

INTERNATIONAL STANDARD



Industrial ~~communication~~ networks – Profiles –
Part 5-19: Installation of fieldbuses – Installation profiles for CPF 19

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Industrial ~~communication~~ networks – Profiles –
Part 5-19: Installation of fieldbuses – Installation profiles for CPF 19

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**INDUSTRIAL ~~COMMUNICATION~~ NETWORKS –
PROFILES –****Part 5-19: Installation of fieldbuses –
Installation profiles for CPF 19****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 61784-5-19:2013. 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 61784-5-19 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 second edition cancels and replaces the first edition published in 2013. This edition constitutes a technical revision.

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

- a) addition of new installation profiles CP19/3 and CP19/4 in Clause 4;
- b) In Annex B, Table B.4 has been changed and Figure B.1 and Figure B.2 have been deleted;
- c) Annex C is new installation profiles for CP19/3 and related references have been added;
- d) Annex D is new installation profiles for CP19/4 and related references have been added.

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

Draft	Report on voting
65C/1281/FDIS	65C/1296/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 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, published 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.

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INTRODUCTION

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

IEC 61918:2013 and IEC 61918:2018/AMD1:2022 and IEC 61918/AMD2:2024 provide 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 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 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 document are defined in Clause 5.

The provision of the installation profiles in one standard for each CPF (for example IEC 61784-5-19 for CPF 19) allows readers to work with standards of a convenient size.

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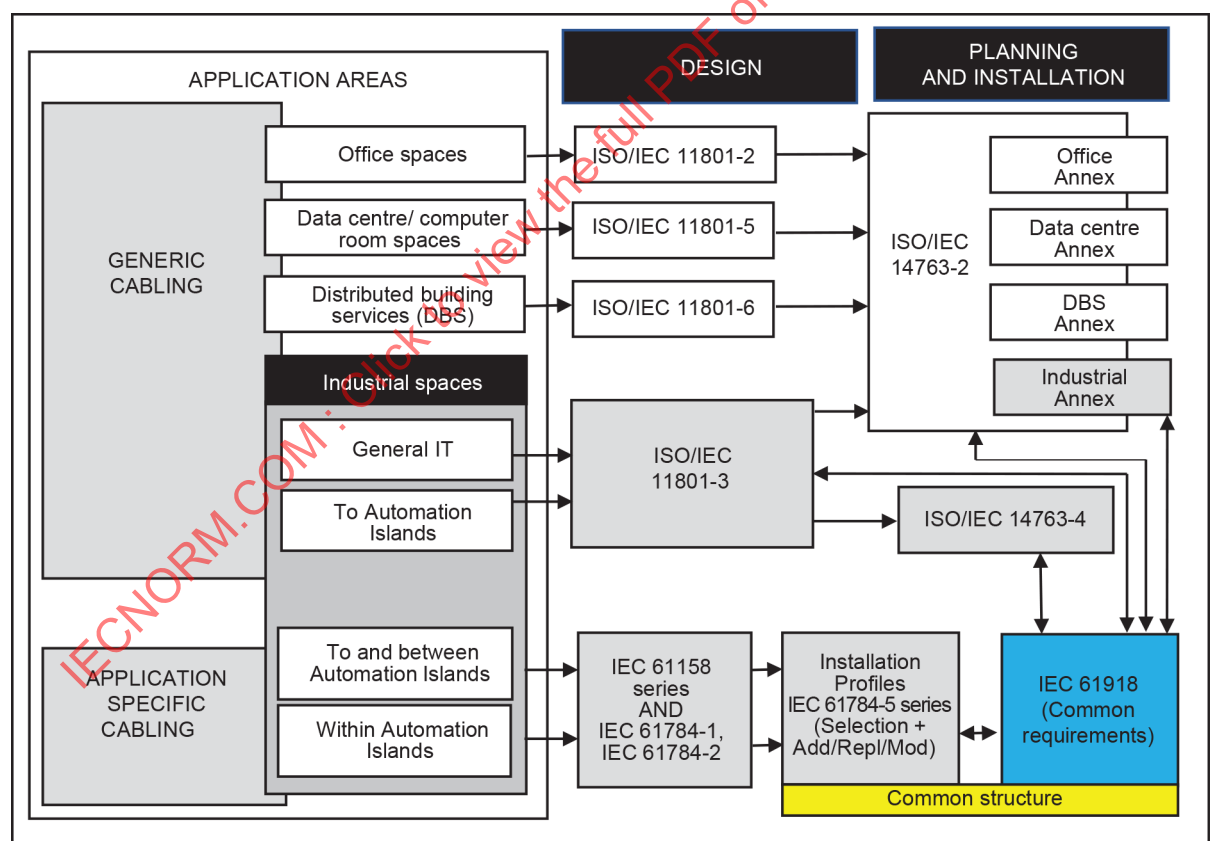
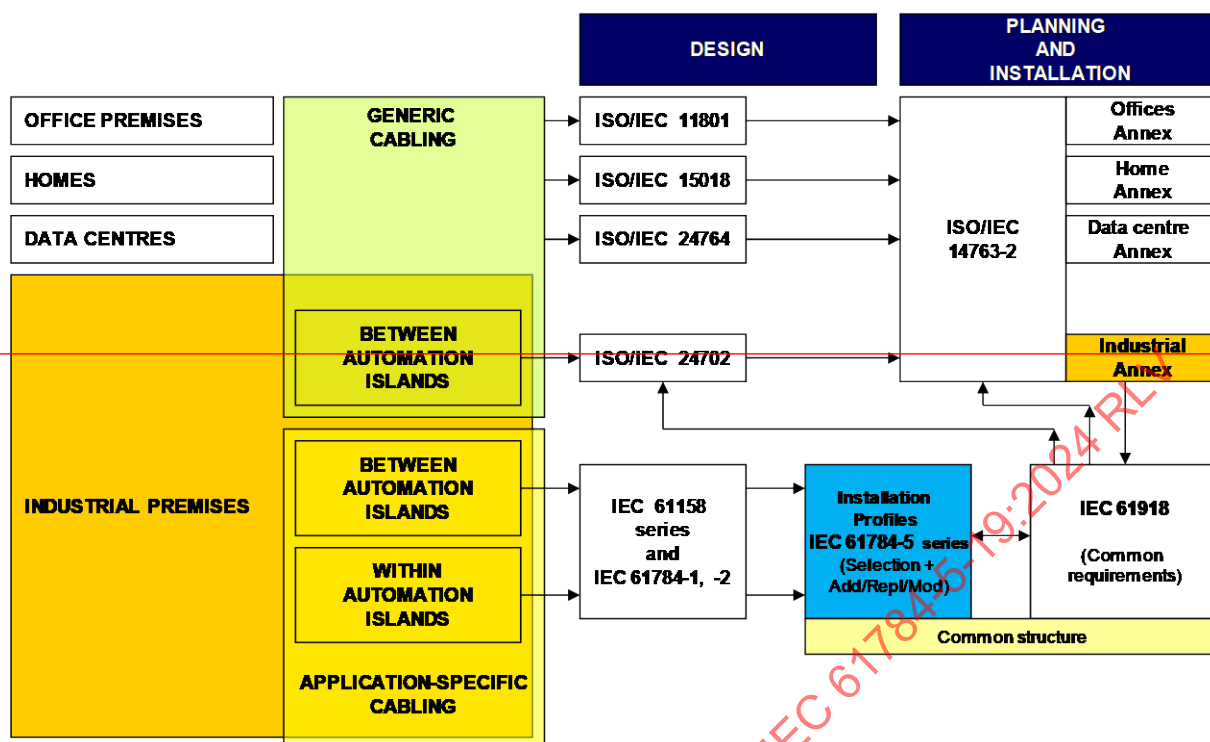


Figure 1 – Standards relationships

INDUSTRIAL ~~COMMUNICATION~~ NETWORKS – PROFILES –

Part 5-19: Installation of fieldbuses – Installation profiles for CPF 19

1 Scope

This part of IEC 61784-5 specifies the installation profile for CPF 19 (MECHATROLINK™¹).

The installation profiles are specified in the annexes. These annexes are read in conjunction with IEC 61918:~~2013~~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:~~2013~~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 61918:2013, Clause 2, apply. For profile specific normative references, see Clause A.2.~~

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

3 Terms, definitions and abbreviated terms

~~For the purposes of this document, the terms, definitions and abbreviated terms given in IEC 61918:2013, Clause 3, apply. For profile specific terms, definitions and abbreviated terms see Clauses A.3 and B.3.~~

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, C.3, and D.3, 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 MECHATROLINK™ and Σ -LINK™ II are trade names of YASKAWA ELECTRIC CORPORATION. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trade names holder or any of its products. Compliance to this profile does not require use of the trade names. Use of the trade name ~~MECHATROLINK~~ 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 CPF19: Overview of installation profiles

CPF 19 consists of ~~two~~ four communication profiles as specified in IEC 61784-1 and IEC 61784-2.

The installation requirements for CP 19/1 (MECHATROLINK™-II) are specified in Annex A.

The installation requirements for CP 19/2 (MECHATROLINK™-III) are specified in Annex B.

The installation requirements for CP 19/3 (Σ-LINK™ II) are specified in Annex C.

The installation requirements for CP 19/4 (MECHATROLINK™-4) are specified in Annex D.

5 Installation profile conventions

The numbering of the clauses and subclauses in the annexes of this document corresponds to the numbering of IEC 61918 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 heading number shall represent the corresponding numbering of IEC 61918.

EXAMPLE "Subclause B.4.4" in IEC 61784-5-19 means that CP 19/2 specifies 4.4 of IEC 61918:2018 and IEC 61918:2018/AMD1:2022.

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 parts of IEC 61918:2013³ and IEC 61918:2018/AMD1:2022. It ~~may~~ can also include defined additional specifications.

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

Compliance ~~to~~ with IEC 61784-5-19:2013⁴ for CP 19/~~n~~m <name> or

Compliance ~~to~~ with IEC 61784-5-19 (Ed. 1~~2~~.0) for CP 19/~~n~~m <name>

where the name within the angle brackets < > is optional and the angle brackets ~~are~~ shall not ~~to~~ be included. The ~~n~~ m within CP 19/~~n~~m shall be replaced by the profile number 1 to 24.

NOTE The name can be the name of the profile, for example MECHATROLINK-II, MECHATROLINK-III, Σ -LINK II or MECHATROLINK-III⁴.

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).

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

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

Annex A (normative)

CP 19/1 (MECHATROLINK™-II) specific installation profile

A.1 Installation profile scope

Addition:

This annex specifies the installation profile for Communication Profile CP 19/1 (MECHATROLINK™-II). The CP 19/1 is specified in IEC 61784-1.

A.2 Normative references

Addition:

~~ANSI~~ TIA/~~EIA~~-485-A, *Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems*

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

A.3.1 Terms and definitions

Addition:

A.3.1.7993

C1 master

master device which initiates cyclic data transfer with slave devices

A.3.1.8094

C2 master

master device which initiates message data exchange with other devices

A.3.1.8195

master

device that controls the data transfer on the CP 19/1 network and initiates the media access of the slaves by sending messages and that constitutes the interface to the control system

A.3.1.8296

slave

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

A.3.2 Abbreviated terms

Addition:

M-II	MECHATROLINK™-II
USB	Universal Serial Bus

A.3.3 Conventions for installation profiles

Not applicable.

A.4 Installation planning

A.4.1 General

Subclause 4.1.4 is not applicable.

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

Not applicable.

A.4.2.1.4 Intrinsic safety

Not applicable.

A.4.2.1.5 Safety of optical fibre communication systems

Not applicable.

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

A.4.2.4 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

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

~~Modification~~ Addition:

CP 19/1 network supports only passive bus topology.

A.4.3.1.3 Basic physical topologies for active networks

Not applicable.

A.4.3.1.4 Combination of basic topologies

A.4.3.1.5 Specific requirements for CPs

Addition:

CP 19/1 supports passive bus topology by daisy chain connection of devices. Passive star topology is not supported and spurs shall not be used. Figure A.1 shows the CP 19/1 passive bus network.

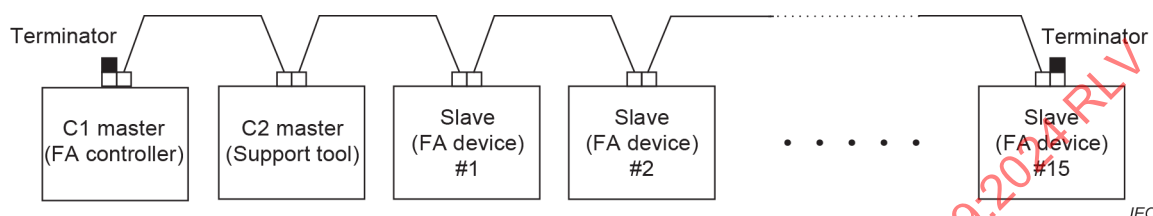


Figure A.1 – Topology of CP 19/1 network

CP 19/1 supports interconnection of two passive bus segments by an active bus repeater. Only one repeater is allowed as shown in Figure A.2.

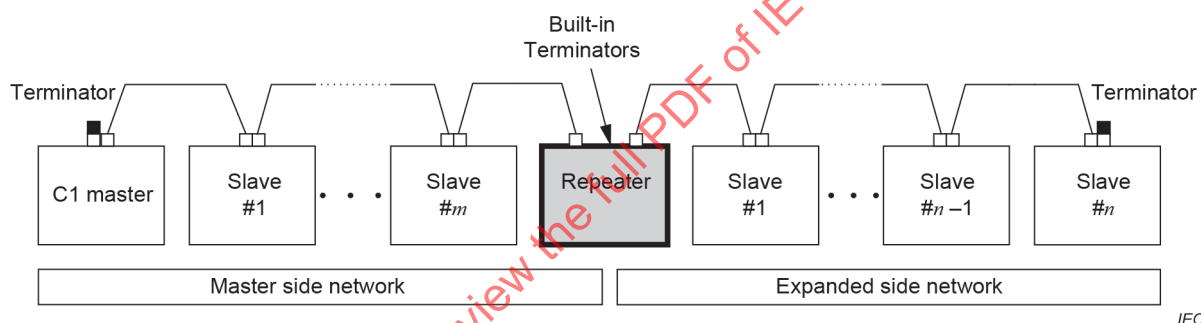


Figure A.2 – Network expansion using repeater

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

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 61918:2013, Table 1.

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

Characteristic	CP 19/1 (MECHATROLINK™-II)
Basic transmission technology	ANSI TIA/ EIA -485-A Linear bus
Length/transmission speed	Segment length m
10 Mbit/s	50 (less than 17 devices) 30 (17 devices)
Maximum capacity	Max. no.
Devices/segment	17
Devices/network	32

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

Not applicable.

A.4.3.2.5 Specific network characteristics

Addition:

The relationship between the number of devices and the maximum segment length is shown in Table A.2 for the topology without repeater shown in Figure A.1. When two network segments are combined using a repeater as shown in Figure A.2, the repeater should be counted as a device on each segment and the number of devices available decreases by one from the value shown in Table A.2. Thus the maximum number of devices per network, which has two segments expanded by a repeater, becomes 32 (17+17-2).

Table A.2 – Number of devices and maximum segment length

Number of devices	Max. segment length
16 or less	50 m
17	30 m
18 or more	Not allowed

Also CP 19/1 has the minimum cable length restriction. The cable between devices shall be at least 0,5 m.

A.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC 24702 11801-3**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 provides values based on the template given in IEC 61918:2013, Table 54.

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

Characteristic	CP 19/1 (MECHATROLINK™-II)
Nominal impedance of cable (tolerance)	130 Ω (±10 %) (130 ± 13) Ω
DCR of conductors	< 120 Ω/km
DCR of shield	–
Number of conductors	2 (twisted pair)
Shielding	Yes
Colour code for conductor	BK, RD
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–
Conductor cross-sectional area	≥ 0,16 mm ² (AWG25)
Capacitance	< 120 nF/km

Addition:

The additional CP 19/1 cable specifications are shown in Table A.4. Figure A.3 shows the structure of CP 19/1 cable.

Table A.4 – Additional cable specifications

Characteristic	Constraints
Overall diameter	(4,8 ± 0,2) mm
Conductor	Tinned annealed copper
Withstand voltage	AC 1 000 V, 1 min
Insulation resistance	≥ 100 MΩ/km
Attenuation	40 dB/km (at 4 MHz) 60 dB/km (at 10 MHz)

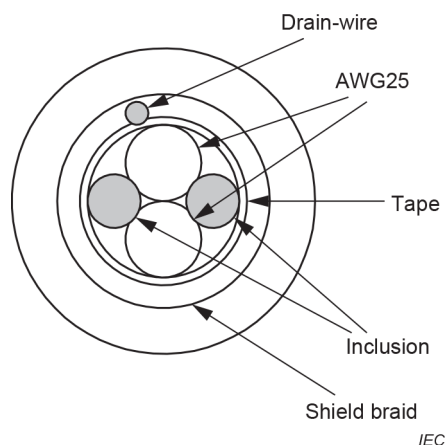


Figure A.3 – Structure of cable

A.4.4.1.3 Cables for wireless installation

Not applicable.

A.4.4.1.4 Optical fibre cables

Not applicable.

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~~ 11801-3

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

Table A.5 – Connectors for copper cabling CPs not based on Ethernet

	IEC 6080 7-2 or IEC 6080 7-3	IEC 61076-2-101			IEC 611 69-8	ANSI/(NFPA) T3.5.29 R1-2007		Others			
	Sub-D	M12-5 with A-coding	M12-5 with B-coding	M12-n with X-coding	Coaxial (BNC)	M 18	7/8-16 UN-2B THD	Open style	Terminal block	M-II ^a	Others
CP 19/1	No	No	No	No	No	No	No	No	No	Yes	No

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 M-II (MECHATROLINKTM-II) connector is specified in the following paragraph.

Addition:

For CP 19/1 network, the CP 19/1 specific connector called M-II (MECHATROLINK™-II) connector shall be used. Figure A.4 and Figure A.5 show the dimensions of the M-II device connectors (receptacles) with single port and dual ports respectively. Figure A.6 shows the dimensions of the M-II cable connector (plug). M-II connector is compatible with the USB series "A" connector specified in Universal Serial Bus Specification Revision 2.0[3] except it has the CP 19/1 specific latching mechanism.

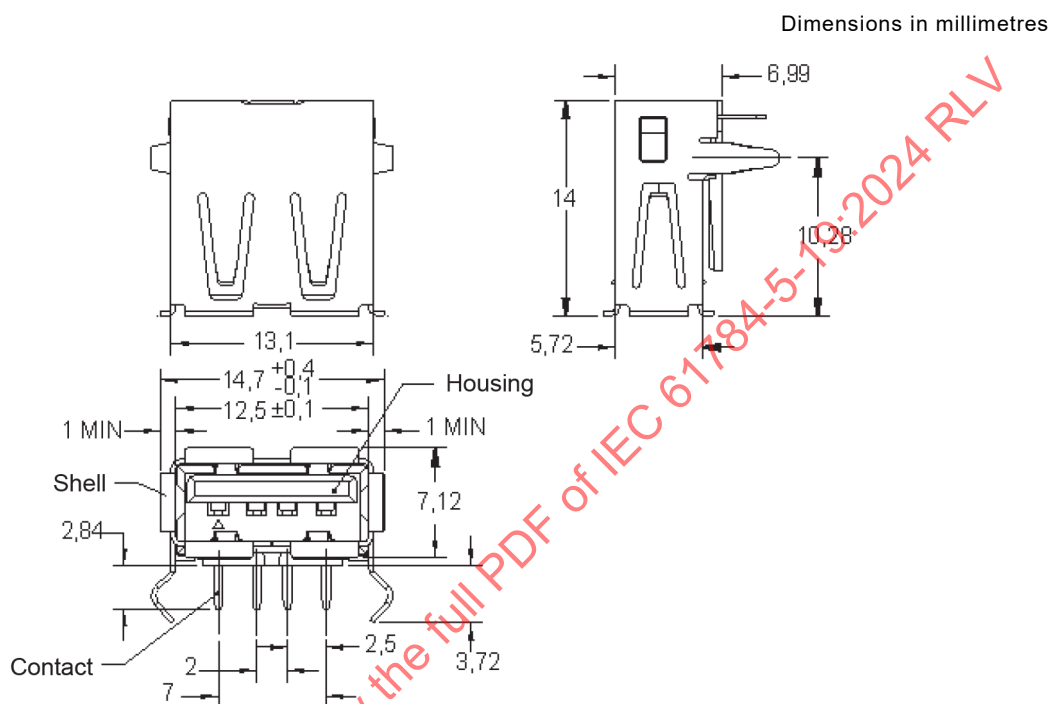
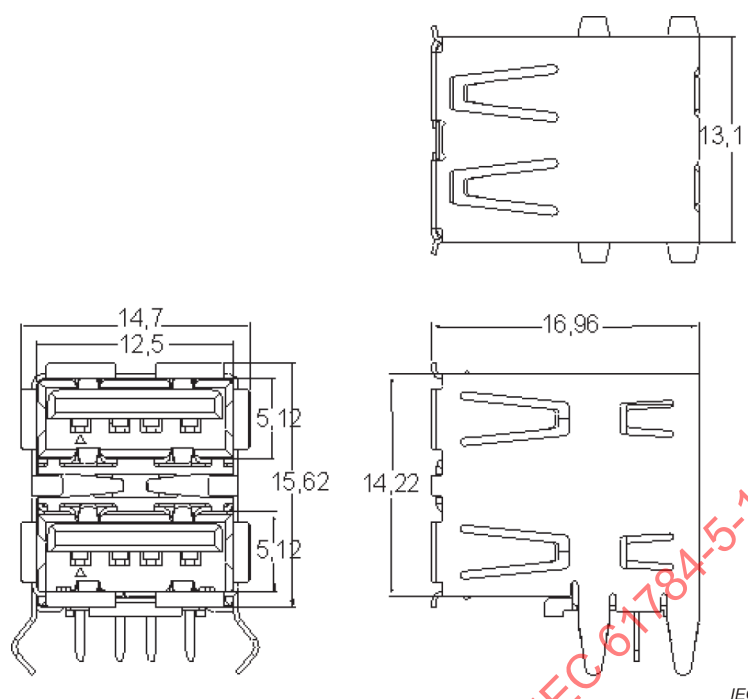
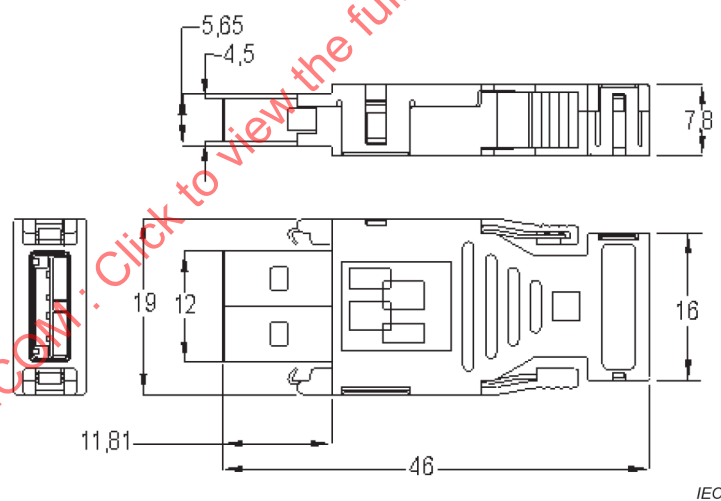


Figure A.4 – Dimensions of single port device connector

Dimensions in millimetres

**Figure A.5 – Dimensions of dual ports device connector**

Dimensions in millimetres

**Figure A.6 – Dimensions of cable connector**

The M-II cable connector has built-in inductors in a connector housing for impedance matching between the line transceiver of a device and the transmission cable as shown in Figure A.7. Therefore the M-II cable connector can be used only for the connection between CP 19/1 device and cable. It shall not be used for connections or splices within a channel.

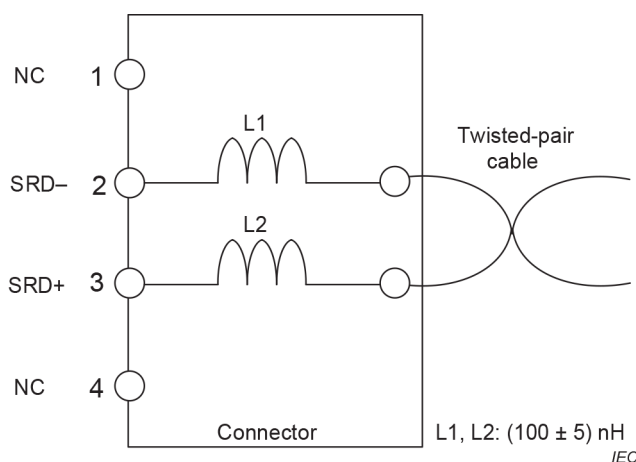


Figure A.7 – Cable connector with inductors

A.4.4.2.4 Connecting hardware for wireless installation

Not applicable.

A.4.4.2.5 Connecting hardware for optical fibre cabling

Not applicable.

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 24702-11801-3

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

Not applicable.

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

4.4.3.3.1 Common description

Addition:

For the CP 19/1 network any connection or splice in a channel using CP 19/1 connectors is not allowed. Also the allowed connector type and number of connections are not defined.

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

Not applicable.

A.4.4.3.6 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

A.4.4.4 Terminators

A.4.4.4.1 Common description

A.4.4.4.2 Specific requirements for CPs

Addition:

The terminator resistance value shall be $(130 \pm 6,5) \Omega$ (min. 1/2 W). Terminators are usually installed on CP 19/1 cable connector housing and connected to the device located at the end of the network segment. Figure A.8 shows the terminator connection in the CP 19/1 cable connector housing.

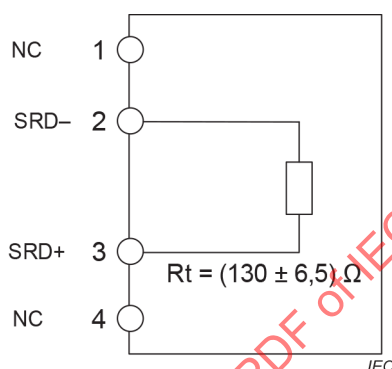


Figure A.8 – Terminator connection in cable connector housing

The network device ~~may~~ can have a built-in terminator and such a device shall be installed at the end of a network segment.

A.4.4.4.3 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

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~~ 11801-3

A.4.4.6 Coding and labelling

A.4.4.6.1 Common description

A.4.4.6.2 Additional requirements for CPs

Not applicable.

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~~ 11801-3

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

A.4.4.7.1 Common description

A.4.4.7.2 Bonding and earthing of enclosures and pathways

A.4.4.7.3 Earthing methods

A.4.4.7.4 Shield earthing

Not applicable.

A.4.4.7.4.1 Non-earthing or parallel RC

Not applicable.

A.4.4.7.4.2 Direct

~~Not applicable.~~

Addition:

CP 19/1 requires direct shield earthing. The communication shield of a CP 19/1 device is normally directly connected to the device's protective earth through the connector shield. If the CP 19/1 specific connector is used, no additional shield earthing is needed.

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 ~~24702~~ 11801-3

A.4.4.8 Storage and transportation of cables

A.4.4.8.1 Common description

A.4.4.8.2 Specific requirements for CPs

Not applicable.

A.4.4.8.3 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

A.4.4.9 Routing of cables

A.4.4.9.1 Common description

A.4.4.9.2 Cable routing of assemblies

A.4.4.9.3 ~~Detailed~~ Requirements for cable routing inside enclosures

A.4.4.9.4 Cable routing inside buildings

A.4.4.9.5 Cable routing outside and between buildings

A.4.4.9.6 Installing redundant communication cables

Not applicable.

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

Not applicable.

A.4.4.11.3 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

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~~ 11801-3

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~~ 11801-3

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

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.6 provides values based on the template given in IEC 61918:~~2013~~2018, Table 18.

Table A.6 – Parameters for balanced cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	20
	Bending radius, multiple bending (mm)	– ^a
	Pull forces (N)	24
	Permanent tensile forces (N)	13
	Maximum lateral forces (N/cm)	– ^a
	Temperature range during installation (°C)	0 to 80
^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

Not applicable.

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

Not applicable.

A.5.2.5 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

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

Addition:

Figure A.9 shows an example of wiring. See the manufacturer's data sheet for the assembly instructions of the M-II connector housing.

Both ends of the network shall have a terminator installed to reduce signal reflection. If one of the end devices (C1 master in this example) has a built-in terminator, only the other end of the network shall have a terminator as described in Figure A.9.

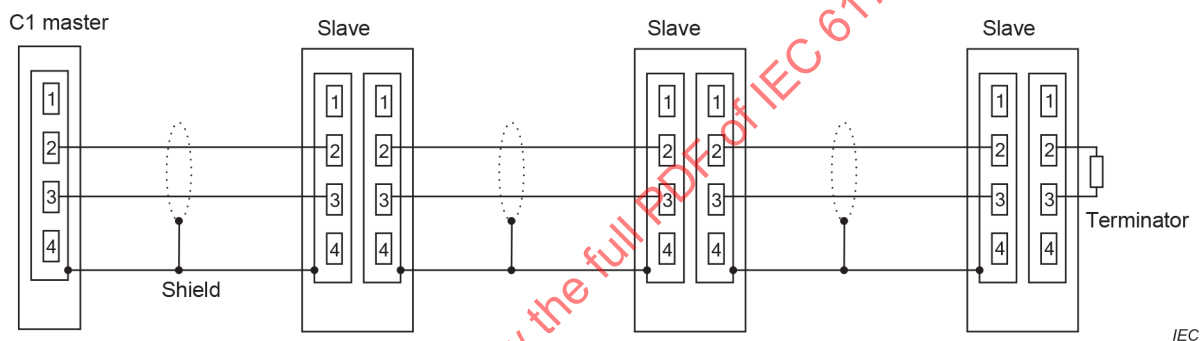


Figure A.9 – Wiring example

Table A.7 shows the pin assignment and wire colour coding for the CP 19/1 connector.

Table A.7 – Pin assignment and wire colour coding for CP 19/1 connector

Pin assignment	Signal	Function	Colour code
1	NC	Not connected	–
2	SRD-	Send/Receive data-	BK
3	SRD+	Send/Receive data+	RD
4	NC	Not connected	–
Shield braid	SH	Shield	–

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~~ 11801-3

A.5.4 Terminator installation

A.5.4.1 Common description

A.5.4.2 Specific requirements for CPs

Addition:

Both ends of a network segment shall be terminated with a CP 19/1 specific terminator. Some device ~~may~~ can have a built-in terminator inside it. Care shall be taken that only terminators at both ends of the network segment are activated. The terminating resistor is usually installed on an M-II connector without cable as shown Figure A.10. For detail of assembly, see manufacturer's data sheet.



Figure A.10 – Terminator installed in M-II cable connector

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

Subclause 5.7.5 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.6.2.5.1 Verification of cable routing

A.6.2.5.2 Verification of cable protection and proper strain relief

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.6.2.8.1 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

A.6.2.9.1 Common description

A.6.2.9.2 Specific requirements for CPs

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.6.3.2.1 Validation of balanced cabling for CPs based on Ethernet

Not applicable.

A.6.3.2.2 Validation of optical fibre cabling for CPs based on Ethernet

Not applicable.

A.6.3.2.3 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

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

Not applicable.

A.6.3.3.2 Optical fibre cabling for non-Ethernet-based CPs

Not applicable.

