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Field device tool (FDT) interface specification –  
Part 303-1: Communication profile integration – IEC 61784 CP 3/1 and CP 3/2

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3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://www.iec.ch)

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**FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –****Part 303-1: Communication profile integration –  
IEC 61784 CP 3/1 and CP 3/2**

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International Standard IEC 62453-303-1 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/127/FDIS	65E/140/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

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- replaced by a revised edition, or
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## 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 fieldbuses 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 fieldbuses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Figure 1 shows how IEC 62453–303-1 is aligned in the structure of the IEC 62453 series.

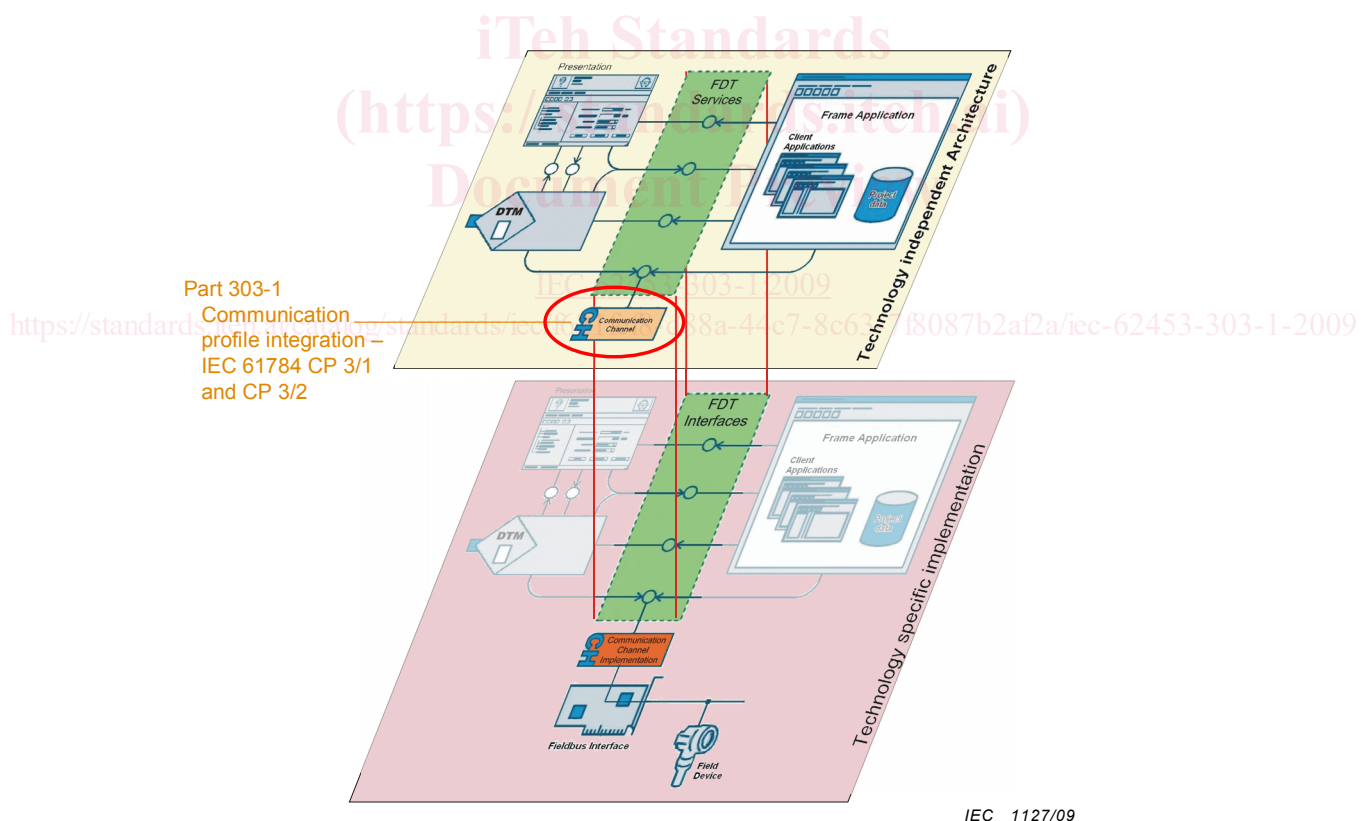


Figure 1 – Part 303-1 of the IEC 62453 series

## FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

### Part 303-1: Communication profile integration – IEC 61784 CP 3/1 and CP 3/2

#### 1 Scope

Communication Profile 3/1 and Communication Profile 3/2 (commonly known as PROFIBUS™<sup>1</sup>) defines communication profiles based on IEC 61158-2 Type 3, IEC 61158-3-3, IEC 61158-4-3, IEC 61158-5-3, and IEC 61158-6-3. The basic profiles CP 3/1 (PROFIBUS DP) and CP 3/2 (PROFIBUS PA) are defined in IEC 61784-1.

This part of IEC 62453 provides information for integrating the PROFIBUS protocol into the FDT interface specification (IEC 62453–2).

This part of the 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 specification. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies

IEC 61131-3:2003, *Programmable controllers – Part 3: Programming languages*

<https://standards.iteh.ai/document/IEC/62453-303-1-2009>  
IEC 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

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

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

IEC 61158-4-3, *Industrial communication networks – Fieldbus specifications – Part 4-3: Data-link layer protocol specification – Type 3 elements*

IEC 61158-5-3, *Industrial communication networks – Fieldbus specifications – Part 5-3: Application layer service definition – Type 3 elements*

IEC 61158-6-3, *Industrial communication networks – Fieldbus specifications – Part 6-3: Application layer protocol specification – Type 3 elements*

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

