IEC 61784-2-6

Edition 1.0 2023-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Industrial networks – Profiles –
Part 2-6: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 – CPF 6

Réseaux industriels – Profils –
Partie 2-6: Profils de bus de terrain supplémentaires pour les réseaux en temps réel fondés sur l'ISO/IEC/IEEE 8802-3 – CPF 6

IEC 61784-2-6:2023-03(en-fr)

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

IEC 61784-2-6 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 fourth edition of IEC 61784-2 published in 2019. This first edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 61784-2:2019:

a) split of the original IEC 61784-2 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/1209/FDIS	65C/1237/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 61784-2 series, published under the general title *Industrial networks – Profiles – Part 2: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3*, 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- withdrawn,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.

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INTRODUCTION

The IEC 61784-2 series provides additional Communication Profiles (CP) to the existing Communication Profile Families (CPF) of the IEC 61784-1 series and additional CPFs with one or more CPs. These profiles meet the industrial automation market objective of identifying Real-Time Ethernet (RTE) communication networks coexisting with ISO/IEC/IEEE 8802-3 – commonly known as Ethernet. These RTE communication networks use provisions of ISO/IEC/IEEE 8802-3 for the lower communication stack layers and additionally provide more predictable and reliable real-time data transfer and means for support of precise synchronization of automation equipment.

More specifically, these profiles help to correctly state the compliance of RTE communication networks with ISO/IEC/IEEE 8802-3, and to avoid the spreading of divergent implementations.

Adoption of Ethernet technology for industrial communication between controllers and even for communication with field devices promotes the use of Internet technologies in the field area. This availability would be unacceptable if it causes the loss of features required in the field area for industrial communication automation networks, such as:

- real-time,
- synchronized actions between field devices like drives,
- efficient, frequent exchange of very small data records.

These new RTE profiles can take advantage of the improvements of Ethernet networks in terms of transmission bandwidth and network span.

Another implicit but essential requirement is that the typical Ethernet communication capabilities, as used in the office world, are fully retained, so that the software involved remains applicable.

The market is in need of several network solutions, each with different performance characteristics and functional capabilities, matching the diverse application requirements. RTE performance indicators, whose values will be provided with RTE devices based on communication profiles specified in the IEC 61784-2 series, enable the user to match network devices with application-dependent performance requirements of an RTE network.

INDUSTRIAL NETWORKS – PROFILES –

Part 2-6: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 – CPF 6

1 Scope

This part of IEC 61784-2 defines extensions of Communication Profile Family 6 (CPF 6) for Real-Time Ethernet (RTE). CPF 6 specifies a set of Real-Time Ethernet (RTE) communication profiles (CPs) and related network components based on the IEC 61158 series (Type 8 and Type 10), ISO/IEC/IEEE 8802-3 and other standards.

For each RTE communication profile, this document also specifies the relevant RTE performance indicators and the dependencies between these RTE performance indicators.

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 The RTE communication profiles use ISO/IEC/IEEE 8802-3 communication networks and its related network components and in some cases amend those standards to obtain RTE features.

NOTE 3 Some CPs of CPF 6 are specified in IEC 61784-1-6.

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 61784-1-6:2023, *Industrial networks – Profiles – Part 1-6: Fieldbus profiles – Communication Profile Family 6*

IEC 61784-2-0:2023, *Industrial networks – Profiles – Part 2-0: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 – General concepts and terminology*

IEC 61784-2-3:2023, *Industrial networks – Profiles – Part 2-3: Additional real-time fieldbus profiles based on ISO/IEC/IEEE 8802-3 – CPF 3*

IEC 61784-5-3, *Industrial communication networks – Profiles – Part 5-3: Installation of fieldbuses – Installation profiles for CPF 3*

IEC 61784-5-6, *Industrial communication networks – Profiles – Part 5-6: Installation of fieldbuses – Installation profiles for CPF 6*

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

IEEE Std 802-2014, *IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture*

IEEE Std 802.1AB-2016, *IEEE Standard for Local and metropolitan area networks – Station and Media Access Control Connectivity Discovery*

IEEE Std 802.1AS-2020, *IEEE Standard for Local and Metropolitan Area Networks – Timing and Synchronization for Time-Sensitive Applications*

IEEE Std 802.1Q-2018, *IEEE Standard for Local and Metropolitan Area Networks – Bridges and Bridged Networks*

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 1157, J.D. Case, M. Fedor, M.L. Schoffstall, J. Davin, *Simple Network Management Protocol (SNMP)*, May 1990, available at https://www.rfc-editor.org/info/rfc1157 [viewed 2022-02-18]

IETF RFC 1213, K. McCloghrie, M. Rose, *Management Information Base for Network Management of TCP/IP-based internets: MIB-II*, March 1991, available at https://www.rfc-editor.org/info/rfc1213 [viewed 2022-02-18]

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

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61784-2-0, ISO/IEC/IEEE 8802-3, IEEE Std 802-2014, IEEE Std 802.1AB-2016, IEEE Std 802.1AS-2020 and IEEE Std 802.1Q-2018 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 Abbreviated terms and acronyms

For the purposes of this document, abbreviated terms and acronyms defined in IEC 61784-2-0 and the following apply.

