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Edition 1.0 2023-03

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

## Industrial networks – Profiles – Part 1-2: Fieldbus profiles – Communication Profile Family 2

## Réseaux industriels – Profils – Partie 1-2: Profils de bus de terrain – Famille de profils de communication 2



IEC 61784-1-2:2023-03(en-fr)



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## Industrial networks – Profiles – Part 1-2: Fieldbus profiles – Communication Profile Family 2

## Réseaux industriels – Profils – Partie 1-2: Profils de bus de terrain – Famille de profils de communication 2

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# CONTENTS

FOREWORD ..... 4
INTRODUCTION ..... 6
1 Scope ..... 7
2 Normative references ..... 7
3 Terms, definitions, abbreviated terms, symbols, and conventions ..... 9
3.1 Terms and definitions ..... 9
3.2 Abbreviations and symbols ..... 9
3.2.1 Common abbreviations and symbols ..... 9
3.2.2 Other abbreviations and symbols ..... 9
3.3 Conventions ..... 9
4 CPF 2 (CIP™) ..... 9
4.1 General overview ..... 9
4.2 CP 2/1 (ControlNet) ..... 10
4.2.1 Physical layer ..... 10
4.2.2 Data-link layer ..... 12
4.2.3 Application layer ..... 14
4.3 CP 2/2 (EtherNet/IP) ..... 17
4.3.1 Physical layer ..... 17
4.3.2 Data-link layer ..... 17
4.3.3 Application layer ..... 19
4.4 CP 2/3 (DeviceNet) ..... 25
4.4.1 Physical layer ..... 25
4.4.2 Data-link layer ..... 25
4.4.3 Application layer ..... 27
Annex A (informative) CPF 2 (CIP) communication concepts ..... 33
A.1 Overview ..... 33
A.2 CIP common characteristics ..... 33
A.3 ControlNet ..... 33
A.3.1 Physical layer characteristics ..... 33
A.3.2 Data-link layer characteristics ..... 34
A.3.3 Management characteristics ..... 34
A.4 EtherNet/IP ..... 34
A.5 DeviceNet ..... 35
Bibliography ..... 36

Table 1 – CPF 2: overview of profile sets ..... 10
Table 2 – CP 2/1: PhL selection ..... 11
Table 3 – CP 2/1: DLL service selection ..... 12
Table 4 – CP 2/1: DLL protocol selection ..... 13
Table 5 – CP 2/1: DLL protocol selection of management objects ..... 13
Table 6 – CP 2/1: AL service selection ..... 14
Table 7 – CP 2/1: AL protocol selection ..... 15
Table 8 – ClockIdentity encoding for CP 2/1 ..... 16
Table 9 – CP 2/2: DLL protocol selection ..... 18
Table 10 – CP 2/2: DLL protocol selection of management objects ..... 19

Table 11 – CP 2/2: AL service selection ..... 20
Table 12 – CP 2/2: AL protocol selection ..... 21
Table 13 – ClockIdentity encoding for CP 2/2 ..... 22
Table 14 – CP 2/2 implementation profiles ..... 23
Table 15 – Features Supported for Type 2 Ethernet Transports implementation profile ..... 23
Table 16 – Type 2 Ethernet transport profile supported Features ..... 24
Table 17 – Supported Encapsulation Commands for transport profiles ..... 24
Table 18 – CP 2/3: DLL protocol selection ..... 26
Table 19 – CP 2/3: DLL protocol selection of management objects ..... 26
Table 20 – CP 2/3: AL service selection ..... 27
Table 21 – CP 2/3: AL protocol selection ..... 28
Table 22 – Unconnected_Send request format (modified) ..... 29
Table 23 – Unconnected_Send_Good response format (modified) ..... 30
Table 24 – Unconnected_Send_Bad response format (modified) ..... 30
Table 25 – ClockIdentity encoding for CP 2/3 ..... 31
Table 26 – Additional values of the state attribute ..... 31
Table 27 – Additional value of the watchdog_timeout_action attribute ..... 31

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# INDUSTRIAL NETWORKS – PROFILES –

## Part 1-2: Fieldbus profiles – Communication Profile Family 2

## FOREWORD

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NOTE Combinations of protocol types are specified in the IEC 61784-1 series and the IEC 61784-2 series.

