

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

**Spécification des interfaces des outils des dispositifs de terrain (FDT) –  
Partie 309: Intégration des profils de communication – CEI 61784 CPF 9**

<https://standards.iteh.ai/catalog/standards/sist/2ed92bc5-bc59-434a-9463-ef1fa1ca3083/iec-62453-309-2009>



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2009 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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 corrigenda or an amendment might have been published.

#### Useful links:

IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables you 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](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - [webstore.iec.ch/csc3/iec-](http://webstore.iec.ch/csc3/iec-)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

### A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Liens utiles:

Recherche de publications CEI - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

**Spécification des interfaces des outils des dispositifs de terrain (FDT) –  
Partie 309: Intégration des profils de communication – CEI 61784 CPF 9**

<https://standards.iec.ch/catalog/standards/sist/21cd92bc5-bc59-434a-9463-ef1fa1ca3083/iec-62453-309-2009>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX

U

ICS 25.040.40; 35.100.05; 35.110

ISBN 978-2-8322-0997-4

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references .....	7
3 Terms, definitions, symbols, abbreviated terms and conventions .....	7
3.1 Terms and definitions .....	7
3.2 Abbreviated terms .....	8
3.3 Conventions .....	8
3.3.1 Data type names and references to data types .....	8
3.3.2 Vocabulary for requirements.....	8
3.3.3 Use of UML .....	8
4 Bus category .....	8
5 Access to instance and device data.....	8
5.1 Process Channel objects provided by DTM.....	8
5.2 DTM services to access instance and device data.....	9
6 Protocol specific behavior.....	9
6.1 Overview.....	9
6.2 Burst mode subscription .....	9
7 Protocol specific usage of general data types.....	10
8 Protocol specific common data types.....	11
9 Network management data types.....	11
10 Communication data types .....	11
11 Channel parameter data types.....	15
12 Device identification.....	17
12.1 Protocol specific handling of data type STRING .....	17
12.2 Common device type identification data types .....	17
12.3 Topology scan data types.....	22
12.4 Scan identification data types.....	23
12.5 Device type identification data types – provided by DTM .....	24
Bibliography.....	27
Figure 1 – Part 309 of the IEC 62453 series .....	6
Figure 2 – Burst mode subscription.....	10
Table 1 – Protocol identifiers .....	8
Table 2 – Protocol specific usage of general data types.....	10
Table 3 – Simple communication data types .....	11
Table 4 – Structured communication data types.....	12
Table 5 – Simple channel parameter data types.....	16
Table 6 – Structured channel parameter data types .....	16
Table 7 – Identification data types with protocol specific mapping.....	19
Table 8 – Identification data types without protocol independent semantics .....	21
Table 9 – Simple identification data types with protocol independent semantics.....	22

Table 10 – Structured identification data types with protocol independent semantics .....	22
Table 11 – Structured device type identification data types .....	22
Table 12 – Simple scan identification data types .....	23
Table 13 – Structured scan identification data types .....	23
Table 14 – Structured device type identification data types .....	25

Withhold

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

IEC 62453-309-2009  
<https://standards.iteh.ai/catalog/standards/sist/2ed92bc5-bc59-434a-9463-ef1fa1ca3083/iec-62453-309-2009>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

**Part 309: Communication profile integration –  
IEC 61784 CPF 9**

## 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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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.

International Standard IEC 62453-309 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.

This bilingual version (2013-07) corresponds to the monolingual English version, published in 2009-07.

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

FDIS	Report on voting
65E/130/FDIS	65E/143/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.