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<sup>1</sup> PROFIBUS™ is a trade name of the non-profit organization PROFIBUS Nutzerorganisation e.V. (PNO). This information is given for the convenience of users of this International Standard 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 registered logos for PROFIBUS™. Use of the registered logos for PROFIBUS™ requires permission of PNO.

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*

### 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.

##### 3.1.1

##### **bus interface module**

module of a field device that provides the connection to the fieldbus

##### 3.1.2

##### **CP 3/1**

Communication profile of CPF3, featuring asynchronous transmission; RS 485 (ANSI TIA/EIA RS-485-A); optional RS 485-IS; plastic fiber; glass multi mode fiber or glass single mode fiber; PCF fiber

##### 3.1.3

##### **CP 3/2**

Communication profile of CPF3, featuring synchronous transmission; manchester coded and bus powered (MBP); optional intrinsically safe (MBP-IS) and lower power (MBP-LP)

#### 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.

BIM	Bus Interface Module
BMCP	Bus Master Configuration Part
GSD	General Station Description

#### 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 behaviour.
Usage of “can” or “optional”	Function or behaviour may be provided, depending on defined conditions.

##### 3.3.3 Use of UML

Figures in this document are using the UML notation as defined in Annex A of IEC 62453-1.

#### 4 Bus category

CP 3/1 and CP 3/2 protocols are identified in the protocolId element of the structured data type 'fdt:BusCategory' by the following unique identifiers (Table 1):

**Table 1 – Protocol identifiers**

Identifier value	ProtocolId name	Description
036D1497-387B-11D4-86E1-00E0987270B9	'Profibus DP/V0'	Support of Profibus DP V0 protocol
036D1499-387B-11D4-86E1-00E0987270B9	'Profibus DP/V1'	Support of Profibus DP V1 protocol

CP 3/1 AND CP 3/2 protocols are using the following unique identifiers in physicalLayer members within PhysicalLayer data type (Table 2):

**Table 2 – Physical layer identifiers**

Identifier value	Description
036D1590-387B-11D4-86E1-00E0987270B9	IEC 61158-2 (Profibus PA)
036D1591-387B-11D4-86E1-00E0987270B9	RS485
036D1592-387B-11D4-86E1-00E0987270B9	Fiber
036D1593-387B-11D4-86E1-00E0987270B9	Ethernet

#### 5 Access to instance and device data

##### 5.1 Process Channel objects provided by DTM

The minimum set of provided data should be: Process values modelled as channel objects including the ranges and scaling

##### 5.2 DTM services to access instance and device data

The services InstanceDataInformation and DeviceDataInformation shall provide access to at least all parameters of the Physical Block and the status and Out value of the Function Blocks shall be exposed.

