

INTERNATIONAL STANDARD

NORME INTERNATIONALE



AMENDMENT 1
AMENDEMENT 1

iTeh STANDARD

Industrial communication networks – Installation of communication networks in industrial premises

(standards.iteh.ai)

Réseaux de communication industriels – Installation de réseaux de communication dans des locaux industriels

[IEC 61918:2018/AMD1:2022](https://standards.iteh.ai/catalog/standards/sist/372a68d2-9f27-4746-9f09-f1db3a2f9468/iec-61918-2018-amd1-2022)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**INDUSTRIAL COMMUNICATION NETWORKS – INSTALLATION OF
COMMUNICATION NETWORKS IN INDUSTRIAL PREMISES**

AMENDMENT 1

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Amendment 1 to IEC 61918:2018 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

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

Draft	Report on voting
65C/1141/FDIS	65C/1162/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 Amendment 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/standardsdev/publications/.

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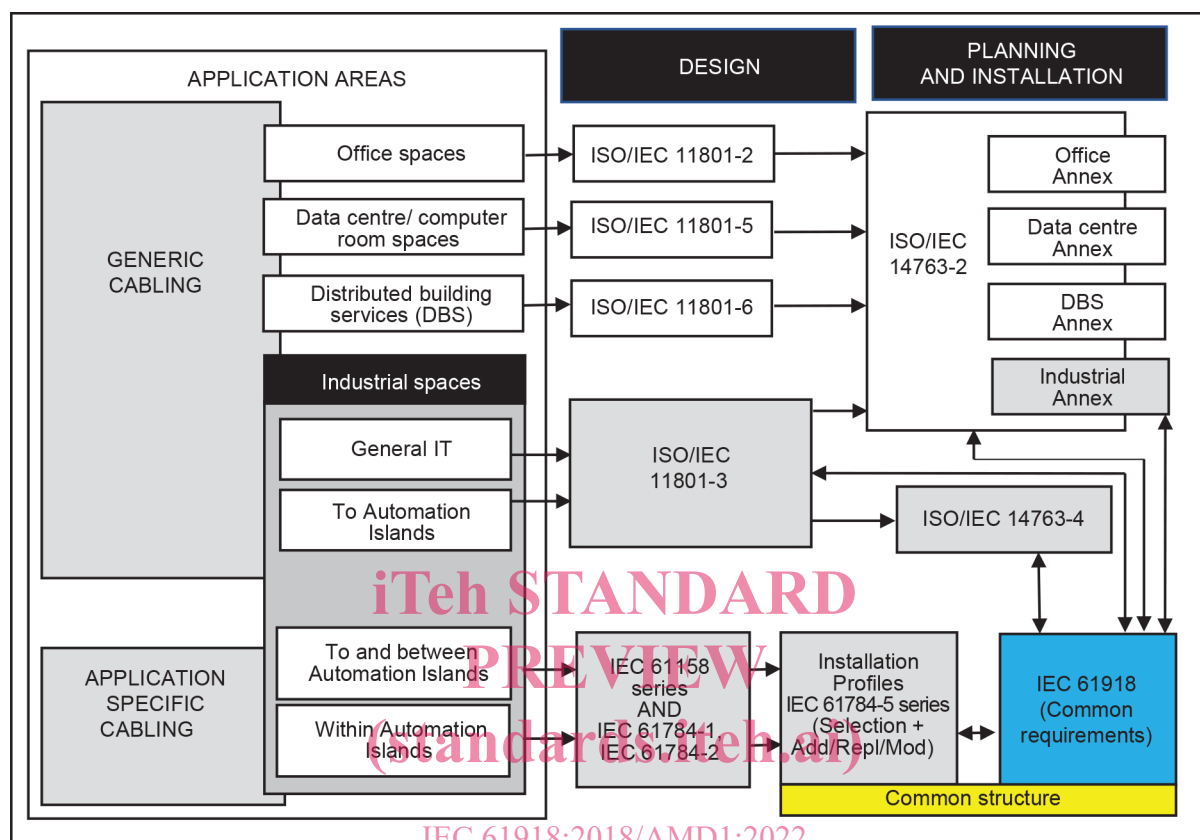
INTRODUCTION to Amendment 1

This Amendment 1 describes the installation in the critical environment of industrial premises of balanced 1-pair networks that use cabling in connection with Ethernet specified in 1000BASE-T1 type A, which allows bidirectional signal transmission at 1 000 Mbit/s up to 15 m, 1000BASE-T1 type B for 1 000 Mbit/s up to 40 m, 100BASE-T1 for 100 Mbit/s up to 15 m, 10BASE-T1S for 10 Mbit/s up to 15 m, 10BASE-T1L for 10 Mbit/s up to 1 000 m.