CP	Communication Profile [according to IEC 61784-1-0]
CPF	Communication Profile Family [according to IEC 61784-1-0]
ICMP	Internet Control Message Protocol (see IETF RFC 792)
IETF	Internet Engineering Task Force
IP	Internet Protocol (see IETF RFC 791)
LLDP	Link Layer Discovery Protocol (see IEEE Std 802.1AB-2016)
MIB	Management Information base
PI	Performance indicator
RSTP	Rapid Spanning Tree Algorithm and Protocol (see IEEE Std 802.1Q-2018)
SNMP	Simple Network Management Protocol (see IETF RFC 1157)
TCP	Transmission Control Protocol (see IETF RFC 793)
UDP	User Datagram Protocol (see IETF RFC 768)

3.3 Symbols

For the purposes of this document, symbols defined in IEC 61784-2-0 and Table 1 apply.

NOTE Definitions of symbols in this Subclause 3.3 do not always use the italic font, as they are already identified as symbols.

Table 1 – CPF 6 symbols

Symbol	Definition	Unit
DTLD	Total delivery time between a Type 8 slave and a Type 10 entity	µs
DT10	Delivery time of the Type 10 network	µs
Cta_M	Application cycle time of the mapping application in the linking-device	
M	Type 8 Master implementation factor	–
n	Number of data octets (user data; payload)	octets
sl8	Number of Type 8 slaves connected to the linking-device	–
T_{bit}	Nominal bit duration (see IEC 61158-2, 27.2)	µs
t_S	Software processing time of the Type 8 master (application specific)	µs

3.4 Conventions

For the purposes of this document, the conventions defined in IEC 61784-2-0 apply.

4 CPF 6 (INTERBUS®[1]) – RTE communication profiles

4.1 General overview

Communication Profile Family 6 (CPF 6) defines communication profiles based on IEC 61158 series Type 8 and Type 10 specifications, which correspond to parts of the communication systems commonly known as INTERBUS and PROFINET.

In this document, the following communication profiles are specified for CPF 6:

– Profile 6/4

  This profile defines service and protocol selections together with a mapping for a linking-device connecting Type 8 and Type 10 communication systems. It comprises CP 6/1 master and CP 3/4 device together with a mapping.

– Profile 6/5

  This profile defines service and protocol selections together with a mapping for a linking-device connecting Type 8 and Type 10 communication systems. It comprises CP 6/1 master and CP 3/5 device together with a mapping.

– Profile 6/6

  This profile defines service and protocol selections together with a mapping for a linking-device connecting Type 8 and Type 10 communication systems. It comprises CP 6/1 master and CP 3/6 device together with a mapping.

Figure 1 shows the linking-device CPs and the relation to other Type 8 and Type 10 CPs.

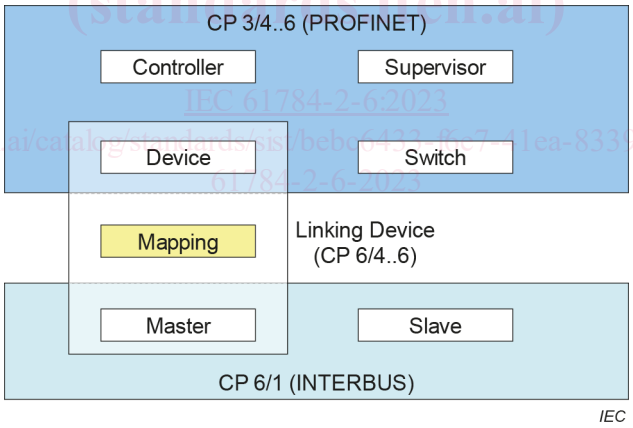

Figure 1 – Linking-device communication profiles RTE-network context

Linking-devices which comply with a communication profile can be further classified by a CP identifier. The CP identifier assignment is shown in Table 2.

1 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.

Table 2 – CPF 6: device CP identifier assignment

Profile	Linking device
Profile 6/4	649
Profile 6/5	659
Profile 6/6	669

Each communication profile provides a well-defined set of provisions. For a distinct device, further selections of services, parameters and parameter values shall 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]" …>

4.2 CP 6/4

4.2.1 Mapping

Type 8 devices shall be assigned to Type 10 slots or Type 10 subslots.

NOTE 1 The mapping concept itself is not part of the communication profile. The mapping concept used could be described in the device description of the linking-device according to ISO 15745-1.

Type 10 slots or subslots could have 1 or more Type 8 devices assigned to it.

Figure 2 depicts the mapping principle. The data mapping is shown in Figure 3.

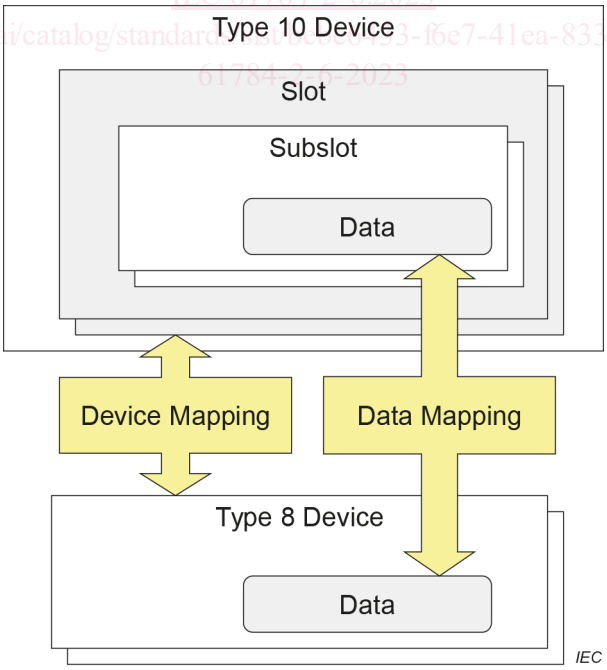

Figure 2 – Linking-device mapping principle