# IEC 61784-5-15

Edition 1.0 2010-07

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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## Industrial communication networks – Profiles – Part 5-15: Installation of fieldbuses – Installation profiles for CPF 15

## Réseaux de communication industriels – Profils – Partie 5-15: Installation de bus de terrain – Profils d'installation pour CPF 15

IEC 61784-5-15:2010

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# INDUSTRIAL COMMUNICATION NETWORKS – PROFILES –

## Part 5-15: Installation of fieldbuses – Installation profiles for CPF 15

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International Standard IEC 61784-5-15 has been prepared by subcommittee 65C: Industrial networks, of IEC technical committee 65: Industrial-process measurement, control and automation.

This standard is to be used in conjunction with IEC 61918:2010.

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This bilingual version (2012-02) corresponds to the monolingual English version, published in 2010-07.

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

| FDIS | Report on voting |
|---|---|
| 65C/602/FDIS | 65C/616/RVD |

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61784-5 series, published under the general title *Industrial communication networks – Profiles – Installation of fieldbuses*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
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# INTRODUCTION

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

IEC 61918:2010 provides the common requirements for the installation of communication networks in industrial control systems. This installation profile standard provides the installation profiles of the communication profiles (CP) of a specific communication profile family (CPF) by stating which requirements of IEC 61918 fully apply and, where necessary, by supplementing, modifying, or replacing the other requirements (see Figure 1).

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

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

The provision of the installation profiles in one standard for each CPF (for example IEC 61784-5-15 for CPF 15), allows readers to work with standards of a convenient size.