These balanced 1-pair networks use the industrial versions of 1 000 Mbit/s and 100 Mbit/s ISO/IEC/IEEE 8802-3:2021, and 10 Mbit/s IEEE Std 802.3cg networks.

INTRODUCTION

Replace Figure 2 with the following updated figure.



IEC 61918:2018/AMD1:2022
<https://standards.iteh.ai/catalog/standards/sist/372a68d2-9f27-4746-9f09-f1db3a2f9468/iec-61918-2018-amd1-2022>
Figure 2 – Standards relationships

2 Normative references

Delete the following normative references:

IEC 61935-1:2015, *Specification for the testing of balanced and coaxial information technology cabling – Part 1: Installed balanced cabling as specified in ISO/IEC 11801 and related standards*

ISO/IEC 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Standard for Ethernet*

Add the following normative references:

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61010-2-201, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-201: Particular requirements for control equipment*

IEC 61010-2-203:—¹, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-203: Particular requirements for industrial communication circuits and communication port interconnection*

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

IEC 61156-11, *Multicore and symmetrical pair/quad cables for digital communications – Part 11: Symmetrical single pair cables with transmission characteristics up to 600 MHz – Horizontal floor wiring – Sectional specification*

IEC 61156-12, *Multicore and symmetrical pair/quad cables for digital communications – Part 12: Symmetrical single pair cables with transmission characteristics up to 600 MHz – Work area wiring – Sectional specification*

IEC 61935-1:2019, *Specification for the testing of balanced and coaxial information technology cabling – Part 1: Installed balanced cabling as specified in ISO/IEC 11801-1 and related standards*

IEC 61935-1-1:2019, *Specification for the testing of balanced and coaxial information technology cabling – Part 1-1: Additional requirements for the measurement of transverse conversion loss and equal level transverse conversion transfer loss*

IEC 63171-6, *Connectors for electrical and electronic equipment – Part 6: Detail specification for 2-way and 4-way (data/power), shielded, free and fixed connectors for power and data transmission with frequencies up to 600 MHz*

ISO/IEC/IEEE 8802-3:2021, *Telecommunications and exchange between information technology systems – Requirements for local and metropolitan area networks – Part 3: Standard for Ethernet*

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1171/AMD1:2021, *Amendment 1 – Information technology – Generic cabling for customer premises – Part 3: Industrial premises*

IEEE Std 802.3cg, *IEEE Standard for Ethernet – Amendment 5, Physical Layer Specifications and Management Parameters for 10 Mb/s Operation and Associated Power Delivery over a Single Balanced Pair of Conductors*

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

Replace, in the boilerplate paragraph, "ISO/IEC 8802-3" with "ISO/IEC/IEEE 8802-3:2021".

Add the following new terms and definitions from 3.1.87 to 3.1.92:

3.1.87

balanced 1-pair cable

cable consisting of a single pair of conductors, optional screen, and overall jacket, primarily intended for use in differential-mode signal transmission and power delivery applications

[SOURCE: ISO/IEC TR 11801-9906:2020, 3.1.2]

¹ Under preparation. Stage at the time of publication: IEC/ACDV 61010-2-203:2021.

3.1.88

balanced 1-pair cabling

cabling composed of balanced 1-pair cables and balanced 1-pair connectors

3.1.89

balanced 1-pair cabling channel

transmission path between equipment constructed from balanced 1-pair cables, balanced 1-pair connectors and balanced 1-pair cable assemblies to facilitate signal and power delivery

[SOURCE: ISO/IEC 11801-3:2017/AMD1:2021, 3.1.14]

3.1.90

balanced 1-pair connector

connector intended for use with balanced 1-pair cable in differential-mode signal transmission and power delivery applications

[SOURCE: ISO/IEC TR 11801-9906:2020, 3.1.3]

3.1.91

balanced 1-pair cord

cable assembly constructed from a 1-pair cable and 1-pair connectors

[SOURCE: ISO/IEC TR 11801-9906:2020, 3.1.4]

3.1.92

edge distributor

optional additional distributor to accommodate active equipment to allow transition from balanced 4-pair cabling to balanced 1-pair cabling

[SOURCE: ISO/IEC 11801-3:2017/AMD1:2021, 3.1.15]

IEC 61918:2018/AMD1:2022
<https://standards.iteh.ai/catalog/standards/sist/372a68d2-0827-4746-9f09-f1db3a2f9468/iec-61918-2018-amd1-2022>

3.2 Abbreviated terms

Add the following abbreviated terms:

ED edge distributor

PHY physical layer

4 Installation planning

4.1.2 Cabling in industrial premises

Add, at the end of the first bullet of the first list, the following text:

, this includes the balanced 1-pair cablings that are specified in Annex Q;

Add, at the end of the third paragraph, the following text:

The industrial cabling may include an edge distributor to accommodate active equipment to allow transition from balanced 4-pair cabling to balanced 1-pair cabling.