A.6.3.3.3 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

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

A.8.1 General

A.8.2 Maintenance

A.8.3 Troubleshooting

A.8.4 Specific requirements for maintenance and troubleshooting

Addition:

For CP 19/1 network, typical problems are given in Table A.8 in addition to IEC 61918:2013/2018, Table 22.

Table A.8 – Typical problems in a network with balanced cabling

Problem	Most probable cause	Corrective action
Communication errors occurred at the specific slave device	Failure of the slave device and no error on communication line	Replace the slave device
Communication errors occurred at all the slave devices connected after a specific slave device	Cable disconnection right after the specific slave device	Replace the cable
	Incorrect insertion of cable connector	Insert the cable connector securely
Communication errors occurred at random slave device	Slave device failure or Cable failure	Locate faulty device, cable or connection and replace it
	Terminator failure	Insert terminator securely or replace it
	EMC influence from other device	Check and reduce noise in system
Communication errors occurred at random device or a specific device in a few minutes to several hours after system start up	Malfunction due to ambient temperature rise	Correct thermal condition of faulty device or replace it

The CP 19/1 employs a daisy chain linear bus topology. Therefore, a failure of one slave or cable ~~may cause~~ causes communication errors on successive slaves. To locate the faulty device, divide the network segment by moving the terminator location as shown in Figure A.11. If the divided segment still has a communication error, the faulty device or cable is included in this segment. Divide this segment again until the unique faulty device is located.

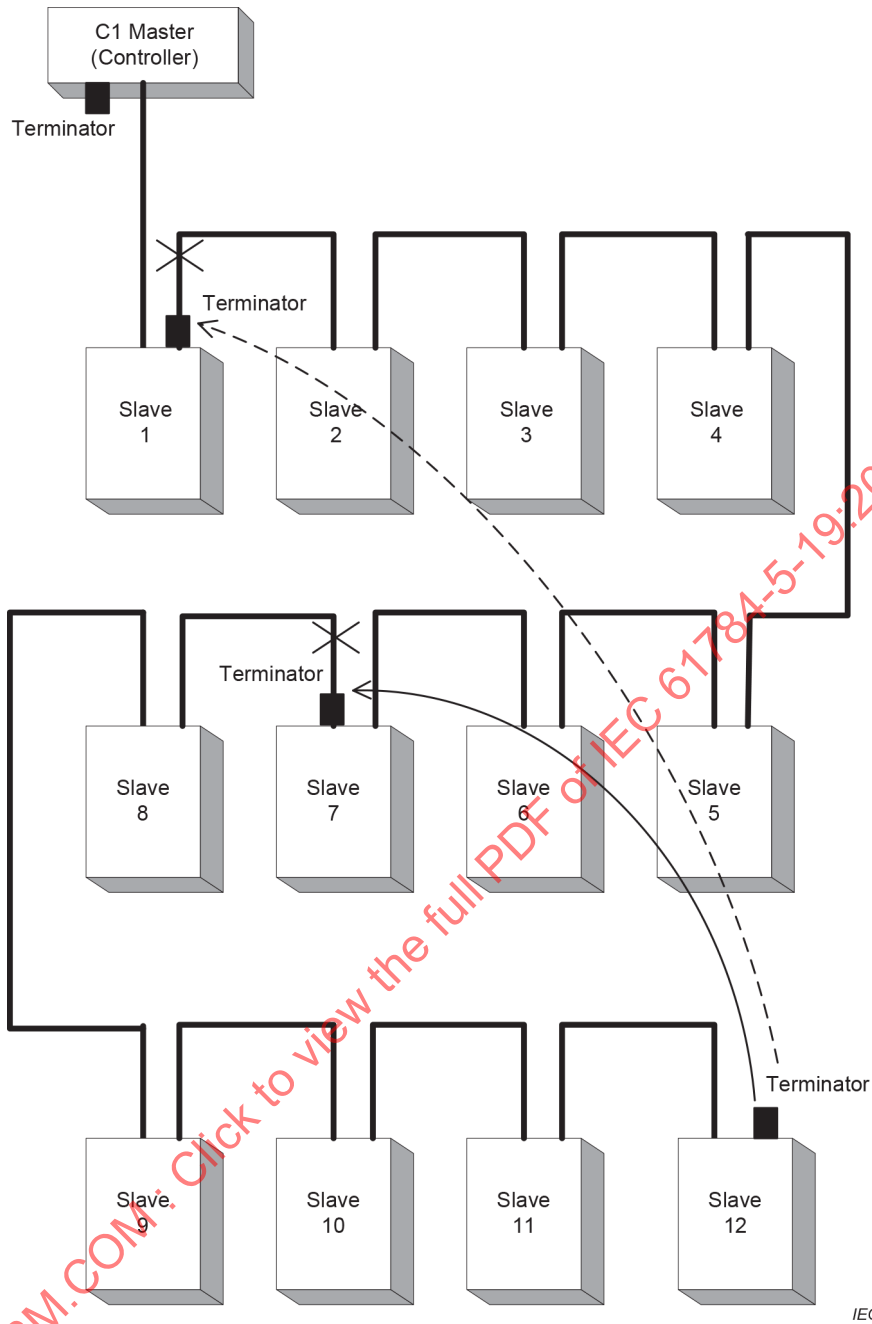


Figure A.11 – Division of network segment by changing terminator location

Annex B (normative)

CP 19/2 (MECHATROLINK™-III) specific installation profile

B.1 Installation profile scope

Addition:

This annex specifies the installation profile for Communication Profile CP 19/2 (MECHATROLINK™-III). The CP 19/2 is specified in IEC 61784-1.

B.2 Normative references

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

B.3.1 Terms and definitions

B.3.2 Abbreviated terms

Addition:

IMI	Industrial mini IO
-----	--------------------

B.3.3 Conventions for installation profiles

Not applicable.

B.4 Installation planning

B.4.1 General

Subclause 4.1.4 is not applicable.

B.4.2 Planning requirements

B.4.2.1 Safety

B.4.2.1.1 General

B.4.2.1.2 Electric safety

B.4.2.1.3 Functional safety

Not applicable.

B.4.2.1.4 Intrinsic safety

Not applicable.

B.4.2.1.5 Safety of optical fibre communication systems

Not applicable.

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

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

B.4.3.1.4 Combination of basic topologies

Not applicable.

B.4.3.1.5 Specific requirements for CPs

Addition:

CP 19/2 (MECHATROLINK™-III) supports linear and star topologies. Ring topology is not supported. Each CP 19/2 devices shall be connected through the crossover cable described in IEC 61918: ~~2013~~ 2018, Annex H.

B.4.3.1.6 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 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: ~~2013~~ 2018, Table 2.

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

Characteristic	CP 19/2
Supported data rates (Mbit/s)	100
Supported channel length (m) ^b	100
Number of connections in the channel (max.) ^{a,b}	4
Patch cord length (m) ^a	100
Channel class per ISO/IEC-24702 11801-3 (min.) ^b	D
Cable category per ISO/IEC-24702 11801-3 (min.) ^c	5
Connecting HW category per ISO/IEC-24702 11801-3 (min.)	5
Cable types	As needed for application
^a See B.4.4.3.2. ^b For the purpose of this table the channel definitions of ISO/IEC-24702 11801-3 are applicable. ^c For additional information see IEC 61156 series.	

B.4.3.2.4 Network characteristics for optical fibre cabling

Not applicable.

B.4.3.2.5 Specific network characteristics

Not applicable.

B.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC-24702 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**

Replacement

Table B.2 provides values based on the template given in IEC 61918:2013 2018, Table 4.

Table B.2 – Information relevant to copper cable: fixed cables

Characteristic	CP 19/2
Nominal impedance of cable (tolerance)	$(100 \pm 15) \Omega$
DCR of conductors	$\leq 52 \Omega/\text{km}$
DCR of shield	–
Number of conductors	4
Shielding	Yes
Colour code for conductor	BU, WH, OG, YE
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

~~Replacement:~~

Table B.3 provides values based on the template given in IEC 61918:2013 2018, Table 5.

Table B.3 – Information relevant to copper cable: cords

Characteristic	CP 19/2
Nominal impedance of cable (tolerance)	$(100 \pm 15) \Omega$
DCR of conductors	$\leq 52 \Omega/\text{km}$
DCR of shield	–
Number of conductors	4
Length	100 m
Shielding	Yes
Colour code for conductor	BU, WH, OG, YE
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

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

Not applicable.

B.4.4.1.5 Special purpose balanced and optical fibre cables

B.4.4.1.6 Specific requirements for CPs

Not applicable.

B.4.4.1.7 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 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.4 provides values based on the template given in IEC 61918:~~2013~~2018, Table 7.

Table B.4 – 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	Others IEC 61076-3-122
	shielded	unshielded	Var. 1	Var. 6	Var. 14	M12-4 with D-coding	M12-8 with X-coding	IMI connector ^c
CP 19/2	IEC 60603-7-3	No	No	No	No	No Yes	No	See the following Addition Yes
^a For IEC 60603-7 series, the connector selection is based on the desired channel performance. ^b Housings to protect connectors. ^c The IMI connector is specified in the following paragraph.								

Addition:

~~CP 19/2 defines two types of connectors, the modular connector specified in IEC 60603-7-3 and the CP 19/2 specific connector, called IMI (industrial mini IO) connector. The electrical specification of the IMI connector is same as specified in IEC 60603-7-3. Figure B.1 and Figure B.2 show the dimension of the IMI device connector and cable connector respectively.~~

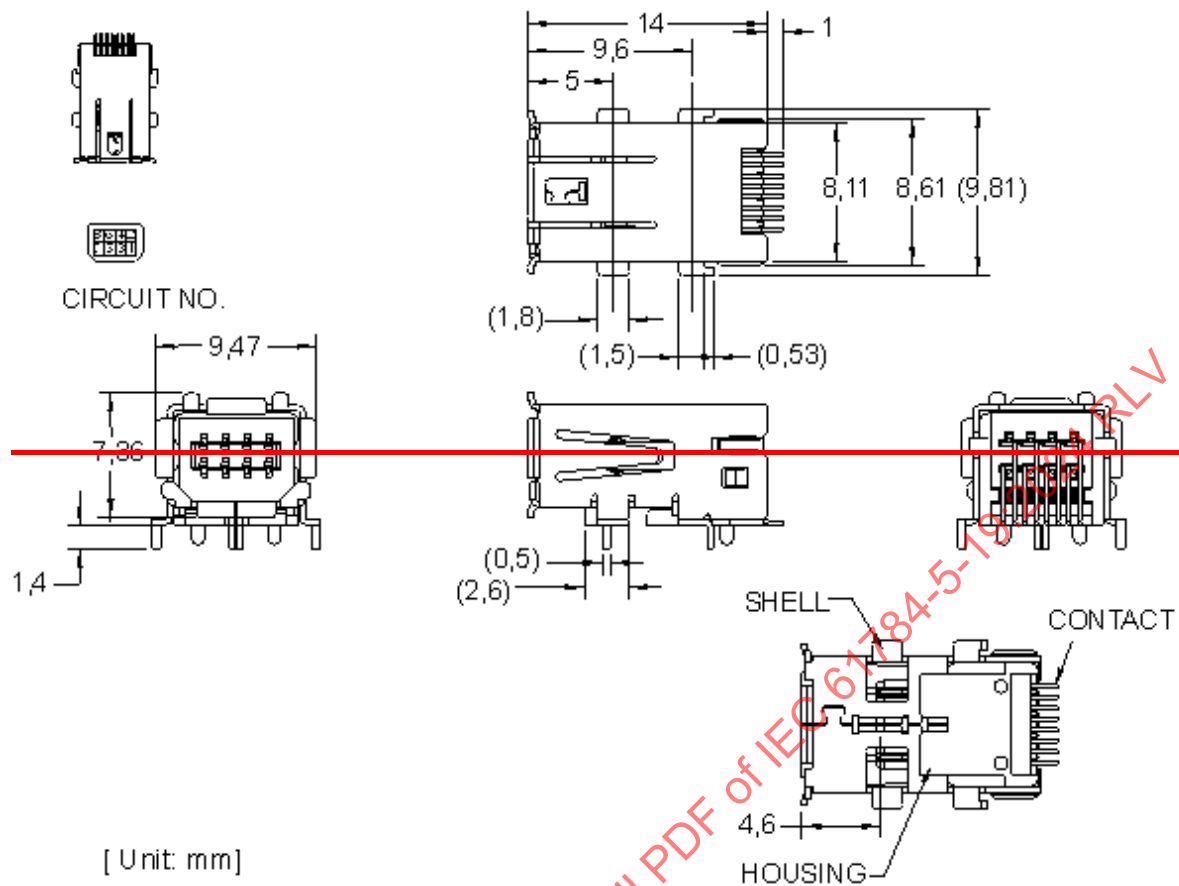


Figure B.1 – Dimensions of IMI device connector

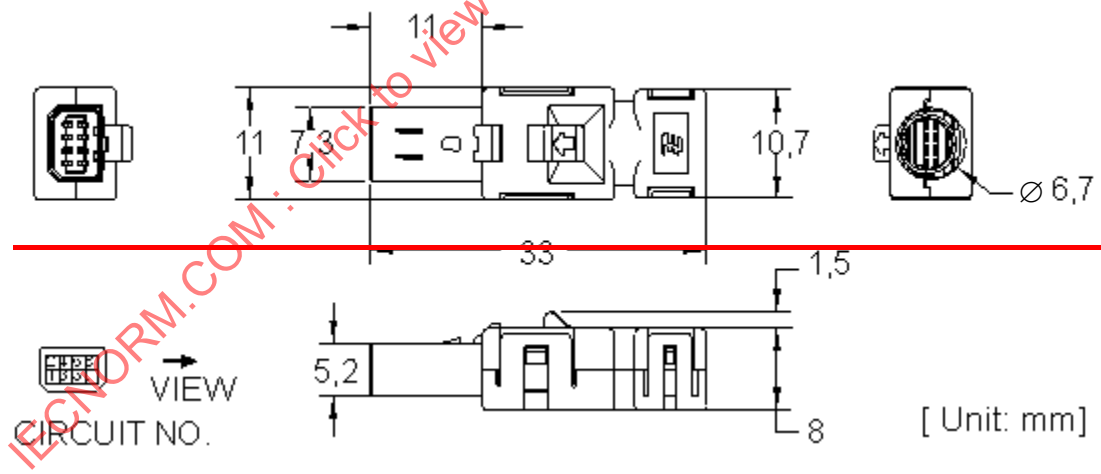


Figure B.2 – Dimensions of IMI cable connector

CP 19/2 defines three types of connectors, modular connector specified in IEC 60603-7-3 and IMI (Industrial Mini IO) connector specified IEC 61076-3-122, and M12-4 connector specified IEC 61076-2-101.

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

Not applicable.

B.4.4.2.4 Connecting hardware for wireless installation

Not applicable.

B.4.4.2.5 Connecting hardware for optical fibre cabling

Not applicable.

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 ~~24702~~ 11801-3

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.4.4.3.3 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

Not applicable.

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 ~~24702~~ 11801-3

B.4.4.4 Terminators

Not applicable.

B.4.4.5 Device location and connection

B.4.4.5.1 Common description

B.4.4.5.2 Specific requirements for CPs

Not applicable.

B.4.4.5.3 Specific requirements for wireless installation

Not applicable.

B.4.4.5.4 **Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3**

B.4.4.6 **Coding and labelling**

B.4.4.6.1 **Common description**

B.4.4.6.2 **Additional requirements for CPs**

B.4.4.6.3 **Specific requirements for CPs**

Not applicable.

B.4.4.6.4 **Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3**

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

B.4.4.7.1 **Common description**

B.4.4.7.2 **Bonding and earthing of enclosures and pathways**

B.4.4.7.3 **Earthing methods**

B.4.4.7.4 **Shield earthing**

Not applicable.

B.4.4.7.4.1 **Non-earthing or parallel RC**

Not applicable.

B.4.4.7.4.2 **Direct**

~~Not applicable.~~

Addition:

CP 19/2 (MECHATROLINK™-III) requires direct shield earthing. The communication shield of a CP 19/2 device is normally directly connected to the device's protective earth through the connector shield. If the CP 19/2 specific connector is used, no additional shield earthing installation is needed.

B.4.4.7.5 **Specific requirements for CPs**

Not applicable.

B.4.4.7.6 **Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3**

B.4.4.8 **Storage and transportation of cables**

B.4.4.8.1 **Common description**

B.4.4.8.2 **Specific requirements for CPs**

Not applicable.

B.4.4.8.3 **Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3**

B.4.4.9 Routing of cables

B.4.4.9.1 Common description

B.4.4.9.2 Cable routing of assemblies

B.4.4.9.3 ~~Detailed~~ Requirements for cable routing inside enclosures

B.4.4.9.4 Cable routing inside buildings

B.4.4.9.5 Cable routing outside and between buildings

B.4.4.9.6 Installing redundant communication cables

Not applicable.

B.4.4.10 Separation of circuits

B.4.4.11 Mechanical protection of cabling components

B.4.4.11.1 Common description

B.4.4.11.2 Specific requirements for CPs

Not applicable.

B.4.4.11.3 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

B.4.4.12 Installation in special areas

B.4.4.12.1 Common description

B.4.4.12.2 Specific requirements for CPs

Not applicable.

B.4.4.12.3 Specific requirements for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

B.4.5 Cabling planning documentation

B.4.5.1 Common description

B.4.5.2 Cabling planning documentation for CPs

B.4.5.3 Network certification documentation

B.4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC ~~24702~~ 11801-3

B.4.6 Verification of cabling planning specification

B.5 Installation implementation

B.5.1 General requirements

B.5.1.1 Common description

B.5.1.2 Installation of CPs

B.5.1.3 Installation of generic cabling in industrial premises

B.5.2 Cable installation

B.5.2.1 General requirements for all cabling types

B.5.2.1.1 Storage and installation

B.5.2.1.2 Protecting communication cables against potential mechanical damage

Replacement:

Table B.5 provides values based on the template given in IEC 61918:2013, Table 18.

Table B.5 – Parameters for balanced cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	26 mm
	Bending radius, multiple bending (mm)	See manufacturer's data sheet
	Pull forces (N)	101 N
	Permanent tensile forces (N)	58 N
	Maximum lateral forces (N/cm)	Not defined
	Temperature range during installation (°C)	0 to 80

B.5.2.1.3 Avoid forming loops

B.5.2.1.4 Torsion (twisting)

B.5.2.1.5 Tensile strength (on installed cables)

B.5.2.1.6 Bending radius

B.5.2.1.7 Pull force

B.5.2.1.8 Fitting strain relief

B.5.2.1.9 Installing cables in cabinet and enclosures

B.5.2.1.10 Installation on moving parts

B.5.2.1.11 Cable crush

B.5.2.1.12 Installation of continuous flexing cables

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

Not applicable.

B.5.2.2 Installation and routing**B.5.2.2.1 Common description****B.5.2.2.2 Separation of circuits****B.5.2.3 Specific requirements for CPs**

Not applicable.

B.5.2.4 Specific requirements for wireless installation

Not applicable.

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

Table B.6 shows the pin assignment and wire colour coding for CP 19/2 modular connector and IMI connectors, and Table B.7 shows the pin assignment and wire colour coding for CP 19/2 M12 connectors specified in B.4.4.2.2. The channel between CP 19/2 devices shall be cross over cable as specified in this table. If a cable is added to a channel for connections or splices, straight through cable shall be used to maintain cross over connection on the whole channel.

Table B.6 – Pin assignment and wire colour coding for CP 19/2 modular and IMI connector

Signal	Function	Color code	Pin	
			One end	Other end
TXD+	Transmit Data+	BU	1	3
TXD-	Transmit Data-	WH	2	6
RXD+	Receive Data+	OG	3	1
RXD-	Receive Data-	YE	6	2
SH	Shield	Shield braid		

Table B.7 – Pin assignment and wire colour coding for CP 19/2 M12 connector

Signal	Function	Color code	Pin	
			One end	Other end
TXD+	Transmit Data+	BU	1	2
TXD-	Transmit Data-	WH	3	4
RXD+	Receive Data+	OG	2	1
RXD-	Receive Data-	YE	4	3
SH	Shield	Shield braid		

B.5.3.5 Specific requirements for wireless installation**B.5.4 Terminator installation**

Not applicable.

B.5.5 Device installation**B.5.5.1 Common description****B.5.5.2 Specific requirements for CPs**

Not applicable.

B.5.6 Coding and labelling**B.5.6.1 Common description****B.5.6.2 Specific requirements for CPs**

Not applicable.

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.6.2.1 General****B.6.2.2 Verification according to cabling planning documentation****B.6.2.3 Verification of earthing and bonding****B.6.2.3.1 General****B.6.2.3.2 Specific requirements for earthing and bonding**

Not applicable.

B.6.2.4 Verification of shield earthing

B.6.2.5 Verification of cabling system

B.6.2.5.1 Verification of cable routing

B.6.2.5.2 Verification of cable protection and proper strain relief

B.6.2.6 Cable selection verification

B.6.2.6.1 Common description

B.6.2.6.2 Specific requirements for CPs

Not applicable.

B.6.2.6.3 Specific requirements for wireless installation

Not applicable.

B.6.2.7 Connector verification

B.6.2.7.1 Common description

B.6.2.7.2 Specific requirements for CPs

Not applicable.

B.6.2.7.3 Specific requirements for wireless installation

Not applicable.

B.6.2.8 Connection verification

B.6.2.8.1 Common description

B.6.2.8.2 Number of connections and connectors

B.6.2.8.3 Wire mapping

B.6.2.9 Terminator verification

Not applicable.

B.6.2.10 Coding and labelling verification

B.6.2.10.1 Common description

B.6.2.10.2 Specific coding and labelling verification requirements

Not applicable.

B.6.2.11 Verification report

B.6.3 Installation acceptance test

B.6.3.1 General

B.6.3.2 Acceptance test of Ethernet-based cabling

B.6.3.2.1 Validation of balanced cabling for CPs based on Ethernet

Subclause 6.3.2.1.3 is not applicable.

B.6.3.2.2 Validation of optical fibre cabling for CPs based on Ethernet

Not applicable.

**B.6.3.2.3 Specific requirements for generic cabling in accordance with
ISO/IEC ~~24702~~ 11801-3**

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

Not applicable.

B.6.3.4 Specific requirements for wireless installation

Not applicable.

B.6.3.5 Acceptance test report

B.7 Installation administration

Subclause 7.8 is not applicable.

B.8 Installation maintenance and installation troubleshooting

Subclause 8.4 is not applicable.

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Annex C (normative)

CP19/3 (Σ -LINK™ II) specific installation profile

C.1 Installation profile scope

Addition:

This annex specifies the installation profile for Communication Profile CP 19/3 (Σ -LINK™ II). The CP 19/3 is specified in IEC 61784-1.

C.2 Normative references

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

C.3.1 Terms and definitions

Addition:

C.3.1.1 T-Branch

A topology using a tap to branch the trunk line and the spur line

C.3.2 Abbreviated terms

C.3.3 Conventions for installation profiles

Not applicable.

C.4 Installation planning

C.4.1 General

Subclause 4.1.4 is not applicable.

C.4.2 Planning requirements

C.4.2.1 Safety

C.4.2.1.1 General

C.4.2.1.2 Electrical safety

C.4.2.1.3 Functional safety

Not applicable.

C.4.2.1.4 Intrinsic safety

Not applicable.

C.4.2.1.5 Safety of optical fibre communication systems

Not applicable.

C.4.2.2 Security

C.4.2.3 Environmental considerations and EMC

C.4.2.3.1 Description methodology

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

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

C.4.3 Network capabilities

C.4.3.1 Network topology

C.4.3.1.1 Common description

C.4.3.1.2 Basic physical topologies for passive networks

Not applicable.

C.4.3.1.3 Basic physical topologies for active networks

Modification:

CP 19/3 network supports 3 types of topologies, about linear, T-branch and Point-to-point.

C.4.3.1.4 Combination of basic topologies

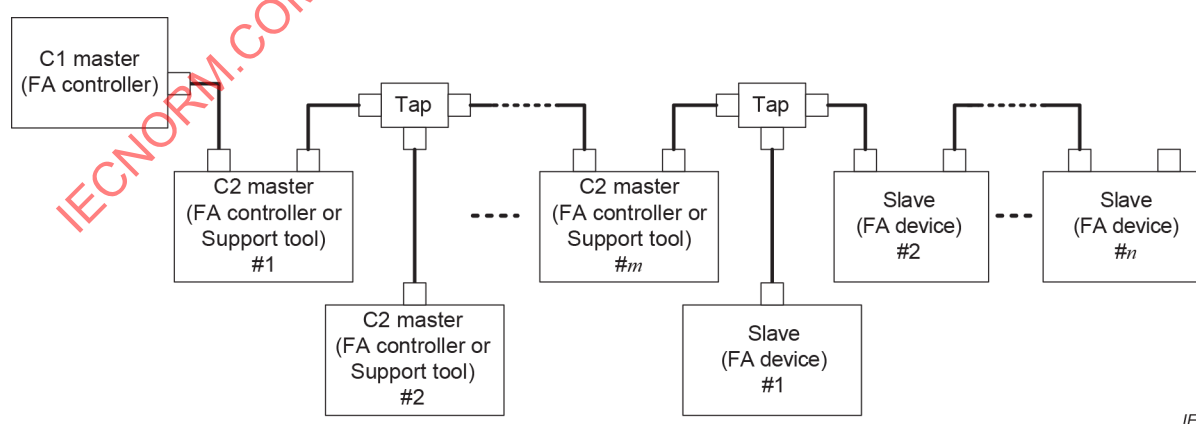
Addition:

CP 19/3 network supports combination topologies which consists of linear and T-branch.

C.4.3.1.5 Specific requirements for CPs

Addition:

CP 19/3 supports active topology by linear, T-branch and combination of linear and T-branch and Point-to-point for connection of devices. Figure C.1 shows the CP 19/3 active networks.



IEC

Figure C.1 – Topology of CP 19/3 combination of linear and T-branch network

For the power supply, the network of CP19/3 supports the topology that connects the power adaptor to supply power within the network. The power adaptor can be connected to any place. Figure C.2 shows an example of the power adaptor connections.

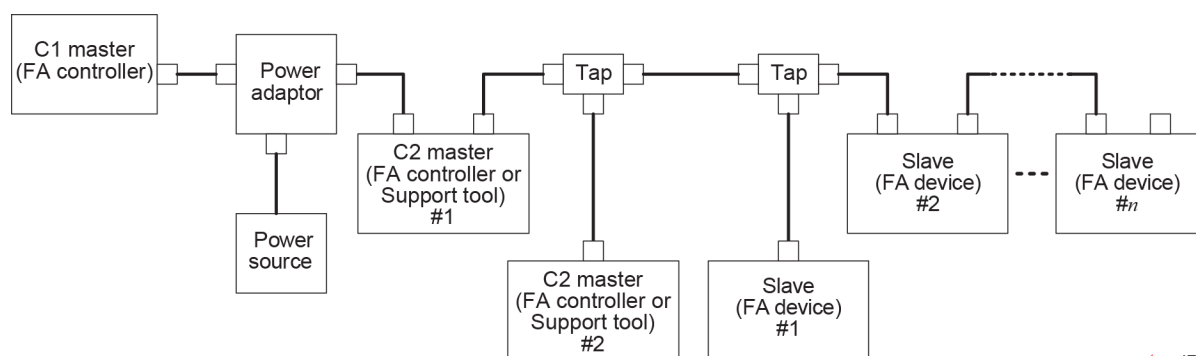


Figure C.2 – Topology of CP 19/3 network example with Power adaptor

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

C.4.3.2 Network characteristics

C.4.3.2.1 General

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

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

Characteristic	CP 19/3 (Σ -LINK™ II)
Basic transmission technology	TIA-485-A Linear bus
Length/transmission speed	Length between nodes m
4 Mbit/s, 8 Mbit/s, 16 Mbit/s, 24 Mbit/s, 32 Mbit/s	50
Maximum capacity	Max. no.
Devices/network	14

C.4.3.2.3 Network characteristics for balanced cabling based on Ethernet

Not applicable.

C.4.3.2.4 Network characteristics for optical fibre cabling

Not applicable.

C.4.3.2.5 Specific network characteristics

The relationship between the number of devices and maximum length between devices is shown in Table C.1.

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

C.4.4 Selection and use of cabling components

C.4.4.1 Cable selection

C.4.4.1.1 Common description

Addition:

The network of CP19/3 uses two types of cables: 6-conductor and 8- conductor cables.

C.4.4.1.2 Copper cables**C.4.4.1.2.1 Balanced cables for Ethernet-based CPs**

Not applicable.

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

Replacement:

Table C.2 – Information relevant to 6-conductor copper cable

Characteristic		CP 19/3 (Σ-LINK™ II)
Nominal impedance of cable (tolerance)	signal	(120 ± 12) Ω for signal wire
Attenuation	Signal	1,16 dB/ 50 m (at 1 MHz) 2,55 dB/ 50 m (at 4 MHz) 4,05 dB/ 50 m (at 8 MHz) 4,68 dB/ 50 m (at 10 MHz) 6,17 dB/ 50 m (at 16 MHz) 6,97 dB/ 50 m (at 20 MHz) 7,85 dB/ 50 m (at 25 MHz) 8,84 dB/ 50 m (at 31,25 MHz) 12,97 dB/ 50 m (at 62,5 MHz) 17,17 dB/ 50 m (at 100 MHz)
DCR of conductors	signal, Auxiliary signal	< 140 Ω/km for signal wire
	power	depends on conductor size
DCR of shield		–
Number of conductors		6
Shielding		Yes
Colour code for conductor		OR, BK, BN, GY, RD, BL
Jacket colour requirements		–
Jacket material		–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)		–
Agency ratings		–
Conductor cross-sectional area		–
Capacitance		–

Table C.3 – Information relevant to 8-conductor copper cable

Characteristic		CP 19/3 (Σ-LINK™ II)
Nominal impedance of cable (tolerance)	signal	(120 ± 12) Ω for signal wire
Attenuation	Signal	1,16 dB/ 50 m (at 1 MHz) 2,55 dB/ 50 m (at 4 MHz) 4,05 dB/ 50 m (at 8 MHz) 4,68 dB/ 50 m (at 10 MHz) 6,17 dB/ 50 m (at 16 MHz) 6,97 dB/ 50 m (at 20 MHz) 7,85 dB/ 50 m (at 25 MHz) 8,84 dB/ 50 m (at 31,25 MHz) 12,97 dB/ 50 m (at 62,5 MHz) 17,17 dB/ 50 m (at 100 MHz)
DCR of conductors	signal,	< 145,6 Ω/km for signal wire
	Auxiliary signal	
	power	depends on conductor size
DCR of shield		–
Number of conductors		8
Shielding		Yes
Colour code for conductor		OR, BK, BN, GY, RD, BL, YE, WT
Jacket colour requirements		–
Jacket material		–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)		–
Agency ratings		–
Conductor cross-sectional area		–
Capacitance		–

Addition:

The additional CP 19/3 cable specifications are shown in Table C.4. Figure C.3 and Figure C.4 show the structure of CP 19/3 cable.