The French version of this standard has not been voted upon. 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.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication 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.**



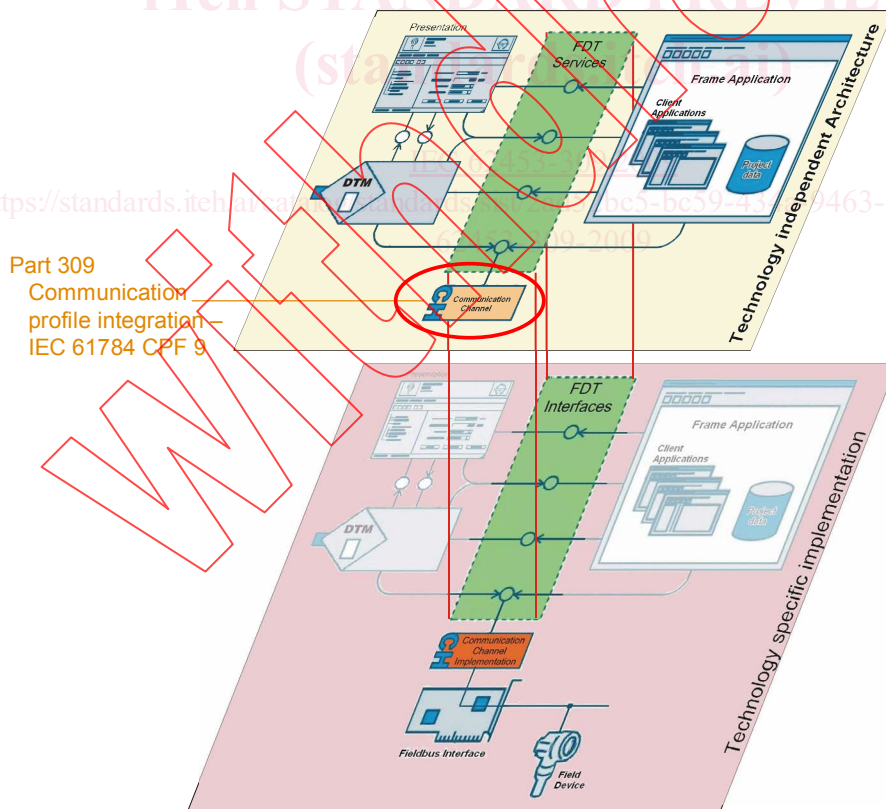
## INTRODUCTION

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 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 kind of fieldbuses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Figure 1 shows how IEC 62453-309 is aligned in the structure of the IEC 62453 series.



IEC 1134/09

Figure 1 – Part 309 of the IEC 62453 series



## FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

### Part 309: Communication profile integration – IEC 61784 CPF 9

#### 1 Scope

Communication Profile Family 9 (commonly known as HART®<sup>1</sup>) defines communication profiles based on IEC 61158-5-20 and IEC 61158-6-20. The basic profile CP 9/1 is defined in IEC 61784-1.

This part of IEC 62453 provides information for integrating the HART® technology into the FDT standard (IEC 62453-2).

This part of the IEC 62453 specifies communication and other services.

This standard 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 61158-5-20, *Industrial communication networks – Fieldbus specifications – Part 5-20: Application layer service definition – Type 20 elements*

IEC 61158-6-20, *Industrial communication networks – Fieldbus specifications – Part 6-20: Application layer protocol specification – Type 20 elements*

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

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 and the following apply.

---

<sup>1</sup> HART ® is the trade name of the 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.

### 3.1.1

#### **burst mode**

mode in which the field device generates response telegrams without request telegram from the master

### 3.2 Abbreviated terms

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

BACK	Burst ACKnowledge
UML	Unified Modelling Language

### 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 UML notation as defined in Annex A of IEC 62453-1.

## 4 Bus category

IEC 61784 CPF 9 protocol is identified in the protocolId element of structured data type 'fdt:BusCategory' by the following unique identifier (Table 1):

**Table 1 – Protocol identifiers**

Identifier value	ProtocolId name	Description
036D1498-387B-11D4-86E1-00E0987270B9	'HART'	Support of IEC 61784 CPF 9 protocol

## 5 Access to instance and device data

### 5.1 Process Channel objects provided by DTM

The minimum set of provided data shall be:

- the first four provided process related values (PV, SV, ...) - if available - are modeled as channel references. The referenced channel shall include ranges and scaling.

