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Edition 1.0 2017-06

TECHNICAL REPORT

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Field device tool (FDT) interface specification – Part 52-90: Communication implementation for common language infrastructure – IEC 61784 CPF 9

IEC TR 62453-52-90:2017-06(en)

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FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 52-90: Communication implementation for common language infrastructure – IEC 61784 CPF 9

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IEC TR 62453-52-90, which is a technical report, has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

Each part of the IEC 62453-52-xy series is intended to be read in conjunction with its corresponding part in the IEC 62453-3xy series. This document corresponds to IEC 62453-309.

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The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
65E/440/DTR	65E/514/RVC

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

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

The 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 "http://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- withdrawn,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

This part of IEC 62453 is an interface specification for developers of Field Device Tool (FDT) 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 Device Type Manager (DTM), 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 kind of fieldbusses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Figure 1 shows how this part of the IEC TR 62453-52-xy series is aligned in the structure of the IEC 62453 series.

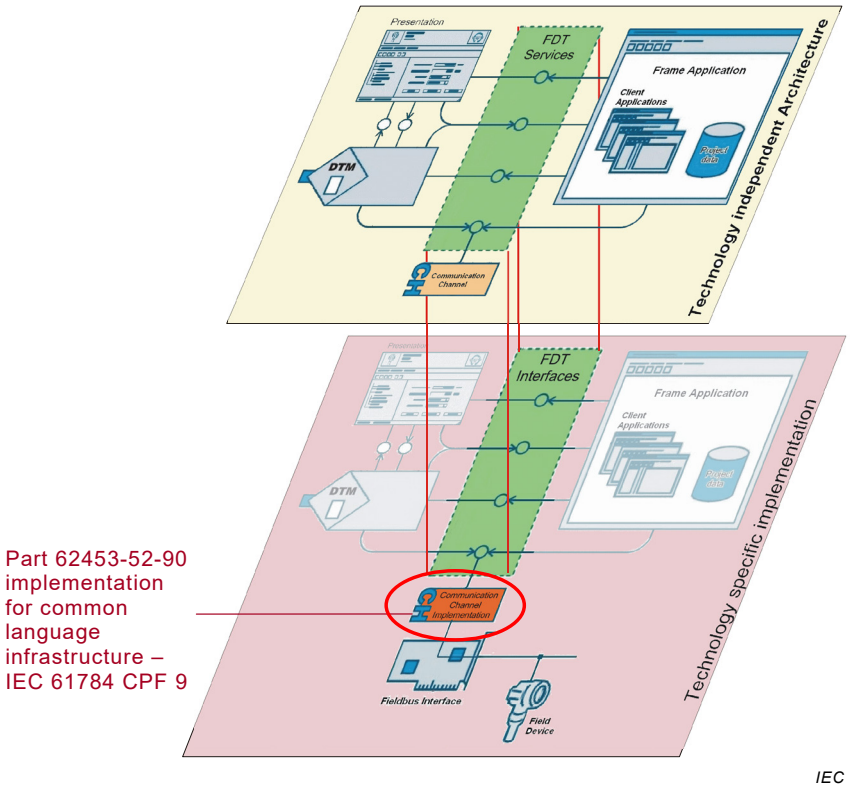

Figure 1 – Part 52-90 of the IEC 62453 series

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FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 52-90: Communication implementation for common language infrastructure – IEC 61784 CPF 9

1 Scope

This part of the IEC 62453-52-xy series, which is a Technical Report, provides information for integrating the HART®[1] technology into the CLI-based implementation of FDT interface specification (IEC TR 62453-42).

This part of IEC 62453 specifies implementation of communication and other services based on IEC 62453-309.

This document 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 61784-1:2014, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

IEC 62453-1:2016, *Field device tool (FDT) interface specification – Part 1: Overview and guidance*

IEC 62453-2:2016, *Field device tool (FDT) interface specification – Part 2: Concepts and detailed description*

IEC TR 62453-42:2016, *Field device tool (FDT) interface specification – Part 42: Object model integration profile – Common language infrastructure*

IEC 62453-309:2016, *Field device tool (FDT) interface specification – Part 309: Communication profile integration – IEC 61784 CPF 9*

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, IEC 62453-2, IEC TR 62453-42 and IEC 62453-309 apply.

[1] HART ® is the trade name of a product supplied by HART Communication Foundation. This information is given for convenience of users of this document and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

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- 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, IEC 62453-309, and IEC TR 62453-42 apply.

3.3 Conventions

3.3.1 Datatype names and references to datatypes

The conventions for naming and referencing of datatypes are explained in IEC 62453-2:2016, 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 UML notation as defined in Annex A of IEC 62453-1:2016.

4 Bus category

IEC 61784 CPF 9 protocol is identified in the attribute busCategory of the BusCategory element by the identifiers, as specified in IEC 62453-309.

5 Access to instance and device data

5.1 General

Used at interfaces:

- IInstanceData
- IDeviceData

These interfaces shall provide access to at least all parameters defined in IEC 62453-309.

5.2 IO signals provided by DTM

A DTM shall provide IO signal information of the device using the IProcessData interface.

To provide all information required to access the output signal information the DTM shall provide the information shown in Table 1 within its HartIOSignalInfo.

