IEC 62453-302

Edition 1.0 2009-06

INTERNATIONAL STANDARD

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

IEC 62453-302:2009(E)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE V

ICS 25.040.40; 35.100.05; 35.110

ISBN 978-2-88910-720-9

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

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FOREWORD

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International Standard 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.

This part, in conjunction with the other parts of the first edition of the IEC 62453 series cancels and replaces IEC/PAS 62453-1, IEC/PAS 62453-2, IEC/PAS 62453-3, IEC/PAS 62453-4 and IEC/PAS 62453-5 published in 2006, and constitutes a technical revision.

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

The text of this standard is based on the following documents:

FDIS	Report on voting
65E/126/FDIS	65E/139/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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 publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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.

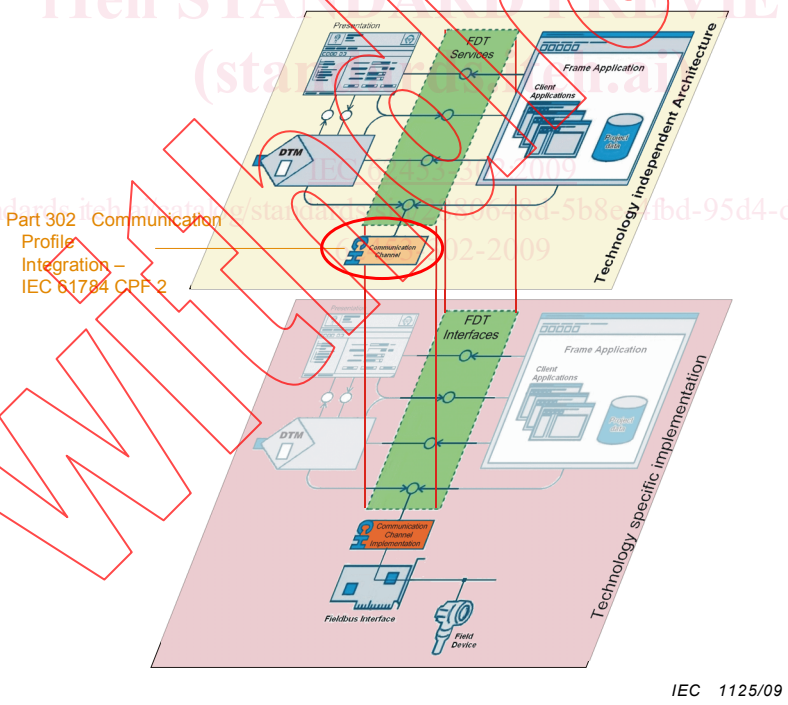

Figure 1 – Part 302 of the IEC 62453 series

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 302: Communication profile integration – IEC 61784 CPF 2

1 Scope

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™ [1]) are defined in IEC 61784-1 and IEC 61784-2. An additional communication profile (CompoNet™ [1]), also based on CIP™, is defined in [14].

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 referenced documents are indispensable for the application 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, *Industrial communication networks – Fieldbus specifications – Part 3-2: Data-link layer service definition – Type 2 elements*

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

IEC 61158-5-2:2007, *Industrial communication networks – Fieldbus specifications – Part 5-2: Application layer service definition – Type 2 elements*

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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.

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IEC 61158-6-2:2007, *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 8802-3*

IEC 61784-3-2:2007, *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 62453-1:2009, *Field Device Tool (FDT) interface specification – Part 1: Overview and guidance*

IEC 62453-2:2009, *Field Device Tool (FDT) interface specification – Part 2: Concepts and detailed description*

ISO/IEC 19501:2005, *Information technology – Open Distributed Processing – Unified Modeling Language (UML) Version 1.4.2*

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.

3.2 Symbols and abbreviated terms

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

CIP™	Common Industrial Protocol	
CP	Communication Profile	[IEC 61784-1]
CPF	Communication Profile Family	[IEC 61784-1]
EDS	Electronic Data Sheet	[ISO 15745]
UML	Unified Modelling Language	[ISO/IEC 19501]

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 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

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 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 6.3 of IEC 62453-2 (Configuration of fieldbus master or communication scheduler).

7 Protocol specific usage of general data types

Table 2 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 2).

Table 2 – 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 6.2.1.2.2 of IEC 61158-5-2)
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 and [8]), therefore it shall not be provided if DTM is running in FDT 1.2 (see [7]) based Frame Applications
fdt:manufacturerId	As defined in Identity object (see 6.2.1.2.2 of IEC 61158-5-2)
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 3 and Table 4 specify the protocol specific common data types, which are used in the definition of other data types.

The data types described in this clause are defined for following namespace:
Namespace: cip

Table 3 – Simple protocol specific common data types

Data type	Definition	Description
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 6.2.1.2.2 of IEC 61158-5-2