IEC 62453-302

Edition 3.0 2023-11
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Field device tool (FDT) interface specification – Part 302: Communication profile integration – IEC 61784 CPF 2

IEC 62453-302:2023-11 RLV(en)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC 62453-302

Edition 3.0 2023-11
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Field device tool (FDT) interface specification – Part 302: Communication profile integration – IEC 61784 CPF 2

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.40, 35.100.05, 35.110

ISBN 978-2-8322-7830-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 302: Communication profile integration – IEC 61784 CPF 2

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62453-302:2016. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62453-302 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This third edition cancels and replaces the second edition published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) improved support for Ethernet IP (see 9.3, Clause 10, and 12.4).

Each part of the IEC 62453-3xy series is intended to be read in conjunction with IEC 62453-2.

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

Draft	Report on voting
65E/1031/FDIS	65E/1032/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/standardsdev/publications.

A list of all parts of the IEC 62453 series, under the general title *Field Device Tool (FDT) interface specification*, 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.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This part of IEC 62453 is an interface specification for developers of FDT (Field Device Tool) components for function control and data access within a client/server architecture. The specification is a result of an analysis and design process to develop standard interfaces to facilitate the development of servers and clients by multiple vendors that need to interoperate seamlessly.

With the integration of fieldbusses into control systems, there are a few other tasks which need to be performed. In addition to fieldbus- and device-specific tools, there is a need to integrate these tools into higher-level system-wide planning or engineering tools. In particular, for use in extensive and heterogeneous control systems, typically in the area of the process industry, the unambiguous definition of engineering interfaces that are easy to use for all those involved is of great importance.

A device-specific software component, called DTM (Device Type Manager), is supplied by the field device manufacturer with its device. The DTM is integrated into engineering tools via the FDT interfaces defined in this specification. The approach to integration is in general open for all kinds of fieldbusses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Figure 1 shows how IEC 62453-302 is aligned in the structure of the IEC 62453 series [1].

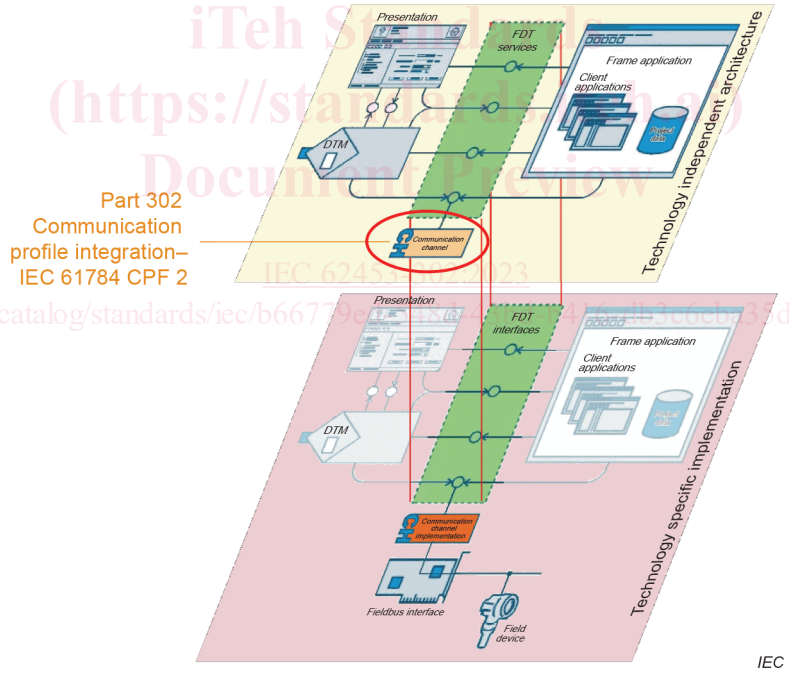

Figure 1 – Part 302 of the IEC 62453 series

NOTE For an example for the technology specific implementation of this document, see [2].

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 302: Communication profile integration – IEC 61784 CPF 2

1 Scope

This part of IEC 62453 provides information for integrating the CIP™ technology into the FDT interface specification (IEC 62453-2). Communication Profile Family 2 (commonly known as CIP™[1]) defines communication profiles based on IEC 61158-2 Type 2, IEC 61158-3-2, IEC 61158-4-2, IEC 61158-5-2, IEC 61158-6-2, and IEC 62026-3. The basic profiles CP 2/1 (ControlNet™[2]), CP 2/2 (EtherNet/IP™[3]), and CP 2/3 (DeviceNet™[2][1]) are defined in IEC 61784-1 and IEC 61784-2. An additional communication profile (CompoNet™[2][1]), also based on CIP™, is defined in IEC 62026-7.

