

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Industrial networks – Profiles –
Part 1-22: Fieldbus profiles – Communication Profile Family 22**

**Réseaux industriels – Profils –
Partie 1-22: Profils de bus de terrain – Famille de profils de communication 22**

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PROFILES –****Part 1-22: Fieldbus profiles –
Communication Profile Family 22****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 61784-1-22 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) new Communication Profile Family (CPF 22).

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

Draft	Report on voting
65C/1208/FDIS	65C/1239/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 2023

- 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- withdrawn,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 1-22: Fieldbus profiles – Communication Profile Family 22

1 Scope

This part of IEC 61784-1 defines Communication Profile Family 22 (CPF 22). CPF 22 specifies a protocol specific communication profile (CP) based on the IEC 61158 series (Type 28) and other standards, to be used in the design of devices involved in communications in factory manufacturing and process control.

NOTE 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.

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 61158-3-28:2023, *Industrial communication networks – Fieldbus specifications – Part 3-28: Data-link layer service definition – Type 28 elements*

IEC 61158-4-28:2023, *Industrial communication networks – Fieldbus specifications – Part 4-28: Data-link layer protocol specification – Type 28 elements*

IEC 61158-5-28:2023, *Industrial communication networks – Fieldbus specifications – Part 5-28: Application layer service definition – Type 28 elements*

IEC 61158-6-28:2023, *Industrial communication networks – Fieldbus specifications – Part 6-28: Application layer protocol specification – Type 28 elements*

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

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

None.

3.3 Conventions

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

4 CPF 22 (AUTBUS™²)

4.1 General overview

Communication Profile Family 22 defines profiles based on IEC 61158-2 type 28, IEC 61158-3-28, IEC 61158-4-28, IEC 61158-5-28 and IEC 61158-6-28, which correspond to part of a communication system commonly known as AUTBUS.

Table 1 gives an overview of the specified profile sets.

Table 1 – CP 22/1: overview of profile sets

Layer	Profile 22/1 (AUTBUS)
Application	IEC 61158-5-28, IEC 61158-6-28
Data-link	IEC 61158-3-28, IEC 61158-4-28
Physical	IEC 61158-2, type 28

² AUTBUS™ is the trade name of Kyland Technology Co. Ltd. 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 AUTBUS™. Use of the trade name AUTBUS™ requires permission of the trade name holder.

Communication Profile Family 22 defines one profile based on Type 28 elements in the IEC 61158 series:

- CP 22/1 also known as AUTBUS.

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

4.2 Profile 22/1

4.2.1 Physical layer

Table 2 specifies the PhL selection within IEC 61158-2 for devices of all types of this profile.

Table 2 – CP 22/1: PhL selection

Clause	Header	Presence	Constraints
1	Scope	YES	—
2	Normative references	Partial	Relevant references only
3	Terms and definitions	Partial	Relevant references only
3.1	Common terms and definitions	NO	—
3.2 – 3.12	—	NO	—
3.13	Type 28: Terms and definitions	Partial	Relevant definitions only
4	Symbols and abbreviated terms	—	—
4.1	Symbols	—	—
4.1.1 – 4.1.11	—	NO	—
4.1.12	Type 28: Symbols	YES	—
4.2	Abbreviated terms	—	—
4.2.1 – 4.2.11	—	NO	—
4.2.12	Type 28: Abbreviations	YES	—
5	DLL-PhL interface	—	—
5.1	General	—	—
5.2 – 5.12	—	NO	—
5.13	Type 28: Required services	YES	—
6	Systems management – PhL interface	—	—
6.1	General	—	—
6.2 – 6.9	—	NO	—
6.10	Type 28: Systems management – PhL interface	YES	—
7	DCE Independent Sublayer (DIS)	—	—
7.1	General	—	—
7.2 – 7.6	—	NO	—
7.7	Type 28: DIS	YES	—
8	DTE – DCE interface and MIS-specific functions	—	—
8.1	General	—	—
8.2 – 8.5	—	NO	—
8.6	Type 28: DTE – DCE interface and MIS-specific functions	YES	—
9	Medium Dependent Sublayer (MDS)	—	—
9.1	General	—	—

Clause	Header	Presence	Constraints
9.2 – 9.12	—	NO	—
9.13	Type 28: MDS: Twisted-pair wire and coaxial media	YES	—
10	MDS – MAU interface	—	—
10.1	General	—	—
10.2 – 10.8	—	NO	—
10.9	Type 28: MDS – MAU interface: Twisted-pair wire and coaxial media	YES	—
11 – 34	—	NO	—
35	Type 28: Medium attachment unit: twisted-pair wire and coaxial media	YES	—
Annex A – S	—	NO	—
Annex V	Type 28: Example of data subframe allocation	YES	—
V.1	Example A	YES	—
V.2	Example B	YES	—
V.3	Example C	YES	—
Annex W	Type 28: RS code generating polynomial	YES	—

4.2.2 Data-link layer

4.2.2.1 DLL service selection

Table 3 specifies the DLL service selection within IEC 61158-3-28 for this profile.

Table 3 – CP 22/1: DLL service selection

Clause	Header	Presence	Constraints
1	Scope	YES	—
2	Normative references	YES	—
3	Terms, definitions, symbols, abbreviated terms and conventions	YES	—
4	Type 28 Data-link service	YES	—
5	Type 28 Data-link management service	YES	—

4.2.2.2 DLL protocol selection

Table 4 specifies the DLL protocol selection within IEC 61158-4-28 for this profile.

Table 4 – CP 22/1: DLL protocol selection

Clause	Header	Presence	Constraints
1	Scope	YES	—
2	Normative references	YES	—
3	Terms, definitions, symbols, abbreviated terms and conventions	YES	—
4	Overview of the DL-protocol	YES	—
5	DLPDU structure	YES	—
6	Working procedure	YES	—
7	State machine	YES	—
8	Error handling	YES	—
Annex A	Example for NodeID and MAC address mapping	YES	—
Annex B	Example for multicast group working mechanism	YES	—

4.2.3 Application layer

4.2.3.1 AL service selection

Table 5 specifies the application layer service selection from IEC 61158-5-28 for this profile.

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Table 5 – CP 22/1: AL service selection

Clause	Header	Presence	Constraints
1	Scope	YES	—
2	Normative references	YES	—
3	Terms, definitions, symbols, abbreviated terms and conventions	YES	—
4	Concepts	YES	—
5	Data type ASE	YES	—
6	Type 28 communication model specification	YES	—
Annex A	Example of service data mapping DTU message	YES	—
Annex B	Example of OPC UA data model and Type 28 data model mapping	YES	—
Annex C	Example of RTA service processing	YES	—
Annex D	Type 28 virtualization solution example	YES	—