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Table 1 – Output signal info within IOSignalInfo / HartIOSignalInfo

Attribute	Description
Name	Name of the IO signal
Range	Reference to the variables providing range information
Unit	Reference to an enumeration variable describing the unit information
DeviceVariableAssignment	Constant enumeration value that can take following values – unassigned: The IO signal is not assigned to dynamic variable and can only be accessed using the indexed approach (reading device variables). – PV: IO signal assigned to the PV dynamic variable – SV: IO signal assigned to the SV dynamic variable – TV: IO signal assigned to the TV dynamic variable – QV: IO signal assigned to the QV dynamic variable
DeviceVariableCode	Constant that specifies the device specific variable code (see [7][2] Table 34). Because of compatibility reasons to other FDT versions (e.g. IEC TR 62453-41), this variable could be set to the value 252 that stands for “unknown”.

5.3 Data interfaces

5.3.1 General

Within HART, several command sets are defined. As part of the command set definition, HART provides a precise naming convention that is documented within the sources of the standard EDD libraries. The data provided by the access data interfaces should be named according to the HART naming convention. For backward compatibility, the semantic IDs as defined in previous versions of FDT should also be provided by the DTM.

A DTM shall provide all device data that is related to the set of Universal Commands and should provide all device data related to Common Practice CommandsIf the device supports additional command sets, like device family profiles, those data should also be exported using the naming convention as defined in the HART EDD libraries and as shown in Figure 2 and Figure 3.

5.3.2 Mapping HART datatypes to FDT datatypes

For a better usability of data provided by the data access interfaces IDeviceData and IInstanceData, all data from the device shall be converted into datatypes that are common to FDT. The mapping of basic datatypes is defined in Table 2.

2 Figures in square brackets refer to the Bibliography.

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Table 2 – Mapping of basic datatypes

HART Datatypes	FDT datatype	IEC datatype
Packed ASCII (see [10] 5.1.1)	String	STRING
ISO Latin-1 (see [10] 5.1.2)	String	STRING
Dates (see [10] 5.2)	DateTime	DATE_AND_TIME
Time (see [10] 5.3)	ULong (1/32 ms since midnight)	ULINT (1/32 ms since midnight)
Single Precision Floating Point (see [10] 5.4)	float	REAL
Double Precision Floating Point (see [10] 5.4)	double	LREAL
1-4 Byte Unsigned Integer (see [10] 5.5)	UInt	UDINT
5-8 Byte Unsigned Integer (see [10] 5.5)	ULong	ULINT
1-4 Byte Unsigned Integer (see [10] 5.5)	UInt	UDINT
5-8 Byte Unsigned Integer (see [10] 5.5)	ULong	ULINT
1-4 Byte Enumerated (see [10] 5.7.1)	UInt	UDINT
5-8 Byte Enumerated (see [10] 5. 7.1)	ULong	ULINT
1-4 Byte Bit Fields (see [10] 5.7.2)	UInt	UDINT
5-8 Byte Bit Fields (see [10] 5.7.2)	ULong	ULINT

HCF standardized the access to device specific data using structures with the standard EDD import libraries for HART. The structure uses ARRAY and COLLECTION constructs that shall be reused when exposing data within FDT in IDeviceData and IInstanceData interfaces with elements of type StructDataGroup.

When converting a COLLECTION into a StructDataGroup, the DataItems shall be identical to the COLLECTION members with:

DataItem Name = COLLECTION member identifier

DataItem Label = COLLECTION member label

When converting an ARRAY into a StructDataGroup, the DataItem shall be identical to the ARRAY element with:

DataItem Name = ARRAY element index as string

DataItem Label = ARRAY element label

An example for such a structure is presented in Figure 2 and Figure 3.

5.3.3 SemanticInfo

The SemanticInfo for HART protocol related parameters is directly related to the protocol specification. The definition of the HART commands is the base for the parameter address information which shall be used in the properties ParameterReadAddress, ParameterWriteAddress and SemanticId of the SemanticInfo datatype.

The syntax of the parameter address information is as follows:

CMD<x>[Q(<r>)]B<y>B<z>L<n>

The [Q(<r>)] portion only is required to define request data.

For description of the attributes, please view Table 3.

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Table 3 – SemanticInfo attributes description

Attribute	Datatype	Description
<x>	decimal integer	command number in the range of 0 to 255
<r>	hex-string	request data bytes
<y>	decimal integer	index of the start byte in the response data section (start index = 0)
<z>	decimal integer	index of the start bit in the byte referenced by <y>
<n>	decimal integer	length of the value in bits

According to 6.4, commands with extended command number shall be described using "CMD31Q<r>..." wherein the first two byte of the request data section shall contain the extended command number.

The property SemanticInfo.ApplicationDomain shall contain 'FDT_HART' for all parameters in Table 4 and Table 5.

5.3.4 Data exposure using IDeviceData and IInstanceData interfaces

5.3.4.1 Export of basic device parameters

Using the HART datatype mapping rules introduced in the preceding sections basic device parameters defined within the Universal and Common Practice Command sets can be exported.

Basic parameters that are not accessed using index information in the request part should for compatibility reasons provide additionally the SemanticInfo information specified in previous versions of FDT. Variables are identified by their standard identifier in HART. In Table 4, all variables are listed that shall be exported in the related data interfaces when supported by the device. HART identifier shall be assigned to the property Data.Id.

Variables with identifiers starting with "PV.", "SV.", "TV." and "QV." shall be seen as short cuts to variables that shall be available too, using the structured exposure of device variables as defined in 5.3.4.2.1.

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