

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Industrial networks – Profiles –
Part 1-6: Fieldbus profiles – Communication Profile Family 6**

**Réseaux industriels – Profils –
Partie 1-6: Profils de bus de terrain – Famille de profils de communication 6**

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**INDUSTRIAL NETWORKS –
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Communication Profile Family 6****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 61784-1-6 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.

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- withdrawn,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 appropriate¹. 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).

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 1-6: Fieldbus profiles – Communication Profile Family 6

1 Scope

This part of IEC 61784-1 defines Communication Profile Family 6 (CPF 6). CPF 6 specifies a set of protocol specific communication profiles (CPs) based on the IEC 61158 series (Type 8) 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 6 are specified in IEC 61784-2-6.

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 61158-3-8:2007, *Industrial communication networks – Fieldbus specifications – Part 3-8: Data-link layer service definition – Type 8 elements*

IEC 61158-4-8:2007, *Industrial communication networks – Fieldbus specifications – Part 4-8: Data-link layer protocol specification – Type 8 elements*

IEC 61158-5-8:2007, *Industrial communication networks – Fieldbus specifications – Part 5-8: Application layer service definition – Type 8 elements*

IEC 61158-6-8:2007, *Industrial communication networks – Fieldbus specifications – Part 6-8: Application layer protocol specification – Type 8 elements*

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

ISO 15745-3:2003, *Industrial automation systems and integration – Open systems application integration framework – Part 3: Reference description for IEC 61158-based control systems*

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

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

3.1 Terms and definitions

For the purposes of this document, all terms and definitions provided 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

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 6 (INTERBUS^{®2})

4.1 General overview

Communication Profile Family 6 defines communication profiles based on IEC 61158-2 type 8, IEC 61158-3-8, IEC 61158-4-8, IEC 61158-5-8 and IEC 61158-6-8, which corresponds to parts of a communication system commonly known as INTERBUS.

- Profile 6/1
This profile contains a selection of AL, DLL and PhL services and protocol definitions with an IEC 61158 compliant application access.
Profile 6/1 defines a generic standard INTERBUS profile.
- Profile 6/2
This profile contains a selection of AL, DLL and PhL services and protocol definitions with an IEC 61158 compliant application access plus an additional AL protocol transparent access path.
Profile 6/2 extends profile 6/1 non cyclic data exchange capabilities. It provides, via AR-Send-Data-Acknowledge, transparent access to field devices. This allows to fit devices with other protocol stacks like TCP/IP and applications based on TCP/IP. Which protocol stacks are using AR-Send-Data-Acknowledge does not impact the profile definition.
- Profile 6/3
This profile contains a selection of AL, DLL and PhL services and protocol definitions with an IEC 61158 compliant application access with a limited set of AL services.
Profile 6/3 uses a reduced set of services for non cyclic data exchange for the use in device with limited resources.

NOTE See Annex A for an overview of INTERBUS communications concepts.

Devices (master or slave) which comply with a communication profile can be further classified by a CP identifier. The CP identifiers are shown in Table 1.

Table 1 – CPF 6: device CP identifier assignment

Profile	Master		Slave			Bus coupler
	cyclic	cyclic and non cyclic	cyclic	non cyclic	cyclic and non cyclic	
Profile 6/1	618	619	611	612	613	614
Profile 6/2	—	629	—	622	623	—
Profile 6/3	—	639	—	632	633	—

Each communication profile provides a well defined set of provisions. For a distinct device, further selections of services, parameter and parameter values have to be made. These selections should be described according to ISO 15745-3 as INTERBUS device profiles in the form of an INTERBUS device profile exchange description. An INTERBUS device profile based on a CP shall specify the CP identifier in the following format:

<communicationEntity ... communicationProfile="[CP identifier]" ...>

2 INTERBUS is the trade name of Phoenix Contact GmbH & Co. KG. 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 INTERBUS. Use of the trade name INTERBUS requires permission of the trade name holder.

4.2 CP 6/1

4.2.1 Physical layer

Table 2 specifies the PhL selection within IEC 61158-2.