Table C.4 – Additional cable specifications

Characteristic	Constraints
Conductor	Tinned annealed copper
Withstand voltage	AC 500 V, 1 min
Insulation resistance	≥ 10 MΩ/km

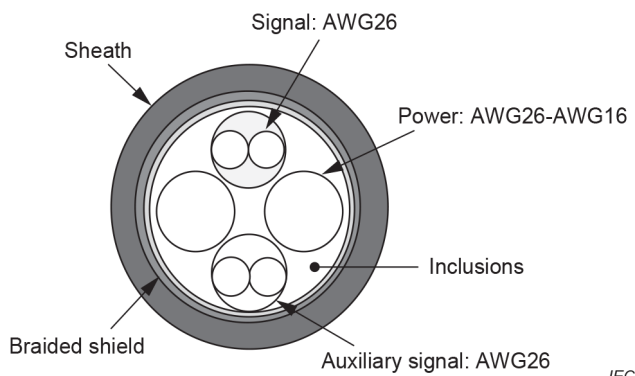


Figure C.3 – Structure of 6-conductor cable

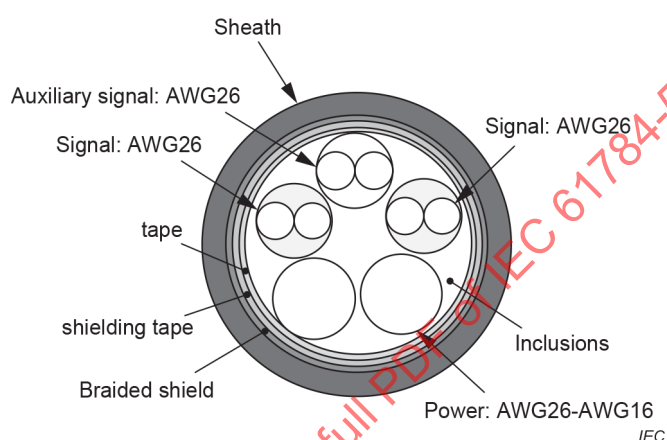


Figure C.4 – Structure of 8-conductor cable

C.4.4.1.3 Cables for wireless installation

Not applicable.

C.4.4.1.4 Optical fibre cables

Not applicable.

C.4.4.1.5 Special purpose balanced and optical fibre cables

C.4.4.1.6 Specific requirements for CPs

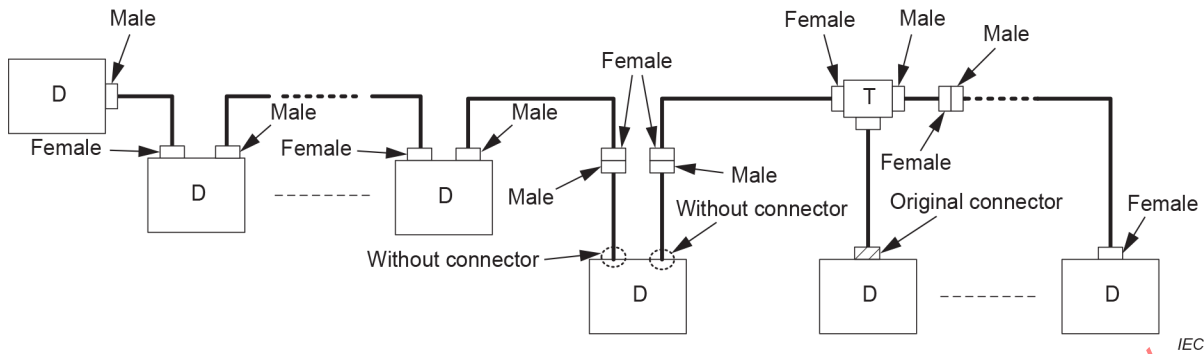
Not applicable.

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

C.4.4.2 Connecting hardware selection

C.4.4.2.1 Common description

Figure C.5 show the connection for linear network and the connection for T-branch network patterns using connectors.



where
D: Device
T: Tap

Figure C.5 – Connection for linear network

Connection of device with original connectors and connection of device without connectors as shown in Figure C.5 are also available. The original connector to be used shall have the electric characteristics equivalent to those described in this document. In either case, cables specified in this document shall be used.

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

Not applicable.

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

Replacement:

Table C.5 provides values based on the template given in IEC 61918:2018, Table 8.

Table C.5 – Connectors for copper cabling CPs not based on Ethernet

	IEC 6080 7-2 or IEC 6080 7-3	IEC 61076-2-101			IEC 6116 9-8	ANSI/(NFPA) T3.5.29 R1-2007		Others			
	Sub-D	M12-8 with A-coding	M12-12 with A-coding	M12-n with X-coding	Coaxial (BNC)	M 18	7/8-16 UN-2B THD	Open style	Terminal block	Σ-LINK II ^a	Others
CP 19/3	No	Yes	No	No	No	No	No	No	No	Yes	Yes
NOTE For M12-8 and M12-12 connectors, there are many applications using these connectors that are not compatible and when mixed cause damage to the applications.											
^a Σ-LINK II connector is specified in the following paragraph.											

Addition:

For CP 19/3 network, CP 19/3 specific connector shall be used. Figure C.6, Figure C.7 and Figure C.8 show the dimensions of the 6 pin device connectors. Figure C.9, Figure C.10 and Figure C.11 shows the dimensions of the 8 pin device connector. Figure C.12 and Figure C.13 show the dimensions of the cable 6 pin connectors. Figure C.14 and Figure C.15 shows the dimensions of the cable 8 pin connector. Table C.6 shows the electric characteristics of 6 pin connector. Table C.7 shows the electric characteristics of 8 pin connector.

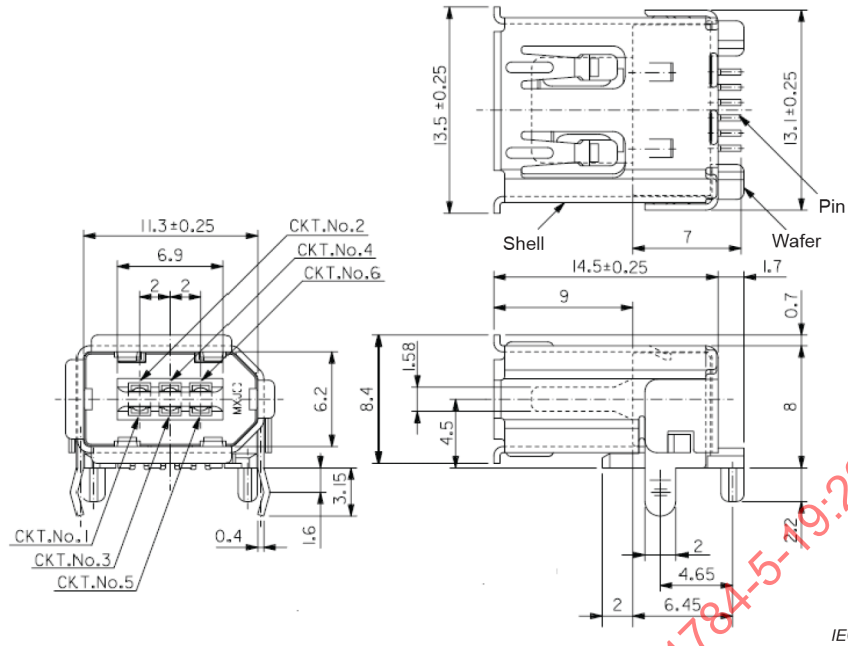


Figure C.6 – Dimensions of device 6 pin connector

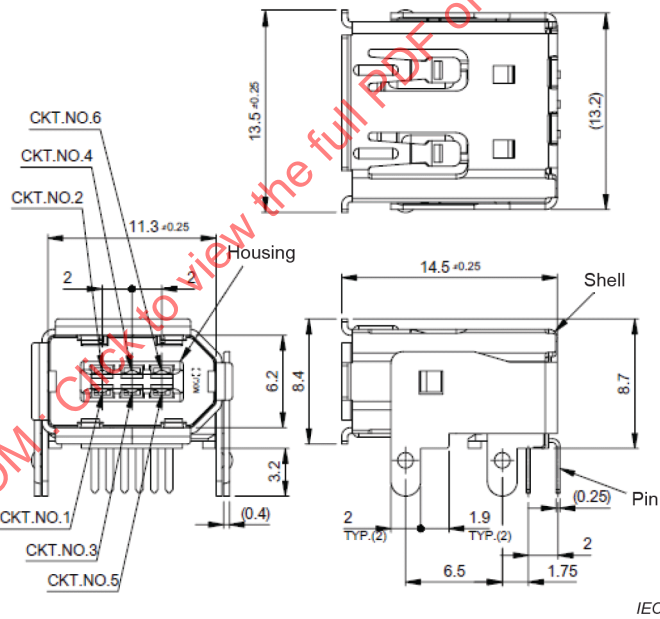


Figure C.7 – Dimensions of device 6 pin connector

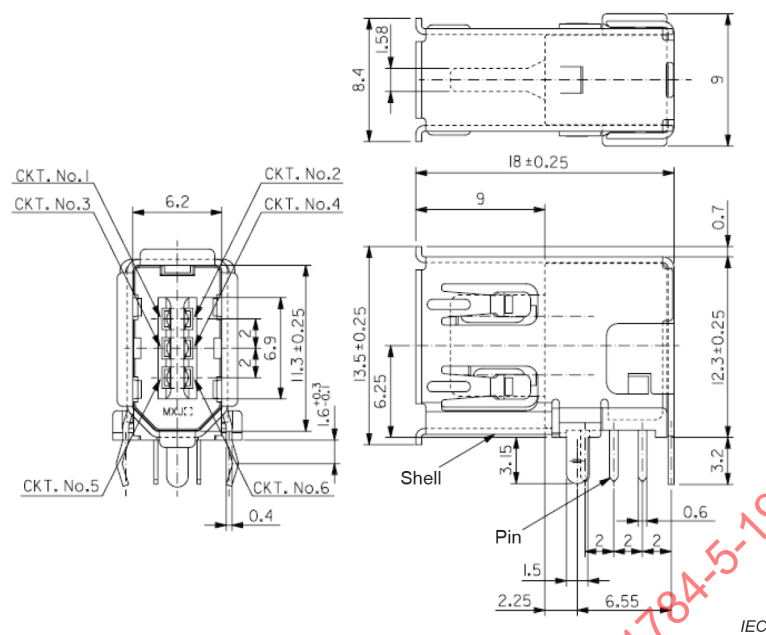


Figure C.8 – Dimensions of device 6 pin connector

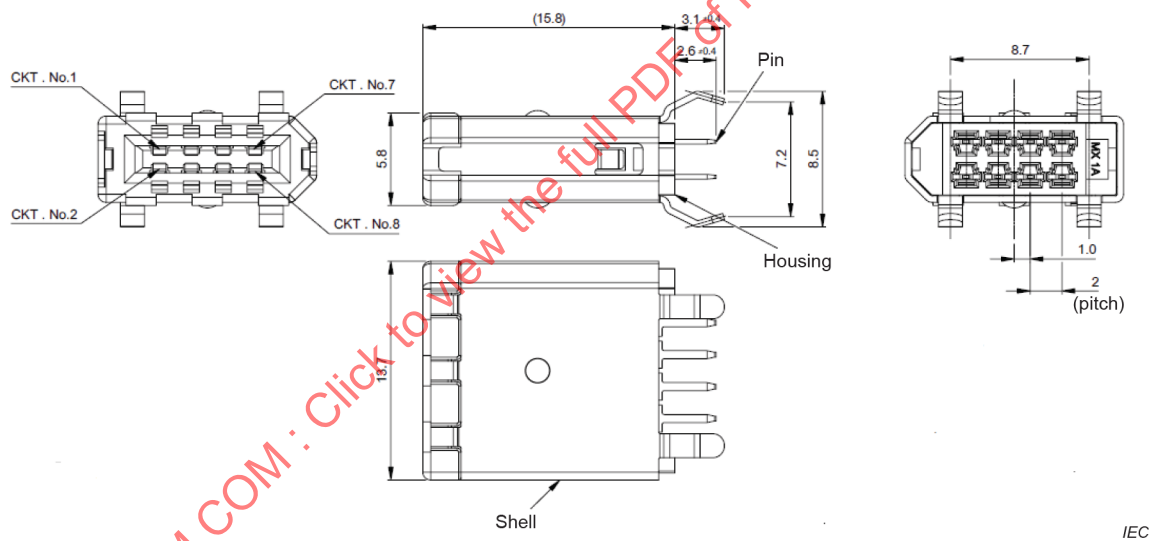


Figure C.9 – Dimensions of device 8 pin male connector

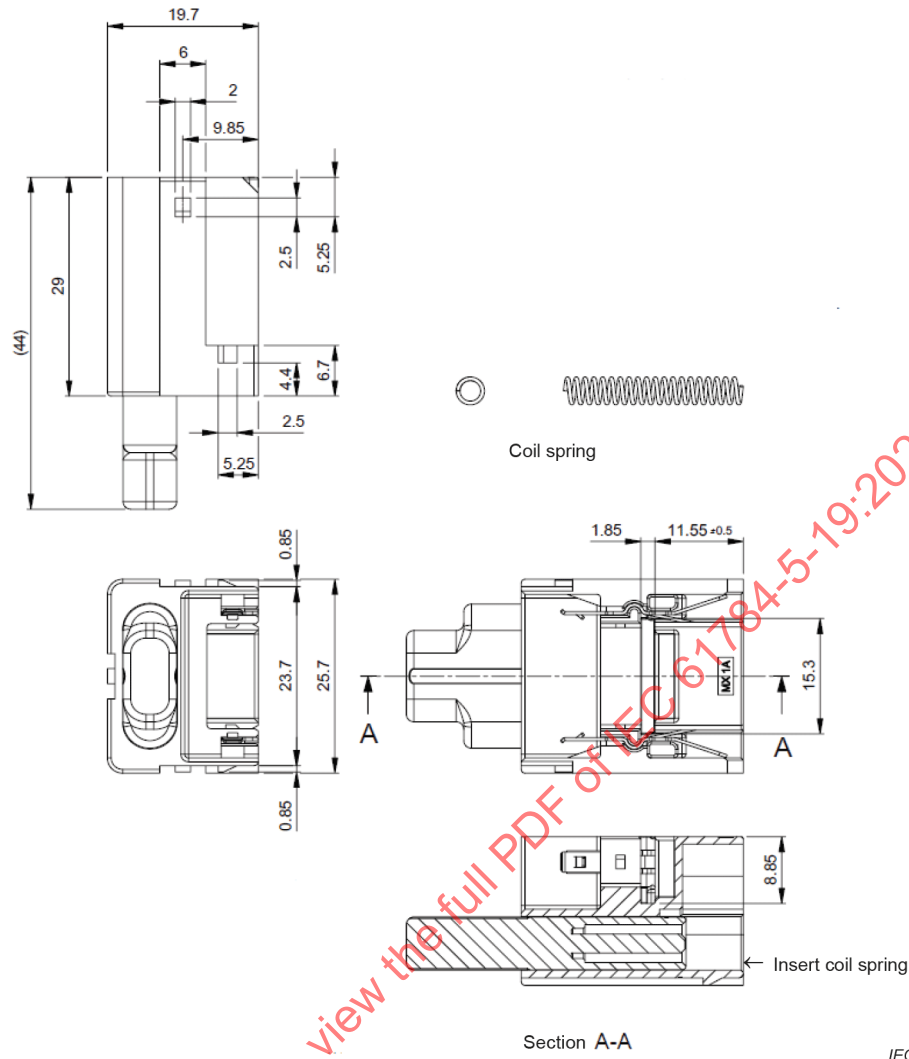


Figure C.10 – Dimensions of ejector for device 8 pin male connector

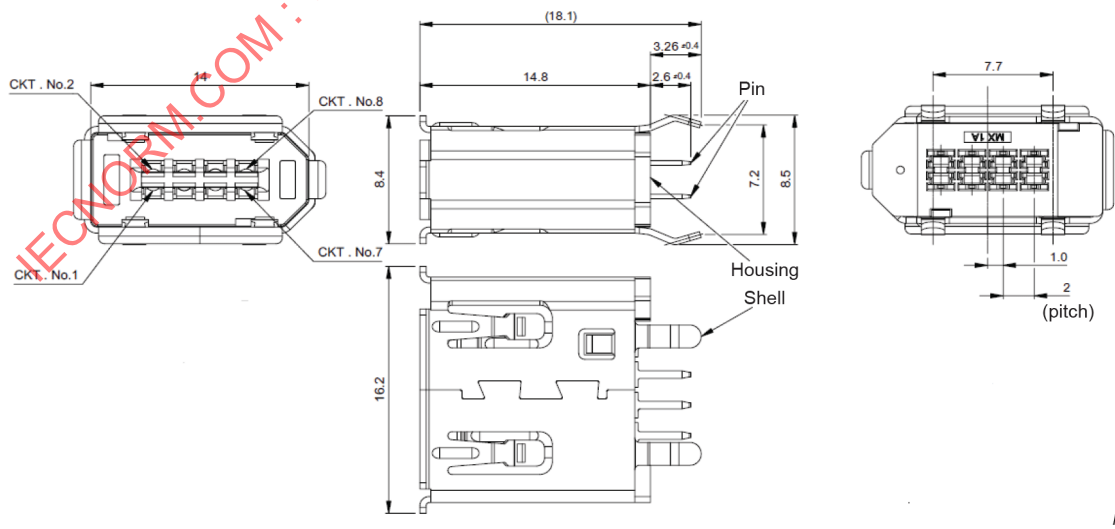


Figure C.11 – Dimensions of device 8 pin female connector

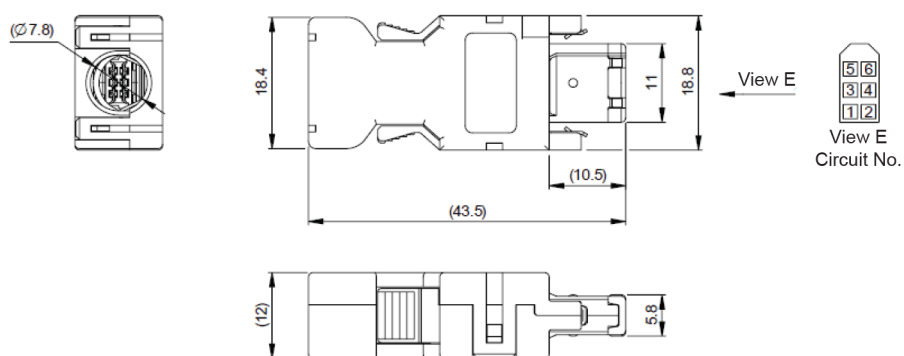


Figure C.12 – Dimensions of cable 6 pin male connector

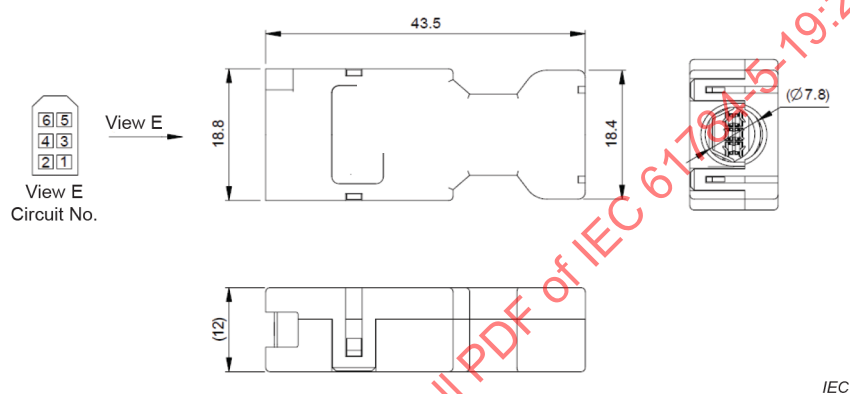


Figure C.13 – Dimensions of cable 6 pin female connector

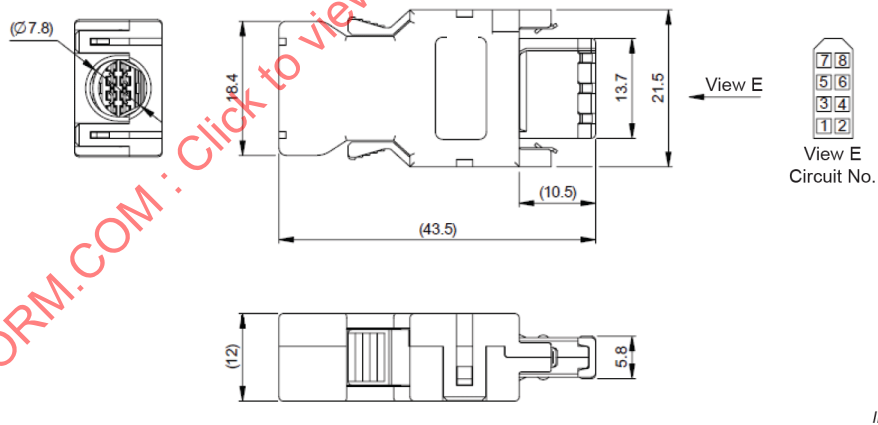


Figure C.14 – Dimensions of cable 8 pin male connector

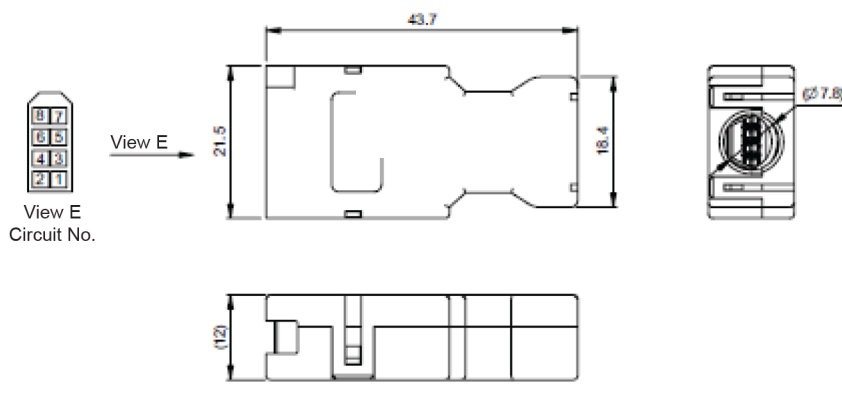


Figure C.15 – Dimensions of cable 8 pin female connector

Table C.6 – Electric characteristics of 6pin connector

Characteristic	value
Maximum rated voltage	125V
Maximum rated current	2.0 A@AWG#16-22(Cable soldering type) 1,5 A@AWG#24 0,5 A@AWG#28
Contact Resistance	Terminal 20 mΩ max Shell 50 mΩ max
Withstand voltage	AC500 V/1min
Insulation resistance	100 MΩ
Operating temperature	-40 to +85 degree

Table C.7 – Electric characteristics of 8pin connector

Characteristic	value
Maximum rated voltage	125 V
Maximum rated current	2.0 A@AWG#16-22(Cable soldering type) 1,5 A@AWG#24 0,5 A@AWG#28
Contact Resistance	Terminal 20 mΩ max Shell 50 mΩ max
Withstand voltage	AC500 V/1 min
Insulation resistance	100 MΩ
Operating temperature	-40 to +85 degree

C.4.4.2.4 Connecting hardware for wireless installation

Not applicable.

C.4.4.2.5 Connecting hardware for optical fibre cabling

Not applicable.

C.4.4.2.6 Specific requirements for CPs

Not applicable.

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

C.4.4.3 Connections within a channel/permanent link

C.4.4.3.1 Common description

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

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

Not applicable.

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

Not applicable.

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

Not applicable.

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

C.4.4.4 Terminators

C.4.4.4.1 Common description

C.4.4.4.2 Specific requirements for CPs

Addition:

The terminator resistance value shall be $(120 \pm 6) \Omega$ (min. 1/2W). Terminators are usually installed on CP 19/3 network device.

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

C.4.4.5 Device location and connection

C.4.4.5.1 Common description

C.4.4.5.2 Specific requirements for CPs

Not applicable.

C.4.4.5.3 Specific requirements for wireless installation

Not applicable.

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

C.4.4.6 Coding and labelling**C.4.4.6.1 Common description****C.4.4.6.2 Additional requirements for CPs****C.4.4.6.3 Specific requirements for CPs**

Not applicable.

C.4.4.6.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**C.4.4.7 Earthing and bonding of equipment and devices and shielded cabling****C.4.4.7.1 Common description****C.4.4.7.2 Bonding and earthing of enclosures and pathways****C.4.4.7.3 Earthing methods****C.4.4.7.4 Shield earthing****C.4.4.7.4.1 Non-earthing or parallel RC**

Not applicable.

C.4.4.7.4.2 Direct

Addition:

CP 19/3 (Σ -LINK™ II) requires direct shield earthing. The communication shield of a CP 19/3 device is normally directly connected to the device's protective earth through connector shield. If CP 19/3 specific connector is used, no additional shield earthing installation is needed.

C.4.4.7.5 Specific requirements for CPs

Not applicable.

C.4.4.7.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**C.4.4.8 Storage and transportation of cables****C.4.4.8.1 Common description****C.4.4.8.2 Specific requirements for CPs**

Not applicable.

C.4.4.8.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

C.4.4.9 Routing of cables

C.4.4.9.1 Common description

C.4.4.9.2 Cable routing of assemblies

C.4.4.9.3 Requirements for cable routing inside enclosures

C.4.4.9.4 Cable routing inside buildings

C.4.4.9.5 Cable routing outside and between buildings

C.4.4.9.6 Installing redundant communication cables

Not applicable.

C.4.4.10 Separation of circuits

C.4.4.11 Mechanical protection of cabling components

C.4.4.11.1 Common description

C.4.4.11.2 Specific requirements for CPs

Not applicable.

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

C.4.4.12 Installation in special areas

C.4.4.12.1 Common description

C.4.4.12.2 Specific requirements for CPs

Not applicable.

C.4.4.12.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

C.4.5 Cabling planning documentation

C.4.5.1 Common description

C.4.5.2 Cabling planning documentation for CPs

C.4.5.3 Network certification documentation

C.4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC 11801-3

C.4.6 Verification of cabling planning specification

C.5 Installation implementation

C.5.1 General requirements

C.5.1.1 Common description

C.5.1.2 Installation of CPs

C.5.1.3 Installation of generic cabling in industrial premises

C.5.2 Cable installation

C.5.2.1 General requirements for all cabling types

C.5.2.1.1 Storage and installation

C.5.2.1.2 Protecting communication cables against potential mechanical damage

Replacement:

Table C.8 provides values based on the template given in IEC 61918:2018, Table 18.

Table C.8 – Parameters for balanced cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	^a
	Bending radius, multiple bending (mm)	^a
	Pull forces (N)	^a
	Permanent tensile forces (N)	^a
	Maximum lateral forces (N/cm)	^a
	Temperature range during installation (°C)	^a
^a Depending on cable type: see manufacturer's data sheet		

C.5.2.1.3 Avoid forming loops

C.5.2.1.4 Torsion (twisting)

C.5.2.1.5 Tensile strength (on installed cables)

C.5.2.1.6 Bending radius

C.5.2.1.7 Pull force

C.5.2.1.8 Fitting strain relief

C.5.2.1.9 Installing cables in cabinet and enclosures

C.5.2.1.10 Installation on moving parts

C.5.2.1.11 Cable crush

C.5.2.1.12 Installation of continuous flexing cables

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

Not applicable.

C.5.2.2 Installation and routing

C.5.2.2.1 Common description

C.5.2.2.2 Separation of circuits

C.5.2.3 Specific cable installation requirements for CPs

Not applicable.

C.5.2.4 Specific requirements for wireless installation

Not applicable.

C.5.2.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**C.5.3 Connector installation****C.5.3.1 Common description****C.5.3.2 Shielded connectors****C.5.3.3 Unshielded connectors**

Not applicable.

C.5.3.4 Specific requirements for CPs

Addition:

Table C.9 and Table C.10 shows the pin assignment and wire colour coding for CP 19/3 connectors.

Table C.9 – Pin assignment and wire colour coding for CP 19/3 6 pin connector

pin assignment	signal	function	Colour code
			Standard
1	VCC	power supply	Orange
2	0V	GND	Black
3	AUX+	auxiliary signal (positive)	Brown
4	AUX–	auxiliary signal (negative)	Gray
5	SRD+	transmission signal (positive)	Red
6	SRD–	transmission signal (negative)	Blue

Table C.10 – Pin assignment and wire colour coding for CP 19/3 8 pin connector

pin assignment	signal	function	Colour code
1	VCC	power supply	Orange
2	0V	GND	Black
3	AUX+	auxiliary signal (positive)	Brown
4	AUX–	auxiliary signal (negative)	Gray
5	SRD1+	transmission signal (positive)	Red
6	SRD1–	transmission signal (negative)	Blue
7	SRD2+	transmission signal (positive)	Yellow
8	SRD2–	transmission signal (negative)	White

C.5.3.5 Specific requirements for wireless installation

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

C.5.4 Terminator installation

Not applicable.

C.5.5 Device installation

C.5.5.1 Common description

C.5.5.2 Specific requirements for CPs

Not applicable.

C.5.6 Coding and labelling

C.5.6.1 Common description

C.5.6.2 Specific requirements for CPs

Not applicable.

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

Subclause 5.7.5 is not applicable.

C.5.8 As-implemented cabling documentation

C.6 Installation verification and installation acceptance test

C.6.1 General

C.6.2 Installation verification

C.6.2.1 General

C.6.2.2 Verification according to cabling planning documentation

C.6.2.3 Verification of earthing and bonding

C.6.2.3.1 General

C.6.2.3.2 Specific requirements for earthing and bonding

Not applicable.

C.6.2.4 Verification of shield earthing

C.6.2.5 Verification of cabling system

C.6.2.5.1 Verification of cable routing

C.6.2.5.2 Verification of cable protection and proper strain relief

C.6.2.6 Cable selection verification

C.6.2.6.1 Common description

C.6.2.6.2 Specific requirements for CPs

Not applicable.

C.6.2.6.3 Specific requirements for wireless installation

Not applicable.

C.6.2.7 Connector verification

C.6.2.7.1 Common description

C.6.2.7.2 Specific requirements for CPs

Not applicable.

C.6.2.7.3 Specific requirements for wireless installation

Not applicable.

C.6.2.8 Connection verification

C.6.2.8.1 Common description

C.6.2.8.2 Number of connections and connectors

C.6.2.8.3 Wire mapping

C.6.2.9 Terminator verification

Not applicable.

C.6.2.10 Coding and labelling verification

C.6.2.10.1 Common description

C.6.2.10.2 Specific coding and labelling verification requirements

Not applicable.

C.6.2.11 Verification report

C.6.3 Installation acceptance test

C.6.3.1 General

C.6.3.2 Acceptance test of Ethernet-based cabling

C.6.3.2.1 Validation of balanced cabling for CPs based on Ethernet

Subclause 6.3.2.1.3 is not applicable.

C.6.3.2.2 Validation of optical fibre cabling for CPs based on Ethernet

Not applicable.

C.6.3.2.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

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

Not applicable.

C.6.3.4 Specific requirements for wireless installation

Not applicable.

C.6.3.5 Acceptance test report

C.7 Installation administration

Subclause 7.8 is not applicable.

C.8 Installation maintenance and installation troubleshooting

Subclause 8.4 is not applicable.

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Annex D (normative)

CP 19/4 (MECHATROLINK™-4) specific installation profile

D.1 Installation profile scope

Addition:

This annex specifies the installation profile for Communication Profile CP 19/4 (MECHATROLINK™-4). The CP 19/4 is specified in IEC 61784-2.

D.2 Normative references

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

D.3.1 Terms and definitions

D.3.2 Abbreviated terms

Addition:

IMI	Industrial Mini IO
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D.3.3 Conventions for installation profiles

Not applicable.

