 11801
Insulation resistance (MΩ)	100
Voltage proof	See ISO/IEC 11801

A.4.4.2.7 Specific requirements for generic cabling in accordance with ISO/IEC 24702

A.4.4.3 Connections within a channel/permanent link

A.4.4.3.1 Common description

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

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

Not applicable.

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

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

Not applicable.

A.4.4.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 24702

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

Not applicable.

A.4.4.5.4 Specific requirements for generic cabling in accordance with ISO/IEC 24702

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

Not applicable.

A.4.4.6.4 Specific requirements for generic cabling in accordance with ISO/IEC 24702

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

A.4.4.7.1 Common description

A.4.4.7.2 Bonding and earthing of enclosures and pathways

A.4.4.7.3 Earthing methods

A.4.4.7.4 Shield earthing

A.4.4.7.5 Specific requirements for CPs

Addition:

For the linear/ring topologies network, the following earthing method is recommended: direct shield earthing on one side of device, and parallel RC shield eathing on the other side. Also, the shield earthing of every device in the linear/ring should be in the same direction, as shown in Figure A.10.

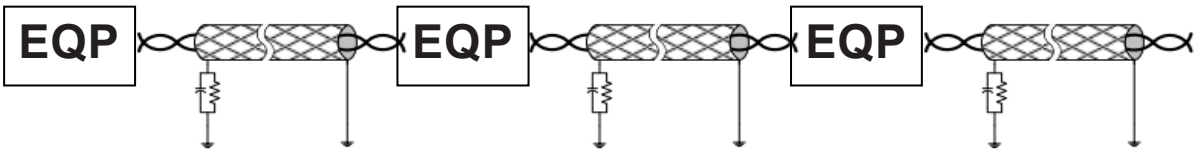

Figure A.10 – Examples of earthing method for the linear/ring topologies network

A.4.4.7.6 Specific requirements for generic cabling in accordance with ISO/IEC 24702

A.4.4.8 Storage and transportation of cables

A.4.4.9 Routing of cables

A.4.4.10 Separation of circuit

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

Not applicable.

A.4.4.11.3 Specific requirements for generic cabling in accordance with ISO/IEC 24702

A.4.4.12 Installation in special areas

A.4.4.12.1 Common description

A.4.4.12.2 Specific requirements for CPs

Not applicable.

A.4.4.12.3 Specific requirements for generic cabling in accordance with ISO/IEC 24702

A.4.5 Cabling planning documentation

A.4.5.1 Common description

A.4.5.2 Cabling planning documentation for CPs

A.4.5.3 Network certification documentation

A.4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC 24702

A.4.6 Verification of cabling planning specification

A.5 Installation implementation

A.5.1 General requirements

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.12 provides values based on the template given in IEC 61918:2013, Table 18.

Table A.12 – Parameters for balanced cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	20 to 65 [a]
	Bending radius, multiple bending (mm)	50 to 100 [a]
	Pull forces (N)	≤ 150 [a]
	Permanent tensile forces (N)	≤ 50 [a]
	Maximum lateral forces (N/cm)	–
	Temperature range during installation (°C)	-20 to +60
[a] Depending on cable type: see manufacturer's data sheet.		

Replacement:

Table A.13 provides values based on the template given in IEC 61918:2013, Table 19.

Table A.13 – Parameters for silica optical fibre cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	50 to 200 [a]
	Bending radius, multiple bending (mm)	30 to 200 [a]
	Pull forces (N)	500 to 800 [a]
	Permanent tensile forces (N)	500 to 800 [a]
	Maximum lateral forces (N/cm)	300 to 500 [a]
	Temperature range during installation (°C)	-5 to +50
[a] Depending on cable type: see manufacturer's data sheet.		

Replacement:

Table A.14 provides values based on the template given in IEC 61918:2013, Table 20.

