FDT3.0 for PROFIBUS
Protocol Annex

Technical Specification

Version 1.00.00

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1 Scope

1.1 General

This document provides information for integrating the PROFIBUS protocol into the Field Device Tool (FDT) specification version 3.0[1].

This document neither contains the FDT3.0 specification nor modifies it. The FDT3.0 specification is available from the homepage of the FDT Group (www.fdtgroup.org).

This document also neither contains the complete specification for PROFIBUS networks nor modifies them.

1.2 Intended audience

The intended audiences of this document are persons who are going to develop FDT3.0 products for PROFIBUS.

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 61158:2008 (all parts): *Industrial communication networks – Fieldbus specifications*

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*

IEC 62453-42:2009, *Field Device Tool (FDT) interface specification – Part 42: Object model integration profile – Common language infrastructure*

*FDT*3.0*, Technical Specification, Version 1.00, FDT Group, AISBL; April 2020*

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 FDT3.0, IEC 62453-1, IEC 62453-2, IEC 62453-41, MSDN® and the following apply.

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

CP 3/1
Communication profile of PROFIBUS DP, 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

CP 3/2
Communication profile of PROFIBUS PA, featuring synchronous transmission; Manchester coded, Bus Powered (MBP); optional intrinsically safe (MBP-IS) and lower power (MBP-LP)

Master Class
In a DP-V0 environment, depending on the situation, the underlying master device may have either Master Class 1 (DPM1) functionality or Master Class 2 (DPM2) functionality. A Class 1 master can write output data to a device and control data exchange, where a Class 2 master can only read the output data.

3.2 Abbreviations

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

ANSI	American National Standards Institute (http://www.ansi.org)
BIM	Bus Interface Module
CFG	Configuration data used during initialization of PROFIBUS slave device
DCS	Distributed Control System
DP	Decentralized Peripherals
EIA	Electronic Industries Alliance
FDL	Fieldbus Data Link layer
FMA	Fieldbus Management layer
FMS	Fieldbus Message Specification
GSD	General Station Description
MBP	Manchester coded Bus Powered
PND	PROFIBUS Network Data
I&M	Identification and maintenance functions
PA	Process Automation
PCF	Polymer Clad Fibre
PROFIBUS	Process Field Bus
RS	Radio Sector / Recommended Standard
TIA	Telecommunications Industry Association
UML	Unified Modeling Language

3.3 Conventions

3.3.1 General convention

The conventions for naming and referencing of datatypes are explained in FDT3.0 specification.

3.3.2 Vocabulary for requirements

The following expressions are used when specifying requirements.

Wording	Indicates
‘shall’, ‘has to’, ‘have to’, or ‘Mandatory’	No exceptions allowed.

Wording	Indicates
‘should’ or ‘Recommended’	Strong recommendation. It may make sense in special exceptional cases to differ from the described behavior.
‘conditional’	Function or behavior shall be provided, depending on defined conditions.
‘can’ or ‘Optional’	Function or behavior may be provided.

Further conventions are:

Convention	Indicates
Note:	Indicates text (in small letters), which does not express requirements, but provides additional information.
<MethodName>	Angle brackets are used to indicate a reference to an asynchronous method.

3.3.3 Use of UML

Figures in this document are using UML notation as defined in Annex I of the FDT3.0 specification.

4 Bus category

DP-V0 and DP-V1 protocols are identified by the following unique identifiers in the ProtocolId property of class BusCategory:

Table 1 – Definition of BusCategory

ProtocolId value	ProtocolName value	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

DP-V2 protocol is not relevant for FDT since it describes communication between slave devices.

Table 2 defines which PhysicalLayer can be used together with the BusCategory values defined in Table 1.

Table 2 – Physical Layer Identifiers

Identifier value	Name	Description
036D1590-387B-11D4-86E1-00E0987270B9	MBP	IEC 61158-2, clause 21 (MBP, PROFIBUS PA)
036D1591-387B-11D4-86E1-00E0987270B9	RS-485	IEC 61158-2, clause 22 (RS-485, PROFIBUS DP)
036D1592-387B-11D4-86E1-00E0987270B9	Fiber Optic	IEC 61158-2, clause 23 (Fiber Optic cable, PROFIBUS DP)

Table 3 defines which DataLinkLayer can be used together with the BusCategory values defined in Table 1.