D.4 Installation planning

D.4.1 General

Subclause 4.1.4 is not applicable.

D.4.2 Planning requirements

D.4.2.1 Safety

D.4.2.1.1 General

D.4.2.1.2 Electrical safety

D.4.2.1.3 Functional safety

Not applicable.

D.4.2.1.4 Intrinsic safety

Not applicable.

D.4.2.1.5 Safety of optical fibre communication systems

Not applicable.

D.4.2.2 Security

D.4.2.3 Environmental considerations and EMC

D.4.2.3.1 Description methodology

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

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

D.4.3 Network capabilities

D.4.3.1 Network topology

D.4.3.1.1 Common description

D.4.3.1.2 Basic physical topologies for passive networks

Not applicable.

D.4.3.1.3 Basic physical topologies for active networks

D.4.3.1.4 Combination of basic topologies

Not applicable.

D.4.3.1.5 Specific requirements for CPs

Addition:

CP 19/4 (MECHATROLINK™-4) supports linear and star topologies. Ring topology is not supported. Each CP 19/4 devices shall be connected through crossover cable described in IEC 61918:2018, Annex H.

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

D.4.3.2 Network characteristics

D.4.3.2.1 General

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

Not applicable.

D.4.3.2.3 Network characteristics for balanced cabling based on Ethernet

Replacement:

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

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

Characteristic	CP 19/4
Supported data rates (Mbit/s)	100 and 1 000
Supported channel length (m) ^b	100
Number of connections in the channel (max.) ^{a b}	8
Patch cord length (m) ^a	100
Channel class per ISO/IEC 11801-3 (min.) ^b	D
Cable category per ISO/IEC 11801-3 (min.) ^c	5
Connecting HW category per ISO/IEC 11801-3 (min.)	5
Cable types	As needed for application
^a See D.4.4.3.2. ^b For the purpose of this table the channel definitions of ISO/IEC 11801-3 are applicable. ^c For additional information see IEC 61156 series.	

D.4.3.2.4 Network characteristics for optical fibre cabling

Not applicable.

D.4.3.2.5 Specific network characteristics

Not applicable.

D.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**D.4.4 Selection and use of cabling components****D.4.4.1 Cable selection****D.4.4.1.1 Common description****D.4.4.1.2 Copper cables****D.4.4.1.2.1 Balanced cables for Ethernet-based CPs**

Replacement:

Table D.2 and Table D.3 provide values based on the template given in IEC 61918:2018, Table 4.

Table D.2 – Information relevant to copper cable: CP 19/4 type A fixed cables

Characteristic	CP 19/4 (MECHATROLINK™-4) Type A Cable
Nominal impedance of cable (tolerance)	(100 ± 15) Ω
DCR of conductors	≤ 52 Ω/km
DCR of shield	–
Number of conductors	4
Shielding	Yes
Colour code for conductor	BU, WH, OG, YE
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

Table D.3 – Information relevant to copper cable: CP 19/4 type B fixed cables

Characteristic	CP 19/4 (MECHATROLINK™-4) Type B Cable
Nominal impedance of cable (tolerance)	(100 ± 15) Ω
DCR of conductors	≤ 260 Ω/km
DCR of shield	–
Number of conductors	8
Shielding	Yes
Colour code for conductor	BU,BU/WH, GR,GR/WH, OG,OG/WH, BR,BR/WH
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

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

Table D.4 – Information relevant to copper cable: CP 19/4 type A fixed cords

Characteristic	CP 19/4 (MECHATROLINK™-4) Type A Cord
Nominal impedance of cable (tolerance)	(100 ± 15) Ω
DCR of conductors	≤ 52 Ω/km
DCR of shield	–
Number of conductors	4
Length	100 m
Shielding	Yes
Colour code for conductor	BU, WH, OG, YE
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

Table D.5 – Information relevant to copper cable: CP 19/4 type B fixed cords

Characteristic	CP 19/4 (MECHATROLINK™-4) Type B Cord
Nominal impedance of cable (tolerance)	(100 ± 15) Ω
DCR of conductors	≤ 260 Ω/km
DCR of shield	–
Number of conductors	8
Length	100 m
Shielding	Yes
Colour code for conductor	BU,BU/WH, GR,GR/WH, OG,OG/WH, BR,BR/WH
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

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

Not applicable.

D.4.4.1.3 Cables for wireless installation

Not applicable.

D.4.4.1.4 Optical fibre cables

Not applicable.

D.4.4.1.5 Special purpose balanced and optical fibre cables

D.4.4.1.6 Specific requirements for CPs

Not applicable.

D.4.4.1.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**D.4.4.2 Connecting hardware selection****D.4.4.2.1 Common description****D.4.4.2.2 Connecting hardware for balanced cabling CPs based on Ethernet**

Replacement:

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

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

	Series IEC 60603-7 series ^a		IEC 61076-3-106 ^b		IEC 61076-3-117 ^b	IEC 61076-2-101	IEC 61076-2-109	IEC 61076-3-122
	shielded	unshielded	Var. 1	Var. 6	Var. 14	M12-4 with D-coding	M12-8 with X-coding	IMI connector with Type II
CP 19/4	IEC 60603-7-3 or IEC 60603-7-5	No	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.								

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

Not applicable.

D.4.4.2.4 Connecting hardware for wireless installation

Not applicable.

D.4.4.2.5 Connecting hardware for optical fibre cabling

Not applicable.

D.4.4.2.6 Specific requirements for CPs

Not applicable.

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

D.4.4.3 Connections within a channel/permanent link

D.4.4.3.1 Common description

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

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

Not applicable.

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

Not applicable.

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

Not applicable.

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

D.4.4.4 Terminators

Not applicable.

D.4.4.5 Device location and connection

D.4.4.5.1 Common description

D.4.4.5.2 Specific requirements for CPs

Not applicable.

D.4.4.5.3 Specific requirements for wireless installation

Not applicable.

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

D.4.4.6 Coding and labelling

D.4.4.6.1 Common description

D.4.4.6.2 Additional requirements for CPs

D.4.4.6.3 Specific requirements for CPs

Not applicable.

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

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

D.4.4.7.1 Common description

D.4.4.7.2 Bonding and earthing of enclosures and pathways

D.4.4.7.3 Earthing methods

D.4.4.7.4 Shield earthing

Not applicable.

D.4.4.7.4.1 Non-earthing or parallel RC

Not applicable.

D.4.4.7.4.2 Direct

Addition:

CP 19/4 (MECHATROLINK™-4) requires direct shield earthing. The communication shield of a CP 19/4 device is normally directly connected to the device's protective earth through connector shield. If CP 19/4 specific connector is used, no additional shield earthing installation is needed.

D.4.4.7.5 Specific requirements for CPs

Not applicable.

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

D.4.4.8 Storage and transportation of cables

D.4.4.8.1 Common description

D.4.4.8.2 Specific requirements for CPs

Not applicable.

D.4.4.8.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

D.4.4.9 Routing of cables

D.4.4.9.1 Common description

D.4.4.9.2 Cable routing of assemblies

D.4.4.9.3 Requirements for cable routing inside enclosures

D.4.4.9.4 Cable routing inside buildings

D.4.4.9.5 Cable routing outside and between buildings

D.4.4.9.6 Installing redundant communication cables

Not applicable.

D.4.4.10 Separation of circuits

D.4.4.11 Mechanical protection of cabling components

D.4.4.11.1 Common description

D.4.4.11.2 Specific requirements for CPs

Not applicable.

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

D.4.4.12 Installation in special areas

D.4.4.12.1 Common description

D.4.4.12.2 Specific requirements for CPs

Not applicable.

D.4.4.12.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

D.4.5 Cabling planning documentation

D.4.5.1 Common description

D.4.5.2 Cabling planning documentation for CPs

D.4.5.3 Network certification documentation

D.4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC 11801-3

D.4.6 Verification of cabling planning specification

D.5 Installation implementation

D.5.1 General requirements

D.5.1.1 Common description

D.5.1.2 Installation of CPs

D.5.1.3 Installation of generic cabling in industrial premises

D.5.2 Cable installation

D.5.2.1 General requirements for all cabling types

D.5.2.1.1 Storage and installation

D.5.2.1.2 Protecting communication cables against potential mechanical damage

Replacement:

Table D.7 provides values based on the template given in IEC 61918:2018, Table 18.

Table D.7 – Parameters for balanced cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	26 mm
	Bending radius, multiple bending (mm)	See manufacturer's data sheet
	Pull forces (N)	101 N
	Permanent tensile forces (N)	58 N
	Maximum lateral forces (N/cm)	Not defined
	Temperature range during installation (°C)	0 to 80

D.5.2.1.3 Avoid forming loops

D.5.2.1.4 Torsion (twisting)

D.5.2.1.5 Tensile strength (on installed cables)

D.5.2.1.6 Bending radius

D.5.2.1.7 Pull force

D.5.2.1.8 Fitting strain relief

D.5.2.1.9 Installing cables in cabinet and enclosures

D.5.2.1.10 Installation on moving parts

D.5.2.1.11 Cable crush

D.5.2.1.12 Installation of continuous flexing cables

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

Not applicable.

D.5.2.2 Installation and routing

D.5.2.2.1 Common description

D.5.2.2.2 Separation of circuits

D.5.2.3 Specific cable installation requirements for CPs

Not applicable.

D.5.2.4 Specific requirements for wireless installation

Not applicable.

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

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

Not applicable.

D.5.3.4 Specific requirements for CPs

Addition:

Table D.8 shows the pin assignment and wire colour coding for CP 19/4 modular connector and IMI connectors, Table D.9 and Table D.10 show the pin assignment and wire colour coding for CP 19/4 M12-4 and M12-8 connectors specified in D.4.4.2.2.

Table D.8 – Pin assignment and wire colour coding for CP 19/4 modular and IMI connector

Signal	Function	Color code	Pin
TXD+	Transmit Data+	BU	1
TXD-	Transmit Data-	WH	2
RXD+	Receive Data+	OG	3
RXD-	Receive Data-	YE	6
SH	Shield	Shield braid	

Table D.9 – Pin assignment and wire colour coding for CP 19/4 M12-4 connector

Signal	Function	Color code	Pin
TXD+	Transmit Data+	BU	1
TXD-	Transmit Data-	WH	3
RXD+	Receive Data+	OG	2
RXD-	Receive Data-	YE	4
SH	Shield	Shield braid	

Table D.10 – Pin assignment and wire colour coding for CP 19/4 M12-8 connector

Signal	Function	Color code	Pin
TP0+	DataA+	OG/WH	1
TP0-	DataA-	OG	2
TP1+	DataB+	GR/WH	3
TP1-	DataB-	GR	4
TP2+	DataC+	BU	5
TP2-	DataC-	BU/WH	6
TP3+	DataD+	BR/WH	7
TP4-	DataD-	BR	8
SH	Shield	Shield braid	

D.5.3.5 Specific requirements for wireless installation

D.5.4 Terminator installation

Not applicable.

D.5.5 Device installation

D.5.5.1 Common description

D.5.5.2 Specific requirements for CPs

Not applicable.

D.5.6 Coding and labelling

D.5.6.1 Common description

D.5.6.2 Specific requirements for CPs

Not applicable.

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

Subclause 5.7.5 is not applicable.

D.5.8 As-implemented cabling documentation

D.6 Installation verification and installation acceptance test

D.6.1 General

D.6.2 Installation verification

D.6.2.1 General

D.6.2.2 Verification according to cabling planning documentation

D.6.2.3 Verification of earthing and bonding

D.6.2.3.1 General

D.6.2.3.2 Specific requirements for earthing and bonding

Not applicable.

D.6.2.4 Verification of shield earthing

D.6.2.5 Verification of cabling system

D.6.2.5.1 Verification of cable routing

D.6.2.5.2 Verification of cable protection and proper strain relief

D.6.2.6 Cable selection verification

D.6.2.6.1 Common description

D.6.2.6.2 Specific requirements for CPs

Not applicable.

D.6.2.6.3 Specific requirements for wireless installation

Not applicable.

D.6.2.7 Connector verification

D.6.2.7.1 Common description

D.6.2.7.2 Specific requirements for CPs

Not applicable.

D.6.2.7.3 Specific requirements for wireless installation

Not applicable.

D.6.2.8 Connection verification

D.6.2.8.1 Common description

D.6.2.8.2 Number of connections and connectors

D.6.2.8.3 Wire mapping

D.6.2.9 Terminator verification

Not applicable.

D.6.2.10 Coding and labelling verification

D.6.2.10.1 Common description

D.6.2.10.2 Specific coding and labelling verification requirements

Not applicable.

D.6.2.11 Verification report

D.6.3 Installation acceptance test

D.6.3.1 General

D.6.3.2 Acceptance test of Ethernet-based cabling

D.6.3.2.1 Validation of balanced cabling for CPs based on Ethernet

Subclause 6.3.2.1.3 is not applicable.

D.6.3.2.2 Validation of optical fibre cabling for CPs based on Ethernet

Not applicable.

D.6.3.2.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

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

Not applicable.

D.6.3.4 Specific requirements for wireless installation

Not applicable.

D.6.3.5 Acceptance test report

D.7 Installation administration

Subclause 7.8 is not applicable.

D.8 Installation maintenance and installation troubleshooting

Subclause 8.4 is not applicable.

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Bibliography

Addition:

[~~27~~41] MECHATROLINK Members Association (MMA): *MECHATROLINK-II Installation Guide*, available at <www.mechatrolink.org>

[~~28~~42] MECHATROLINK Members Association (MMA): *MECHATROLINK-III Installation Guide*, available at <www.mechatrolink.org>

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INTERNATIONAL STANDARD

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Industrial networks – Profiles –

Part 5-19: Installation of fieldbuses – Installation profiles for CPF 19

Réseaux industriels – Profils –

Partie 5-19: Installation des bus de terrain – Profils d'installation pour CPF 19

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL NETWORKS –
PROFILES –****Part 5-19: Installation of fieldbuses –
Installation profiles for CPF 19****FOREWORD**

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IEC 61784-5-19 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 second edition cancels and replaces the first edition published in 2013. This edition constitutes a technical revision.

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

- a) addition of new installation profiles CP19/3 and CP19/4 in Clause 4;
- b) In Annex B, Table B.4 has been changed and Figure B.1 and Figure B.2 have been deleted;
- c) Annex C is new installation profiles for CP19/3 and related references have been added;
- d) Annex D is new installation profiles for CP19/4 and related references have been added.

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

Draft	Report on voting
65C/1281/FDIS	65C/1296/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 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, published 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

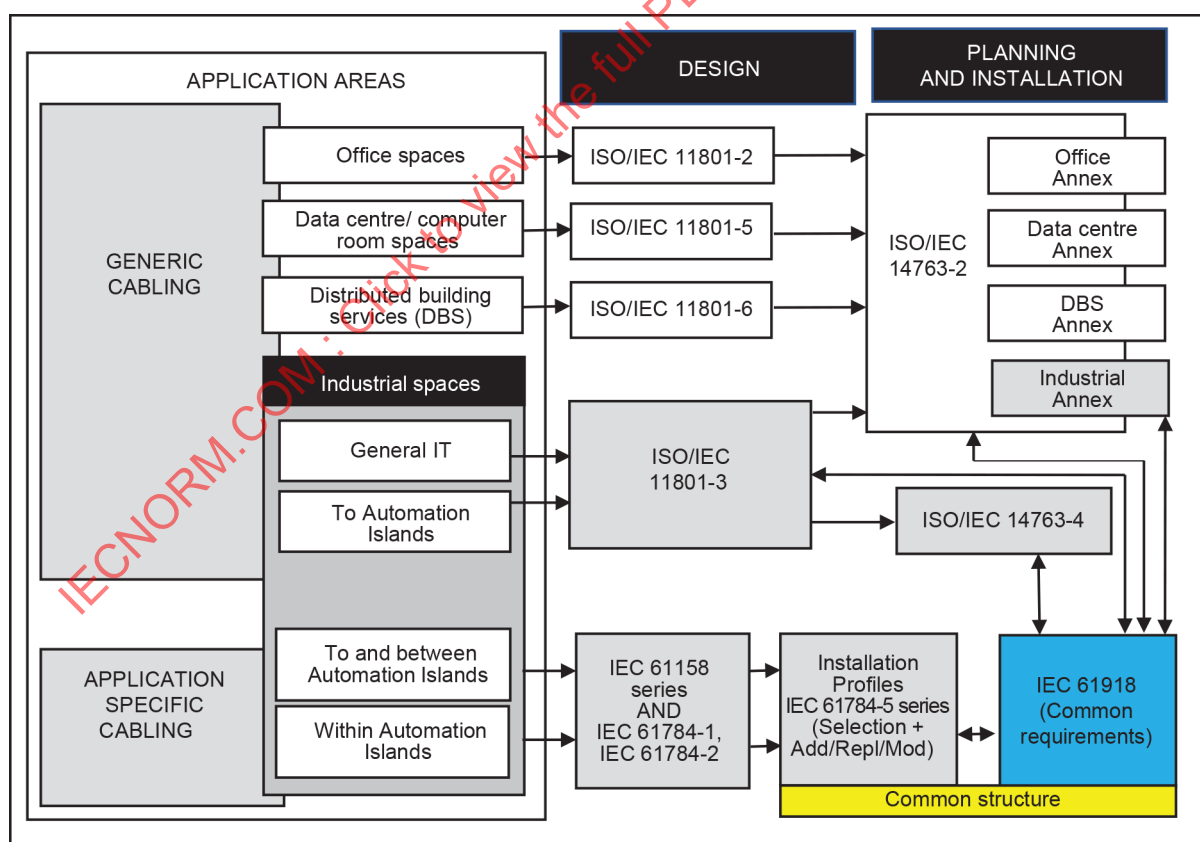
This document is one of a series produced to facilitate the use of communication networks in industrial control systems.

IEC 61918:2018 and IEC 61918:2018/AMD1:2022 and IEC 61918/AMD2:2024 provide 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 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 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 document are defined in Clause 5.

The provision of the installation profiles in one standard for each CPF (for example IEC 61784-5-19 for CPF 19) allows readers to work with standards of a convenient size.



IEC

Figure 1 – Standards relationships

INDUSTRIAL NETWORKS – PROFILES –

Part 5-19: Installation of fieldbuses – Installation profiles for CPF 19

1 Scope

This part of IEC 61784-5 specifies the installation profile for CPF 19 (MECHATROLINK™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, C.2, D.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, C.3, and D.3, 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>

4 CPF19: Overview of installation profiles

CPF 19 consists of four communication profiles as specified in IEC 61784-1 and IEC 61784-2.

The installation requirements for CP 19/1 (MECHATROLINK™-II) are specified in Annex A.

¹ MECHATROLINK™ and Σ -LINK™ II are trade names of YASKAWA ELECTRIC CORPORATION. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trade names holder or any of its products. Compliance to this profile does not require use of the trade names. Use of the trade name 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.

The installation requirements for CP 19/2 (MECHATROLINK™-III) are specified in Annex B.

The installation requirements for CP 19/3 (Σ -LINK™ II) are specified in Annex C.

The installation requirements for CP 19/4 (MECHATROLINK™-4) are specified in Annex D.

5 Installation profile conventions

The numbering of the clauses and subclauses in the annexes of this document corresponds to the numbering of IEC 61918 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 heading number shall represent the corresponding numbering of IEC 61918.

EXAMPLE "Subclause B.4.4" in IEC 61784-5-19 means that CP 19/2 specifies 4.4 of IEC 61918:2018 and IEC 61918:2018/AMD1:2022.

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 parts of IEC 61918:2018 and IEC 61918:2018/AMD1:2022. It can also include defined additional specifications.

A statement of compliance to an installation profile of this document shall be stated as either

Compliance with IEC 61784-5-19:2024 for CP 19/m <name> or

Compliance with IEC 61784-5-19 (Ed.2.0) for CP 19/m <name>

where the name within the angle brackets < > is optional and the angle brackets shall not be included. The m within CP 19/m shall be replaced by the profile number 1 to 4.

NOTE The name can be the name of the profile, for example MECHATROLINK-II, MECHATROLINK-III, Σ -LINK II or MECHATROLINK-4.

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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Annex A

(normative)

CP 19/1 (MECHATROLINK™-II) specific installation profile

A.1 Installation profile scope

Addition:

This annex specifies the installation profile for Communication Profile CP 19/1 (MECHATROLINK™-II). The CP 19/1 is specified in IEC 61784-1.

A.2 Normative references

Addition:

TIA-485-A, *Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems*

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

A.3.1 Terms and definitions

Addition:

A.3.1.93

C1 master

master device which initiates cyclic data transfer with slave devices

A.3.1.94

C2 master

master device which initiates message data exchange with other devices

A.3.1.95

master

device that controls the data transfer on the CP 19/1 network and initiates the media access of the slaves by sending messages and that constitutes the interface to the control system

A.3.1.96

slave

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

A.3.2 Abbreviated terms

Addition:

M-II	MECHATROLINK™-II
USB	Universal Serial Bus

A.3.3 Conventions for installation profiles

Not applicable.

A.4 Installation planning

A.4.1 General

Subclause 4.1.4 is not applicable.

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

Not applicable.

A.4.2.1.4 Intrinsic safety

Not applicable.

A.4.2.1.5 Safety of optical fibre communication systems

Not applicable.

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

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

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

Addition:

CP 19/1 network supports only passive bus topology.

A.4.3.1.3 Basic physical topologies for active networks

Not applicable.

A.4.3.1.4 **Combination of basic topologies**

A.4.3.1.5 **Specific requirements for CPs**

Addition:

CP 19/1 supports passive bus topology by daisy chain connection of devices. Passive star topology is not supported and spurs shall not be used. Figure A.1 shows the CP 19/1 passive bus network.

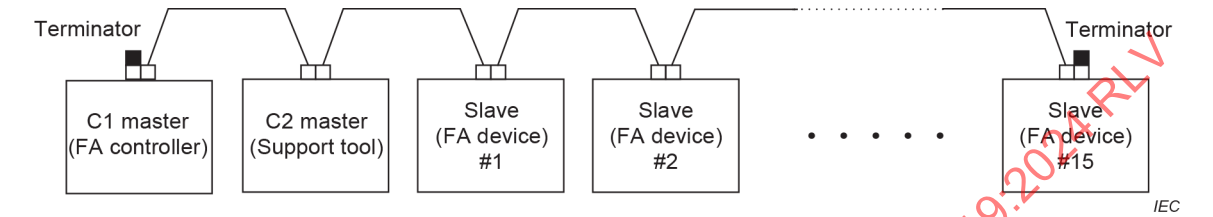


Figure A.1 – Topology of CP 19/1 network

CP 19/1 supports interconnection of two passive bus segments by an active bus repeater. Only one repeater is allowed as shown in Figure A.2.

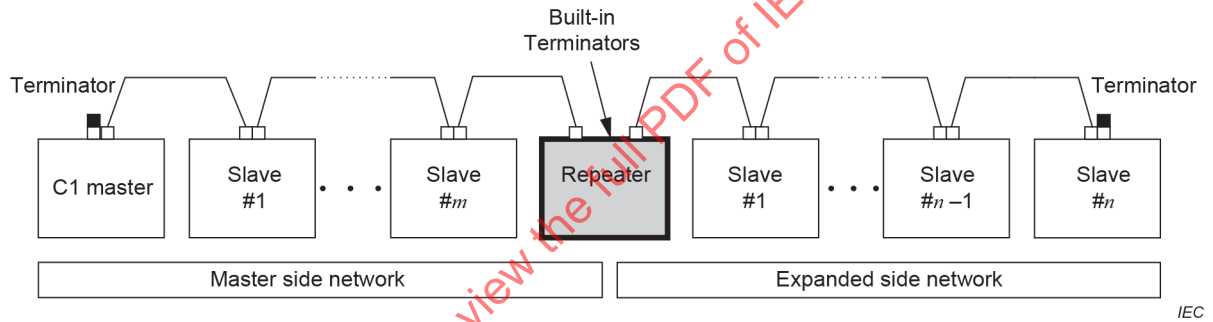


Figure A.2 – Network expansion using repeater

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

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	CP 19/1 (MECHATROLINK™-II)
Basic transmission technology	TIA-485-A Linear bus
Length/transmission speed	Segment length m
10 Mbit/s	50 (less than 17 devices) 30 (17 devices)
Maximum capacity	Max. no.
Devices/segment	17
Devices/network	32

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

Not applicable.

A.4.3.2.5 Specific network characteristics

Addition:

The relationship between the number of devices and the maximum segment length is shown in Table A.2 for the topology without repeater shown in Figure A.1. When two network segments are combined using a repeater as shown in Figure A.2, the repeater should be counted as a device on each segment and the number of devices available decreases by one from the value shown in Table A.2. Thus the maximum number of devices per network, which has two segments expanded by a repeater, becomes 32 (17+17-2).

Table A.2 – Number of devices and maximum segment length

Number of devices	Max. segment length
16 or less	50 m
17	30 m
18 or more	Not allowed

Also CP 19/1 has the minimum cable length restriction. The cable between devices shall be at least 0,5 m.

A.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**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 provides values based on the template given in IEC 61918:2018, Table 4.

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

Characteristic	CP 19/1 (MECHATROLINK™-II)
Nominal impedance of cable (tolerance)	$(130 \pm 13) \Omega$
DCR of conductors	$< 120 \Omega/\text{km}$
DCR of shield	–
Number of conductors	2 (twisted pair)
Shielding	Yes
Colour code for conductor	BK, RD
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–
Conductor cross-sectional area	$\geq 0,16 \text{ mm}^2$ (AWG25)
Capacitance	$< 120 \text{ nF/km}$

Addition:

The additional CP 19/1 cable specifications are shown in Table A.4. Figure A.3 shows the structure of CP 19/1 cable.

Table A.4 – Additional cable specifications

Characteristic	Constraints
Overall diameter	$(4,8 \pm 0,2) \text{ mm}$
Conductor	Tinned annealed copper
Withstand voltage	AC 1 000 V, 1 min
Insulation resistance	$\geq 100 \text{ M}\Omega/\text{km}$
Attenuation	40 dB/km (at 4 MHz) 60 dB/km (at 10 MHz)

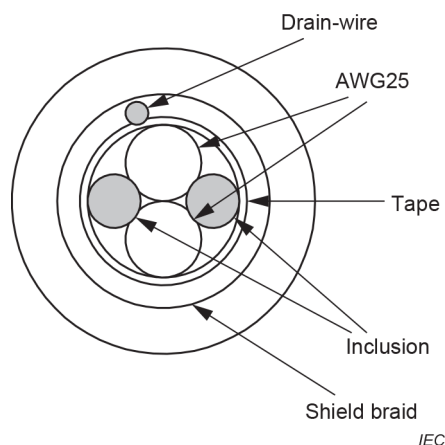


Figure A.3 – Structure of cable

A.4.4.1.3 Cables for wireless installation

Not applicable.

A.4.4.1.4 Optical fibre cables

Not applicable.

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 11801-3

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

Table A.5 – Connectors for copper cabling CPs not based on Ethernet

	IEC 6080 7-2 or IEC 6080 7-3	IEC 61076-2-101			IEC 611 69-8	ANSI/(NFPA) T3.5.29 R1-2007		Others			
	Sub-D	M12-5 with A-coding	M12-5 with B-coding	M12-n with X-coding	Coaxial (BNC)	M 18	7/8-16 UN-2B THD	Open style	Terminal block	M-II ^a	Others
CP 19/1	No	No	No	No	No	No	No	No	No	Yes	No

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 M-II (MECHATROLINK™-II) connector is specified in the following paragraph.

Addition:

For CP 19/1 network, the CP 19/1 specific connector called M-II (MECHATROLINK™-II) connector shall be used. Figure A.4 and Figure A.5 show the dimensions of the M-II device connectors (receptacles) with single port and dual ports respectively. Figure A.6 shows the dimensions of the M-II cable connector (plug). M-II connector is compatible with the USB series "A" connector specified in Universal Serial Bus Specification Revision 2.0[3] except it has the CP 19/1 specific latching mechanism.

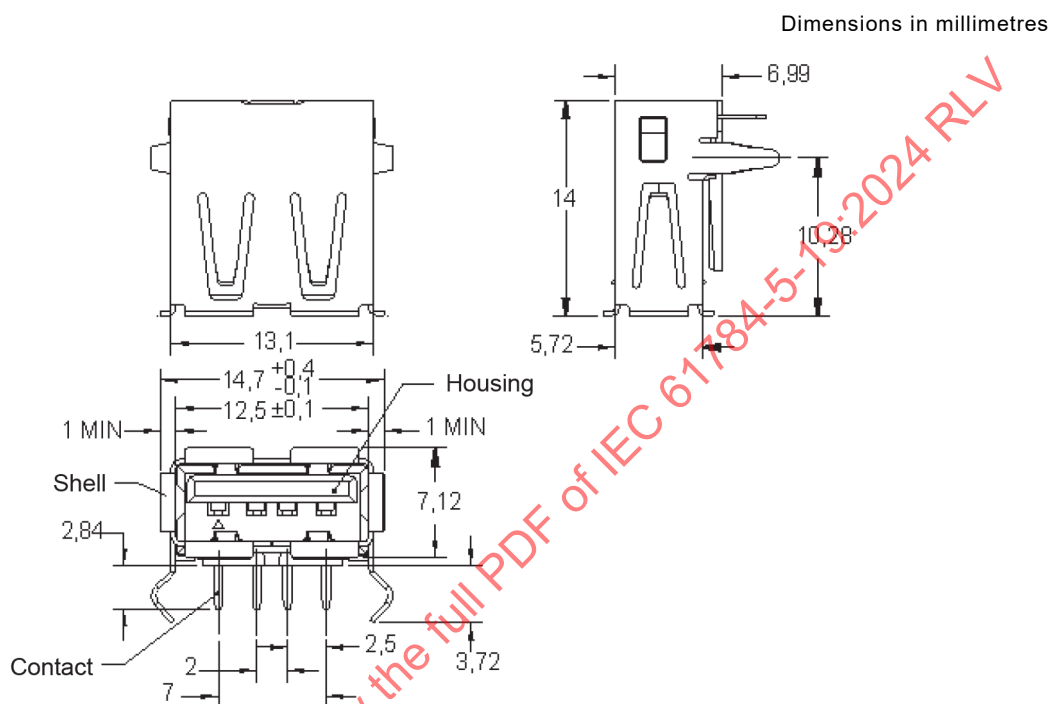


Figure A.4 – Dimensions of single port device connector

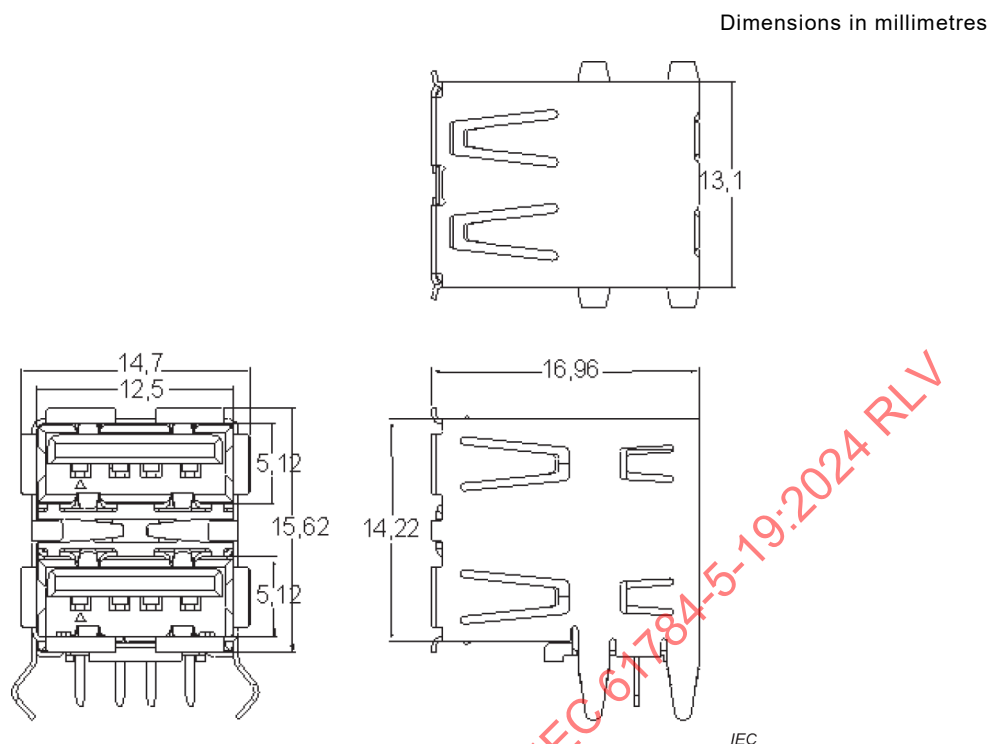


Figure A.5 – Dimensions of dual ports device connector

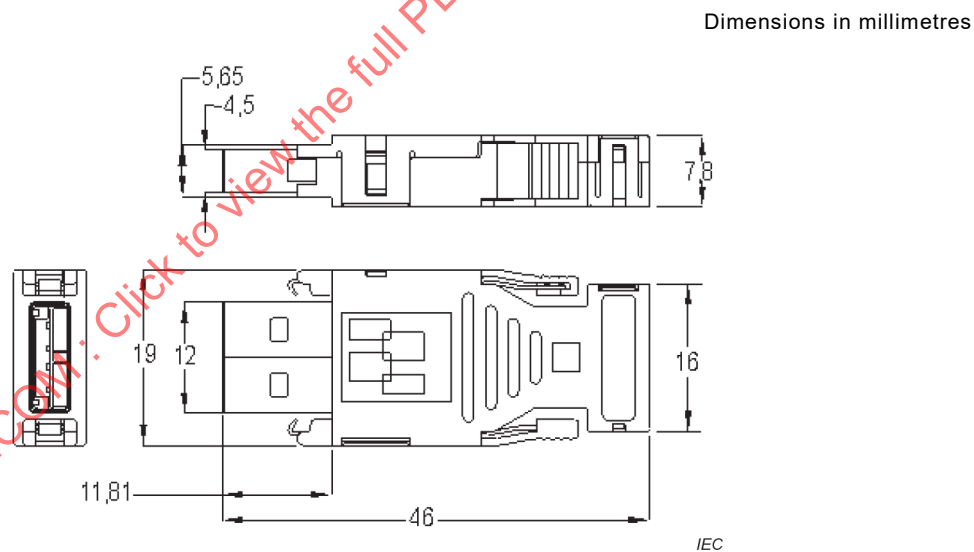


Figure A.6 – Dimensions of cable connector

The M-II cable connector has built-in inductors in a connector housing for impedance matching between the line transceiver of a device and the transmission cable as shown in Figure A.7. Therefore the M-II cable connector can be used only for the connection between CP 19/1 device and cable. It shall not be used for connections or splices within a channel.