IEC 61784-1-2 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 first edition, together with the other parts of the same series, cancels and replaces the fifth edition of IEC 61784-1 published in 2019. This first edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 61784-1:2019:

a) split of the original IEC 61784-1 into several subparts, one subpart for the material of a generic nature, and one subpart for each Communication Profile Family specified in the original document;

b) addition of two DLL protocol management objects;

c) addition of profile information removed from the Type standards.

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

| Draft | Report on voting |
|---|---|
| 65C/1207/FDIS | 65C/1236/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 the IEC 61784-1 series, published under the general title *Industrial networks – Profiles – Part 1: Fieldbus profiles*, 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,
- replaced by a revised edition, or
- amended.

# INTRODUCTION

The IEC 61784-1 series provides a set of Communication Profiles (CP) in the sense of ISO/IEC TR 10000-1. These answer the need of identifying the protocol families co-existing within the IEC 61158 series, as a result of the international harmonization of fieldbus technologies available on the market. More specifically, these profiles help to correctly state the compliance with the IEC 61158 series, and to avoid the spreading of divergent implementations, which would limit its use, clearness and understanding. Additional profiles to address specific market concerns, such as functional safety or information security, can be addressed by future parts of the IEC 61784-1 series.

The IEC 61784-1 series contains several Communication Profile Families (CPF), which specify one or more communication profiles. Such profiles identify, in a strict sense, protocol subsets of the IEC 61158 series via protocol specific communication profiles. They do not define device profiles that specify communication profiles together with application functions needed to answer the need of a specific application ("application profiles").

It is agreed that these latter classes of profiles would facilitate the use of the IEC 61158 series of standards; the profiles defined in the IEC 61784-1 series are a necessary step to achieve that task.

It is also important to clarify that interoperability – defined as the ability of two or more network systems to exchange information and to make mutual use of the information that has been exchanged (see ISO/IEC TR 10000-1) – can be directly achieved on the same link only for those devices complying with the same communication profile.

Profiles contained in the IEC 61784-1 series are constructed of references to IEC 61158-2 and the IEC 61158-3, IEC 61158-4, IEC 61158-5 and IEC 61158-6 series, and other IS, TS or worldwide-accepted standards, as appropriate[1]. Each profile is required to reference at least one part of the IEC 61158 series in addition to IEC 61158-1.

Two or more Profiles, which are related to a common family, are specified within a "Communication Profile Family" (CPF).

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[1] International Standardised Profiles may contain normative references to specifications other than International Standards; see ISO/IEC JTC 1 N 4047: *The Normative Referencing of Specifications other than International Standards in JTC 1 International Standardized Profiles – Guidelines for ISP Submitters*.

# INDUSTRIAL NETWORKS – PROFILES –

# Part 1-2: Fieldbus profiles – Communication Profile Family 2

## 1 Scope

This part of IEC 61784-1 defines Communication Profile Family 2 (CPF 2). CPF 2 specifies a set of protocol specific communication profiles (CPs) based on the IEC 61158 series (Type 2) and other standards, to be used in the design of devices involved in communications in factory manufacturing and process control.

NOTE 1 All CPs are based on standards or draft standards or International Standards published by the IEC or on standards or International Standards established by other standards bodies or open standards processes.

NOTE 2 Some CPs of CPF 2 are specified in IEC 61784-2-2.

Each CP selects an appropriate consistent and compatible subset of services and protocols from the relevant set that is defined and modelled in the IEC 61158 series. For the selected subset of services and protocols, the profile also describes any possible or necessary constraints in parameter values.

## 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.

NOTE All parts of the IEC 61158 series, as well as the IEC 61784-1 series and the IEC 61784-2 series are maintained simultaneously. Cross-references to these documents within the text therefore refer to the editions as dated in this list of normative references.

IEC 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

IEC 61158-2:2023, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 61158-3-2:2023, *Industrial communication networks – Fieldbus specifications – Part 3-2: Data-link layer service definition – Type 2 elements*

IEC 61158-4-2:2023, *Industrial communication networks – Fieldbus specifications – Part 4-2: Data-link layer protocol specification – Type 2 elements*

IEC 61158-5-2:2023, *Industrial communication networks – Fieldbus specifications – Part 5-2: Application layer service definition – Type 2 elements*

IEC 61158-6-2:2023, *Industrial communication networks – Fieldbus specifications – Part 6-2: Application layer protocol specification – Type 2 elements*

IEC 61588:2021, *Precision clock synchronization protocol for networked measurement and control systems*