Table A.14 – Parameters for POF optical fibre cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	30 to 100 [a]
	Bending radius, multiple bending (mm)	50 to 150 [a]
	Pull forces (N)	50 to 100 [a]
	Permanent tensile forces (N)	Not allowed
	Maximum lateral forces (N/cm)	35 to 100 [a]
	Temperature range during installation (°C)	0 to +50
[a] Depending on cable type: see manufacturer’s data sheet.		

Replacement:

Table A.15 provides values based on the template given in IEC 61918:2013, Table 21.

Table A.15 – Parameters for hard cladded silica optical fibre cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	75 to 200 [a]
	Bending radius, multiple bending (mm)	75 to 200 [a]
	Pull forces (N)	100 to 800 [a]
	Permanent tensile forces (N)	≤ 100 [a]
	Maximum lateral forces (N/cm)	≤ 75 to 300 [a]
	Temperature range during installation (°C)	-5 to +50
[a] Depending on cable type: 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.5.2.3 Specific requirements for CPs

Not applicable.

A.5.2.4 Specific requirements for wireless installation

Not applicable.

A.5.2.5 Specific requirements for generic cabling in accordance with ISO/IEC 24702

A.5.3 Connector installation

A.5.3.1 Common description

A.5.3.2 Shielded connectors

A.5.3.3 Unshielded connectors

A.5.3.4 Specific requirements for CPs

Addition:

Each device may be connected to the cable via a 9-pin sub-D connector. The female side of the connector is located inside the device, while the male side is mounted to the cable. If a shield layer is used, 360° shielding with a sub-D connector should be guaranteed. Figure A.11 shows the pin assignment of a sub-D connector.

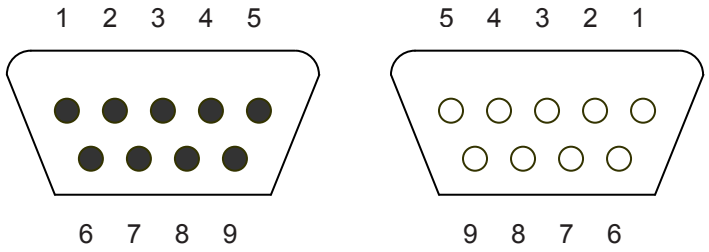

Figure A.11 – Pin assignment of sub-D connector

Table A.16 and Table A.17 provide the signal lines assignment of a sub-D connector.

Table A.16 – Signal lines assignment of sub-D connector

Pin	Colour code	Signal line (for 10/100 Mbit/s)	Signal line (for 10/100 Mbit/s with power)
1	WH/OG	Transmit +	Transmit +
2	OG	Transmit -	Transmit -
3	WH/GN	Receive +	Receive +
4	BU	–	L1
5	WH/BU	–	L2
6	WH/BN	–	N1
7	GN	Receive -	Receive -
8	BN	–	N2
9	NA	–	–

Table A.17 – Signal lines assignment of sub-D connector for a 1 000 Mbit/s base Ethernet

Pin	Colour code	Signal line (for 1 000 Mbit/s)
1	WH/OG	BI_DA+
2	OG	BI_DA-
3	WH/GN	BI_DB+
4	BU	BI_DC+
5	WH/BU	BI_DC-
6	GN	BI_DB-
7	WH/BN	BI_DD+
8	BN	BI_DD-
9	Reserved	–

Each device may be connected to the media via an open style connector (4-pin, 6-pin or 8-pin). The open style connector shall be located inside the device. If a shielding cable is used, 360° shielding of the device should be guaranteed, and the shield of the cable should be connected to the device housing. Figure A.12 shows an example of a 4-pin open style connector, and Table A.18 provides its signal lines assignment.