Table 2 – CPF 6: PhL selection

Clause	Header	Presence	Constraints
1	Scope	YES	—
2	Normative references	Partial	Used if needed
3	Terms and definitions	—	—
3.1	Common terms and definitions	Partial	Used if needed
3.2 – 3.6	—	NO	—
3.7	Type 8: Terms and definitions	YES	—
Next subclauses	—	NO	—
4	Symbols and abbreviated terms	—	—
4.1	Symbols	—	—
4.1.1 – 4.1.5	—	NO	—
4.1.6	Type 8: Symbols	YES	—
Next subclauses	—	NO	—
4.2	Abbreviated terms	—	—
4.2.1 – 4.2.5	—	NO	—
4.2.6	Type 8: Additional abbreviations	YES	—
Next subclauses	—	NO	—
5	Data-link – Physical Layer interface	—	—
5.1	General	YES	—
5.2 – 5.6	—	NO	—
5.7	Type 8: Required services	YES	—
Next subclauses	—	NO	—
6	Station Management – Physical Layer interface	—	—
6.1	General	YES	—
6.2 – 6.5	—	NO	—
6.6	Type 8: Station Management – Physical Layer interface	YES	—
Next subclauses	—	NO	—
7	DCE Independent Sublayer (DIS)	—	—
7.1	General	YES	—
7.2 – 7.4	—	NO	—
7.5	Type 8: DIS	YES	—
Next subclauses	—	NO	—
8	DTE – DCE interface	—	—
8.1	General	YES	—
8.2 – 8.3	—	NO	—
8.4	Type 8: MIS – MDS Interface	YES	—

Clause	Header	Presence	Constraints
Next subclauses	—	NO	—
9	Medium Dependent Sublayer (MDS)	—	—
9.1	General	YES	—
9.2 – 9.7	—	NO	—
9.8	Type 8: MDS: Wire and optical media	YES	—
Next subclauses	—	NO	—
10	MDS – MAU interface	—	—
10.1	General	YES	—
10.2 – 10.5	—	NO	—
10.6	Type 8: MDS – MAU interface: Wire and optical media	YES	—
Next subclauses	—	—	—
11 – 26	—	NO	—
27	Type 8: Medium Attachment Unit: twisted-pair wire medium	YES	See Note 1
28	Type 8: Medium Attachment Unit: optical media	YES	See Note 1
Next clauses	—	NO	—
Annex A – L	—	NO	—
Annex M	(normative) Type 8: Connector specification	YES	See Note 2
Next annexes	—	NO	—
NOTE 1 The used MAU is selected at device level.			
NOTE 2 The used connector is selected at device level.			

4.2.2 Data-link layer

4.2.2.1 DLL service

4.2.2.1.1 DLL service selection

Data-link layer services are defined in IEC 61158-3-8. All clauses are included in communication profile 6/1 with the constraints specified in 4.2.2.1.2.

4.2.2.1.2 Assignment of DLL services to device types

Table 3 defines the valid combinations of DLL services and their assignment to device types for profile 6/1.

Table 3 – CP 6/1: DLL service selection, assignment of DLL services to device types

DLL Services	Master		Slave			Bus coupler
	cyclic	cyclic and non cyclic	cyclic	non cyclic	cyclic and non cyclic	
CP identifier	618	619	611	612	613	614
DL services						
Put Buffer	M	M	O ^a	—	O ^a	—
Get Buffer	M	M	O ^b	—	O ^b	—
Buffer received	M	M	M	—	M	—
Normal data transfer	—	M	—	M	M	—
DL-management services						
Reset	M	M	M	M	M	M
Set value	M	M	O	O	O	O
Read value	M	M	O	O	O	O
Event	M	M	M	M	M	M
Get current configuration	M	M	—	—	—	—
Get active configuration	M	M	—	—	—	—
Set active configuration	M	M	—	—	—	—

^a A slave shall support Put Buffer if process data should be sent to the master.

^b A slave shall support Get Buffer if process data should be received from the master.

4.2.2.2 DLL protocol

4.2.2.2.1 DLL protocol selection

Data-link layer protocols are defined in IEC 61158-4-8. All clauses are included in communication profile 6/1 with the constraints specified in 4.2.2.2.2.

NOTE The service primitives provisions used depend on the supported device type services.

4.2.2.2.2 Constraints for MAC parameter data width

A master shall support data width as defined in Table 4.

To ensure interoperability, slaves shall select their data width used from those supported mandatorily by the master, see Table 4.