IEC 61784-1-0:2023, *Industrial networks – Profiles – Part 1-0: Fieldbus profiles – General concepts and terminology*

IEC 61784-5-2, *Industrial communication networks – Profiles – Part 5-2: Installation of fieldbuses – Installation profiles for CPF 2*

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

IEC 62026-3, *Low-voltage switchgear and controlgear – Controller-device interfaces (CDIs) – Part 3: DeviceNet*

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

ISO 11898-1, *Road vehicles – Controller area network (CAN) – Part 1: Data link layer and physical signalling*

ISO 11898-2, *Road vehicles – Controller area network (CAN) – Part 2: High-speed medium access unit*

IETF RFC 768, J. Postel, *User Datagram Protocol*, August 1980, available at https://www.rfc-editor.org/info/rfc768 [viewed 2022-02-18]

IETF RFC 791, J. Postel, *Internet Protocol*, September 1981, available at https://www.rfc-editor.org/info/rfc791 [viewed 2022-02-18]

IETF RFC 792, J. Postel, *Internet Control Message Protocol*, September 1981, available at https://www.rfc-editor.org/info/rfc792 [viewed 2022-02-18]

IETF RFC 793, J. Postel, *Transmission Control Protocol*, September 1981, available at https://www.rfc-editor.org/info/rfc793 [viewed 2022-02-18]

IETF RFC 826, D. Plummer, *An Ethernet Address Resolution Protocol: Or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware*, November 1982, available at https://www.rfc-editor.org/info/rfc826 [viewed 2022-02-18]

IETF RFC 894, C. Hornig, *A Standard for the Transmission of IP Datagrams over Ethernet*, April 1984, available at https://www.rfc-editor.org/info/rfc894 [viewed 2022-02-18]

IETF RFC 1112, S.E. Deering, *Host Extensions for IP Multicasting*, August 1989, available at https://www.rfc-editor.org/info/rfc1112 [viewed 2022-02-18]

IETF RFC 1122, R. Braden, *Requirements for Internet Hosts – Communication Layers,* October 1989, available at https://www.rfc-editor.org/info/rfc1122 [viewed 2022-02-18]

IETF RFC 1123, R. Braden, *Requirements for Internet Hosts – Application and Support,* October 1989, available at https://www.rfc-editor.org/info/rfc1123 [viewed 2022-02-18]

IETF RFC 1127, R.T. Braden, *Perspective on the Host Requirements RFCs,* October 1989, available at https://www.rfc-editor.org/info/rfc1127 [viewed 2022-02-18]

IETF RFC 2236, W. Fenner, *Internet Group Management Protocol, Version 2*, November 1997, available at https://www.rfc-editor.org/info/rfc2236 [viewed 2022-02-18]

# 3 Terms, definitions, abbreviated terms, symbols, and conventions

## 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in the IEC 61158 series and IEC 61784-1-0 apply.

ISO and IEC maintain terminological 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

## 3.2 Abbreviations and symbols

### 3.2.1 Common abbreviations and symbols

For the purposes of this document, all abbreviations and symbols defined in the IEC 61158 series and IEC 61784-1-0 apply.

CP communication profile

CPF communication profile family

MAU medium attachment unit

### 3.2.2 Other abbreviations and symbols

CAN Controller Area Network (see ISO 11898-1)

IP internet protocol (see IETF RFC 791)

TCP terminal control protocol (see IETF RFC 793)

UDP user datagram protocol (see IETF RFC 768)

## 3.3 Conventions

For the purposes of this document, the conventions defined in IEC 61784-1-0 apply.

# 4 CPF 2 (CIP™[2])

## 4.1 General overview

Communication Profile Family 2 defines several communication profiles based on IEC 61158-2 (protocol type 2), IEC 61158-3-2, IEC 61158-4-2, IEC 61158-5-2, and IEC 61158-6-2, and on other standards. These profiles all share for their upper layers the same communication system commonly known as the Common Industrial Protocol (CIP).

This document defines three communication profiles.

1) Profile 2/1 ControlNet™[3]

   This profile contains a selection of AL, DLL and PhL services and protocol definitions from IEC 61158-2 type 2, IEC 61158-3-2, IEC 61158-4-2, IEC 61158-5-2, and IEC 61158-6-2.

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[2] CIP™ is a trade name of ODVA, Inc. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance with this profile does not require use of the trade name CIP™. Use of the trade name CIP™ requires permission of ODVA, Inc.

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