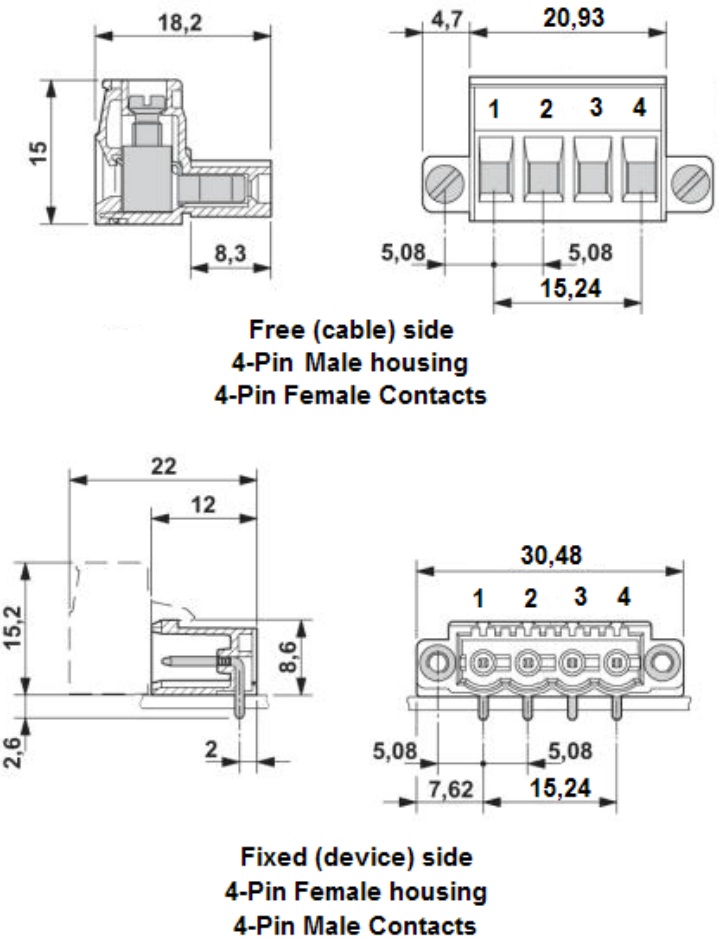

Figure A.12 – Example of a 4-pin open style connector

Table A.18 – Signal lines assignment for a 4-pin open style connector

Pin	Colour code	Signal line (for 10/100 Mbit/s)
1	WH/OG	Transmit +
2	OG	Transmit -
3	WH/GN	Receive +
4	GN	Receive -

Figure A.13 shows an example of a 6-pin open style connector, and Table A.19 provides its signal lines assignment.