Replace, in the second bullet of the second list, "(ISO/IEC 8802-3)" with "(ISO/IEC/IEEE 8802-3:2021 and IEEE Std 802.3cg)".

4.1.3 The planning process

Replace, in the first dash of the first bullet, "IEC 60950-1" with "IEC 61010-2-201".

4.2.1.2 Electrical safety

Add ", IEC 61010-2-203" after "IEC 61010-2-201".

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

Add, before Figure 7, the following sentence:

The planner, when consulting the device and cabling manufacturer, shall take into account the guidance provided in Clause B.6 for the correct selection of the device and cabling in relation to the environment EMI of the installation under consideration.

4.3.2.1 General

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

Media types consist of optical fibre cabling, balanced cabling (4-pair, 2-pair, 1-pair), wireless, and other CP specific media types. Wireless network installation is not within the scope of this document. Selection of physical media technologies should partner with architectural considerations, taking into account network topology, network characteristics, as well as data propagation and aggregation throughout the network.

Optical fibre is generally recommended where high bandwidth is needed or a high data integrity is required. Where powering is required or for reduced bandwidth or length compared to optical fibre, wire cabling is recommended. 4-pair is mostly recommended for connecting control and automation equipment. 1-pair (see Annex Q) is mostly limited to connecting control and automation equipment with field devices.

The planner should take into account EMI performance when selecting cabling types and spacings from types of conductors. In practice, need for EMI reduction equates to increase in spacing, which can translate to installation cost. Failure to consider EMI performance and mitigations can ultimately lead to areas of high disturbance at critical points in the network.

Comparative measurements (unshielded versus shielded) have shown that shielded constructions can provide a higher level of protection against EMI when applied according to equipment manufacturers specifications.

4.3.2.3 Network characteristics for balanced cabling based on Ethernet

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

For balanced 1-pair networks, the requirements specified in Annex Q apply.

4.4.1.2.1 Balanced cables for Ethernet-based CPs

Add, after the first sentence, the following text:

For balanced 1-pair cables, the requirements specified in Annex Q apply.

Replace, in the fourth bullet, "cabling that uses mixed 2 and 4 pair cable elements in the same channel" with "cabling that uses cable elements with a different pair count in the same channel (e.g., 2- and 4-pair or 1- and 4-pair),"

Delete the NOTE after the fourth bullet.

4.4.2.2 Connecting hardware for balanced cabling CPs based on Ethernet

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

For balanced 1-pair connecting hardware the requirements specified in Annex Q apply.

4.4.3.1 Common description

Add, at the end of the first sentence of the fifth paragraph, the following text:

for 4-pair cabling. For 1-pair cabling, the requirements specified in Annex Q apply.

Replace, at the end of the second sentence of the fifth paragraph, "are limited to 4. If the planning requires more than 4 connections," with "have a limited number of connections (e.g., 4 for 4-pair and 10 for 1-pair). If the planning requires more connections than the corresponding reference implementation,"

4.4.3.2.1 Common description

Change title of item a) to: "a) 4-pair basic reference implementation"

Change title of item b) to: "b) 4-pair enhanced reference implementation"

Add, after item c) the following new item:

d) Balanced 1-pair cabling

For balanced 1-pair cabling connections, the requirements specified in Annex Q apply.

4.4.3.4.1 Common description

Replace, in the first paragraph, "ISO/IEC 8802-3" with "ISO/IEC/IEEE 8802-3:2021".

4.4.7.1.4 Selection of the earthing and bonding systems

Replace, in the first sentence of the last paragraph, "equipotential" with "mesh".

4.4.7.3.1 Equipotential

Replace the title of the subclause with "Mesh".

Replace, in the title of Figure 17, "an equipotential" with "a mesh".

5 Installation implementation

5.1.1 Common description

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

The requirements specified in this Clause 5 for the CPs also apply for the installation implementation of balanced 1-pair networks specified in Annex Q.

Additional requirements are specified in Clause Q.3.

6 Installation verification and installation acceptance test

6.1 General

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

The requirements specified in this Clause 6 for the CPs also apply for the installation implementation of balanced 1-pair networks specified in Annex Q.

Additional requirements for balanced 1-pair network are specified in Clause Q.4.

6.2.8.3 Wire mapping

Replace, in the first paragraph of this subclause, "5.3.2.2 of IEC 61935-1:2015" with "5.3.3.2 of IEC 61935-1:2019.