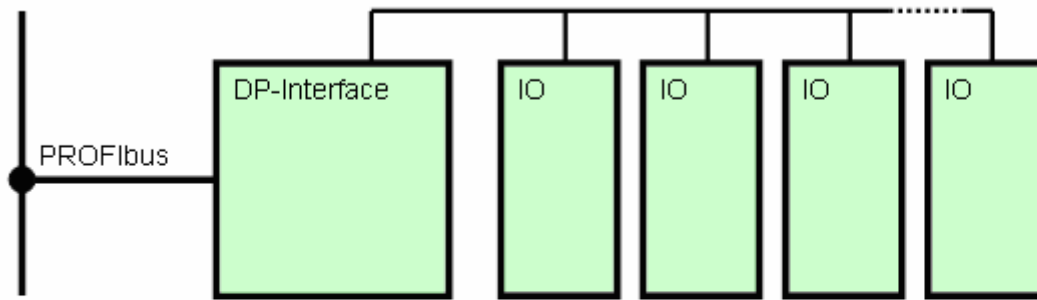
According to IEC 62453-2, at least one set of semantic information (one per supported fieldbus protocol) shall be provided for each accessible data object, using the 'SemanticInformation' general data type. The corresponding data type 'applicationDomain' shall have a value defined for Profibus and the data type 'semanticId' shall have an appropriate value, as specified in Table 9.