Table 3 – DataLink Layer Identifiers

Identifier value	Name	Description
50A21B35-7EE7-4999-8174-70396929C0B4	PROFIBUS FDL	PROFIBUS FDL
CDF338DC-E9A3-4D13-91AC-60A43DCB2904	PROFIBUS FMA1/2	PROFIBUS FMA1/2

5 Access to instance, device and process data

5.1 General

The minimum set of provided data shall be:

- All device parameters of the Physical Block and Out value of the Function Blocks shall be exposed via the data interfaces (PROFIBUS PA devices).
- All process values available for the device shall be modelled as ProcessData including the ranges and scaling if applicable
- All network configuration related parameters shall be exposed in NetworkData (see section 8)

5.2 IO signals provided by DTM

A DTM shall provide IO signal information for the device using the IProcessData interface. The IO signals describe datatype and address parameters of process data as detailed in chapter 11.

5.3 Data interfaces

Via the interfaces IDeviceData and IInstanceData all device specific parameters shall be exposed.

5.3.1 Mapping of PROFIBUS datatypes to FDT datatypes

PROFIBUS uses datatypes as specified in IEC 61158 for the transmission on the fieldbus. The FDT interfaces IDeviceData and IInstanceData use .NET datatypes, while PLC applications use datatypes defined in IEC 61131-3. Hence a mapping between these three type systems is defined in Table 4.

Table 4 – Mapping of datatypes

PROFIBUS datatype	FDT datatype	IEC 61131 datatype
Bit information		
Boolean	BooleanValue	BOOL
Unsigned8	BinaryBitArrayValue[8]	BYTE
Unsigned16	BinaryBitArrayValue[16]	WORD
Unsigned32	BinaryBitArrayValue[32]	DWORD
Numeric information with and without sign		
Integer8	SignedByteValue	SINT
Integer16	IntValue	INT
Integer32	LongValue	DINT
Unsigned8	ByteValue	USINT
Unsigned16	UIntValue	UINT

PROFIBUS datatype	FDT datatype	IEC 61131 datatype
Unsigned32	ULongValue	UDINT
Float32	FloatValue	REAL
Float64	DoubleValue	LREAL
Printable characters (e.g. text)		
Visible String	StringValue	STRING
Unicode String	StringValue	WSTRING
Time information		
TimeDifference without Date Indication	TimeSpanValue	TIME
Date	DateValue	DATE
Time Of Day without date indication	TimeValue	TIME_OF_DAY
Time of Day with date indication	DateTimeValue	DATE_AND_TIME
Combinations of basic datatypes		
Octet String	BinaryByteArrayValue	ARRAY
ARRAY	StructDataGroup	ARRAY
STRUCT OF	StructDataGroup	STRUCT

The FDT datatypes are used by the <Read> and <Write> methods in the interfaces IInstanceData and IDeviceData.

5.3.2 SemanticInfo

The identifier in SemanticId shall be unique and always reference the same element. This means the semantic information shall be the same whenever the same data is referenced. By using this attribute e.g. a Frame Application is able to get the information regarding the meaning and usage of a single data structure.

Table 5 – Usage of SemanticInfo

Attribute	Description for use in PROFIBUS
SemanticInfo.ReadParameterAddress SemanticInfo.WriteParameterAddress	For PROFIBUS, ReadParameterAddress and WriteParameterAddress are always identical. The address string shall be constructed according to the rules of the FDT SemanticId. PROFIBUS Parameter Address: The property 'Address' follows the different device models that are defined for PROFIBUS devices. FDT currently supports the following models: - PROFIBUS DP / DP-V1, - PROFIBUS PA, - PROFIdrive (greater or equal profile version 3) **PROFIBUS DP / DP-V1** The device model is based on devices that are composed of slots, whereas slots do not have to represent physical objects. The data that is contained in the slots are addressable via Indexes. This data may be variables or composed blocks of data. The Address property is API*xx*SLOT*yy*INDEX*zz* *xx* - API *yy* - Slot *zz* - Index *xx*, *yy*, *zz* are based on decimal format without leading '0'