~~This part of IEC 62453 provides information for integrating the CIP™ technology into the FDT interface specification (IEC 62453-2).~~

This part of IEC 62453 specifies communication and other services.

This specification neither contains the FDT specification nor modifies it.

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.

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

IEC 61158-3-2[4], *Industrial communication networks – Fieldbus specifications – Part 3-2: Data-link layer service definition – Type 2 elements*

---

[1] CIP™ (Common Industrial Protocol), DeviceNet™ and CompoNet™ are trade names of Open DeviceNet Vendor Association, Inc (ODVA). This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trade name holder or any of its products. Compliance to this standard does not require use of the trade names CIP™, DeviceNet™ or CompoNet™. Use of the trade names CIP™, DeviceNet™ or CompoNet™ requires permission of Open DeviceNet Vendor Association, Inc.

[2] ControlNet™ is a trade name of ControlNet International, 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 to this profile does not require use of the trade name ControlNet™. Use of the trade name ControlNet™ requires permission of ControlNet International, Ltd.

[3] EtherNet/IP™ is a trade name of ControlNet International, Ltd. and Open DeviceNet Vendor Association, 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 to this profile does not require use of the trade name EtherNet/IP™. Use of the trade name EtherNet/IP™ requires permission of either ControlNet International, Ltd. or Open DeviceNet Vendor Association, Inc.

[4] A consolidated version of this document exists, comprising the second edition (2014-08) [documents 65C/759/FDIS and 65C/769/RVD] and its amendment 1 (2019-04) [documents 65C/945/FDIS and 65C/954/RVD].

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

IEC 61158-5-2:~~2014~~2019, *Industrial communication networks – Fieldbus specifications – Part 5-2: Application layer service definition – Type 2 elements*

IEC 61158-6-2:~~2014~~2019, *Industrial communication networks – Fieldbus specifications – Part 6-2: Application layer protocol specification – Type 2 elements*

IEC 61784-1, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

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

IEC 61784-3-2:~~2010~~2021, *Industrial communication networks – Profiles – Part 3-2: Functional safety fieldbuses – Additional specifications for CPF 2*

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

IEC 62026-7, *Low-voltage switchgear and controlgear – Controller-device interfaces (CDIs) – Part 7: CompoNet*

IEC 62453-1:–[5], *Field device tool (FDT) interface specification – Part 1: Overview and guidance*

IEC 62453-2:~~–~~[5]2022, *Field device tool (FDT) interface specification – Part 2: Concepts and detailed description*

ISO 15745-2:2003, *Industrial automation systems and integration – Open systems application integration framework – Part 2: Reference description for ISO 11898-based control systems*

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

3 Terms, definitions, symbols, abbreviated terms and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62453-1 and IEC 62453-2 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http:www.iso.org/obp

3.2 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviations given in IEC 62453-1, IEC 62453-2, as well as the following apply.

---

5 Under preparation. Stage at the time of publication: IEC/RPUB 62453-1:2022.
To be published concurrently with this document.

CIP™	Common Industrial Protocol
EDS	Electronic Data Sheet ~~[ISO 15745-2]~~

3.3 Conventions

3.3.1 Data type names and references to data types

The conventions for naming and referencing of data types are explained in IEC 62453-2~~:--~~:2022, Clause A.1.

3.3.2 Vocabulary for requirements

The following expressions are used when specifying requirements.

Usage of "shall" or "mandatory"	No exceptions allowed.
Usage of "should" or "recommended"	Strong recommendation. It may make sense in special exceptional cases to differ from the described behavior.
Usage of "can' or "optional'	Function or behavior may be provided, depending on defined conditions.

4 Bus category

IEC 61784 CPF 2 protocol is identified in the protocolId element of the structured data type 'fdt:BusCategory' by the following unique identifiers, as specified in Table 1.