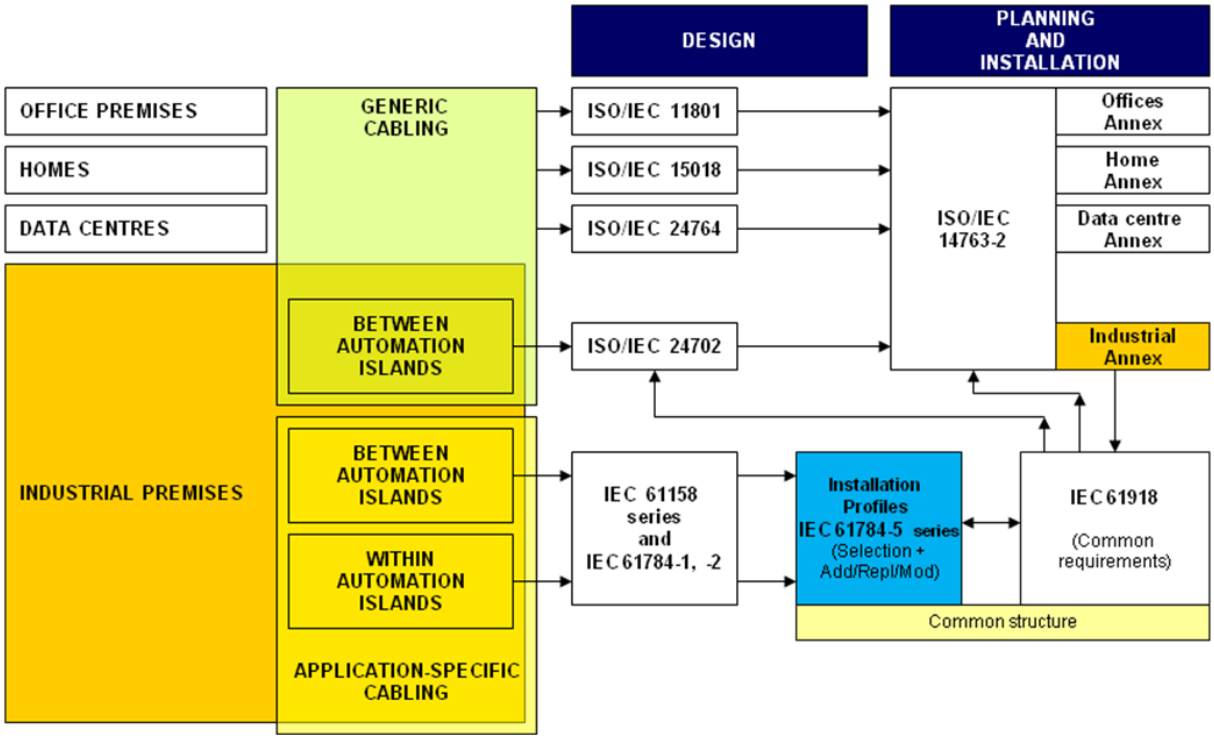


**Figure 1 – Standards relationships**

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# INDUSTRIAL COMMUNICATION NETWORKS – PROFILES –

## Part 5-15: Installation of fieldbuses – Installation profiles for CPF 15

## 1 Scope

This part of IEC 61784 specifies the installation profiles for CPF 15/1 (MODBUS™-TCP)[1] and CPF 15/2 (RTPS).

The installation profiles are specified in the annex. This annex is read in conjunction with IEC 61918:2010.

## 2 Normative references

The following referenced documents are indispensable for the application 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 61918:2010, *Industrial communication networks – Installation of communication networks in industrial premises*

The normative references of IEC 61918:2010, Clause 2, apply. For profile specific normative references, see Clause A.2.

## 3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms, definitions and abbreviated terms of IEC 61918:2010, Clause 3, apply. For profile specific terms, definitions and abbreviated terms see Clause A.3.

## 4 CPF 15: Overview of installation profiles

CPF 15 consists of two communication profiles as specified in IEC 61784-2.

The installation requirements for CP 15/1 (MODBUS TCP) and CP 15/2 (MODBUS with RTPS) are identical and are specified in Annex A.

## 5 Installation profile conventions

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

---

[1] MODBUS is a trademark of Schneider Automation Inc. registered in the United States of America and other countries. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trademark MODBUS. Use of the trademark MODBUS requires permission from Schneider Automation Inc.

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The annex clauses and subclauses of this standard 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 standard, the subclause of I IEC 61918 applies without modification.

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

EXAMPLE "Annex B.4.4" in IEC 61784-5-3 means that CP 3/2 specifies the Subclause 4.4 of IEC 61918.

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

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

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

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

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

NOTE A replacement can also comprise additions.

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

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

## 6 Conformance to installation profiles

Each installation profile within this standard includes part of IEC 61918:2010. It may also include defined additional specifications.

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

Compliance to IEC 61784-5-15:2010[3] for CP 15/ <name> or

Compliance to IEC 61784-5-15 (Ed.2.0) for CP 15/m<name>

where the name within the angle brackets < > is optional and the angle brackets are not to be included. The m within CP 15/m shall be replaced by the profile number 1 or 2.

NOTE The name may be the name of the profile, for example MODBUS™-TCP.

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

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2 In accordance with ISO/IEC Directives

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

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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 15/1 (MODBUS™-TCP) and CP 15/2 (RTPS) specific installation profile

## A.1 Installation profile scope

*Addition:*

This standard specifies the installation profile for Communication Profile CP 15/1 (MODBUS™-TCP) and CP15/2 (RTPS). The CP15/1 and CP15/2 are specified in IEC 61784-2.

## A.2 Normative references

*Addition:*

IEC 60793-2-50:2008, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single–mode fibres*

IEC 60793-2-10:2007, *Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres*

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

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

### A.3.1 Terms and definitions

### A.3.2 Abbreviated terms

*Addition:*

| | |
|---|---|
| MMF | Multi Mode Fibre |
| SMF | Single Mode Fibre |
| RTPS | Real Time Publisher Subscriber |

### A.3.3 Conventions for installation profiles

Not applicable.

## A.4 Installation planning

### A.4.1 Introduction

Subclause 4.1.4 is not applicable.