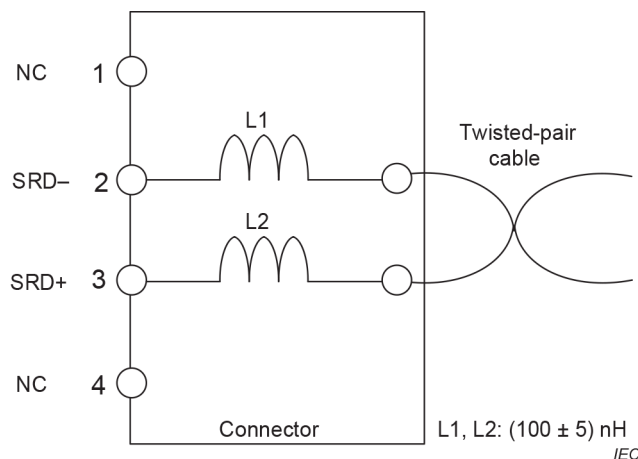


Figure A.7 – Cable connector with inductors

A.4.4.2.4 Connecting hardware for wireless installation

Not applicable.

A.4.4.2.5 Connecting hardware for optical fibre cabling

Not applicable.

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

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

Not applicable.

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

4.4.3.3.1 Common description

Addition:

For the CP 19/1 network any connection or splice in a channel using CP 19/1 connectors is not allowed. Also the allowed connector type and number of connections are not defined.

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

Not applicable.

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

A.4.4.4 Terminators

A.4.4.4.1 Common description

A.4.4.4.2 Specific requirements for CPs

Addition:

The terminator resistance value shall be $(130 \pm 6,5) \Omega$ (min. 1/2 W). Terminators are usually installed on CP 19/1 cable connector housing and connected to the device located at the end of the network segment. Figure A.8 shows the terminator connection in the CP 19/1 cable connector housing.

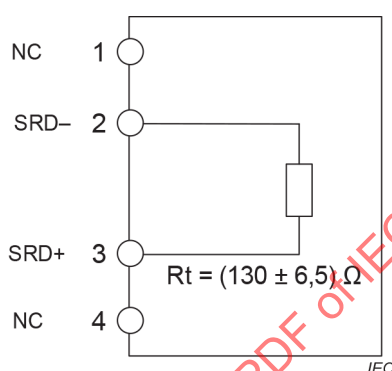


Figure A.8 – Terminator connection in cable connector housing

The network device can have a built-in terminator and such a device shall be installed at the end of a network segment.

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

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 11801-3

A.4.4.6 Coding and labelling

A.4.4.6.1 Common description

A.4.4.6.2 Additional requirements for CPs

Not applicable.

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 11801-3**A.4.4.7 Earthing and bonding of equipment and devices and shielded cabling****A.4.4.7.1 Common description****A.4.4.7.2 Bonding and earthing of enclosures and pathways****A.4.4.7.3 Earthing methods****A.4.4.7.4 Shield earthing**

Not applicable.

A.4.4.7.4.1 Non-earthing or parallel RC

Not applicable.

A.4.4.7.4.2 Direct

Addition:

CP 19/1 requires direct shield earthing. The communication shield of a CP 19/1 device is normally directly connected to the device's protective earth through the connector shield. If the CP 19/1 specific connector is used, no additional shield earthing is needed.

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**A.4.4.8 Storage and transportation of cables****A.4.4.8.1 Common description****A.4.4.8.2 Specific requirements for CPs**

Not applicable.

A.4.4.8.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**A.4.4.9 Routing of cables****A.4.4.9.1 Common description****A.4.4.9.2 Cable routing of assemblies****A.4.4.9.3 Requirements for cable routing inside enclosures****A.4.4.9.4 Cable routing inside buildings****A.4.4.9.5 Cable routing outside and between buildings**

A.4.4.9.6 Installing redundant communication cables

Not applicable.

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

Not applicable.

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

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 11801-3

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 11801-3

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

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

Table A.6 – Parameters for balanced cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	20
	Bending radius, multiple bending (mm)	– ^a
	Pull forces (N)	24
	Permanent tensile forces (N)	13
	Maximum lateral forces (N/cm)	– ^a
	Temperature range during installation (°C)	0 to 80
^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

Not applicable.

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

Not applicable.

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

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

Addition:

Figure A.9 shows an example of wiring. See the manufacturer's data sheet for the assembly instructions of the M-II connector housing.

Both ends of the network shall have a terminator installed to reduce signal reflection. If one of the end devices (C1 master in this example) has a built-in terminator, only the other end of the network shall have a terminator as described in Figure A.9.

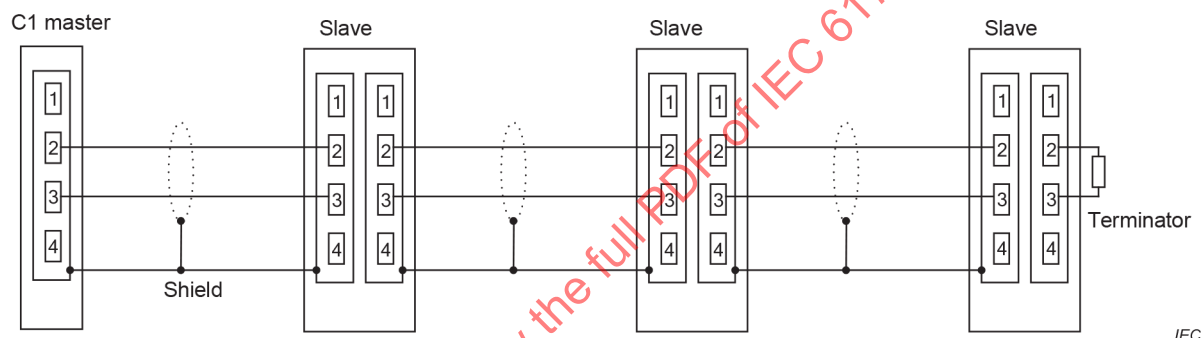


Figure A.9 – Wiring example

Table A.7 shows the pin assignment and wire colour coding for the CP 19/1 connector.

Table A.7 – Pin assignment and wire colour coding for CP 19/1 connector

Pin assignment	Signal	Function	Colour code
1	NC	Not connected	–
2	SRD-	Send/Receive data-	BK
3	SRD+	Send/Receive data+	RD
4	NC	Not connected	–
Shield braid	SH	Shield	–

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 11801-3

A.5.4 Terminator installation

A.5.4.1 Common description

A.5.4.2 Specific requirements for CPs

Addition:

Both ends of a network segment shall be terminated with a CP 19/1 specific terminator. Some device can have a built-in terminator inside it. Care shall be taken that only terminators at both ends of the network segment are activated. The terminating resistor is usually installed on an M-II connector without cable as shown Figure A.10. For detail of assembly, see manufacturer's data sheet.



Figure A.10 – Terminator installed in M-II cable connector

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

Subclause 5.7.5 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.6.2.5.1 Verification of cable routing

A.6.2.5.2 Verification of cable protection and proper strain relief

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.6.2.8.1 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**A.6.2.9.1 Common description****A.6.2.9.2 Specific requirements for CPs**

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.6.3.2.1 Validation of balanced cabling for CPs based on Ethernet**

Not applicable.

A.6.3.2.2 Validation of optical fibre cabling for CPs based on Ethernet

Not applicable.

A.6.3.2.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**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**

Not applicable.

A.6.3.3.2 Optical fibre cabling for non-Ethernet-based CPs

Not applicable.

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

A.8.1 General

A.8.2 Maintenance

A.8.3 Troubleshooting

A.8.4 Specific requirements for maintenance and troubleshooting

Addition:

For CP 19/1 network, typical problems are given in Table A.8 in addition to IEC 61918:2018, Table 22.

Table A.8 – Typical problems in a network with balanced cabling

Problem	Most probable cause	Corrective action
Communication errors occurred at the specific slave device	Failure of the slave device and no error on communication line	Replace the slave device
Communication errors occurred at all the slave devices connected after a specific slave device	Cable disconnection right after the specific slave device	Replace the cable
	Incorrect insertion of cable connector	Insert the cable connector securely
Communication errors occurred at random slave device	Slave device failure or Cable failure	Locate faulty device, cable or connection and replace it
	Terminator failure	Insert terminator securely or replace it
	EMC influence from other device	Check and reduce noise in system
Communication errors occurred at random device or a specific device in a few minutes to several hours after system start up	Malfunction due to ambient temperature rise	Correct thermal condition of faulty device or replace it

The CP 19/1 employs a daisy chain linear bus topology. Therefore, a failure of one slave or cable causes communication errors on successive slaves. To locate the faulty device, divide the network segment by moving the terminator location as shown in Figure A.11. If the divided segment still has a communication error, the faulty device or cable is included in this segment. Divide this segment again until the unique faulty device is located.

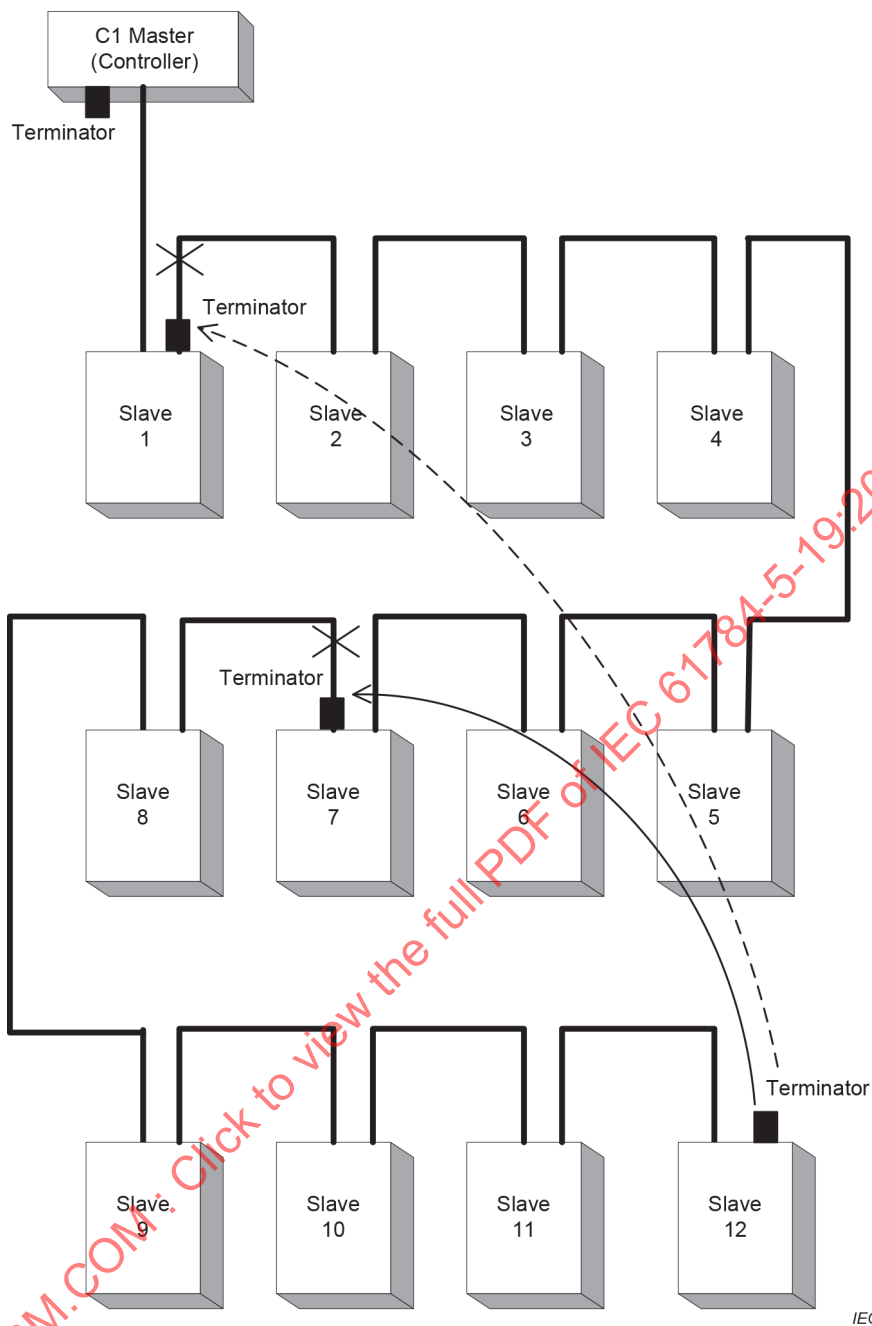


Figure A.11 – Division of network segment by changing terminator location

Annex B (normative)

CP 19/2 (MECHATROLINK™-III) specific installation profile

B.1 Installation profile scope

Addition:

This annex specifies the installation profile for Communication Profile CP 19/2 (MECHATROLINK™-III). The CP 19/2 is specified in IEC 61784-1.

B.2 Normative references

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

B.3.1 Terms and definitions

B.3.2 Abbreviated terms

Addition:

IMI	Industrial mini IO
-----	--------------------

B.3.3 Conventions for installation profiles

Not applicable.

B.4 Installation planning

B.4.1 General

Subclause 4.1.4 is not applicable.

B.4.2 Planning requirements

B.4.2.1 Safety

B.4.2.1.1 General

B.4.2.1.2 Electric safety

B.4.2.1.3 Functional safety

Not applicable.

B.4.2.1.4 Intrinsic safety

Not applicable.

B.4.2.1.5 Safety of optical fibre communication systems

Not applicable.

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****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**B.4.3.1.4 Combination of basic topologies**

Not applicable.

B.4.3.1.5 Specific requirements for CPs

Addition:

CP 19/2 (MECHATROLINK™-III) supports linear and star topologies. Ring topology is not supported. Each CP 19/2 devices shall be connected through the crossover cable described in IEC 61918:2018, Annex H.

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 19/2
Supported data rates (Mbit/s)	100
Supported channel length (m) ^b	100
Number of connections in the channel (max.) ^{a,b}	4
Patch cord length (m) ^a	100
Channel class per ISO/IEC 11801-3 (min.) ^b	D
Cable category per ISO/IEC 11801-3 (min.) ^c	5
Connecting HW category per ISO/IEC 11801-3 (min.)	5
Cable types	As needed for application
^a See B.4.4.3.2. ^b For the purpose of this table the channel definitions of ISO/IEC 11801-3 are applicable. ^c For additional information see IEC 61156 series.	

B.4.3.2.4 Network characteristics for optical fibre cabling

Not applicable.

B.4.3.2.5 Specific network characteristics

Not applicable.

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**

Replacement:

Table B.2 provides values based on the template given in IEC 61918:2018, Table 4.

Table B.2 – Information relevant to copper cable: fixed cables

Characteristic	CP 19/2
Nominal impedance of cable (tolerance)	$(100 \pm 15) \Omega$
DCR of conductors	$\leq 52 \Omega/\text{km}$
DCR of shield	–
Number of conductors	4
Shielding	Yes
Colour code for conductor	BU, WH, OG, YE
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LSOH)	–
Agency ratings	–

Table B.3 provides values based on the template given in IEC 61918:2018, Table 5.

Table B.3 – Information relevant to copper cable: cords

Characteristic	CP 19/2
Nominal impedance of cable (tolerance)	$(100 \pm 15) \Omega$
DCR of conductors	$\leq 52 \Omega/\text{km}$
DCR of shield	–
Number of conductors	4
Length	100 m
Shielding	Yes
Colour code for conductor	BU, WH, OG, YE
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LSOH)	–
Agency ratings	–

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

Not applicable.

B.4.4.1.5 Special purpose balanced and optical fibre cables

B.4.4.1.6 Specific requirements for CPs

Not applicable.

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

Table B.4 – 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 61076-3-122
	shielded	unshielded	Var. 1	Var. 6	Var. 14	M12-4 with D-coding	M12-8 with X-coding	IMI connector
CP 19/2	IEC 60603-7-3	No	No	No	No	Yes	No	Yes
^a For IEC 60603-7 series, the connector selection is based on the desired channel performance.								
^b Housings to protect connectors.								

Addition:

CP 19/2 defines three types of connectors, modular connector specified in IEC 60603-7-3 and IMI (Industrial Mini IO) connector specified IEC 61076-3-122, and M12-4 connector specified IEC 61076-2-101.

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

Not applicable.

B.4.4.2.4 Connecting hardware for wireless installation

Not applicable.

B.4.4.2.5 Connecting hardware for optical fibre cabling

Not applicable.

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

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.4.4.3.3 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

Not applicable.

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**

Not applicable.

B.4.4.5 Device location and connection**B.4.4.5.1 Common description****B.4.4.5.2 Specific requirements for CPs**

Not applicable.

B.4.4.5.3 Specific requirements for wireless installation

Not applicable.

B.4.4.5.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**B.4.4.6 Coding and labelling****B.4.4.6.1 Common description****B.4.4.6.2 Additional requirements for CPs****B.4.4.6.3 Specific requirements for CPs**

Not applicable.

B.4.4.6.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**B.4.4.7 Earthing and bonding of equipment and devices and shielded cabling****B.4.4.7.1 Common description****B.4.4.7.2 Bonding and earthing of enclosures and pathways****B.4.4.7.3 Earthing methods****B.4.4.7.4 Shield earthing**

Not applicable.

B.4.4.7.4.1 Non-earthing or parallel RC

Not applicable.

B.4.4.7.4.2 Direct

Addition:

CP 19/2 (MECHATROLINK™-III) requires direct shield earthing. The communication shield of a CP 19/2 device is normally directly connected to the device's protective earth through the connector shield. If the CP 19/2 specific connector is used, no additional shield earthing installation is needed.

B.4.4.7.5 Specific requirements for CPs

Not applicable.

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

B.4.4.8 Storage and transportation of cables

B.4.4.8.1 Common description

B.4.4.8.2 Specific requirements for CPs

Not applicable.

B.4.4.8.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.4.9 Routing of cables

B.4.4.9.1 Common description

B.4.4.9.2 Cable routing of assemblies

B.4.4.9.3 Requirements for cable routing inside enclosures

B.4.4.9.4 Cable routing inside buildings

B.4.4.9.5 Cable routing outside and between buildings

B.4.4.9.6 Installing redundant communication cables

Not applicable.

B.4.4.10 Separation of circuits

B.4.4.11 Mechanical protection of cabling components

B.4.4.11.1 Common description

B.4.4.11.2 Specific requirements for CPs

Not applicable.

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

B.4.4.12 Installation in special areas

B.4.4.12.1 Common description

B.4.4.12.2 Specific requirements for CPs

Not applicable.

B.4.4.12.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

B.4.5 Cabling planning documentation

B.4.5.1 Common description

B.4.5.2 Cabling planning documentation for CPs

B.4.5.3 Network certification documentation

B.4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC 11801-3

B.4.6 Verification of cabling planning specification

B.5 Installation implementation

B.5.1 General requirements

B.5.1.1 Common description

B.5.1.2 Installation of CPs

B.5.1.3 Installation of generic cabling in industrial premises

B.5.2 Cable installation

B.5.2.1 General requirements for all cabling types

B.5.2.1.1 Storage and installation

B.5.2.1.2 Protecting communication cables against potential mechanical damage

Replacement:

Table B.5 provides values based on the template given in IEC 61918:2018, Table 18.

Table B.5 – Parameters for balanced cables

	Characteristic	Value
Mechanical force	Minimum bending radius, single bending (mm)	26 mm
	Bending radius, multiple bending (mm)	See manufacturer's data sheet
	Pull forces (N)	101 N
	Permanent tensile forces (N)	58 N
	Maximum lateral forces (N/cm)	Not defined
	Temperature range during installation (°C)	0 to 80

B.5.2.1.3 Avoid forming loops

B.5.2.1.4 Torsion (twisting)

B.5.2.1.5 Tensile strength (on installed cables)

B.5.2.1.6 Bending radius

B.5.2.1.7 Pull force

- B.5.2.1.8 Fitting strain relief**
- B.5.2.1.9 Installing cables in cabinet and enclosures**
- B.5.2.1.10 Installation on moving parts**
- B.5.2.1.11 Cable crush**
- B.5.2.1.12 Installation of continuous flexing cables**
- B.5.2.1.13 Additional instructions for the installation of optical fibre cables**

Not applicable.

B.5.2.2 Installation and routing

B.5.2.2.1 Common description

B.5.2.2.2 Separation of circuits

B.5.2.3 Specific requirements for CPs

Not applicable.

B.5.2.4 Specific requirements for wireless installation

Not applicable.

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

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:

Table B.6 shows the pin assignment and wire colour coding for CP 19/2 modular connector and IMI connectors, and Table B.7 shows the pin assignment and wire colour coding for CP 19/2 M12 connectors specified in B.4.4.2.2. The channel between CP 19/2 devices shall be cross over cable as specified in this table. If a cable is added to a channel for connections or splices, straight through cable shall be used to maintain cross over connection on the whole channel.

Table B.6 – Pin assignment and wire colour coding for CP 19/2 modular and IMI connector

Signal	Function	Color code	Pin	
			One end	Other end
TXD+	Transmit Data+	BU	1	3
TXD-	Transmit Data-	WH	2	6
RXD+	Receive Data+	OG	3	1
RXD-	Receive Data-	YE	6	2
SH	Shield	Shield braid		

Table B.7 – Pin assignment and wire colour coding for CP 19/2 M12 connector

Signal	Function	Color code	Pin	
			One end	Other end
TXD+	Transmit Data+	BU	1	2
TXD-	Transmit Data-	WH	3	4
RXD+	Receive Data+	OG	2	1
RXD-	Receive Data-	YE	4	3
SH	Shield	Shield braid		

B.5.3.5 Specific requirements for wireless installation**B.5.4 Terminator installation**

Not applicable.

B.5.5 Device installation**B.5.5.1 Common description****B.5.5.2 Specific requirements for CPs**

Not applicable.

B.5.6 Coding and labelling**B.5.6.1 Common description****B.5.6.2 Specific requirements for CPs**

Not applicable.

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.6.2.1 General

B.6.2.2 Verification according to cabling planning documentation

B.6.2.3 Verification of earthing and bonding

B.6.2.3.1 General

B.6.2.3.2 Specific requirements for earthing and bonding

Not applicable.

B.6.2.4 Verification of shield earthing

B.6.2.5 Verification of cabling system

B.6.2.5.1 Verification of cable routing

B.6.2.5.2 Verification of cable protection and proper strain relief

B.6.2.6 Cable selection verification

B.6.2.6.1 Common description

B.6.2.6.2 Specific requirements for CPs

Not applicable.

B.6.2.6.3 Specific requirements for wireless installation

Not applicable.

B.6.2.7 Connector verification

B.6.2.7.1 Common description

B.6.2.7.2 Specific requirements for CPs

Not applicable.

B.6.2.7.3 Specific requirements for wireless installation

Not applicable.

B.6.2.8 Connection verification

B.6.2.8.1 Common description

B.6.2.8.2 Number of connections and connectors

B.6.2.8.3 Wire mapping

B.6.2.9 Terminator verification

Not applicable.

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

Not applicable.

B.6.2.11 Verification report**B.6.3 Installation acceptance test****B.6.3.1 General****B.6.3.2 Acceptance test of Ethernet-based cabling****B.6.3.2.1 Validation of balanced cabling for CPs based on Ethernet**

Subclause 6.3.2.1.3 is not applicable.

B.6.3.2.2 Validation of optical fibre cabling for CPs based on Ethernet

Not applicable.

B.6.3.2.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**B.6.3.3 Acceptance test of non-Ethernet-based cabling**

Not applicable.

B.6.3.4 Specific requirements for wireless installation

Not applicable.

B.6.3.5 Acceptance test report**B.7 Installation administration**

Subclause 7.8 is not applicable.

B.8 Installation maintenance and installation troubleshooting

Subclause 8.4 is not applicable.

Annex C (normative)

CP19/3 (Σ -LINK™ II) specific installation profile

C.1 Installation profile scope

Addition:

This annex specifies the installation profile for Communication Profile CP 19/3 (Σ -LINK™ II). The CP 19/3 is specified in IEC 61784-1.

C.2 Normative references

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

C.3.1 Terms and definitions

Addition:

C.3.1.1 T-Branch

A topology using a tap to branch the trunk line and the spur line

C.3.2 Abbreviated terms

C.3.3 Conventions for installation profiles

Not applicable.

C.4 Installation planning

C.4.1 General

Subclause 4.1.4 is not applicable.

C.4.2 Planning requirements

C.4.2.1 Safety

C.4.2.1.1 General

C.4.2.1.2 Electrical safety

C.4.2.1.3 Functional safety

Not applicable.

C.4.2.1.4 Intrinsic safety

Not applicable.

C.4.2.1.5 Safety of optical fibre communication systems

Not applicable.

C.4.2.2 Security**C.4.2.3 Environmental considerations and EMC****C.4.2.3.1 Description methodology****C.4.2.3.2 Use of the described environment to produce a bill of material****C.4.2.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3****C.4.3 Network capabilities****C.4.3.1 Network topology****C.4.3.1.1 Common description****C.4.3.1.2 Basic physical topologies for passive networks**

Not applicable.

C.4.3.1.3 Basic physical topologies for active networks

Modification:

CP 19/3 network supports 3 types of topologies, about linear, T-branch and Point-to-point.

C.4.3.1.4 Combination of basic topologies

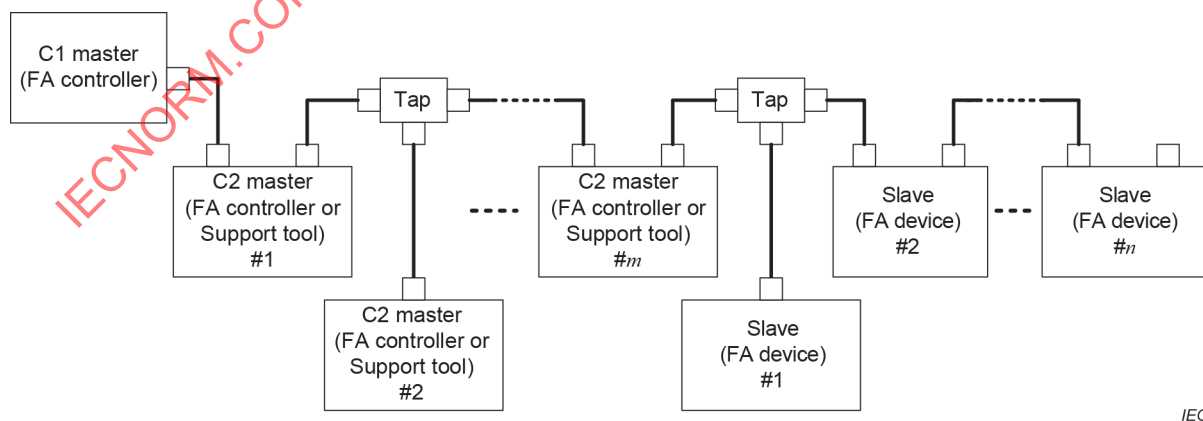
Addition:

CP 19/3 network supports combination topologies which consists of linear and T-branch.

C.4.3.1.5 Specific requirements for CPs

Addition:

CP 19/3 supports active topology by linear, T-branch and combination of linear and T-branch and Point-to-point for connection of devices. Figure C.1 shows the CP 19/3 active networks.



IEC

Figure C.1 – Topology of CP 19/3 combination of linear and T-branch network

For the power supply, the network of CP19/3 supports the topology that connects the power adaptor to supply power within the network. The power adaptor can be connected to any place. Figure C.2 shows an example of the power adaptor connections.



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

C.4.3.2 **Network characteristics**

C.4.3.2.1 **General**

C.4.3.2.2 **Network characteristics for balanced cabling not based on Ethernet**

Characteristic	CP 19/3 (Σ-LINK™ II)
Basic transmission technology	TIA-485-A Linear bus
Length/transmission speed	Length between nodes m
4 Mbit/s, 8 Mbit/s, 16 Mbit/s, 24 Mbit/s, 32 Mbit/s	50
Maximum capacity	Max. no.
Devices/network	14

Not applicable.

Not applicable.

The relationship between the number of devices and maximum length between devices is shown in Table C.1.