Table 1 – Protocol identifiers

Identifier value	ProtocolId name	Description
19B91472-EDB9-4e8c-BB61-516EEC79C1C0	'CIP DeviceNet'	Support for CP 2/3 (DeviceNet)
6CD80F51-019D-4e60-AEAC-B10144943B4B	'CIP EthernetIP'	Support for CP 2/2 (EtherNet/IP)
C290CE23-62EA-478c-97F2-97EFEC602E05	'CIP ControlNet'	Support for CP 2/1 (ControlNet)
089BB2BC-B75A-11DB-8314-0800200C9A66	'CIP CompoNet'	Support for CompoNet

Table 2 shows the identifiers for physical layer that can be used for DeviceNet.

Table 2 – Physical layer identifiers for DeviceNet

Identifier value	Description
23E6EFA5-B1DA-11E2-9D9C-005056C00008	Standard DeviceNet

Table 3 shows the identifiers for physical layer that can be used for ControlNet.

Table 3 – Physical layer identifiers for ControlNet

Identifier value	Description
30F4EF13-B1DA-11E2-9D9C-005056C00008	ControlNet Coaxial Medium
30F4EF14-B1DA-11E2-9D9C-005056C00008	ControlNet Fiber Medium
30F4EF15-B1DA-11E2-9D9C-005056C00008	ControlNet Network Access Port (NAP)

Table 4 shows the identifiers for physical layer that can be used for Ethernet/IP.

Table 4 – Physical layer identifiers for Ethernet/IP

Identifier value	Description
307dd808-c010-11db-90e7-0002b3ecdcbe	10BASET
307dd809-c010-11db-90e7-0002b3ecdcbe	10BASETXHD
307dd80a-c010-11db-90e7-0002b3ecdcbe	10BASETXFD
307dd80b-c010-11db-90e7-0002b3ecdcbe	10BASEFLHD
307dd80c-c010-11db-90e7-0002b3ecdcbe	10BASEFLFD
307dd80d-c010-11db-90e7-0002b3ecdcbe	10BASEFXHD
307dd80e-c010-11db-90e7-0002b3ecdcbe	10BASEFXFD
307dd80f-c010-11db-90e7-0002b3ecdcbe	100BASETXHD
307dd810-c010-11db-90e7-0002b3ecdcbe	100BASETXFD
307dd811-c010-11db-90e7-0002b3ecdcbe	100BASEFXHD
307dd812-c010-11db-90e7-0002b3ecdcbe	100BASEFXFD
307dd813-c010-11db-90e7-0002b3ecdcbe	100BASELX10
307dd814-c010-11db-90e7-0002b3ecdcbe	100BASEPX10
307dd815-c010-11db-90e7-0002b3ecdcbe	1000BASEXHD
307dd816-c010-11db-90e7-0002b3ecdcbe	1000BASEXFD
307dd817-c010-11db-90e7-0002b3ecdcbe	1000BASELXHD
307dd818-c010-11db-90e7-0002b3ecdcbe	1000BASELXFD
307dd819-c010-11db-90e7-0002b3ecdcbe	1000BASESXHD
307dd81a-c010-11db-90e7-0002b3ecdcbe	1000BASESXFD
307dd81b-c010-11db-90e7-0002b3ecdcbe	1000BASETHD
307dd81c-c010-11db-90e7-0002b3ecdcbe	1000BASETFD
307dd81d-c010-11db-90e7-0002b3ecdcbe	10GigBASEFX

Table 5 shows the identifiers for physical layer that can be used for CompoNet.

Table 5 – Physical layer identifiers for CompoNet

Identifier value	Description
475B2CB0-B1DA-11E2-9D9C-005056C00008	Standard CompoNet
475B2CAF-B1DA-11E2-9D9C-005056C00008	CompoNet IP67 Cable

Table 6 shows the identifiers for data link layer.

Table 6 – Data link layer identifiers

Identifier value	Description
5B1EDEF7-B1CC-11E2-9D9C-005056C00008	DeviceNet (CAN – CSMA/NBA)
5B1EDEF8-B1CC-11E2-9D9C-005056C00008	ControlNet (CTDMA)
5B1EDEF9-B1CC-11E2-9D9C-005056C00008	EtherNet/IP (CSMA/CD)
5B1EDEFA-B1CC-11E2-9D9C-005056C00008	CompoNet (TDMA)

5 Access to instance and device data

The services InstanceDataInformation and DeviceDataInformation shall provide access at least to all parameters defined in the Params section of the EDS.

6 Protocol specific behavior

IEC 61784 CPF 2 protocol has specific requirements related to configuration of fieldbus masters.

