

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Industrial networks – Profiles –
Part 1-19: Fieldbus profiles – Communication Profile Family 19**

**Réseaux industriels – Profils –
Partie 1-19: Profils de bus de terrain – Famille de profils de communication 19**

<https://standards.iteh.ai/catalog/standards/sist/07a119f1-437a-42e2-b601-182288ea29e5/iec-61784-1-19-2023>



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INTERNATIONAL
ELECTROTECHNICAL
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COMMISSION
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INTERNATIONALE

ICS 35.100.20; 35.240.50

ISBN 978-2-8322-6618-2

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PROFILES –****Part 1-19: Fieldbus profiles –
Communication Profile Family 19****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 61784-1-19 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:

- 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;
- addition of profile CP 19/3;
- update of selection tables for CPF 19.

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 1-19: Fieldbus profiles – Communication Profile Family 19

1 Scope

This part of IEC 61784-1 defines Communication Profile Family 19 (CPF 19). CPF 19 specifies a set of protocol specific communication profiles (CPs) based on the IEC 61158 series (Type 24 and Type 27) 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 19 are specified in IEC 61784-2-19.

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 61158-3-24:2023, *Industrial communication networks – Fieldbus specifications – Part 3-24: Data-link layer service definition – Type 24 elements*

IEC 61158-4-24:2023, *Industrial communication networks – Fieldbus specifications – Part 4-24: Data-link layer protocol specification – Type 24 elements*

IEC 61158-5-24:2023, *Industrial communication networks – Fieldbus specifications – Part 5-24: Application layer service definition – Type 24 elements*

IEC 61158-5-27:2023, *Industrial communication networks – Fieldbus specifications – Part 5-27: Application layer service definition – Type 27 elements*

IEC 61158-6-24:2023, *Industrial communication networks – Fieldbus specifications – Part 6-24: Application layer protocol specification – Type 24 elements*

IEC 61158-6-27:2023, *Industrial communication networks – Fieldbus specifications – Part 6-27: Application layer protocol specification – Type 27 elements*

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

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

TIA-485-A:1998, *Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems*

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

RS 485	MAU according to TIA-485-A
--------	----------------------------

3.3 Conventions

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

4 CPF 19 (MECHATROLINK²)

4.1 General overview

Communication Profile Family 19 defines communication profiles (CPs) based on IEC 61158-2 type 24, IEC 61158-3-24, IEC 61158-4-24, IEC 61158-5-24 and IEC 61158-6-24, and on other standards. (See Table 1 and Table 2.)

² MECHATROLINK™ is a trade name of YASKAWA ELECTRIC CORPORATION. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trade names holder or any of its products. Compliance with this profile does not require use of the trade names. Use of the trade name MECHATROLINK requires permission of the trade name holder.

The CPF 19 (MECHATROLINK) consists of four distinct protocol sets, known generically (for historical reasons) as MECHATROLINK- II (M-II) for CP 19/1, MECHATROLINK- III (M-III) for CP 19/2, Σ -LINK II for CP19/3, and MECHATROLINK-4 (M-4) for CP 19/4, which mainly differ by their physical layers.

- Profile 19/1 (M-II): based on TIA-485-A PhL, which operates at 10 Mbit/s,
- Profile 19/2 (M-III): based on ISO/IEC/IEEE 8802-3 (Ethernet) PhL, which operates at 100 Mbit/s,
- Profile 19/3 (Σ -LINK II): based on TIA-485-A PhL, which operates at up to 32 Mbit/s;
- Profile 19/4 (M-4): based on ISO/IEC/IEEE 8802-3 (Ethernet) PhL, which operates at 100 Mbit/s.

Each CP is classified into more detailed profiles, based on another aspect of application process (AP) type or a sort of device type. Each AP types in a same CP play different roles in a same network as C1 master, C2 master and slave. Such detailed profiles are described in each subclause if needed.

Table 1 – CPF 19: overview of profile sets (CP19/1 and CP19/2)

Layer	Profile 19/1 (M-II)			Profile 19/2 (M-III)		
	C1 master	C2 master	Slave	C1 master	C2 master	Slave
Application	IEC 61158-5-24, IEC 61158-6-24			IEC 61158-5-24, IEC 61158-6-24		
Data link	IEC 61158-3-24, IEC 61158-4-24			IEC 61158-3-24, IEC 61158-4-24		
Physical	IEC 61158-2			IEC 61158-2 ISO/IEC/IEEE 8802-3		

Table 2 – CPF 19: Overview of profile sets (CP19/3 and CP19/4)

Layer	Profile 19/3(Σ -LINK II)			Profile 19/4(M-4)-	
	C1 master	C2 master	Slave	C1 master	Slave
Application	IEC 61158-5-24, IEC 61158-6-24			IEC 61158-5-27, IEC 61158-6-27	
Data link	IEC 61158-3-24, IEC 61158-4-24			—	
Physical	IEC 61158-2			IEC 61158-2 ISO/IEC/IEEE 8802-3	

4.2 CP 19/1 (MECHATROLINK-II)

4.2.1 Physical layer selection

Table 3 specifies the PhL selection within IEC 61158-2 for this profile.