C.4.4 Selection and use of cabling components

C.4.4.1.1 Common description

The network of CP19/3 uses two types of cables: 6-conductor and 8- conductor cables.

C.4.4.1.2 Copper cables**C.4.4.1.2.1 Balanced cables for Ethernet-based CPs**

Not applicable.

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

Replacement:

Table C.2 – Information relevant to 6-conductor copper cable

Characteristic		CP 19/3 (Σ-LINK™ II)
Nominal impedance of cable (tolerance)	signal	(120 ± 12) Ω for signal wire
Attenuation	Signal	1,16 dB/ 50 m (at 1 MHz) 2,55 dB/ 50 m (at 4 MHz) 4,05 dB/ 50 m (at 8 MHz) 4,68 dB/ 50 m (at 10 MHz) 6,17 dB/ 50 m (at 16 MHz) 6,97 dB/ 50 m (at 20 MHz) 7,85 dB/ 50 m (at 25 MHz) 8,84 dB/ 50 m (at 31,25 MHz) 12,97 dB/ 50 m (at 62,5 MHz) 17,17 dB/ 50 m (at 100 MHz)
DCR of conductors	signal, Auxiliary signal	< 140 Ω/km for signal wire
	power	depends on conductor size
DCR of shield		–
Number of conductors		6
Shielding		Yes
Colour code for conductor		OR, BK, BN, GY, RD, BL
Jacket colour requirements		–
Jacket material		–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)		–
Agency ratings		–
Conductor cross-sectional area		–
Capacitance		–

Table C.3 – Information relevant to 8-conductor copper cable

Characteristic		CP 19/3 (Σ-LINK™ II)
Nominal impedance of cable (tolerance)	signal	(120 ± 12) Ω for signal wire
Attenuation	Signal	1,16 dB/ 50 m (at 1 MHz) 2,55 dB/ 50 m (at 4 MHz) 4,05 dB/ 50 m (at 8 MHz) 4,68 dB/ 50 m (at 10 MHz) 6,17 dB/ 50 m (at 16 MHz) 6,97 dB/ 50 m (at 20 MHz) 7,85 dB/ 50 m (at 25 MHz) 8,84 dB/ 50 m (at 31,25 MHz) 12,97 dB/ 50 m (at 62,5 MHz) 17,17 dB/ 50 m (at 100 MHz)
DCR of conductors	signal,	< 145,6 Ω/km for signal wire
	Auxiliary signal	
	power	depends on conductor size
DCR of shield		–
Number of conductors		8
Shielding		Yes
Colour code for conductor		OR, BK, BN, GY, RD, BL, YE, WT
Jacket colour requirements		–
Jacket material		–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)		–
Agency ratings		–
Conductor cross-sectional area		–
Capacitance		–

Addition:

The additional CP 19/3 cable specifications are shown in Table C.4. Figure C.3 and Figure C.4 show the structure of CP 19/3 cable.

Table C.4 – Additional cable specifications

Characteristic	Constraints
Conductor	Tinned annealed copper
Withstand voltage	AC 500 V, 1 min
Insulation resistance	≥ 10 MΩ/km

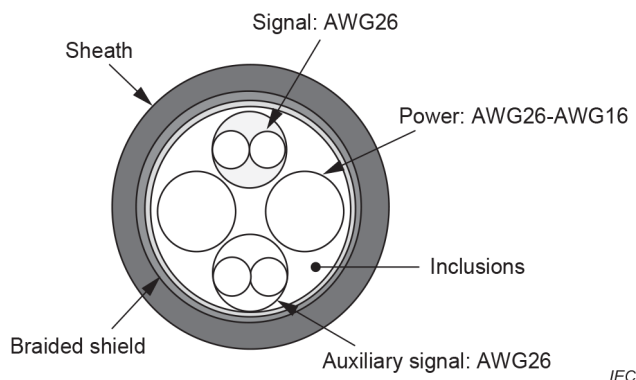


Figure C.3 – Structure of 6-conductor cable

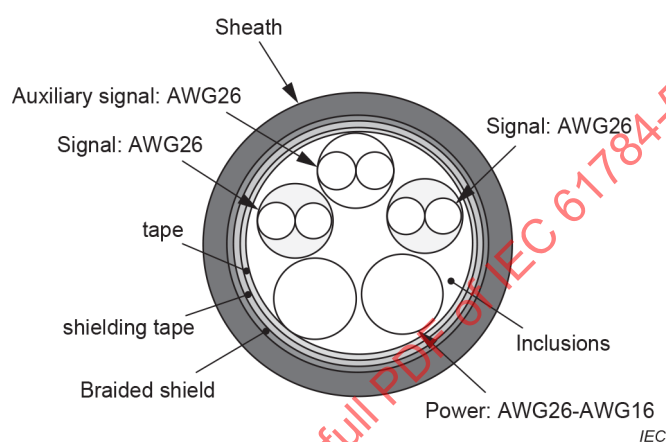


Figure C.4 – Structure of 8-conductor cable

C.4.4.1.3 Cables for wireless installation

Not applicable.

C.4.4.1.4 Optical fibre cables

Not applicable.

C.4.4.1.5 Special purpose balanced and optical fibre cables

C.4.4.1.6 Specific requirements for CPs

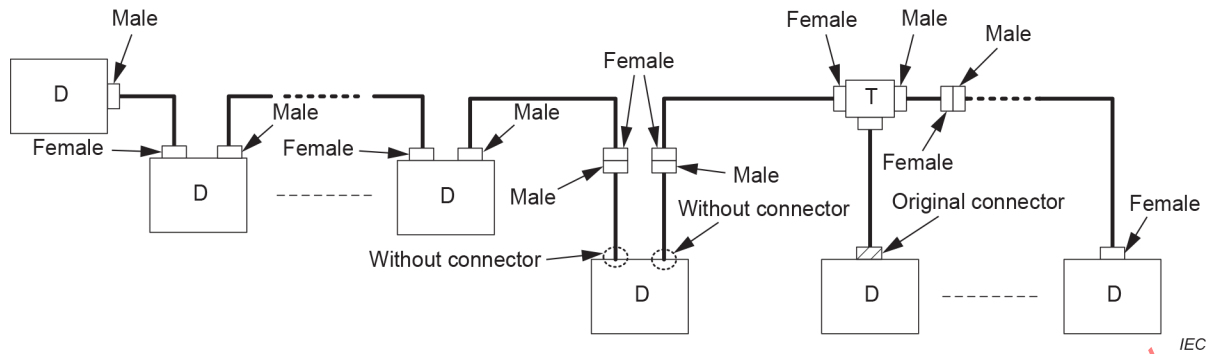
Not applicable.

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

C.4.4.2 Connecting hardware selection

C.4.4.2.1 Common description

Figure C.5 show the connection for linear network and the connection for T-branch network patterns using connectors.



where

D: Device

T: Tap

Figure C.5 – Connection for linear network

Connection of device with original connectors and connection of device without connectors as shown in Figure C.5 are also available. The original connector to be used shall have the electric characteristics equivalent to those described in this document. In either case, cables specified in this document shall be used.

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

Not applicable.

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

Replacement:

Table C.5 provides values based on the template given in IEC 61918:2018, Table 8.

Table C.5 – Connectors for copper cabling CPs not based on Ethernet

	IEC 6080 7-2 or IEC 6080 7-3	IEC 61076-2-101			IEC 6116 9-8	ANSI/(NFPA) T3.5.29 R1-2007		Others			
	Sub-D	M12-8 with A-coding	M12-12 with A-coding	M12-n with X-coding	Coaxial (BNC)	M 18	7/8-16 UN-2B THD	Open style	Terminal block	Σ-LINK II ^a	Others
CP 19/3	No	Yes	No	No	No	No	No	No	No	Yes	Yes
NOTE For M12-8 and M12-12 connectors, there are many applications using these connectors that are not compatible and when mixed cause damage to the applications.											
^a Σ-LINK II connector is specified in the following paragraph.											

Addition:

For CP 19/3 network, CP 19/3 specific connector shall be used. Figure C.6, Figure C.7 and Figure C.8 show the dimensions of the 6 pin device connectors. Figure C.9, Figure C.10 and Figure C.11 shows the dimensions of the 8 pin device connector. Figure C.12 and Figure C.13 show the dimensions of the cable 6 pin connectors. Figure C.14 and Figure C.15 shows the dimensions of the cable 8 pin connector. Table C.6 shows the electric characteristics of 6 pin connector. Table C.7 shows the electric characteristics of 8 pin connector.

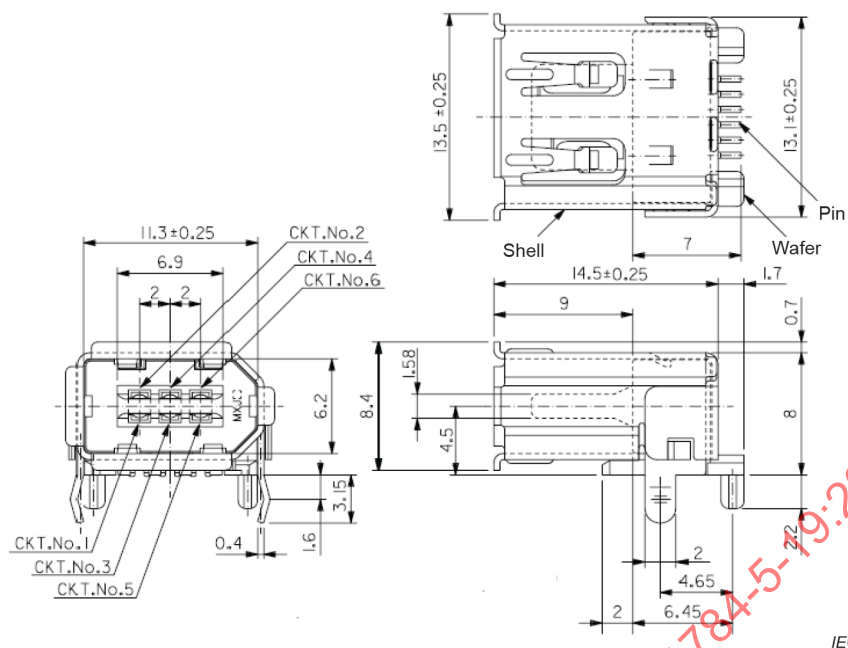


Figure C.6 – Dimensions of device 6 pin connector

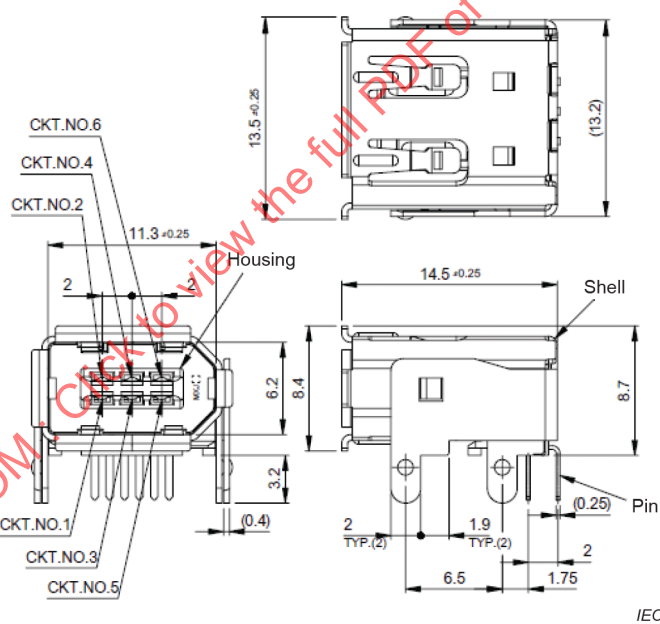


Figure C.7 – Dimensions of device 6 pin connector

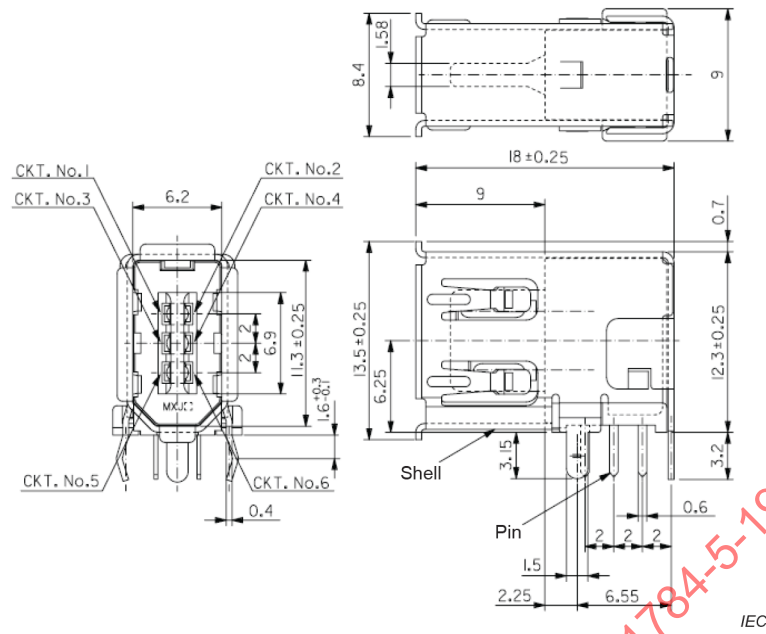


Figure C.8 – Dimensions of device 6 pin connector

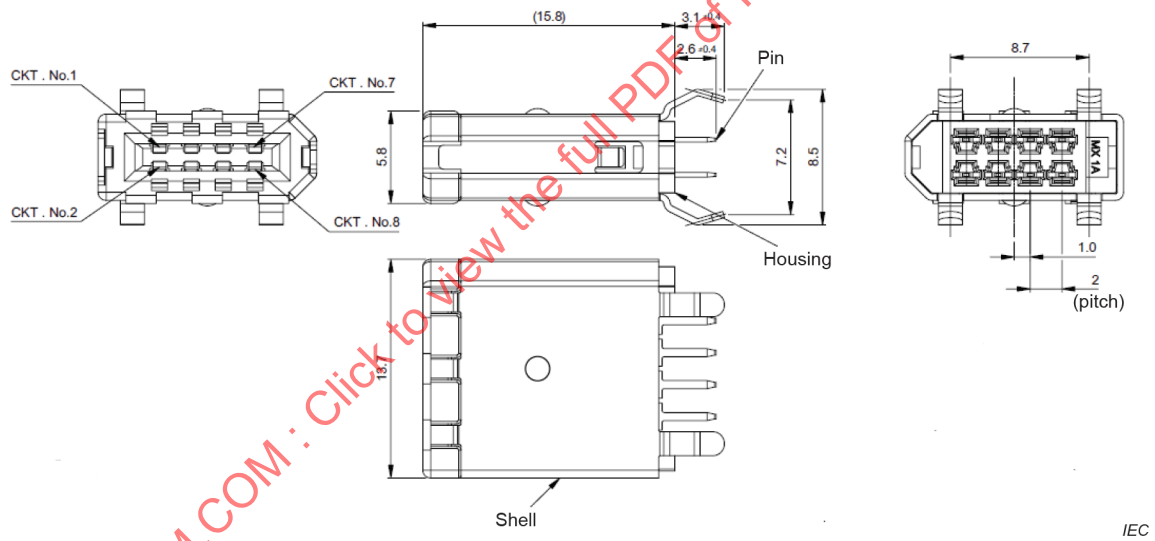


Figure C.9 – Dimensions of device 8 pin male connector

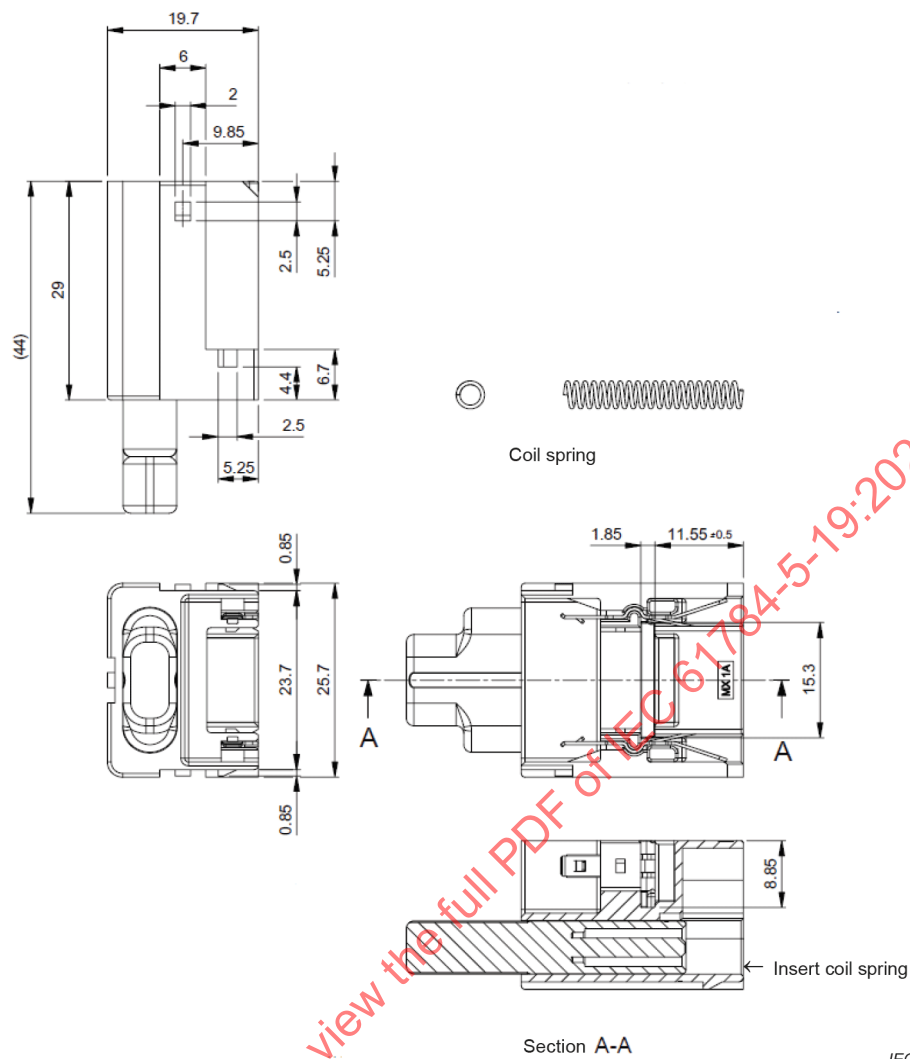


Figure C.10 – Dimensions of ejector for device 8 pin male connector

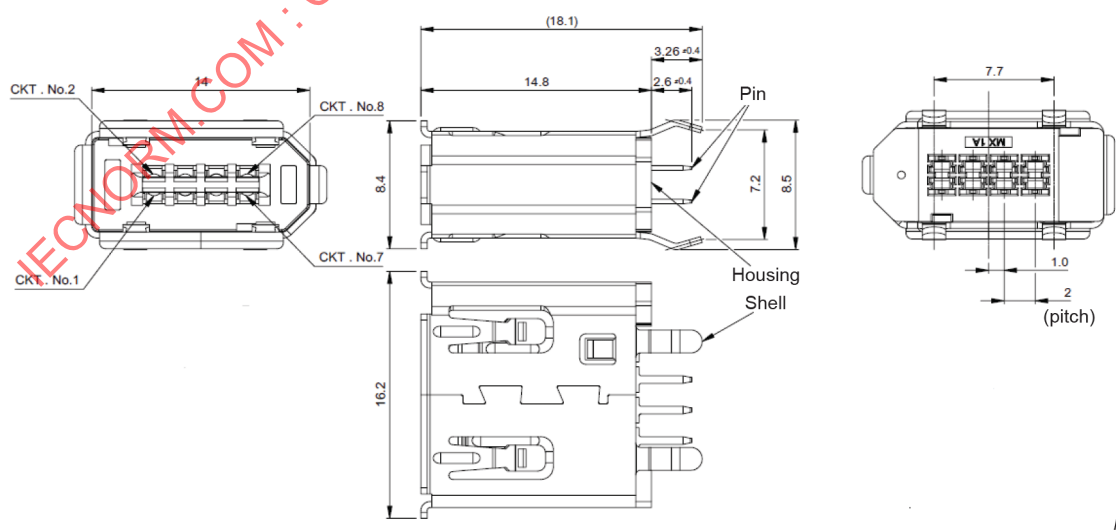


Figure C.11 – Dimensions of device 8 pin female connector

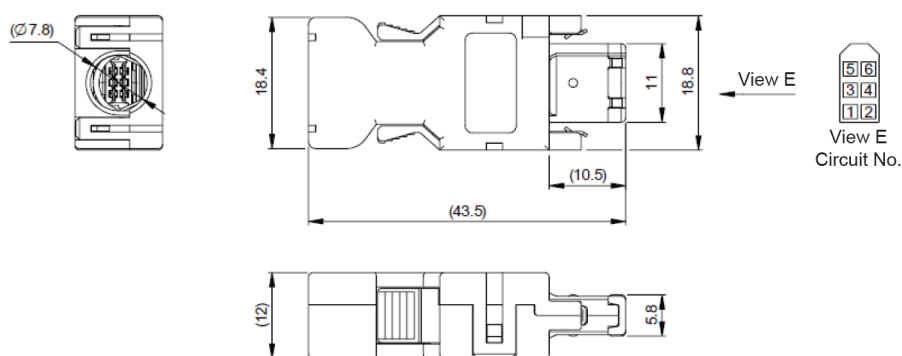


Figure C.12 – Dimensions of cable 6 pin male connector

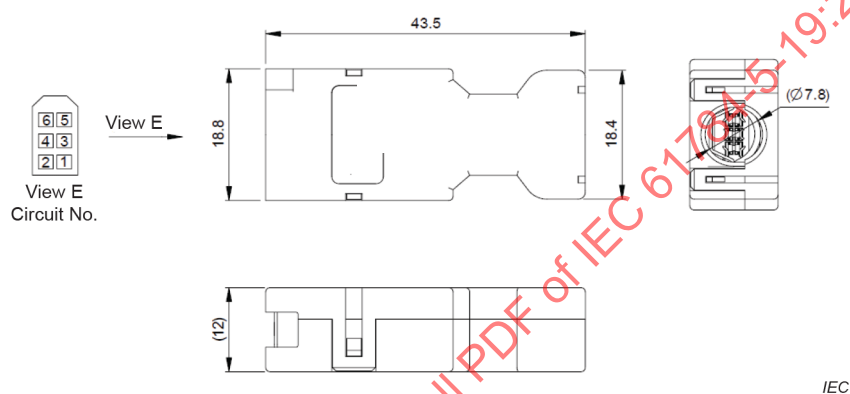


Figure C.13 – Dimensions of cable 6 pin female connector

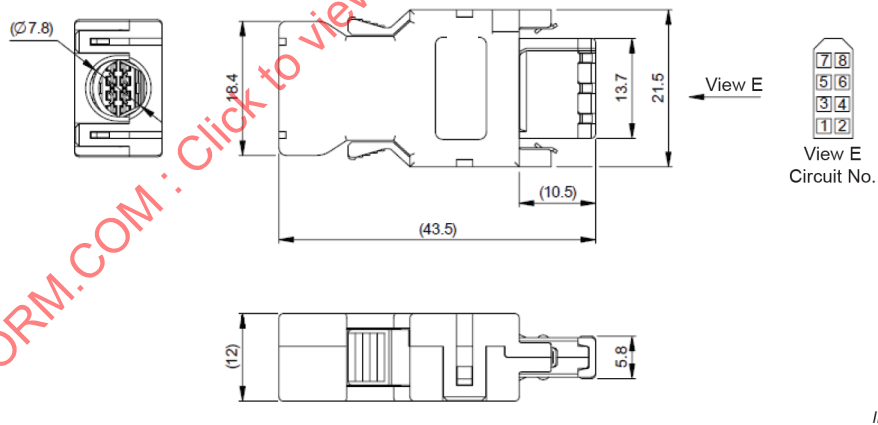


Figure C.14 – Dimensions of cable 8 pin male connector

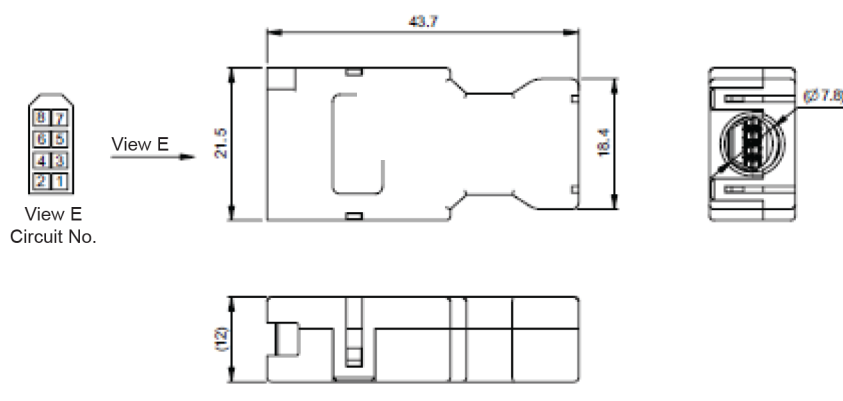


Figure C.15 – Dimensions of cable 8 pin female connector

Table C.6 – Electric characteristics of 6pin connector

Characteristic	value
Maximum rated voltage	125V
Maximum rated current	2.0 A@AWG#16-22(Cable soldering type) 1,5 A@AWG#24 0,5 A@AWG#28
Contact Resistance	Terminal 20 mΩ max Shell 50 mΩ max
Withstand voltage	AC500 V/1min
Insulation resistance	100 MΩ
Operating temperature	-40 to +85 degree

Table C.7 – Electric characteristics of 8pin connector

Characteristic	value
Maximum rated voltage	125 V
Maximum rated current	2.0 A@AWG#16-22(Cable soldering type) 1,5 A@AWG#24 0,5 A@AWG#28
Contact Resistance	Terminal 20 mΩ max Shell 50 mΩ max
Withstand voltage	AC500 V/1 min
Insulation resistance	100 MΩ
Operating temperature	-40 to +85 degree

C.4.4.2.4 Connecting hardware for wireless installation

Not applicable.

C.4.4.2.5 Connecting hardware for optical fibre cabling

Not applicable.

C.4.4.2.6 Specific requirements for CPs

Not applicable.

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

C.4.4.3 Connections within a channel/permanent link

C.4.4.3.1 Common description

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

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

Not applicable.

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

Not applicable.

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

Not applicable.

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

C.4.4.4 Terminators

C.4.4.4.1 Common description

C.4.4.4.2 Specific requirements for CPs

Addition:

The terminator resistance value shall be $(120 \pm 6) \Omega$ (min. 1/2W). Terminators are usually installed on CP 19/3 network device.

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

C.4.4.5 Device location and connection

C.4.4.5.1 Common description

C.4.4.5.2 Specific requirements for CPs

Not applicable.

C.4.4.5.3 Specific requirements for wireless installation

Not applicable.

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

C.4.4.6 Coding and labelling**C.4.4.6.1 Common description****C.4.4.6.2 Additional requirements for CPs****C.4.4.6.3 Specific requirements for CPs**

Not applicable.

C.4.4.6.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**C.4.4.7 Earthing and bonding of equipment and devices and shielded cabling****C.4.4.7.1 Common description****C.4.4.7.2 Bonding and earthing of enclosures and pathways****C.4.4.7.3 Earthing methods****C.4.4.7.4 Shield earthing****C.4.4.7.4.1 Non-earthing or parallel RC**

Not applicable.

C.4.4.7.4.2 Direct

Addition:

CP 19/3 (Σ -LINK™ II) requires direct shield earthing. The communication shield of a CP 19/3 device is normally directly connected to the device's protective earth through connector shield. If CP 19/3 specific connector is used, no additional shield earthing installation is needed.

C.4.4.7.5 Specific requirements for CPs

Not applicable.

C.4.4.7.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**C.4.4.8 Storage and transportation of cables****C.4.4.8.1 Common description****C.4.4.8.2 Specific requirements for CPs**

Not applicable.

C.4.4.8.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

C.4.4.9 Routing of cables

C.4.4.9.1 Common description

C.4.4.9.2 Cable routing of assemblies

C.4.4.9.3 Requirements for cable routing inside enclosures

C.4.4.9.4 Cable routing inside buildings

C.4.4.9.5 Cable routing outside and between buildings

C.4.4.9.6 Installing redundant communication cables

Not applicable.

C.4.4.10 Separation of circuits

C.4.4.11 Mechanical protection of cabling components

C.4.4.11.1 Common description

C.4.4.11.2 Specific requirements for CPs

Not applicable.

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

C.4.4.12 Installation in special areas

C.4.4.12.1 Common description

C.4.4.12.2 Specific requirements for CPs

Not applicable.

C.4.4.12.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

C.4.5 Cabling planning documentation

C.4.5.1 Common description

C.4.5.2 Cabling planning documentation for CPs

C.4.5.3 Network certification documentation

C.4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC 11801-3

C.4.6 Verification of cabling planning specification

C.5 Installation implementation

C.5.1 General requirements

C.5.1.1 Common description

C.5.1.2 Installation of CPs

C.5.1.3 Installation of generic cabling in industrial premises

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

Replacement:

Table C.8 provides values based on the template given in IEC 61918:2018, Table 18.

Table C.8 – Parameters for balanced cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	a
	Bending radius, multiple bending (mm)	a
	Pull forces (N)	a
	Permanent tensile forces (N)	a
	Maximum lateral forces (N/cm)	a
	Temperature range during installation (°C)	a
a Depending on cable type: see manufacturer's data sheet		

C.5.2.1.3 Avoid forming loops**C.5.2.1.4 Torsion (twisting)****C.5.2.1.5 Tensile strength (on installed cables)****C.5.2.1.6 Bending radius****C.5.2.1.7 Pull force****C.5.2.1.8 Fitting strain relief****C.5.2.1.9 Installing cables in cabinet and enclosures****C.5.2.1.10 Installation on moving parts****C.5.2.1.11 Cable crush****C.5.2.1.12 Installation of continuous flexing cables****C.5.2.1.13 Additional instructions for the installation of optical fibre cables**

Not applicable.

C.5.2.2 Installation and routing**C.5.2.2.1 Common description****C.5.2.2.2 Separation of circuits****C.5.2.3 Specific cable installation requirements for CPs**

Not applicable.

C.5.2.4 Specific requirements for wireless installation

Not applicable.

C.5.2.5 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**C.5.3 Connector installation****C.5.3.1 Common description****C.5.3.2 Shielded connectors****C.5.3.3 Unshielded connectors**

Not applicable.

C.5.3.4 Specific requirements for CPs

Addition:

Table C.9 and Table C.10 shows the pin assignment and wire colour coding for CP 19/3 connectors.

Table C.9 – Pin assignment and wire colour coding for CP 19/3 6 pin connector

pin assignment	signal	function	Colour code
			Standard
1	VCC	power supply	Orange
2	0V	GND	Black
3	AUX+	auxiliary signal (positive)	Brown
4	AUX–	auxiliary signal (negative)	Gray
5	SRD+	transmission signal (positive)	Red
6	SRD–	transmission signal (negative)	Blue

Table C.10 – Pin assignment and wire colour coding for CP 19/3 8 pin connector

pin assignment	signal	function	Colour code
1	VCC	power supply	Orange
2	0V	GND	Black
3	AUX+	auxiliary signal (positive)	Brown
4	AUX–	auxiliary signal (negative)	Gray
5	SRD1+	transmission signal (positive)	Red
6	SRD1–	transmission signal (negative)	Blue
7	SRD2+	transmission signal (positive)	Yellow
8	SRD2–	transmission signal (negative)	White

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

Not applicable.