It is very important to keep both data provider and consumer synchronized. Therefore, the data provider shall be informed if the provided data has been modified. For instance, in case the provided data is modified by the scanner/master DTM, then the slave/adapter DTM shall be provided with the new data set.

NOTE For a description of data exchange between DTMs, see IEC 62453-2:–2022, 6.3 (Configuration of fieldbus master or communication scheduler).

7 Protocol specific usage of general data types

Table 7 shows how general data types, defined in IEC 62453-2 within the namespace ‘fdt’, are used with IEC 61784 CPF 2 devices.

According to IEC 62453-2, at least one set of semantic information (one per supported fieldbus protocol) shall be provided for each accessible data object, using the ‘SemanticInformation’ general data type. The corresponding data type ‘applicationDomain’ shall have the value "FDT_CIP" and the data type ‘semanticId’ shall have an appropriate value, as specified in Table 7).

Table 7 – Protocol specific usage of general data types

Data type	Description for use
fdt:address	The "address" data type is not mandatory for the exposed parameters in the DTMs. But if the address will be used, the string shall be constructed according to the rules of the semanticId. That means the data type "semanticId" is always the same as the data type "address"
fdt:protocolId	See Clause 4.
fdt:deviceTypeId	As defined in Identity object (see IEC 61158-5-2:~~2014~~2019, 6.2.1.2.2)
fdt:deviceTypeInformation	A CIP DTM shall provide the path to the device specific EDS file with this data type. For DTM certification, the path to the certified EDS file shall be provided here. ~~NOTE~~ The EDS information is accessible via • IDtmParameter::GetParameters() • IDtmInformation::GetInformation()
fdt:deviceTypeInformationPath	Path to the EDS file which is also provided via the attribute ‘deviceTypeInformation’ The attribute contains full path to the EDS file including the file name in URL notation. For CIP devices, it is mandatory to provide information for this data type. This attribute is specific to FDT 1.2.1 (see IEC 62453-~~2~~52 and [3]), therefore it shall not be provided if DTM is running in FDT 1.2 (see [3]) based Frame Applications
fdt:manufacturerId	As defined in Identity object (see IEC 61158-5-2:~~2014~~2019, 6.2.1.2.2)

Data type	Description for use
fdt:semanticId fdt:applicationDomain	The applicationDomain is: FDT_CIP. The data that is contained in the objects are addressable via classId, instanceId and attributeId. This data may be variables or composed blocks of data. The semanticID is directly based on the CIP address information: The semanticId is: CLASSxx.INSTANCEyy.ATTRIBUTEzz xx classId yy instanceId zz attributeId xx, yy, zz are based on decimal format without leading '0'. Since 'ATTRIBUTE' is conditional in CIP in certain cases, it can be left out. In this case, the semanticId is: CLASSxx.INSTANCEyy
fdt:tag	CIP assembly, parameter name or name of a I/O connection (in the context of channel data)

8 Protocol specific common data types

Table 8 and Table 9 specify the protocol specific common data types, which are used in the definition of other data types.

The data types described in Clause 8 are defined for following namespace:
Namespace: cip

Table 8 – Simple protocol specific common data types

Data type	Definition	Description
arrayDimensions	STRING	Represents the dimension of an array, see [5], Appendix C
attributeId	USINT	CIP attribute identifier
bitOffset	UDINT	Bit offset of a parameter in an assembly
cipStatus	UINT	cipStatus represents the Status (attribute 5) of the Identity object. See IEC 61158-5-2:~~2014~~2019, 6.2.1.2.2
classId	UINT	CIP class identifier
constValue	UDINT	Represents the constant value used in the data type Constant
dataType	enumeration (byte | float | double | int | unsigned | enumerator | bitEnumerator | index | ascii | password | bitString | hexString | date | time | dateAndTime | duration | binary | structured | dtmSpecific)	Defines the different enumerations of the CIP data types
deviceType	UINT	Represents the DeviceType (attribute 2) of the Identity object. See IEC 61158-5-2:~~2014~~2019, 6.2.1.2.2
ePath	ARRAY OF USINT	CIP EPATH, see IEC 61158-6-2:~~2014~~2019, 4.1.9.
extendedIdentifier	STRING	Represents the address of the CIP device in the CIPNodeID if the address used on this CIP network is a name or IP-address. The extendedIdentifier shall be used for CompoNet networks to cover the CompoNet MAC ID. See also shortIdentifier
instanceId	UINT	CIP object instance identifier