Table 3 – CP 19/1 profile: PhL selection

Clause	Header	Presence	Constraints
1	Scope	YES	—
2	Normative reference	Partial	Used if needed
3	Terms and definitions	—	—
3.1	Common terms and definitions	Partial	Used when applicable
3.2 – 3.10	—	NO	—
3.11	Type 24: terms and definitions	YES	—
Next subclauses	—	NO	—
4	Symbols and abbreviated terms	—	—
4.1	Symbols	—	—
4.1.1 – 4.1.9	—	NO	—
4.1.10	Type 24: symbols	YES	—
Next subclauses	—	NO	—
4.2	Abbreviated terms	—	—
4.2.1 – 4.2.9	—	NO	—
4.2.10	Type 24: abbreviations	YES	—
Next subclauses	—	NO	—
5	DLL-PhL interface	—	—
5.1	General	Partial	Used when applicable
5.2 – 5.10	—	NO	—
5.11	Type 24: Required Service	YES	—
Next subclauses	—	NO	—
6	Systems management – PhL interface	—	—
6.1	General	Partial	Used when applicable
6.2 – 6.8	—	NO	—
6.9	Type 24: Systems management – PhL interface	YES	—
Next subclauses	—	NO	—
7 – 8	—	NO	—
9	Medium dependent sublayer (MDS)	—	—
9.1	General	Partial	Used when applicable
9.2 – 9.11	—	NO	—
9.12	Type 24: MDS Twisted-pair wire	YES	—
Next subclauses	—	NO	—
10	MDS – MAU interface	—	—
10.1	General	Partial	Used when applicable
10.2 – 10.7	—	NO	—
10.8	Type 24: MDS – MAU interface: Twisted-pair wire medium	YES	—
Next subclauses	—	NO	—

Clause	Header	Presence	Constraints
11 – 32	—	NO	—
33	Type 24: Medium attachment unit: twisted-pair wire medium	YES	
Next clauses	—	NO	—
Annex A – R	—	NO	—
Annex S	Type 24: Connector specification	—	—
S.1	Overview	Partial	Used when applicable
S.2	Type 24-1 connector	YES	—
S.3	Type 24-2 connector	NO	—
S.4	Type 24-3 connector	NO	—
Annex T	—	NO	—
Annex U	Type 24: Media cable specifications and Network topologies	—	—
U.1	Type 24: MAU options: twisted-pair wire medium	NO	—
Next annexes	—	NO	—

4.2.2 Data-link layer

4.2.2.1 DLL service selection

4.2.2.1.1 Generic profile

Table 4 specifies the DLL service selection within IEC 61158-3-24 for this profile.

IEC 61784-1-19:2023
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Table 4 – CP 19/1: DLL service selection

Clause	Header	Presence	Constraints
1	Scope	YES	—
2	Normative references	Partial	Used as needed
3	Terms, definitions, symbols, abbreviations and conventions	Partial	Used when applicable
4	Data-link service and concepts	—	—
4.1	Overview	YES	—
4.2	DLS-user services	—	—
4.2.1	General	YES	—
4.2.2	Write data	YES	—
4.2.3	Read data	YES	—
4.2.4	Send data with acknowledge service (SDA)	YES	Option
4.2.5	Send data with no acknowledge service (SDN)	NO	—
4.2.6	Event	YES	—
4.2.7	Get status	YES	—
4.3	Overview of interactions	YES	—
4.4	Detailed specification of services and interactions	—	—
4.4.1	Write data	YES	—
4.4.2	Read data	YES	—
4.4.3	Send data with acknowledge	YES	Option

Clause	Header	Presence	Constraints
4.4.4	Send data with no-acknowledge (SDN)	NO	—
4.4.5	Cyclic event	YES	—
5	DL-management service	—	—
5.1	Overview	—	—
5.1.1	General	YES	—
5.1.2	Reset	YES	—
5.1.3	Set value	YES	—
5.1.4	Get value	YES	—
5.1.5	Evaluate delay	NO	—
5.1.6	Set communication mode	NO	—
5.1.7	Start communication	YES	—
5.1.8	Clear error status	YES	—
5.1.9	DLM Event	YES	—
5.2	Overview of interactions	YES	—
5.3	Detailed specification of services and interactions	—	—
5.3.1	Reset	YES	—
5.3.2	Set value	YES	—
5.3.2.1	Function	YES	—
5.3.2.2	Types of parameters	—	—
5.3.2.2.1	General	YES	—
5.3.2.2.2	Var_ID	Partial	See 4.2.2.1.2 to 4.2.2.1.4
5.3.2.2.3	Val	Partial	See 4.2.2.1.2 to 4.2.2.1.4
5.3.2.2.4	Result	YES	—
5.3.3	Get value	—	—
5.3.3.1	Function	YES	—
5.3.3.2	Types of parameters	YES	—
5.3.3.2.1	General	YES	—
5.3.3.2.2	Var_ID	Partial	See 4.2.2.1.2 to 4.2.2.1.4
5.3.3.2.3	Val	Partial	See 4.2.2.1.2 to 4.2.2.1.4
5.3.3.2.4	Result	YES	—
5.3.4	Evaluate delay	NO	—
5.3.5	Set communication mode	NO	—
5.3.6	Start communication	YES	—
5.3.7	Clear error	YES	—
5.3.8	DLM error event	YES	—