Add, after Figure 45 the following sentence:

For balanced 1-pair applications, the requirements specified in Q.4.2 apply.

6.3.2.1.2 Transmission performance test parameters

Replace, in the first paragraph, "IEC 61935-1:2015" with "IEC 61935-1:2019 and IEC 61935-1-1:2019"

Add, after the last item l), the following new items:

- m) Unbalance attenuation, near-end (TCL)
- n) Unbalance attenuation, far-end (ELTCTL)

Add, after new items m) and n), the following new paragraph:
Items m) and n) above apply where requirements are given in the relevant CP.

8 Installation maintenance and installation troubleshooting

8.3.3 Typical problems

Add, after the first paragraph, the following text:

When troubleshooting unshielded installations, EMC influence can be quantified through field-testing of TCL and ELTCTL transmission parameters. If needed, noise impact reduction may be achieved by identification of at-risk components and selection of replacement components with superior performance.

Annex B MICE description methodology

B.4 Determining E classification

Replace Table B.3 with the following new table:

Table B.3 – Relationship between electromagnetic disturbance-generating devices and “E” classification

Electromagnetic disturbance-generating device	Distance from cabling	“E” classification
Contactor relay	< 0,5 m	E ₂
	> 0,5 m	E ₁
Transmitters (< 1 W)	< 0,5 m	E ₃
	> 0,5 m	E ₁ or E ₂
Transmitters (1 W to 3 W)	< 1,0 m	E ₃
	≥ 1,0 m	E ₁ or E ₂
Transmitters (TV, radio, mobile, base station)	< 3 km	E ₃
	> 3 km	E ₁ or E ₂
High power motors	< 3 m	E ₃
	> 3 m	E ₁ or E ₂
Motor controllers	< 0,5 m	E ₃
	0,5 m to 3 m	E ₂
	> 3 m	E ₁
Induction heating < 8 MW	< 0,5 m	E ₃
	0,5 m to 3 m	E ₂
	> 3 m	E ₁
Resistance heating	< 0,5 m	E ₂
	> 0,5 m	E ₁
Fluorescent lights	< 0,15 m	E ₃
	> 0,15 m	E ₁ or E ₂
Thermostatic switches 110 V to 230 V	< 0,5 m	E ₂ or E ₃
	> 0,5 m	E ₁

Add, after Clause B.5, the following new clause:

B.6 Communication devices and cabling considerations

B.6.1 General

The planner should consult the device and cabling manufacturer regarding correct selection of the device and cabling for the application under consideration.

The impact of industrial environment EMI on the communication network could result in incorrect reconstruction of the signal at the receiver.

The requirements specified in Clause 4, Clause 5 and Clause 6 fully clarify the mitigation measures to be used for the cabling. In this Annex B, some additional clarifications are provided in regard to the selection of the proper communication devices and cabling.

Communication devices are available with different constructions in order to serve a large range of different applications. The most critical impact of the industrial environment EMI on the devices is the saturation of the device physical layer interface with the cabling, which happens when the common mode (CM) voltage tolerance of the devices is less than the impact of the conducted disturbances.

Typically, the level of the CM voltage tolerance of a device depends on the performance of the device interface with the cabling.

B.6.2 Device types

From the point of view of the enhanced device interface immunity, the communication devices may be grouped in two types.

a) Devices type 1

Figure B.8 and Figure B.9 show the structures of the device type 1 interfaces.

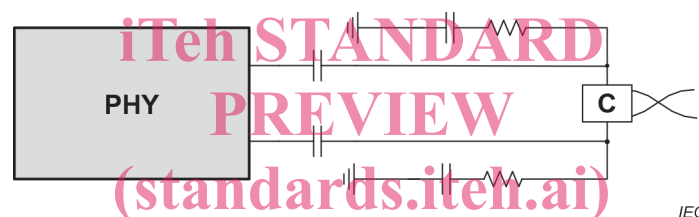


Figure B.8 – Communication device interface with limited EMI immunity

All the devices having type 1 interface, if associated with shielded cabling whose CA is at least 60 dB, can provide a compatibility with electromagnetic interferences up to the E3.

The use of unshielded cabling is not recommended in combination with devices type 1 for environments E2 and E3. In fact, these resulting combinations would require the use of costly and complex additional mitigation measures (see Clause 4 and Clause 5).

NOTE 1 All communication device interface figures only show the interface of the master device. The same interface is used at the field device, to prevent the saturation effect also on this side.

NOTE 2 It is possible to assess coupling attenuation by laboratory measurements of representative samples of channels assembled using their component and connector practices.