### A.4.2 Planning requirements

#### A.4.2.1 Safety

Subclause 4.2.1.4 is not applicable

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#### A.4.2.2 Security

#### A.4.2.3 Environmental considerations and EMC

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

### A.4.3 Network capabilities

#### A.4.3.1 Network topology

##### A.4.3.1.1 Common description

##### A.4.3.1.2 Basic physical topologies for passive networks

Not applicable.

##### A.4.3.1.3 Basic physical topologies for active networks

##### A.4.3.1.4 Combination of basic topologies

*Replacement*: The combination of basic topologies is permitted.

Figure A.1 provides an example for three daisy chain lines coupled to a star topology.

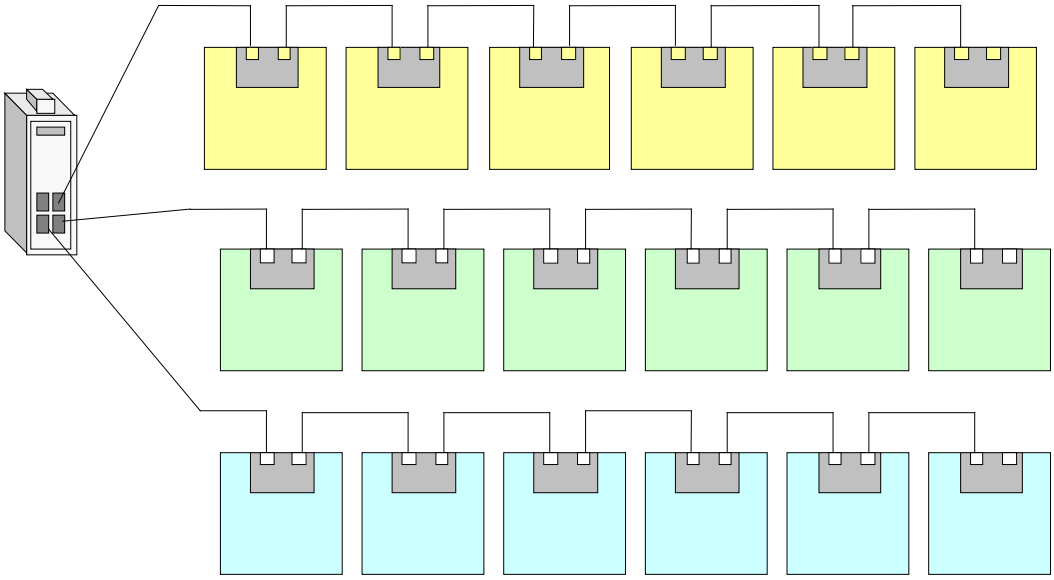

**Figure A.1 – Combined basic topologies**

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#### A.4.3.1.5 Specific requirements for CPs

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

### A.4.3.2 Network characteristics

#### A.4.3.2.1 General

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

Not applicable.

#### A.4.3.2.3 Network characteristics for balanced cabling based on Ethernet

*Replacement*:

Table A.1 provides values based on the template given in IEC 61918:2010, Table 2.

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

| Characteristic | CP 15/1, CP15/2 |
|---|---|
| Supported data rates (Mbit/s) | 10/100 |
| Supported channel length (m) [b] | 100 |
| Number of connections in the channel (max.) [a] [b] | 6 |
| Patch cord length (m) [a] | 100 |
| Channel class per ISO/IEC 24702 (min.) [b] | D |
| Cable category per ISO/IEC 24702 (min.) [c] | 5 |
| Connecting HW category per ISO/IEC 24702 (min.) | 5 |
| Cable types | Application dependent |
| [a] See 4.4.3.2.<br>[b] For the purpose of this table the channel definitions of ISO/IEC 24702 are applicable.<br>[c] For additional information see IEC 61156 series. | |

#### A.4.3.2.4 Network characteristics for optical fibre cabling

*Replacement*:

Table A.2 provides values based on the template given in IEC 61918:2010, Table 3.