C.5.5 Device installation**C.5.5.1 Common description****C.5.5.2 Specific requirements for CPs**

Not applicable.

C.5.6 Coding and labelling**C.5.6.1 Common description****C.5.6.2 Specific requirements for CPs**

Not applicable.

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

Subclause 5.7.5 is not applicable.

C.5.8 As-implemented cabling documentation**C.6 Installation verification and installation acceptance test****C.6.1 General****C.6.2 Installation verification****C.6.2.1 General****C.6.2.2 Verification according to cabling planning documentation****C.6.2.3 Verification of earthing and bonding****C.6.2.3.1 General****C.6.2.3.2 Specific requirements for earthing and bonding**

Not applicable.

C.6.2.4 Verification of shield earthing

C.6.2.5 Verification of cabling system

C.6.2.5.1 Verification of cable routing

C.6.2.5.2 Verification of cable protection and proper strain relief

C.6.2.6 Cable selection verification

C.6.2.6.1 Common description

C.6.2.6.2 Specific requirements for CPs

Not applicable.

C.6.2.6.3 Specific requirements for wireless installation

Not applicable.

C.6.2.7 Connector verification

C.6.2.7.1 Common description

C.6.2.7.2 Specific requirements for CPs

Not applicable.

C.6.2.7.3 Specific requirements for wireless installation

Not applicable.

C.6.2.8 Connection verification

C.6.2.8.1 Common description

C.6.2.8.2 Number of connections and connectors

C.6.2.8.3 Wire mapping

C.6.2.9 Terminator verification

Not applicable.

C.6.2.10 Coding and labelling verification

C.6.2.10.1 Common description

C.6.2.10.2 Specific coding and labelling verification requirements

Not applicable.

C.6.2.11 Verification report

C.6.3 Installation acceptance test

C.6.3.1 General

C.6.3.2 Acceptance test of Ethernet-based cabling

C.6.3.2.1 Validation of balanced cabling for CPs based on Ethernet

Subclause 6.3.2.1.3 is not applicable.

C.6.3.2.2 Validation of optical fibre cabling for CPs based on Ethernet

Not applicable.

C.6.3.2.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

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

Not applicable.

C.6.3.4 Specific requirements for wireless installation

Not applicable.

C.6.3.5 Acceptance test report

C.7 Installation administration

Subclause 7.8 is not applicable.

C.8 Installation maintenance and installation troubleshooting

Subclause 8.4 is not applicable.

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Annex D (normative)

CP 19/4 (MECHATROLINK™-4) specific installation profile

D.1 Installation profile scope

Addition:

This annex specifies the installation profile for Communication Profile CP 19/4 (MECHATROLINK™-4). The CP 19/4 is specified in IEC 61784-2.

D.2 Normative references

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

D.3.1 Terms and definitions

D.3.2 Abbreviated terms

Addition:

IMI	Industrial Mini IO
-----	--------------------

D.3.3 Conventions for installation profiles

Not applicable.

D.4 Installation planning

D.4.1 General

Subclause 4.1.4 is not applicable.

D.4.2 Planning requirements

D.4.2.1 Safety

D.4.2.1.1 General

D.4.2.1.2 Electrical safety

D.4.2.1.3 Functional safety

Not applicable.

D.4.2.1.4 Intrinsic safety

Not applicable.

D.4.2.1.5 Safety of optical fibre communication systems

Not applicable.

D.4.2.2 Security**D.4.2.3 Environmental considerations and EMC****D.4.2.3.1 Description methodology****D.4.2.3.2 Use of the described environment to produce a bill of material****D.4.2.4 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3****D.4.3 Network capabilities****D.4.3.1 Network topology****D.4.3.1.1 Common description****D.4.3.1.2 Basic physical topologies for passive networks**

Not applicable.

D.4.3.1.3 Basic physical topologies for active networks**D.4.3.1.4 Combination of basic topologies**

Not applicable.

D.4.3.1.5 Specific requirements for CPs

Addition:

CP 19/4 (MECHATROLINK™-4) supports linear and star topologies. Ring topology is not supported. Each CP 19/4 devices shall be connected through crossover cable described in IEC 61918:2018, Annex H.

D.4.3.1.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**D.4.3.2 Network characteristics****D.4.3.2.1 General****D.4.3.2.2 Network characteristics for balanced cabling not based on Ethernet**

Not applicable.

D.4.3.2.3 Network characteristics for balanced cabling based on Ethernet

Replacement:

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

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

Characteristic	CP 19/4
Supported data rates (Mbit/s)	100 and 1 000
Supported channel length (m) ^b	100
Number of connections in the channel (max.) ^{a b}	8
Patch cord length (m) ^a	100
Channel class per ISO/IEC 11801-3 (min.) ^b	D
Cable category per ISO/IEC 11801-3 (min.) ^c	5
Connecting HW category per ISO/IEC 11801-3 (min.)	5
Cable types	As needed for application
^a See D.4.4.3.2. ^b For the purpose of this table the channel definitions of ISO/IEC 11801-3 are applicable. ^c For additional information see IEC 61156 series.	

D.4.3.2.4 Network characteristics for optical fibre cabling

Not applicable.

D.4.3.2.5 Specific network characteristics

Not applicable.

D.4.3.2.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**D.4.4 Selection and use of cabling components****D.4.4.1 Cable selection****D.4.4.1.1 Common description****D.4.4.1.2 Copper cables****D.4.4.1.2.1 Balanced cables for Ethernet-based CPs**

Replacement:

Table D.2 and Table D.3 provide values based on the template given in IEC 61918:2018, Table 4.

Table D.2 – Information relevant to copper cable: CP 19/4 type A fixed cables

Characteristic	CP 19/4 (MECHATROLINK™-4) Type A Cable
Nominal impedance of cable (tolerance)	(100 ± 15) Ω
DCR of conductors	≤ 52 Ω/km
DCR of shield	–
Number of conductors	4
Shielding	Yes
Colour code for conductor	BU, WH, OG, YE
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

Table D.3 – Information relevant to copper cable: CP 19/4 type B fixed cables

Characteristic	CP 19/4 (MECHATROLINK™-4) Type B Cable
Nominal impedance of cable (tolerance)	(100 ± 15) Ω
DCR of conductors	≤ 260 Ω/km
DCR of shield	–
Number of conductors	8
Shielding	Yes
Colour code for conductor	BU,BU/WH, GR,GR/WH, OG,OG/WH, BR,BR/WH
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

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

Table D.4 – Information relevant to copper cable: CP 19/4 type A fixed cords

Characteristic	CP 19/4 (MECHATROLINK™-4) Type A Cord
Nominal impedance of cable (tolerance)	(100 ± 15) Ω
DCR of conductors	≤ 52 Ω/km
DCR of shield	–
Number of conductors	4
Length	100 m
Shielding	Yes
Colour code for conductor	BU, WH, OG, YE
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

Table D.5 – Information relevant to copper cable: CP 19/4 type B fixed cords

Characteristic	CP 19/4 (MECHATROLINK™-4) Type B Cord
Nominal impedance of cable (tolerance)	(100 ± 15) Ω
DCR of conductors	≤ 260 Ω/km
DCR of shield	–
Number of conductors	8
Length	100 m
Shielding	Yes
Colour code for conductor	BU,BU/WH, GR,GR/WH, OG,OG/WH, BR,BR/WH
Jacket colour requirements	–
Jacket material	–
Resistance to harsh environment (e.g. UV, oil resist, LS0H)	–
Agency ratings	–

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

Not applicable.

D.4.4.1.3 Cables for wireless installation

Not applicable.

D.4.4.1.4 Optical fibre cables

Not applicable.

D.4.4.1.5 Special purpose balanced and optical fibre cables

D.4.4.1.6 Specific requirements for CPs

Not applicable.

D.4.4.1.7 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**D.4.4.2 Connecting hardware selection****D.4.4.2.1 Common description****D.4.4.2.2 Connecting hardware for balanced cabling CPs based on Ethernet**

Replacement:

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

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

	Series IEC 60603-7 series ^a		IEC 61076-3-106 ^b		IEC 61076-3-117 ^b	IEC 61076-2-101	IEC 61076-2-109	IEC 61076-3-122
	shielded	unshielded	Var. 1	Var. 6	Var. 14	M12-4 with D-coding	M12-8 with X-coding	IMI connector with Type II
CP 19/4	IEC 60603-7-3 or IEC 60603-7-5	No	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.								

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

Not applicable.

D.4.4.2.4 Connecting hardware for wireless installation

Not applicable.

D.4.4.2.5 Connecting hardware for optical fibre cabling

Not applicable.

D.4.4.2.6 Specific requirements for CPs

Not applicable.

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

D.4.4.3 Connections within a channel/permanent link

D.4.4.3.1 Common description

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

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

Not applicable.

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

Not applicable.

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

Not applicable.

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

D.4.4.4 Terminators

Not applicable.

D.4.4.5 Device location and connection

D.4.4.5.1 Common description

D.4.4.5.2 Specific requirements for CPs

Not applicable.

D.4.4.5.3 Specific requirements for wireless installation

Not applicable.

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

D.4.4.6 Coding and labelling

D.4.4.6.1 Common description

D.4.4.6.2 Additional requirements for CPs

D.4.4.6.3 Specific requirements for CPs

Not applicable.

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

D.4.4.7 Earthing and bonding of equipment and devices and shielded cabling**D.4.4.7.1 Common description****D.4.4.7.2 Bonding and earthing of enclosures and pathways****D.4.4.7.3 Earthing methods****D.4.4.7.4 Shield earthing**

Not applicable.

D.4.4.7.4.1 Non-earthing or parallel RC

Not applicable.

D.4.4.7.4.2 Direct

Addition:

CP 19/4 (MECHATROLINK™-4) requires direct shield earthing. The communication shield of a CP 19/4 device is normally directly connected to the device's protective earth through connector shield. If CP 19/4 specific connector is used, no additional shield earthing installation is needed.

D.4.4.7.5 Specific requirements for CPs

Not applicable.

D.4.4.7.6 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**D.4.4.8 Storage and transportation of cables****D.4.4.8.1 Common description****D.4.4.8.2 Specific requirements for CPs**

Not applicable.

D.4.4.8.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3**D.4.4.9 Routing of cables****D.4.4.9.1 Common description****D.4.4.9.2 Cable routing of assemblies****D.4.4.9.3 Requirements for cable routing inside enclosures****D.4.4.9.4 Cable routing inside buildings****D.4.4.9.5 Cable routing outside and between buildings****D.4.4.9.6 Installing redundant communication cables**

Not applicable.

D.4.4.10 Separation of circuits

D.4.4.11 Mechanical protection of cabling components

D.4.4.11.1 Common description

D.4.4.11.2 Specific requirements for CPs

Not applicable.

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

D.4.4.12 Installation in special areas

D.4.4.12.1 Common description

D.4.4.12.2 Specific requirements for CPs

Not applicable.

D.4.4.12.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

D.4.5 Cabling planning documentation

D.4.5.1 Common description

D.4.5.2 Cabling planning documentation for CPs

D.4.5.3 Network certification documentation

D.4.5.4 Cabling planning documentation for generic cabling in accordance with ISO/IEC 11801-3

D.4.6 Verification of cabling planning specification

D.5 Installation implementation

D.5.1 General requirements

D.5.1.1 Common description

D.5.1.2 Installation of CPs

D.5.1.3 Installation of generic cabling in industrial premises

D.5.2 Cable installation

D.5.2.1 General requirements for all cabling types

D.5.2.1.1 Storage and installation

D.5.2.1.2 Protecting communication cables against potential mechanical damage

Replacement:

Table D.7 provides values based on the template given in IEC 61918:2018, Table 18.

Table D.7 – Parameters for balanced cables

Characteristic		Value
Mechanical force	Minimum bending radius, single bending (mm)	26 mm
	Bending radius, multiple bending (mm)	See manufacturer's data sheet
	Pull forces (N)	101 N
	Permanent tensile forces (N)	58 N
	Maximum lateral forces (N/cm)	Not defined
	Temperature range during installation (°C)	0 to 80

D.5.2.1.3 Avoid forming loops

D.5.2.1.4 Torsion (twisting)

D.5.2.1.5 Tensile strength (on installed cables)

D.5.2.1.6 Bending radius

D.5.2.1.7 Pull force

D.5.2.1.8 Fitting strain relief

D.5.2.1.9 Installing cables in cabinet and enclosures

D.5.2.1.10 Installation on moving parts

D.5.2.1.11 Cable crush

D.5.2.1.12 Installation of continuous flexing cables

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

Not applicable.

D.5.2.2 Installation and routing

D.5.2.2.1 Common description

D.5.2.2.2 Separation of circuits

D.5.2.3 Specific cable installation requirements for CPs

Not applicable.

D.5.2.4 Specific requirements for wireless installation

Not applicable.

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

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

Not applicable.

D.5.3.4 Specific requirements for CPs

Addition:

Table D.8 shows the pin assignment and wire colour coding for CP 19/4 modular connector and IMI connectors, Table D.9 and Table D.10 show the pin assignment and wire colour coding for CP 19/4 M12-4 and M12-8 connectors specified in D.4.4.2.2.

Table D.8 – Pin assignment and wire colour coding for CP 19/4 modular and IMI connector

Signal	Function	Color code	Pin
TXD+	Transmit Data+	BU	1
TXD-	Transmit Data-	WH	2
RXD+	Receive Data+	OG	3
RXD-	Receive Data-	YE	6
SH	Shield	Shield braid	

Table D.9 – Pin assignment and wire colour coding for CP 19/4 M12-4 connector

Signal	Function	Color code	Pin
TXD+	Transmit Data+	BU	1
TXD-	Transmit Data-	WH	3
RXD+	Receive Data+	OG	2
RXD-	Receive Data-	YE	4
SH	Shield	Shield braid	

Table D.10 – Pin assignment and wire colour coding for CP 19/4 M12-8 connector

Signal	Function	Color code	Pin
TP0+	DataA+	OG/WH	1
TP0-	DataA-	OG	2
TP1+	DataB+	GR/WH	3
TP1-	DataB-	GR	4
TP2+	DataC+	BU	5
TP2-	DataC-	BU/WH	6
TP3+	DataD+	BR/WH	7
TP4-	DataD-	BR	8
SH	Shield	Shield braid	

D.5.3.5 Specific requirements for wireless installation**D.5.4 Terminator installation**

Not applicable.

D.5.5 Device installation**D.5.5.1 Common description****D.5.5.2 Specific requirements for CPs**

Not applicable.

D.5.6 Coding and labelling**D.5.6.1 Common description****D.5.6.2 Specific requirements for CPs**

Not applicable.

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

Subclause 5.7.5 is not applicable.

D.5.8 As-implemented cabling documentation**D.6 Installation verification and installation acceptance test****D.6.1 General****D.6.2 Installation verification****D.6.2.1 General****D.6.2.2 Verification according to cabling planning documentation****D.6.2.3 Verification of earthing and bonding****D.6.2.3.1 General****D.6.2.3.2 Specific requirements for earthing and bonding**

Not applicable.

D.6.2.4 Verification of shield earthing**D.6.2.5 Verification of cabling system****D.6.2.5.1 Verification of cable routing****D.6.2.5.2 Verification of cable protection and proper strain relief****D.6.2.6 Cable selection verification****D.6.2.6.1 Common description****D.6.2.6.2 Specific requirements for CPs**

Not applicable.

D.6.2.6.3 Specific requirements for wireless installation

Not applicable.

D.6.2.7 Connector verification

D.6.2.7.1 Common description

D.6.2.7.2 Specific requirements for CPs

Not applicable.

D.6.2.7.3 Specific requirements for wireless installation

Not applicable.

D.6.2.8 Connection verification

D.6.2.8.1 Common description

D.6.2.8.2 Number of connections and connectors

D.6.2.8.3 Wire mapping

D.6.2.9 Terminator verification

Not applicable.

D.6.2.10 Coding and labelling verification

D.6.2.10.1 Common description

D.6.2.10.2 Specific coding and labelling verification requirements

Not applicable.

D.6.2.11 Verification report

D.6.3 Installation acceptance test

D.6.3.1 General

D.6.3.2 Acceptance test of Ethernet-based cabling

D.6.3.2.1 Validation of balanced cabling for CPs based on Ethernet

Subclause 6.3.2.1.3 is not applicable.

D.6.3.2.2 Validation of optical fibre cabling for CPs based on Ethernet

Not applicable.

D.6.3.2.3 Specific requirements for generic cabling in accordance with ISO/IEC 11801-3

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

Not applicable.

D.6.3.4 Specific requirements for wireless installation

Not applicable.

D.6.3.5 Acceptance test report

D.7 Installation administration

Subclause 7.8 is not applicable.

D.8 Installation maintenance and installation troubleshooting

Subclause 8.4 is not applicable.

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Addition:

- [41] MECHATROLINK Members Association (MMA): *MECHATROLINK-II Installation Guide*, available at <www.mechatrolink.org>
 - [42] MECHATROLINK Members Association (MMA): *MECHATROLINK-III Installation Guide*, available at <www.mechatrolink.org>
 - [43] USB Implementers Forum, Inc: *Universal Serial Bus Specification Revision 2.0*, available at <www.usb.org>
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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

RÉSEAUX INDUSTRIELS –
PROFILS –Partie 5-19: Installation des bus de terrain –
Profils d'installation pour CPF 19

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L'IEC 61784-5-19 a été établie par le sous-comité 65C: Réseaux industriels, du comité technique 65 de l'IEC: Mesure, commande et automation dans les processus industriels. Il s'agit d'une Norme internationale.

Le présent document doit être utilisé conjointement avec l'IEC 61918:2018, l'IEC 61918:2018/AMD1:2022 et l'IEC 61918:2018/AMD2:2024.

Cette deuxième édition annule et remplace la première édition parue en 2013. Cette édition constitue une révision technique.

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

- a) ajout des nouveaux profils d'installation pour les CP 19/3 et CP 19/4 à l'Article 4;
- b) dans l'Annexe B, le Tableau B.4 a été modifié et la Figure B.1 et la Figure B.2 ont été supprimées;
- c) l'Annexe C, qui correspond aux nouveaux profils d'installation pour le CP 19/3, et les références connexes, ont été ajoutées;
- d) l'Annexe D, qui correspond aux nouveaux profils d'installation pour le CP 19/4, et les références connexes, ont été ajoutées.

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

Projet	Rapport de vote
65C/1281/FDIS	65C/1296/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

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INTRODUCTION

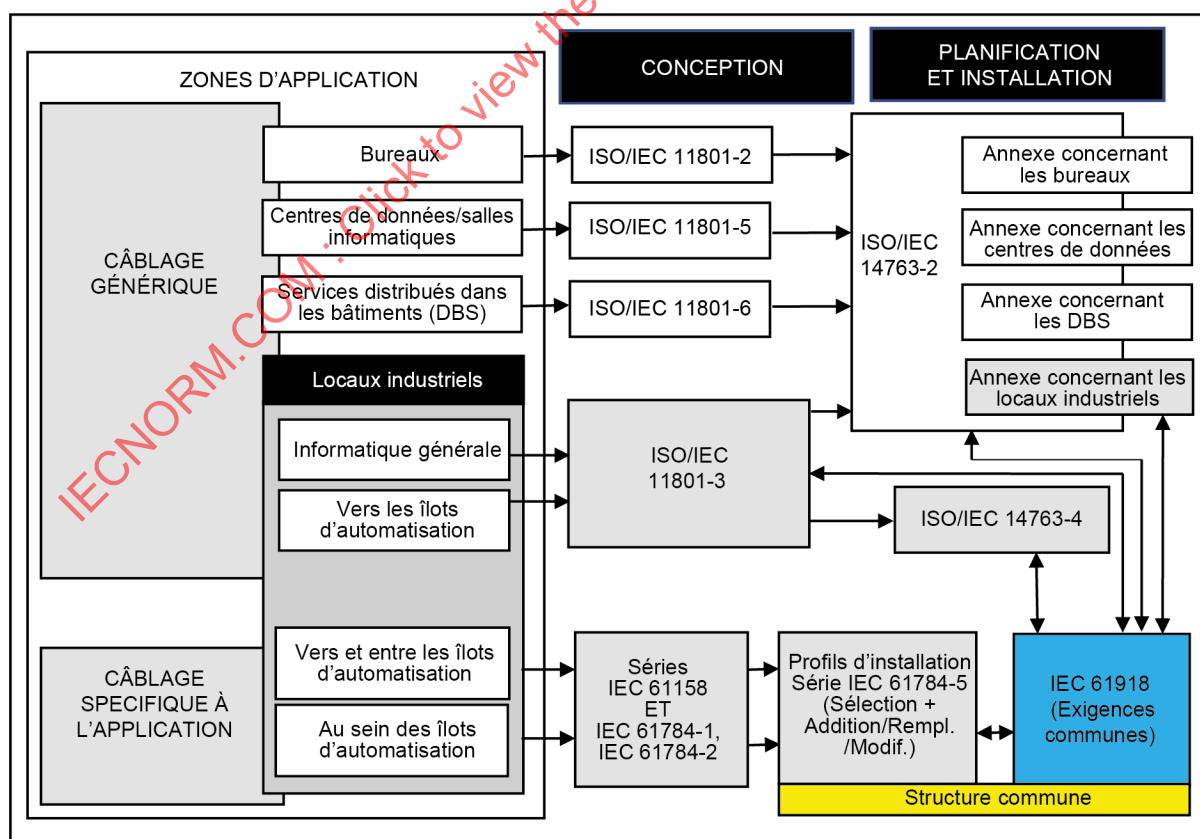
Le présent document fait partie d'une série élaborée pour faciliter l'utilisation des réseaux de communication dans des systèmes de contrôle-commande industriels.

L'IEC 61918:2018, l'IEC 61918:2018/AMD1:2022 et l'IEC 61918/AMD2:2024 définissent les exigences communes applicables 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). Si elles utilisent le profil d'installation conjointement avec l'IEC 61918, ces personnes savent immédiatement quelles exigences sont communes à l'installation de tous les CP et lesquelles sont modifiées ou remplacées. Les conventions utilisées pour la rédaction du présent document sont définies à l'Article 5.

La définition d'une norme de profil d'installation pour chaque CPF (par exemple l'IEC 61784-5-19 pour la CPF 19) permet aux utilisateurs de travailler avec des documents de taille convenable.



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Figure 1 – Relations entre les normes

RÉSEAUX INDUSTRIELS – PROFILS –

Partie 5-19: Installation des bus de terrain – Profils d'installation pour CPF 19

1 Domaine d'application

La présente partie de l'IEC 61784-5 définit les profils d'installation pour la CPF 19 (MECHATROLINK^{TM1}).

Les profils d'installation sont spécifiés dans les annexes. Ces annexes doivent être utilisées 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 au profil, voir les paragraphes A.2, B.2, C.2 et D.2.

3 Termes, définitions et termes abrégés

Pour les besoins du présent document, les termes, définitions et termes abrégés donnés dans l'IEC 61918:2018, Article 3, l'IEC 61918:2018/AMD1:2022, Article 3 et les Articles A.3, B.3, C.3 et D.3 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 MECHATROLINKTM et Σ -LINKTM II sont des appellations commerciales de YASKAWA ELECTRIC CORPORATION. Cette information est donnée à l'intention des utilisateurs du présent document et ne signifie nullement que l'IEC approuve ou recommande l'organisation détentrice de l'appellation commerciale, ni un quelconque de ses produits. La conformité n'exige pas l'utilisation des appellations commerciales. L'utilisation de l'appellation commerciale exige l'autorisation du détenteur de celle-ci.

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 19: vue d'ensemble des profils d'installation

La CPF 19 comprend 4 profils de communication spécifiés dans l'IEC 61784-1 et l'IEC 61784-2.

Les exigences d'installation pour le CP 19/1 (MECHATROLINK™-II) sont définies dans l'Annexe A.

Les exigences d'installation pour le CP 19/2 (MECHATROLINK™-III) sont définies dans l'Annexe B.

Les exigences d'installation pour le CP 19/3 (Σ -LINK™ II) sont définies dans l'Annexe C.

Les exigences d'installation pour le CP 19/4 (MECHATROLINK™-4) sont définies dans l'Annexe D.

5 Conventions relatives aux profils d'installation

La numérotation des articles et paragraphes des annexes du présent document correspond à celle des principaux articles et paragraphes de l'IEC 61918.

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

EXEMPLE "Le paragraphe B.4.4" dans l'IEC 61784-5-19 signifie que le CP 19/2 est défini dans le paragraphe 4.4 de l'IEC 61918:2018 et de l'IEC 61918:2018/AMD1:2022.

Tous les articles principaux de l'IEC 61918 sont cités et sont pleinement applicables, 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 (paragraphe) indique "*Addition:*", l'article (paragraphe) correspondant de l'IEC 61918 s'applique en incluant les ajouts indiqués pour le profil.

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

NOTE Un remplacement peut également comprendre des additions.

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 (paragraphe) sont omis alors que, dans ledit article (paragraphe), il est indiqué "*l'Article (paragraphe) x comporte une addition:*" (ou un "*Remplacement:*") ou "*l'Article (paragraphe) x ne s'applique pas*", l'Article (paragraphe) x est valide tel que spécifié et tous les autres articles (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 et de l'IEC 61918:2018/AMD1:2022. 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:

Conformité à l'IEC 61784-5-19:2024 pour CP 19/m <nom> ou

Conformité à l'IEC 61784-5-19 (Éd.2.0) pour CP 19/m <nom>

Le nom indiqué entre crochets obliques < > est facultatif et les crochets obliques ne doivent pas être inclus. Le "m" dans CP 19/m doit être remplacé par le numéro de profil 1 à 4.

NOTE Le nom peut être celui du profil, par exemple MECHATROLINK-II, MECHATROLINK-III, Σ-LINK II ou MECHATROLINK-4.

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

Les normes de produits ne doivent pas intégrer d'éventuels aspects d'évaluation de la conformité (y compris les dispositions de management de la qualité), qu'ils soient normatifs ou informatifs, autres que les dispositions d'essai du produit (évaluation et examen).

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Annexe A (normative)

Profil d'installation spécifique au CP 19/1 (MECHATROLINK™-II)

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

Addition:

La présente annexe définit le profil d'installation du profil de communication CP 19/1 (MECHATROLINK™-II). Le CP 19/1 est défini dans l'IEC 61784-1.

A.2 Références normatives

Addition:

TIA-485-A, *Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems* (disponible en anglais seulement)

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

A.3.1 Termes et définitions

Addition:

A.3.1.93

appareil principal C1

dispositif principal qui déclenche le transfert de données cycliques avec les dispositifs subordonnés

A.3.1.94

appareil principal C2

dispositif principal qui déclenche l'échange de données de transmission avec d'autres dispositifs

A.3.1.95

appareil principal

dispositif qui contrôle le transfert de données sur le réseau CP 19/1 et déclenche l'accès au support des appareils subordonnés par la transmission de messages, et qui constitue l'interface au système de commande

A.3.1.96

appareil subordonné

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

A.3.2 Termes abrégés

Addition:

M-II	MECHATROLINK™-II
USB	Universal serial bus (Bus série universel)

A.3.3 Conventions relatives aux profils d'installation

Non applicable.

A.4 Planification de l'installation

A.4.1 Généralités

Le paragraphe 4.1.4 ne s'applique pas.

A.4.2 Exigences de planification

A.4.2.1 Sûreté

A.4.2.1.1 Généralités

A.4.2.1.2 Sécurité électrique

A.4.2.1.3 Sécurité fonctionnelle

Non applicable.

A.4.2.1.4 Sécurité intrinsèque

Non applicable.

A.4.2.1.5 Sécurité des systèmes de communication par fibres optiques

Non applicable.

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

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

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

Addition:

Le réseau CP 19/1 ne prend en charge que la topologie en bus passive.

A.4.3.1.3 Topologies physiques de base des réseaux actifs

Non applicable.

A.4.3.1.4 Combinaison de topologies de base

A.4.3.1.5 Exigences spécifiques pour les CP

Addition:

Le CP 19/1 prend en charge la topologie en bus passive par enchaînement en cascade des dispositifs. La topologie en étoile passive n'est pas prise en charge et les dérivations ne doivent pas être utilisées. La Figure A.1 représente la topologie en bus passive du réseau CP 19/1.

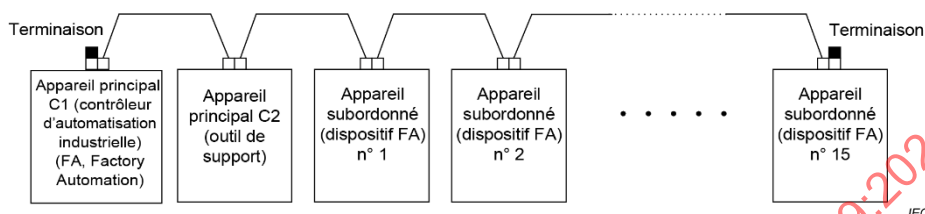


Figure A.1 – Topologie du réseau CP 19/1

Le CP 19/1 prend en charge l'interconnexion de deux segments de bus passifs au moyen d'un répéteur de bus actif. Un seul répéteur est admis, comme représenté à la Figure A.2.

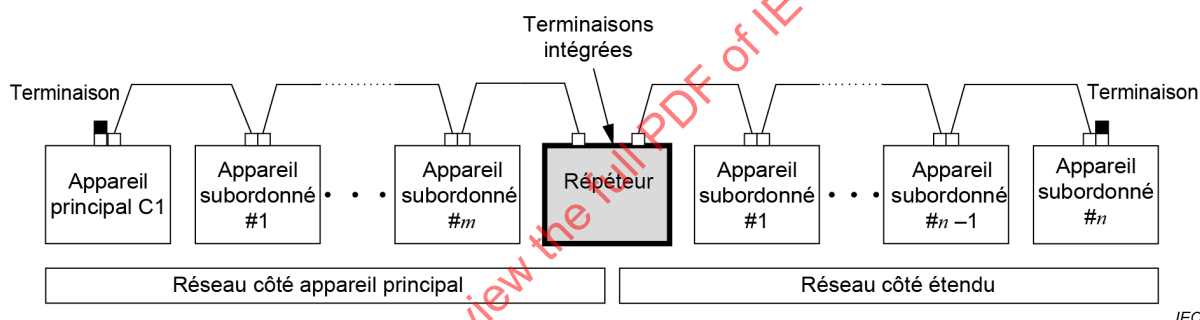


Figure A.2 – Extension d'un réseau au moyen d'un répéteur

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

A.4.3.2 Caractéristiques du réseau

A.4.3.2.1 Généralités

A.4.3.2.2 Caractéristiques du réseau pour un câblage à paires symétriques ne reposant pas sur Ethernet

Remplacement:

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

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

Caractéristique	CP 19/1 (MECHATROLINK™-II)
Technologie de transmission de base	TIA-485-A Bus linéaire
Longueur / vitesse de transmission	Longueur de segment m
10 Mbit/s	50 (moins de 17 dispositifs) 30 (17 dispositifs)
Capacité maximale	Nbre max.
Dispositifs / segment	17
Dispositifs / réseau	32

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

Non applicable.