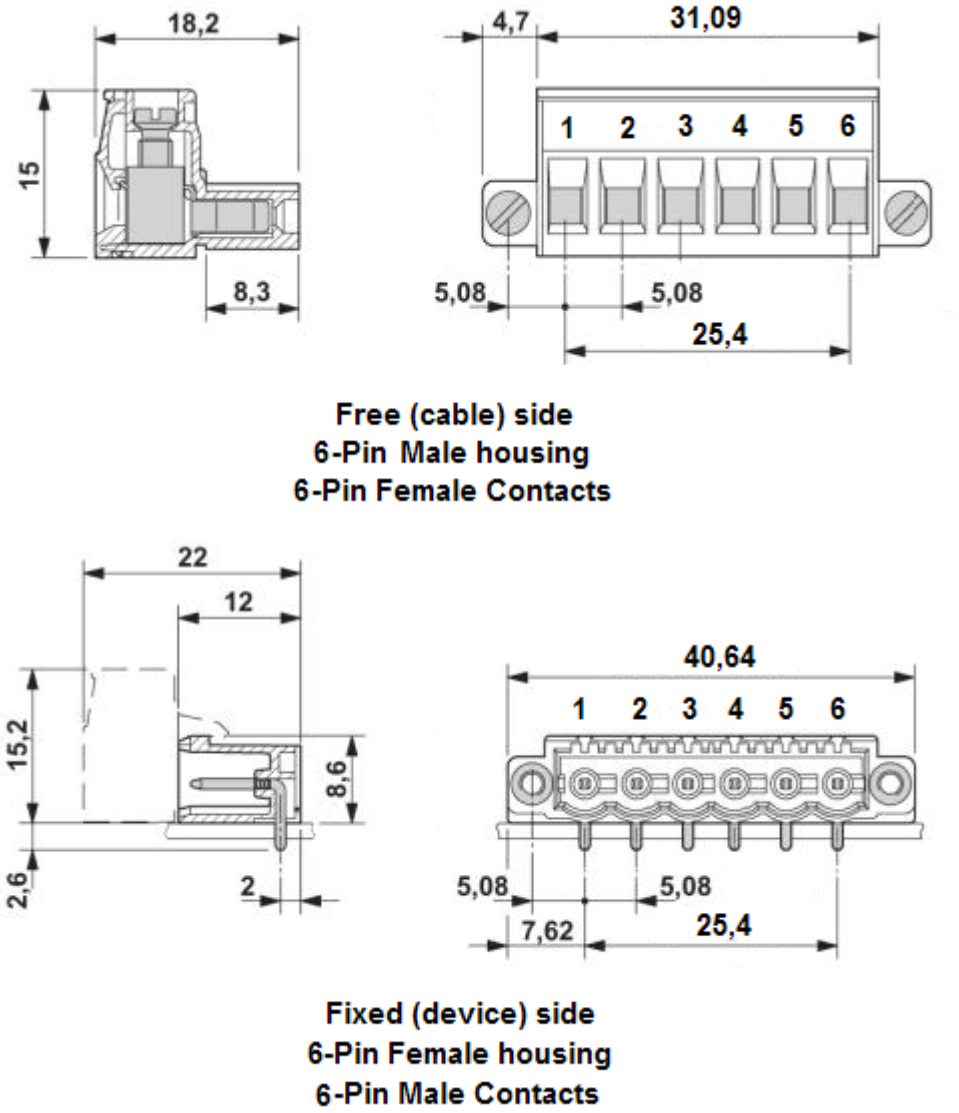

Figure A.13 – Example of a 6-pin open style connector

Table A.19 – Signal lines assignment for a 6-pin open style connector

Pin	Colour code	Signal lines (for 10/100 Mbit/s with power)
1	WH/OG	Transmit +
2	OG	Transmit -
3	WH/GN	Receive +
4	GN	Receive -
5	BU	L
6	BN	N

Figure A.14 shows an example of an 8-pin open style connector. Table A.20 and Table A.21 provide its signal lines assignment.