Attribute	Description for use in PROFIBUS
	PROFIBUS PA The device is represented by a device management structure and a number of blocks that provide different functionality (physical block, function block, transducer block). The blocks are mapped to slot addresses, but this mapping may vary depending on the device type. The Address property is API*xx*SLOT*yy*INDEX*zz* *xx* - API *yy* - Slot *zz* - Index *xx*, *yy*, *zz* are based on decimal format without leading '0' **PROFIdrive** According to the PROFIdrive profile [6], a device (drive unit) may be composed by a number (1..many) of drive objects (DOs). The DOs may have different type. Each DO is uniquely identifiable and manages its own parameters. Each parameter can be uniquely identified by its number (PNU). Each DO has its own number space. A parameter may contain simple data or composed data (e.g. arrays). The data of the device are accessible via a parameter channel (normaly slot 0 index 47). The Address property is API*xx*SLOT*yy*INDEX*zz*.DO*do-id.pnu* *xx* - API *yy* - Slot *zz* - Index *do-id* - Drive Object ID *pnu* - ParameterNumber *xx*, *yy*, *zz*, *do-id*, *pnu* are based on decimal format without leading '0'
SemanticInfo.ApplicationDomain/ SemanticInfo.SemanticId	The SemanticIDs for PROFIBUS follow the different device models that are defined for PROFIBUS devices. FDT currently supports the following models: - PROFIBUS DP, - PROFIBUS PA, - PROFIdrive. **PROFIBUS DP / DP-V1** The ApplicationDomain is: FDT_PROFIBUS_DPV1 The device model is based on devices that are composed of slots, whereas slots do not have to represent physical objects. The data that is contained in the slots are addressable via Indexes. This data may be variables or composed blocks of data. The SemanticId for devices not based on a profile is directly based on the PROFIBUS address information: The SemanticId is: API*xx*.SLOT*yy*.INDEX*zz* *xx - AP* *yy - Slot* *zz - Index* *xx*, *yy*, *zz* are based on decimal format without leading '0' **PROFIBUS PA** The ApplicationDomain is: FDT_PROFIBUS_PA The device is represented by a device management structure and a number of blocks that provide different functionality (physical block, function block, transducer block). The blocks are mapped to slot addresses, but this mapping may vary depending on the device type. Since the device model is based on blocks, the SemanticIds also are based on the block model. Within each block, the data is identifiable by names of parameters. The SemanticId for PROFIBUS profile related parameter follows the following rules: the SemanticId shall be built based on the names defined in

Attribute	Description for use in PROFIBUS
	the profiles structured parameters shall be combined with a '.'; spaces within the profile definition shall be exchanged with an underscore; blocks shall be counted according to the Object Dictionary; the block number shall be part of the SemanticId. The SemanticId is *BlockType.BlockIndex.NameOfParameter.AttributeOfParameter* Example AnalogInputFB.3.OUT.Unit **PROFIdrive** The ApplicationDomain is: FDT_PROFIBUS_PROFIDRIVE According to the PROFIdrive profile, a device (drive unit) may be composed by a number (1..many) of drive objects (DOs). The DOs may have different types. Each DO is uniquely identifiable and manages its own parameters. Each parameter can be uniquely identified by its number (PNU). Each DO has its own number space. A parameter may contain simple data or composed data (e.g. arrays). The data of the device are accessible via a parameter channel (slot 0, index 47). The SemanticId is: DO*do-id*.PNU*pnu* *do-id* - Drive Object ID *pnu* - ParameterNumber *do-id*, *pnu* are based on decimal format without leading '0' Example DO3.PNU64

6 Protocol specific behaviour

6.1 PROFIBUS device model

The definition of Process Data Items for the description of I/O values (see Figure 1) shall be structured according to the PROFIBUS device model.