#### 6 Protocol specific behavior

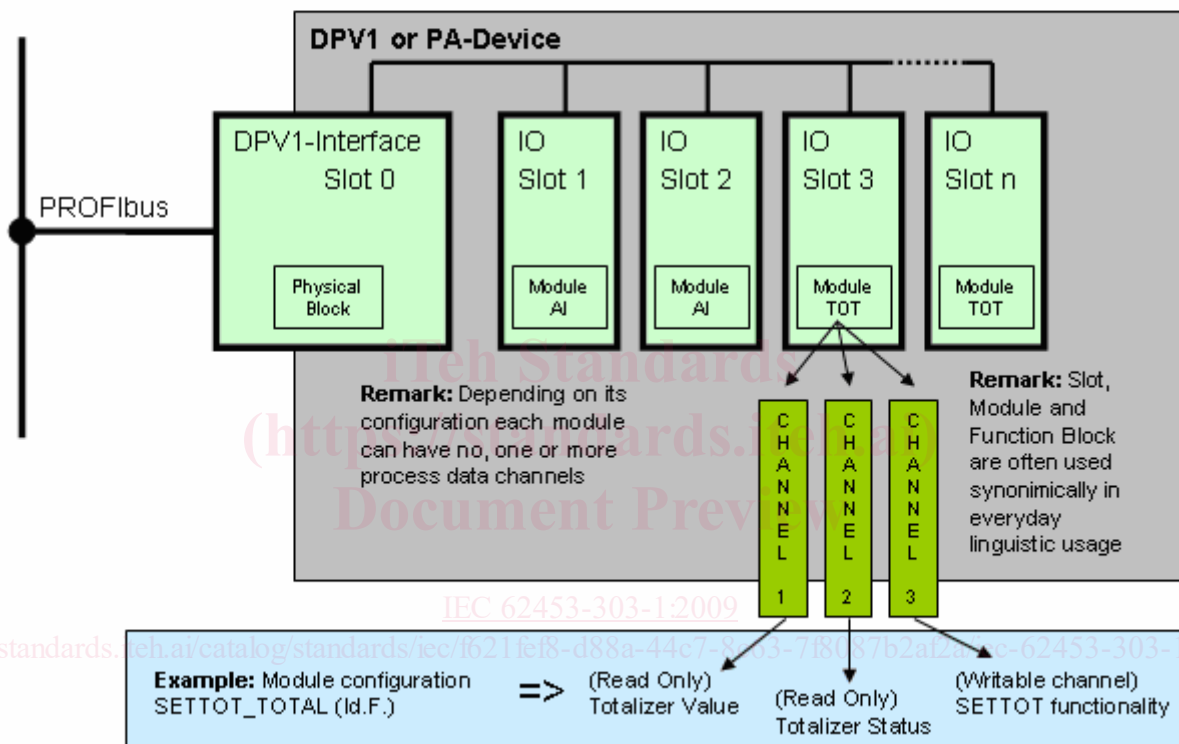
##### 6.1 PROFIBUS device model

FDT extends the PROFIBUS device model by using Process Channels for description of I/O values (see Figure 2).

**Classical View of PROFIBUS device**



**PROFIBUS notations from a monolithic DPV1 or PA device DTMs point of view**



IEC 1128/09

**Figure 2 – FDT PROFIBUS device model**

**6.2 Configuration and parameterization of PROFIBUS devices**

**6.2.1 General**

In a GSD-based configuration tool the user defines the configuration and sets the appropriate parameters for the modules. The configuration tool creates the configuration string and the parameter string that are used to set up the slave properly.

With FDT the configuration and parameterization of the devices is no longer executed only by a central component; it moved partly into the DTMs. A DTM is responsible for providing configuration and parameterization information for the cyclic master that puts the PROFIBUS slaves in operation.

A DTM is used to adjust a field device to its specific application. Within PROFIBUS, there are three different aspects of adjustment:

- parameterization: usr prm data (used in the PROFIBUS service SET\_PRM for setting up the cyclic communication and the specific behavior of the device);

- application parameterization: application specific parameters (transmitted via acyclic read/write PROFIBUS services);
- configuration: configuration data (used in the PROFIBUS service CHK\_CFG for definition of the format and length of the input/output data that are transmitted within cyclic communication).

The application parameterization transmitted via acyclic communication is not in the scope of this document. Within this document the term parameterization represents communication parameterization (SET\_PRM).

### 6.2.2 Monolithic DTM for a modular PROFIBUS device

A monolithic DTM is one single DTM that represents the complete device with its Bus Interface Module (BIM) and its I/O modules. In general, such a DTM offers a configuration dialog (presentation object) that allows definition of the used BIM and modules. The configuration dialog must be available via the FDT standard function “Configure” (see [1] 4.3 Operation Configuration).

Not all PROFIBUS devices require a configuration dialog. That is why not all DTMs provide the “Configure” function. This is valid only for non-modular PROFIBUS devices if the usr prm data cannot be changed.

The configuration dialog allows changing the data only in offline mode if the data set can be locked.

### 6.2.3 Modular DTM for a modular PROFIBUS device

Separate DTMs represent the BIM (Device DTM) and the particular I/O modules (Module DTMs). The effort developing such a modular DTM is normally higher than in the case of a monolithic DTM, because:

- a private protocol has to be implemented between BIM and I/O modules to ensure that only a Module DTM can be added to the BIM DTM. This requires an own protocol ID and the adaptation / creation of communication;
- in some cases, additional private interfaces are necessary to exchange information between Device DTM for BIM and Module DTMs.

Implementing a Modular DTM results in the following advantages:

- the project represents the device structure;
- the user is able to access module-related information directly as a function of the Module DTM;
- the FDT specification defines a mechanism to identify DTMs. With these mechanisms it is possible to provide support for scanning the modules below the BIM and generate the topology automatically;
- supporting a new type of BIM or I/O module requires an additional DTM “only” and does not affect existing components. This may result in reduced test effort.

The configuration data to set up the PROFIBUS configuration must be provided by the Device DTM (representing the BIM). This configuration data may be generated from information of the instantiated Child DTMs and by using a configuration dialog.

Modular DTMs should be provided for modular devices (e.g. a plant operator may add/remove modules). Monolithic DTMs are used to represent devices that show no modularity (e.g. PA devices).