## 5.2 DTM services to access instance and device data

The services InstanceDataInformation and DeviceDataInformation shall provide access to at least to all parameters of the Universal and Common Practice commands (as far as the device supports the function).

Furthermore, the Response Byte 0 and the Response Byte 1 for each command shall be exposed.

The services InstanceDataInformation and DeviceDataInformation may also provide access to device specific parameters (e.g. diagnostic information).

## 6 Protocol specific behavior

### 6.1 Overview

There is only one protocol specific sequence defined for IEC 61784 CPF 9:

- burst mode subscription.

This sequence explains how the sequence “”, defined in Part 2 of this standard, is applied in context of burst telegrams as defined by IEC 61784 CPF 9.

### 6.2 Burst mode subscription

A subscription to device initiated data transfer can be requested by sending a transaction request with SubscribeRequest content (see Figure 2). The Communication Channel may detect if the device is already in burst mode.

NOTE In HART 5 this can be detected only when burst frames are received from the device. In HART 6 the burst mode can be detected using command 105.

The Communication Channel answers to a SubscribeRequest with a SubscribeResponse content. If burst frames are received, the device is in burst mode and burstModeDetected value is set to TRUE. This means that Device DTM will start to receive burst messages via the transaction response mechanism. In the case that no burst messages were received, burstModeDetected value is set to FALSE. It is up to Device DTM to set device into burst mode. Then Device DTM may call a transaction request with SubscribeRequest content again in order to receive burst messages.

In order to unsubscribe, the Device DTM sends a transaction request with a UnsubscribeRequest. The Communication Channel answers with a SubscribeResponse where burstModeDetected value is set to FALSE. The Device DTM will not receive any more burst information via the transaction response mechanism. The Communication Channel does not switch off the burst mode in the device. The Device DTM may switch burst mode on or off by using normal transaction requests (command 109). This is independent of the subscription.