A.4.3.2.5 Caractéristiques spécifiques du réseau

Addition:

La relation entre le nombre de dispositifs et la longueur de segment maximale est représentée dans le Tableau A.2 pour la topologie sans répéteur représentée à la Figure A.1. Lorsque deux segments de réseau sont combinés au moyen d'un répéteur, comme représenté à la Figure A.2, il convient de considérer le répéteur comme un dispositif sur chaque segment et le nombre de dispositifs disponibles est réduit de un par rapport à la valeur donnée dans le Tableau A.2. Ainsi, le nombre maximal de dispositifs par réseau, dont deux segments sont étendus par un répéteur, devient 32 (17+17-2).

Tableau A.2 – Nombre de dispositifs et longueur de segment maximale

Nombre de dispositifs	Longueur de segment maximale
16 ou moins	50 m
17	30 m
18 ou plus	Non autorisé

Le CP 19/1 est également soumis à une longueur de câble minimale. La longueur du câble entre les dispositifs doit être d'au moins 0,5 m.

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

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 fournit des valeurs fondées sur le modèle du Tableau 4 de l'IEC 61918:2018.

Tableau A.3 – Informations applicables aux câbles en cuivre: câbles fixes

Caractéristique	CP 19/1 (MECHATROLINK™-II)
Impédance nominale du câble (tolérance)	$(130 \pm 13) \Omega$
DCR des conducteurs	$< 120 \Omega/\text{km}$
DCR du blindage	–
Nombre de conducteurs	2 (paire torsadée)
Blindage	Oui
Code de couleur du conducteur	BK, RD
Exigences de couleur de gaine extérieure	–
Matériau de gaine extérieure	–
Résistance aux environnements rigoureux (par exemple UV, résistance à l'huile, LS0H)	–
Évaluation par les organismes de certification	–
Section du conducteur	$\geq 0,16 \text{ mm}^2$ (AWG25)
Capacité	$< 120 \text{ nF/km}$

Addition:

Les spécifications supplémentaires relatives au câble du CP 19/1 sont données dans le Tableau A.4. La Figure A.3 représente la structure d'un câble CP 19/1.

Tableau A.4 – Spécifications supplémentaires relatives au câble

Caractéristique	Contraintes
Diamètre extérieur	$(4,8 \pm 0,2) \text{ mm}$
Conducteur	Cuivre étamé recuit
Tension de tenue	1 000 V en courant alternatif, 1 min
Résistance d'isolement	$\geq 100 \text{ M}\Omega/\text{km}$
Affaiblissement	40 dB/km (à 4 MHz) 60 dB/km (à 10 MHz)

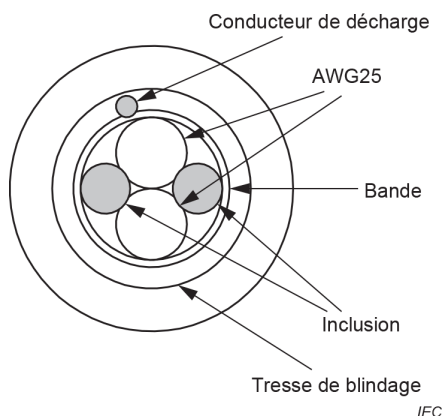


Figure A.3 – Structure de câble

A.4.4.1.3 Câbles pour installation sans fil

Non applicable.

A.4.4.1.4 Câbles à fibres optiques

Non applicable.

A.4.4.1.5 Câbles symétriques et à fibres optiques spéciaux

A.4.4.1.6 Exigences spécifiques pour les CP

Non applicable.

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

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.5 fournit des valeurs fondées sur le modèle du Tableau 8 de l'IEC 61918:2018.

Tableau A.5 – 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 avec codage A	M12-5 avec codage B	M12-n avec codage X	Coaxial (BNC)	M 18	7/8-16 UN-2B THD	Type ouvert	Bornier	M-II ^a	Autres
CP 19/1	Non	Non	Non	Non	Non	Non	Non	Non	Non	Oui	Non

NOTE De nombreuses applications utilisant les connecteurs M12-5 ne sont pas compatibles, en cas de mélange des connecteurs, cela peut endommager les applications.

^a Le connecteur M-II (MECHATROLINK™-II) est spécifié à l'alinéa suivant.

Addition:

Pour le réseau CP 19/1, le connecteur spécifique au CP 19/1 appelé connecteur M-II (MECHATROLINK™-II) doit être utilisé. La Figure A.4 et la Figure A.5 représentent les dimensions des connecteurs de dispositif M-II (embases) à un et deux ports respectivement. La Figure A.6 représente les dimensions du connecteur de câble M-II (fiche). Le connecteur M-II est compatible avec le connecteur USB type "A" spécifié dans la révision 2.0 de la spécification du bus série universel [3], à l'exception du fait qu'il dispose d'un mécanisme de verrouillage spécifique au CP 19/1.

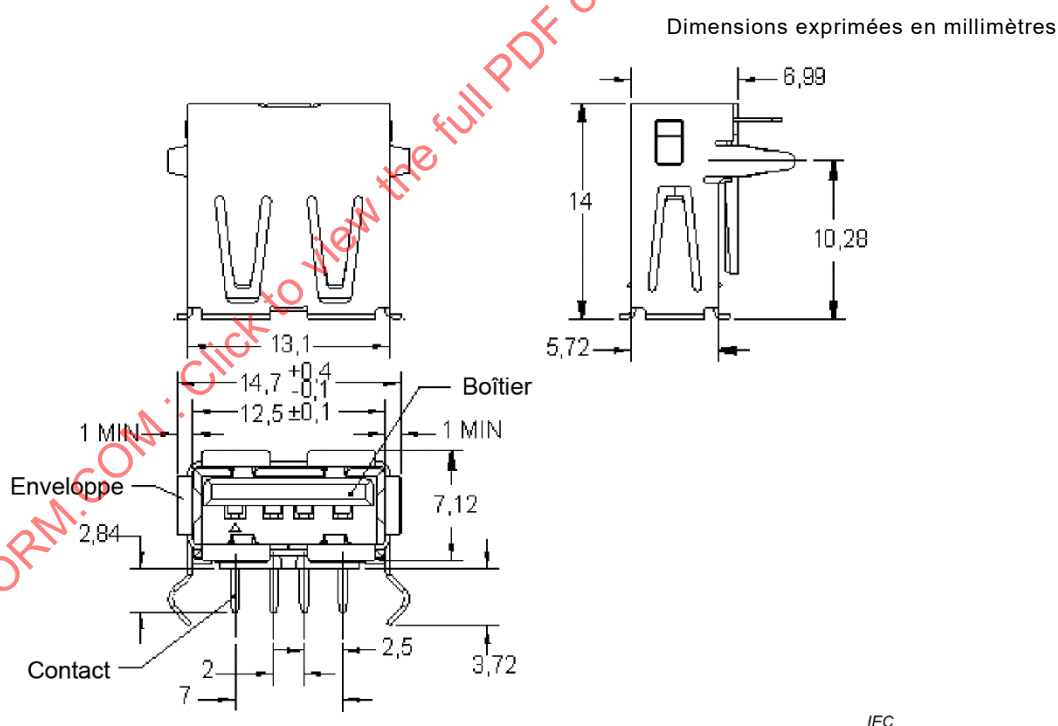


Figure A.4 – Dimensions d'un connecteur de dispositif à un port

Dimensions exprimées en millimètres

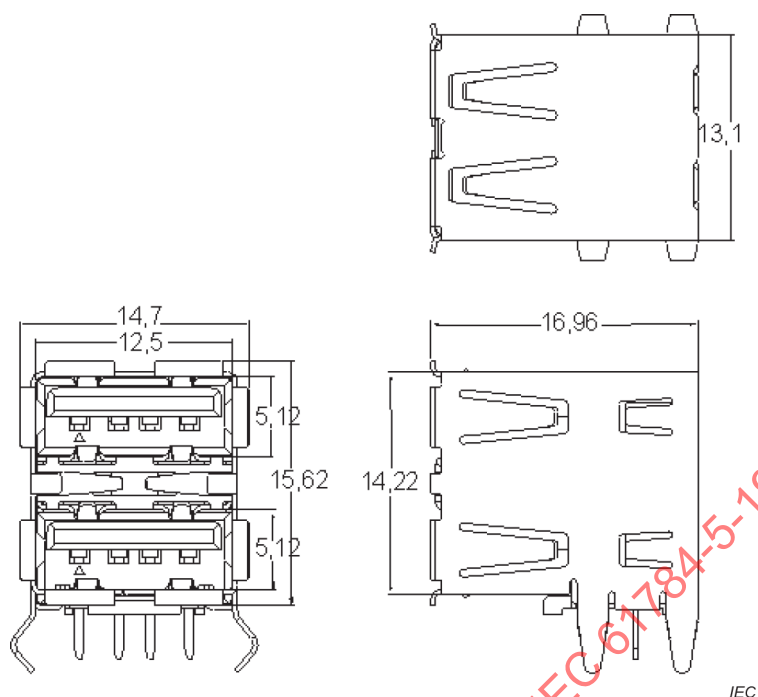


Figure A.5 – Dimensions d'un connecteur de dispositif à deux ports

Dimensions exprimées en millimètres

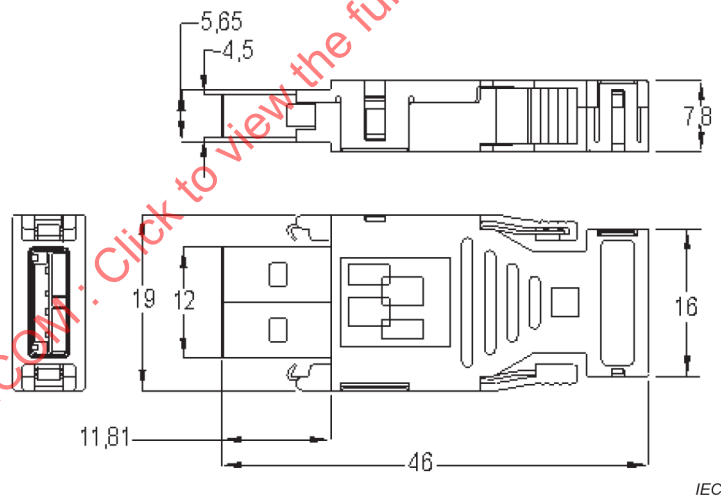


Figure A.6 – Dimensions d'un connecteur de câble

Le connecteur de câble M-II dispose de bobines d'inductance intégrées dans un boîtier de connecteur pour assurer l'adaptation de l'impédance entre l'émetteur-récepteur de ligne d'un dispositif et le câble de transmission, comme représenté à la Figure A.7. Par conséquent, le connecteur de câble M-II ne peut être utilisé que pour assurer la connexion entre le dispositif de CP 19/1 et le câble. Il ne doit pas être utilisé pour les connexions ou épissures dans un canal.

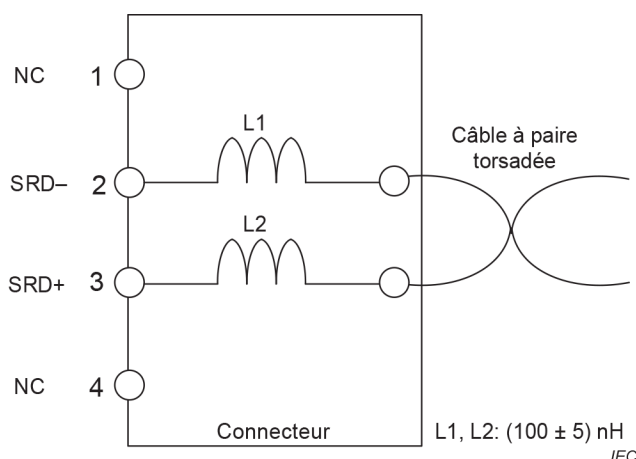


Figure A.7 – Connecteur de câble à bobines d'inductance

A.4.4.2.4 Matériel de connexion des installations sans fil

Non applicable.

A.4.4.2.5 Matériel de connexion pour câblage à fibres optiques

Non applicable.

A.4.4.2.6 Exigences spécifiques pour les CP

Non applicable.

A.4.4.2.7 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

A.4.4.3 Connexions dans un canal/une liaison permanente

A.4.4.3.1 Description commune

A.4.4.3.2 Connexions et épissures de câblage symétrique pour les CP reposant sur Ethernet

Non applicable.

A.4.4.3.3 Connexions et épissures de câblage en cuivre pour les CP ne reposant pas sur Ethernet

4.4.3.3.1 Description commune

Addition:

Pour le réseau CP 19/1, aucune connexion ou épissure dans un canal au moyen de connecteurs CP 19/1 n'est admise. De même, le type de connecteur et le nombre de connexions admis ne sont pas définis.

A.4.4.3.4 Connexions et épissures de câblage à fibres optiques pour les CP reposant sur Ethernet

Non applicable.

A.4.4.3.5 Connexions et épissures de câblage à fibres optiques pour les CP ne reposant pas sur Ethernet

Non applicable.

A.4.4.3.6 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

A.4.4.4 Terminaisons

A.4.4.4.1 Description commune

A.4.4.4.2 Exigences spécifiques pour les CP

Addition:

La valeur de la résistance des terminaisons doit être de $(130 \pm 6,5) \Omega$ (min. 1/2 W). Les terminaisons sont généralement installées sur le boîtier de connecteur de câble CP 19/1 et connectées au dispositif placé à l'extrémité du segment de réseau. La Figure A.8 représente la connexion de la terminaison dans le boîtier de connecteur de câble CP 19/1.

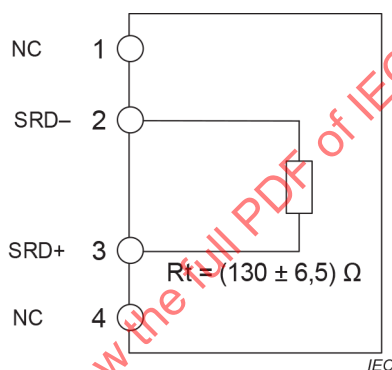


Figure A.8 – Connexion de la terminaison dans le boîtier de connecteur de câble

Le dispositif de réseau peut disposer d'une terminaison intégrée qui doit être installée à l'extrémité d'un segment de réseau.

A.4.4.4.3 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

A.4.4.5 Emplacement et connexion du dispositif

A.4.4.5.1 Description commune

A.4.4.5.2 Exigences spécifiques pour les CP

Non applicable.

A.4.4.5.3 Exigences spécifiques pour l'installation sans fil

Non applicable.

A.4.4.5.4 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

A.4.4.6 Codage et étiquetage**A.4.4.6.1 Description commune****A.4.4.6.2 Exigences supplémentaires pour les CP**

Non applicable.

A.4.4.6.3 Exigences spécifiques pour les CP

Non applicable.

A.4.4.6.4 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3**A.4.4.7 Mise à la terre et équipotentialité du matériel et des dispositifs et câblage blindé****A.4.4.7.1 Description commune****A.4.4.7.2 Équipotentialité et mise à la terre des enveloppes et des chemins****A.4.4.7.3 Méthodes de mise à la terre****A.4.4.7.4 Mise à la terre du blindage**

Non applicable.

A.4.4.7.4.1 Absence de mise à la terre ou RC parallèle

Non applicable.

A.4.4.7.4.2 Direct

Addition:

Le CP 19/1 exige une mise à la terre directe du blindage. Le blindage de communication d'un dispositif de CP 19/1 est généralement relié directement à la terre de protection du dispositif par le blindage du connecteur. Si le connecteur spécifique au CP 19/1 est utilisé, aucune autre mise à la terre du blindage n'est nécessaire.

A.4.4.7.5 Exigences spécifiques pour les CP

Non applicable.

A.4.4.7.6 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3**A.4.4.8 Stockage et transport des câbles****A.4.4.8.1 Description commune****A.4.4.8.2 Exigences spécifiques pour les CP**

Non applicable.

A.4.4.8.3 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

A.4.4.9 Acheminement des câbles

A.4.4.9.1 Description commune

A.4.4.9.2 Acheminement des câbles des assemblages

A.4.4.9.3 Exigences pour l'acheminement des câbles à l'intérieur des enveloppes

A.4.4.9.4 Acheminement des câbles à l'intérieur des bâtiments

A.4.4.9.5 Acheminement des câbles à l'extérieur des bâtiments et entre les bâtiments

A.4.4.9.6 Installation des câbles de communication redondants

Non applicable.

A.4.4.10 Séparation des circuits

A.4.4.11 Protection mécanique des composants de câblage

A.4.4.11.1 Description commune

A.4.4.11.2 Exigences spécifiques pour les CP

Non applicable.

A.4.4.11.3 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

A.4.4.12 Installation dans des zones particulières

A.4.4.12.1 Description commune

A.4.4.12.2 Exigences spécifiques pour les CP

Non applicable.

A.4.4.12.3 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

A.4.5 Documentation de planification du câblage

A.4.5.1 Description commune

A.4.5.2 Documentation de planification du câblage pour les CP

A.4.5.3 Documentation de certification du réseau

A.4.5.4 Documentation de planification du câblage relative au câblage générique conformément à l'ISO/IEC 11801-3

A.4.6 Vérification de la spécification de planification du câblage

A.5 Mise en œuvre de l'installation

A.5.1 Exigences générales

A.5.1.1 Description commune

A.5.1.2 Installation des CP

A.5.1.3 Installation du câblage générique dans des locaux industriels

A.5.2 Installation des câbles**A.5.2.1 Exigences générales relatives aux types de câblage****A.5.2.1.1 Stockage et installation****A.5.2.1.2 Protection des câbles de communication contre les éventuels dommages mécaniques**

Remplacement:

Le Tableau A.6 fournit des valeurs fondées sur le modèle du Tableau 18 de l'IEC 61918:2018.

Tableau A.6 – Paramètres pour câbles symétriques

Caractéristique		Valeur
Effort mécanique	Rayon minimal de courbure, une seule courbure (mm)	20
	Rayon de courbure, plusieurs courbures (mm)	— ^a
	Efforts de traction (N)	24
	Efforts de tension permanents (N)	13
	Forces latérales maximales (N/cm)	— ^a
	Plage de températures pendant l'installation (°C)	0 à 80
^a Selon le type de câble: voir la fiche technique du fabricant.		

A.5.2.1.3 Prévention de formation de boucles**A.5.2.1.4 Torsion****A.5.2.1.5 Résistance à la traction (des câbles installés)****A.5.2.1.6 Rayon de courbure****A.5.2.1.7 Force de traction****A.5.2.1.8 Ajustement du réducteur de tension****A.5.2.1.9 Installation des câbles dans l'armoire et les enveloppes****A.5.2.1.10 Installation sur des parties mobiles****A.5.2.1.11 Écrasement du câble****A.5.2.1.12 Installation des câbles de flexion continue****A.5.2.1.13 Instructions supplémentaires pour l'installation des câbles à fibres optiques**

Non applicable.

A.5.2.2 Installation et acheminement**A.5.2.2.1 Description commune****A.5.2.2.2 Séparation des circuits****A.5.2.3 Exigences spécifiques pour les CP**

Non applicable.

A.5.2.4 Exigences spécifiques pour l'installation sans fil

Non applicable.

A.5.2.5 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3

A.5.3 Installation de connecteur

A.5.3.1 Description commune

A.5.3.2 Connecteurs blindés

A.5.3.3 Connecteurs non blindés

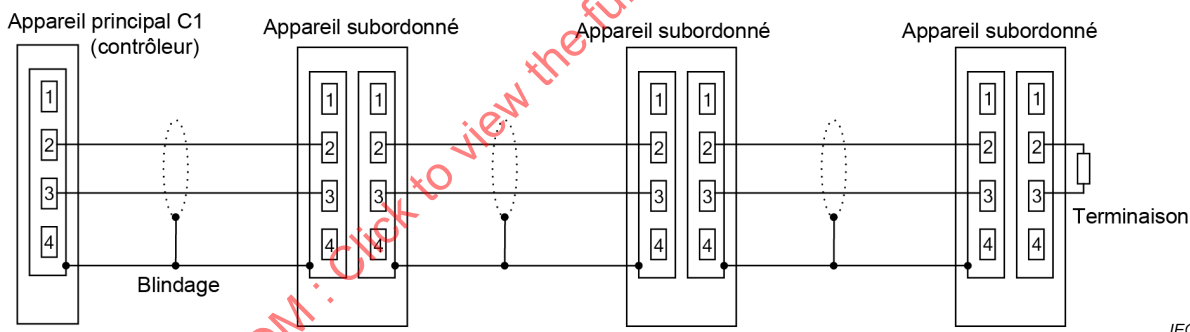
Non applicable.

A.5.3.4 Exigences spécifiques pour les CP

Addition:

La Figure A.9 représente un exemple de câblage. Voir la fiche technique du fabricant pour les instructions de montage du boîtier de connecteur M-II.

Les deux extrémités du réseau doivent être équipées d'une terminaison permettant de réduire la réflexion du signal. Si l'un des dispositifs d'extrémité (l'appareil principal C1 dans cet exemple) est équipé d'une terminaison intégrée, seule l'autre extrémité du réseau doit disposer d'une terminaison comme décrit à la Figure A.9.



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Figure A.9 – Exemple de câblage

Le Tableau A.7 présente l'affectation des broches et les codes de couleur du câblage pour le connecteur CP 19/1.

Tableau A.7 – Affectation des broches et codes de couleur du câblage pour le connecteur CP 19/1

Affectation des broches	Signal	Fonction	Code de couleur
1	NC	Non connecté	–
2	SRD-	Émission/réception données-	BK
3	SRD+	Émission/réception données+	RD
4	NC	Non connecté	–
Tresse de blindage	SH	Blindage	–

A.5.3.5 Exigences spécifiques pour l'installation sans fil

Non applicable.

A.5.3.6 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3**A.5.4 Installation des terminaisons****A.5.4.1 Description commune****A.5.4.2 Exigences spécifiques pour les CP**

Addition:

Les deux extrémités d'un segment de réseau doivent être équipées d'une terminaison spécifique au CP 19/1. Certains dispositifs peuvent avoir leur propre terminaison intégrée. Il doit être veillé à ce que seules les terminaisons aux deux extrémités du segment de réseau sont activées. La résistance de terminaison est généralement installée sur un connecteur M-II sans câble, comme représenté à la Figure A.10. Pour de plus amples informations sur le montage, voir la fiche technique du fabricant.



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Figure A.10 – Terminaison installée dans un connecteur de câble M-II

A.5.5 Installation du dispositif**A.5.5.1 Description commune****A.5.5.2 Exigences spécifiques pour les CP**

Non applicable.

A.5.6 Codage et étiquetage**A.5.6.1 Description commune****A.5.6.2 Exigences spécifiques pour les CP**

Non applicable.

A.5.7 Mise à la terre et équipotentialité du matériel et des dispositifs et câblage blindé

Le paragraphe 5.7.5 ne s'applique pas.

A.5.8 Documentation du câblage comme exécuté

A.6 Installation, vérification et essai de réception de l'installation

A.6.1 Généralités

A.6.2 Vérification de l'installation

A.6.2.1 Généralités

A.6.2.2 Vérification conformément à la documentation de planification du câblage

A.6.2.3 Vérification de la mise à la terre et de l'équipotentialité

A.6.2.3.1 Généralités

A.6.2.3.2 Exigences spécifiques relatives à la mise à la terre et à l'équipotentialité

Non applicable.

A.6.2.4 Vérification de la mise à la terre du blindage

A.6.2.5 Vérification du système de câblage

A.6.2.5.1 Vérification de l'acheminement de câbles

A.6.2.5.2 Vérification de la protection du câble et du réducteur de traction approprié

A.6.2.6 Vérification de la sélection du câble

A.6.2.6.1 Description commune

A.6.2.6.2 Exigences spécifiques pour les CP

Non applicable.

A.6.2.6.3 Exigences spécifiques pour l'installation sans fil

Non applicable.

A.6.2.7 Vérification du connecteur

A.6.2.7.1 Description commune

A.6.2.7.2 Exigences spécifiques pour les CP

Non applicable.

A.6.2.7.3 Exigences spécifiques pour l'installation sans fil

Non applicable.

A.6.2.8 Vérification de la connexion

A.6.2.8.1 Description commune

A.6.2.8.2 Nombre de connexions et de connecteurs

A.6.2.8.3 Table de correspondance des fils

A.6.2.9 Vérification des terminaisons**A.6.2.9.1 Description commune****A.6.2.9.2 Exigences spécifiques pour les CP**

Non applicable.

A.6.2.10 Vérification du codage et de l'étiquetage**A.6.2.10.1 Description commune****A.6.2.10.2 Exigences spécifiques de vérification du codage et de l'étiquetage**

Non applicable.

A.6.2.11 Rapport de vérification**A.6.3 Essai de réception de l'installation****A.6.3.1 Généralités****A.6.3.2 Essai de réception du câblage reposant sur Ethernet****A.6.3.2.1 Validation du câblage symétrique de CP reposant sur Ethernet**

Non applicable.

A.6.3.2.2 Validation du câblage à fibres optiques des CP reposant sur Ethernet

Non applicable.

A.6.3.2.3 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3**A.6.3.3 Essai de réception du câblage ne reposant pas sur Ethernet****A.6.3.3.1 Câblage en cuivre pour les CP ne reposant pas sur Ethernet****A.6.3.3.1.1 Description commune****A.6.3.3.1.2 Exigences spécifiques relatives au câblage en cuivre des CP ne reposant pas sur Ethernet**

Non applicable.

A.6.3.3.2 Câblage à fibres optiques pour les CP ne reposant pas sur Ethernet

Non applicable.

A.6.3.3.3 Exigences spécifiques pour le câblage générique conformément à l'ISO/IEC 11801-3**A.6.3.4 Exigences spécifiques pour l'installation sans fil**

Non applicable.

A.6.3.5 Rapport d'essai de réception

A.7 Administration de l'installation

Le paragraphe 7.8 ne s'applique pas.

A.8 Maintenance et dépannage de l'installation

A.8.1 Généralités

A.8.2 Maintenance

A.8.3 Dépannage

A.8.4 Exigences spécifiques pour la maintenance et le dépannage

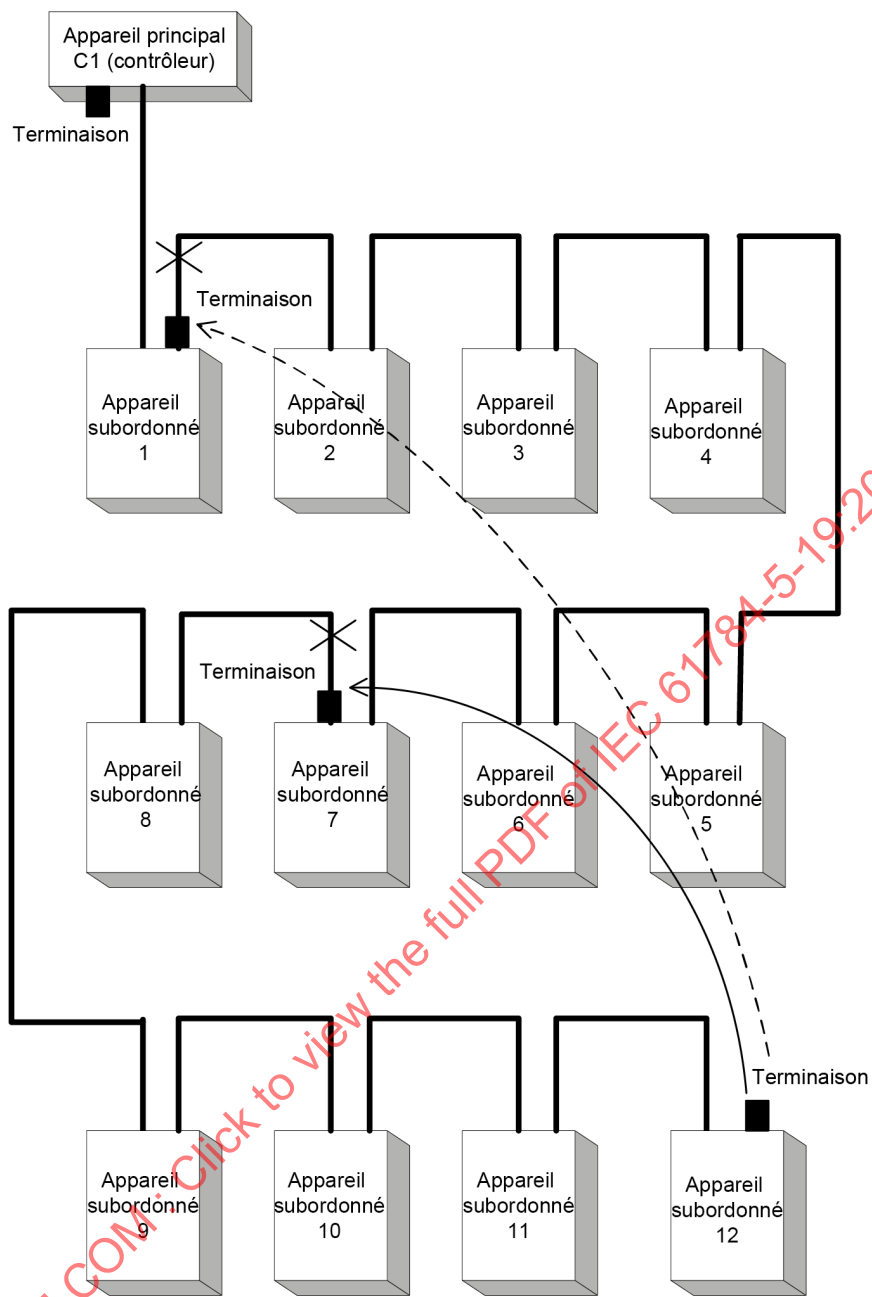
Addition:

Pour le réseau CP 19/1, des problèmes types sont donnés dans le Tableau A.8, qui complètent ceux du Tableau 22 de l'IEC 61918:2018.

Tableau A.8 – Problèmes types dans un réseau à câblage symétrique

Problème	Cause la plus probable	Action corrective
Erreurs de communication au niveau du dispositif subordonné spécifique	Défaillance du dispositif subordonné et pas d'erreur sur la ligne de communication	Remplacer le dispositif subordonné
Erreurs de communication au niveau de tous les dispositifs subordonnés connectés après un dispositif subordonné spécifique	Déconnexion du câble juste après le dispositif subordonné spécifique	Remplacer le câble
	Insertion incorrecte du connecteur de câble	Insérer le connecteur de câble solidement
Erreurs de communication au niveau du dispositif subordonné aléatoire	Défaillance du dispositif subordonné ou du câble	Localiser le dispositif, le câble ou la connexion défectueux et le remplacer
	Défaillance de la terminaison	Insérer la terminaison solidement ou la remplacer
	Influence CEM d'un autre dispositif	Vérifier et réduire le bruit dans le système
Erreurs de communication au niveau d'un dispositif aléatoire ou d'un dispositif spécifique durant de quelques minutes à plusieurs heures après démarrage du système	Dysfonctionnement dû à une élévation de la température ambiante	Corriger la condition thermique du dispositif défectueux ou le remplacer

Le CP 19/1 utilise une topologie en bus linéaire en cascade. Par conséquent, la défaillance d'un appareil subordonné ou d'un câble engendre des erreurs de communication sur les appareils subordonnés successifs. Afin de localiser le dispositif défectueux, diviser le segment de réseau en déplaçant la position de la terminaison, comme représenté à la Figure A.11. Si le segment divisé présente encore une erreur de communication, cela signifie que le dispositif ou le câble défectueux est toujours inclus dans ce segment. Diviser de nouveau ce segment jusqu'à localiser le dispositif défectueux incriminé.



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Figure A.11 – Division d'un segment de réseau par déplacement de la position de la terminaison