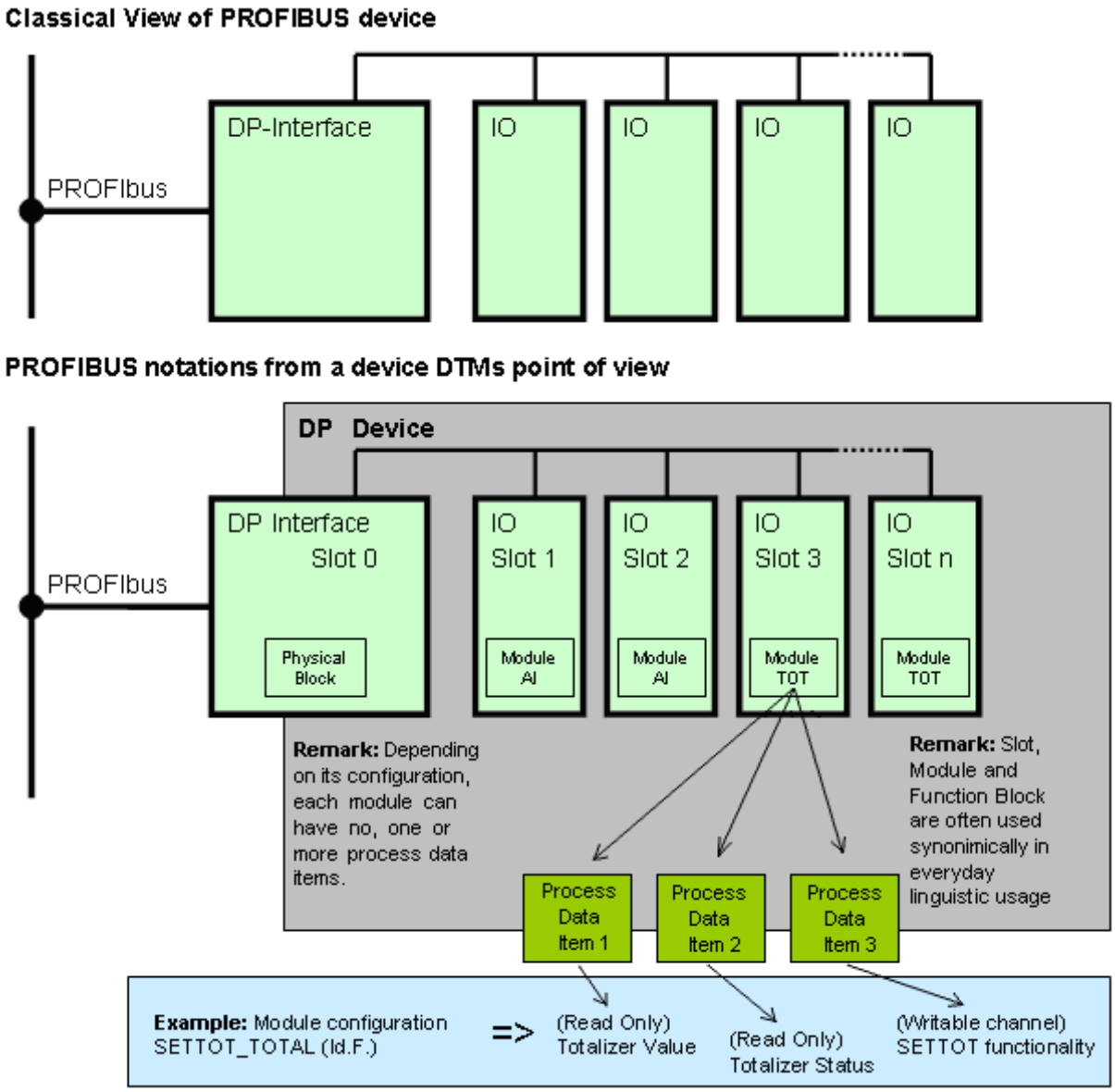


Figure 1 - FDT PROFIBUS Device Model

DTMs for PROFIBUS devices shall provide information about their I/O data to provide engineering systems knowledge to access such data without the use of the DTMs.

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 piece of software; it moved partly into the DTMs. A Device DTM is responsible for providing configuration and parameterization information for a PROFIBUS master that puts the PROFIBUS slaves in operation.

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

- Communication parameterization: User Prm Data (used in the PROFIBUS service Set_Prm for setting up the cyclic communication and the specific behavior of the device);
- Configuration data: Cfg 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).
- Application parameterization: application specific parameters (transmitted via acyclic read/write PROFIBUS services);

The application parameterization transmitted via acyclic communication is not in the scope of this document. The parameter data transmitted for this purpose is device specific. Only the communication services that can be used by Device DTMs for performing such device specific parameterization are defined. 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 user interface (presentation object) that allows definition of the used BIM and module types.