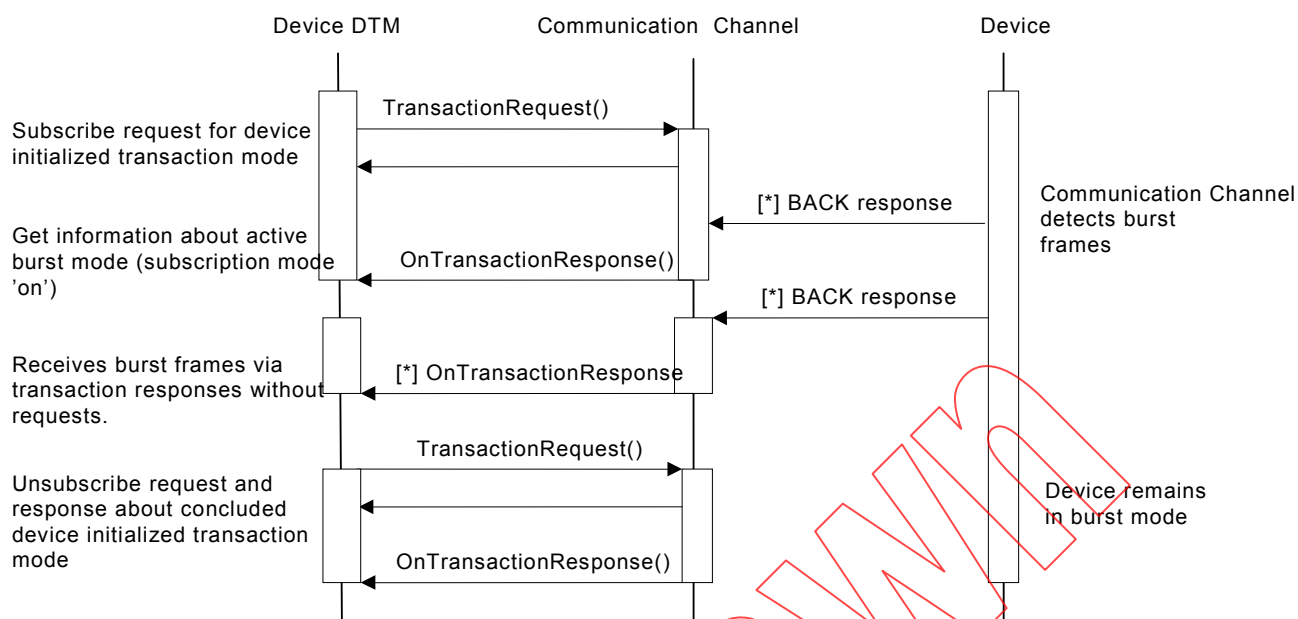


Figure 2 – Burst mode subscription

## 7 Protocol specific usage of general data types

The following table (Table 2) shows how general data types, defined in IEC 62453-2 within the namespace 'fdt', are used with HART devices.

Table 2 – Protocol specific usage of general data types

Data type	Description for use
fdt:address	The address property is not mandatory for the exposed parameters in the DTMs. But if the address property is used the string shall be constructed according to the rules of the semanticId. That means the property 'semanticId' is always the same as the property 'address'
fdt:protocolId	See Clause 4
fdt:deviceTypeId	The property "fdt:DtmDeviceType.deviceTypeId" shall contain the DeviceTypeId of the supported physical device according to the HCF online product catalog
fdt:manufacturerId	Enter manufacturer according HCF list
fdt:semanticId fdt:applicationDomain	<p>The applicationDomain attribute is: FDT_HART</p> <p>The semanticId for protocol related parameter is directly related to the protocol specification. The definition of the commands is the base for the semanticId. The semanticId for a parameter follows the following definition:</p> <p style="text-align: center;">CMDxxBy</p> <p>and</p> <p style="text-align: center;">CMD31EXTENDEDxxBy</p> <p>for extended HART 6 device family commands.</p> <p>The semanticIds for the Response Byte 0 and 1 defined in the IEC 61784 CPF 9 specification are:</p> <p>CMDxxRESPONSE_BYTE_0</p> <p>CMDxxRESPONSE_BYTE_1</p>

Data type	Description for use
	xx: represents the command number, getting the parameter via IEC 61784 CPF 9 protocol or the device family command number y: start byte within the command definition  xx, y are based on decimal format without leading '0'
subDeviceType	Enter manufacturer specific value

## 8 Protocol specific common data types

Not applicable.

## 9 Network management data types

The data types specified in this subclause are used in the following services:

- NetworkManagementInfoRead service;
- NetworkManagementInfoWrite service.

The data type net:DeviceAddress (defined in IEC 62453-2) is used for defining the network address of a device.

## 10 Communication data types

The data types described in this clause are used in the following services:

- connect service;
- disconnect service;
- transaction service.

The service arguments contain the address information and the communication data (explained in Table 3 and Table 4).

The data types described in this clause are defined for the following namespace.  
Namespace: fdthart

**Table 3 – Simple communication data types**

Data type	Definition	Description
address1	USINT	Address information according to the IEC 61784 CPF 9 specification
address2	USINT	Address information according to the IEC 61784 CPF 9 specification
address3	USINT	Address information according to the IEC 61784 CPF 9 specification
burstFrame	BOOL	Information whether the IEC 61784 CPF 9 response is a burst frame (message or not)
burstModeDetected	BOOL	Indicates whether the Communication Channel has detected that the device is already in burst mode. This is detected during a subscription request
commandNumber	USINT	Address information according to the IEC 61784 CPF 9 specification
communicationRefere	UUID	Mandatory identifier for a communication link to a device This