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**Table A.2 – Network characteristics for optical fibre cabling**

| CP 15/1, CP15/2 | | |
|---|---|---|
| **Optical fibre type** | **Description** | |
| Single mode silica | Standard | IEC 60793-2-50; Type B1 |
| | Nominal transmission wavelength $\lambda$ | 1 300 nm |
| | Attenuation coefficient at $\lambda$ | ≤ 0,5 dB/km |
| | Cut off wavelength | < 1 260 nm |
| | Alternative description | |
| | Mode field diameter (μm) | 9 … 10 |
| | Cladding diameter (μm) | 125 |
| | Minimum length (m) | 0 |
| | Maximum length (m) | 15 000 [a] |
| Multimode silica | Standard | IEC 60793-2-10; Type A1a, A1b |
| | Nominal transmission wavelength $\lambda$ | 1 300 nm |
| | Attenuation coefficient at $\lambda$ | ≤ 1,5 dB/km |
| | Modal bandwidth at $\lambda$ | 600 MHz × km |
| | Alternative description | |
| | Core diameter (μm) | 50 (A1a),<br>62,5 (A1b) |
| | Cladding diameter (μm) | 125 |
| | NA | 0,20 ± 0,02 at 50/125<br>0,275 ± 0,015 at 62,5/125 |
| | Minimum length (m) | 0 |
| | Maximum length (m) | 2 000 [a] |
| POF | Standard | IEC 60793-2-40; Type A4a2 |
| | Nominal transmission wavelength $\lambda$ | 650 nm |
| | Attenuation coefficient at $\lambda$ | ≤ 160 dB/km |
| | Modal bandwidth at $\lambda$ | 35 MHz × 100m |
| | Alternative description | |
| | Core diameter (μm) | 980 |
| | Cladding diameter (μm) | 1 000 |
| | NA | 0,5 ± 0,03 |
| | Minimum length (m) | 0 |
| | Maximum length (m) | 50 [a] |

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| CP 15/1, CP15/2 | | |
|---|---|---|
| **Optical fibre type** | **Description** | |
| Plastic clad silica | Standard | IEC 60793-2-30; Type A3c |
| | Nominal transmission wavelength $\lambda$ | 650 nm |
| | Attenuation coefficient at $\lambda$ | ≤ 10 dB/km |
| | Modal bandwidth at $\lambda$ | 70 MHz × km |
| | Alternative description | |
| | Core diameter (μm) | 200 |
| | Cladding diameter (μm) | 230 |
| | NA | 0,37 ± 0,04 |
| | Minimum length (m) | 0 |
| | Maximum length (m) | 100 [a] |
| [a] Depending on the manufacturer's specification and the optical budget, longer distances can be reached. | | |

#### A.4.3.2.5 Specific network characteristics

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

### A.4.4 Selection and use of cabling components

#### A.4.4.1 Cable selection

#### A.4.4.1.1 Common description

#### A.4.4.1.2 Copper cables

##### A.4.4.1.2.1 Balanced cables for Ethernet based CPs

*Replacement*:

Table A.3, Table A.4 and Table A.5 provide values based on the template given in IEC 61918:2010, Table 4.

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

| Characteristic | CP 15/1, CP15/2 |
|---|---|
| Nominal impedance of cable (tolerance) | 100 Ω ± 15 Ω (IEC 61156-5) |
| DCR of conductors | ≤ 90 Ω/km |
| DCR of shield | ≤ 60 Ω/km |
| Number of conductors | 4 and 8 [a] |
| Shielding | S/FTP, S/FTQ, S/STP |
| Colour code for conductor | OG/WH, GN/WH (BU/WH, BN/WH) [b] |
| Jacket colour requirements | GN (RAL 6018) |
| Jacket material | Application dependent |
| Resistance to harsh environment (e.g. UV, oil resist, LS0H) | Application dependent |
| Transfer Impedance | < 50 mΩ/m at 10 MHz |

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