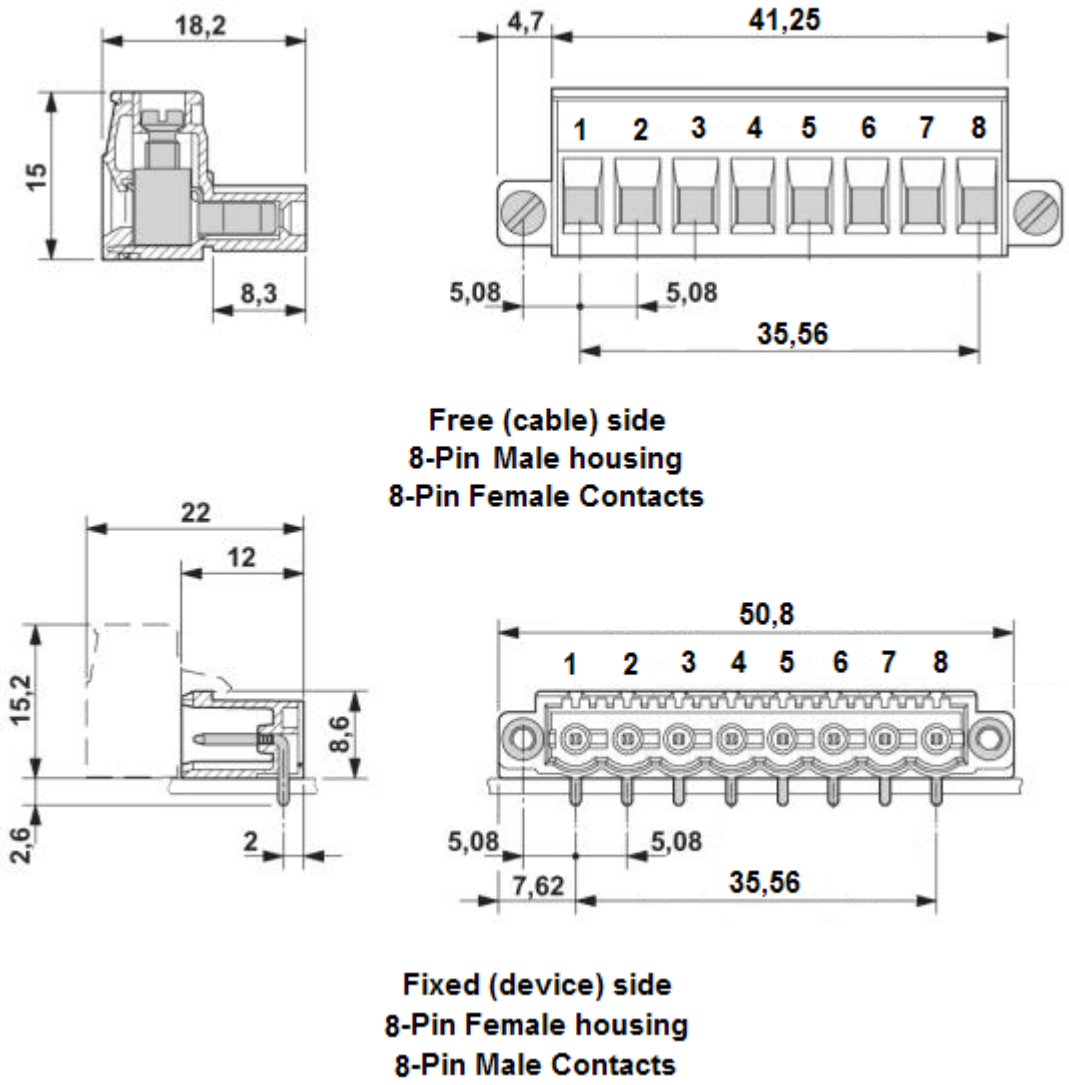

Figure A.14 – Example of an 8-pin open style connector

Table A.20 – Signal lines assignment for an 8-pin open style connector (10/100 Mbps)

Pin	Colour code	Signal lines (for 10/100 Mbit/s)
1	WH/OG	Transmit +
2	OG	Transmit -
3	WH/GN	Receive +
4	BU	L1
5	WH/BU	L2
6	GN	Receive -
7	WH/BN	N1
8	BN	N2

Table A.21 – Signal lines assignment for an 8-pin open style connector (1 000 Mbit/s)

Pin	Colour code	Signal lines (for 1 000 Mbit/s)
1	WH/OG	BI_DA+
2	OG	BI_DA-
3	WH/GN	BI_DB+
4	BU	BI_DC+
5	WH/BU	BI_DC-
6	GN	BI_DB-
7	WH/BN	BI_DD+
8	BN	BI_DD-

A.5.3.5 Specific requirements for wireless installation

Not applicable.

A.5.3.6 Specific requirements for generic cabling in accordance with ISO/IEC 24702

A.5.4 Terminator installation

A.5.4.1 Common description

A.5.4.2 Specific requirements for CPs

Not applicable.

A.5.5 Device installation

A.5.5.1 Common description

A.5.5.2 Specific requirements for CPs

Not applicable.

A.5.6 Coding and labelling

A.5.6.1 Common description

A.5.6.2 Specific requirements for CPs

Not applicable.

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

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

Not applicable.

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

Not applicable.

A.6.2.8 Connection verification

A.6.2.9 Terminators 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

A.6.3.3 Acceptance test of non-Ethernet-based cabling

Not applicable.

A.6.3.4 Specific requirements for wireless installation

Not applicable.

A.6.3.5 Acceptance test report

A.7 Installation administration

Subclause 7.8 is not applicable.

A.8 Installation maintenance and installation troubleshooting

Subclause 8.4 is not applicable.

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