Data type	Definition	Description
nce		identifier is allocated by the communication component during the connect. The address information has to be used for all following communication calls
delayTime	UDINT	Minimum delay time in [ms] between two communication calls
deviceStatus	USINT	Status information. This is the second status byte returned in command responses according to the IEC 61784 CPF 9 specification
deviceTypeId	USINT	Address information according to the IEC 61784 CPF 9 specification
longFrameRequired	BOOL	Address information according to the IEC 61784 CPF 9 specification
manufacturerId	USINT	Address information according to the IEC 61784 CPF 9 specification (Table: VIII, MANUFACTURER IDENTIFICATION CODES)
preambleCount	USINT	At the connect request the attribute is optional and contains a hint for the communication component about the number of preambles, required by the device type. At the connect response the attribute is mandatory and contains the information about the currently used preambleCount
primaryMaster	BOOL	At the connect request the attribute is optional and contains a hint for a communication component that a DTM requires communication as primary or secondary master. At the connect response the attribute is mandatory and contains the information about the current state of the master
sequenceTime	UDINT	Period of time in [ms] for the whole sequence
shortAddress	USINT	Address information according to the IEC 61784 CPF 9 specification. This value is accessible via the attribute slaveAddress. SlaveAddress is part of the BusInformation structure. These values shall be set by the responsible component as described in clause Nested Communication of IEC 62453-2
value	USINT	Variable for status information
systemTag	String	System Tag of a DTM. It is strongly recommended to provide the attribute in the Request document.

**Table 4 – Structured communication data types**

Data type	Definition			Description
	Elementary data types	U s a g e	Multiplicity	
Abort	STRUCT			Describes the abort
	communicationReference	O	[0..1]	
CommandResponse	STRUCT			Status information. This is computed from the first status byte returned in command responses according to the IEC 61784 CPF 9 specification. If bit 7 of the first status byte is clear this value contains the value in the first status byte. If bit 7 is set this element is not returned in the status structure
	value	M	[1..1]	
CommunicationStatus	STRUCT			Status information. This is computed from the first status byte returned in command responses according to the IEC 61784 CPF 9 specification. If bit 7 of the first status byte is set this value contains the value in the first status

Data type	Definition			Description
	Elementary data types	U s a g e	Multiplicity	
				byte (This is where we need to state whether it is the first status byte or bits 0-6 of the first status byte). If bit 7 is clear this element is not returned in the status structure
	value	M	[1..1]	
ConnectRequest	STRUCT			Describes the communication request
	fdt:tag	M	[1..1]	
	preambleCount	O	[0..1]	
	primaryMaster	O	[0..1]	
	longFrameRequired	O	[0..1]	
	fdt:systemTag	O	[0..1]	
	LongAddress	O	[0..1]	
	ShortAddress	M	[1..1]	
ConnectResponse	STRUCT			Describes the communication response
	fdt:tag	M	[1..1]	
	preambleCount	M	[1..1]	
	primaryMaster	M	[1..1]	
	communicationReference	M	[1..1]	
	LongAddress	O	[0..1]	
	ShortAddress	M	[1..1]	
DataExchange-Request	STRUCT			Describes the communication request
	commandNumber	M	[1..1]	
	communicationReference	M	[1..1]	
	fdt:CommunicationData	O	[0..1]	
DataExchange-Response	STRUCT			Describes the communication response
	commandNumber	M	[1..1]	
	communicationReference	M	[1..1]	
	burstFrame	O	[0..1]	
	fdt:CommunicationData	O	[0..1]	
Status	M	[1..1]		
DisconnectRequest	STRUCT			Describes the communication request
	communicationReference	M	[1..1]	
DisconnectResponse	STRUCT			Describes the communication response
	communicationReference	M	[1..1]	
SubscribeRequest	STRUCT			Describes the subscription request for device initiated data transfer (IEC 61784 CPF 9 burst mode)
	communicationReference	M	[1..1]	