Not all PROFIBUS devices require a configuration user interface. That is why not all DTMs provide the configuration function (ApplicationID: Configuration). This is valid only for non-modular PROFIBUS devices if the User Prm Data cannot be changed.

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

6.2.3 Composite DTM for a modular PROFIBUS device

Separate DTMs represent the BIM (Composite 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 FDT protocol ID and the adaptation / creation of FDT communication datatypes.

Implementing a Modular DTM results in the following advantages:

- the project topology 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 that can also simplify the certification process.

The configuration data to set up the PROFIBUS configuration of a modular PROFIBUS device shall be provided by the Device DTM representing the BIM. This configuration data may be generated from information of the instantiated Module DTMs and by using a configuration dialog.

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

6.3 Support for DP-V0 configuration

A PROFIBUS slave usually communicates cyclically via PROFIBUS DP-V0 with a class 1 master (DPM1). In addition to this the slave may support DP-V1 communication. This should be indicated by setting the SlaveFlagDpv1Slave property (see 6.5.2.2.1 Slave bus parameter set) to true.

A Gateway DTM for a PROFIBUS slave does not have to provide DP-V0 communication. An example is a remote I/O system with HART modules. It may have a Gateway DTM that requires the DP-V1 protocol and provides the HART protocol. This enables HART Device DTMs to communicate with their devices via the Gateway DTM and via a Communication DTM for DP-V1. Following the specification the Gateway DTM delivers process data items for both protocols DP-V1 and HART. The ProtocolId is a member of NetworkDataInfo datatype.

The Process Data Info of a Device DTM shall contain data items for DP-V0 including all information to allow integration into the control system (e.g. Dpv0IOSignalInfo of the I/O value if available).

6.4 PROFIBUS slaves operating without a class 1 PROFIBUS master

In most cases, a PROFIBUS slave is configured and parameterized by a PROFIBUS class 1 master device. So a running master device in the network is required.

Some slaves (marked via SlaveFlagDpv1Slave) are able to allow acyclic communication without cyclic master to slave communication. Especially in the case of gateway functionality this allows the parameterization of field devices connected to them by using a class 2 master. So instrument specialists are able to work with field devices also in case the controller is not yet working.

If a master starts communication, these devices start to detect bus speed to react properly. This may take some time. A communication or gateway DTM shall take this into account and adjust internal timeouts accordingly.

In the following, two scenarios are described that a user may keep in mind when working with such devices.

Scenario 1:
The user performs a network scan. The Communication DTM tries to read diagnostic data via a Dpv0ReadDiagnosis Request but does not receive a response. The device is not detected by the Communication DTM. This occurs mostly when the device has a low PROFIBUS address. The reason is that the device has not completed bus speed detection when it was asked for its diagnostic data. The workaround is to assign these devices a higher PROFIBUS address.

Scenario 2:
The user tries to connect a field device linked to a gateway that supports DP-V1 without a running cyclic master. This can lead to an error message because the gateway device has not completed bus speed detection when it is asked for a connection. So the user has to try to connect again. This happens only in very rare situations.

6.5 PROFIBUS-related information of a slave DTM

6.5.1 General

The information used by a cyclic master device to set up the PROFIBUS network properly and allow cyclic communication between control system and slave devices shall be provided by a DTM in

- PROFIBUS Network Data,
- GSD information,
- Process data items.

A DTM of a PROFIBUS slave shall deliver these parts of PROFIBUS-related information to get integrated into a Frame Application. In the next subclauses, a more detailed description is given on how to generate and how to provide this information. The actual information depends on the kind of DTM (see 6.2 Configuration and parameterization of PROFIBUS devices).

6.5.2 PROFIBUS Network Data (PND)

6.5.2.1 PND introduction

The PND of a single DTM instance describes the actual parameter and configuration data of the corresponding PROFIBUS slave. Each DTM representing a PROFIBUS slave device shall provide PROFIBUS Network Data. The PND is the PROFIBUS specific NetworkDataInfo datatype. This information is obtained by calling the service GetNetworkDataInfo.

The PND includes information about the configuration and the parameters for initialization of the slave. The PND is provided by the DTM and is required in order to generate the bus master configuration.

The PND contains data which might be changed during master configuration. That means that the PND may be transferred back to the slave DTM by calling SetNetworkData. A Slave DTM shall accept the new information and recompute the configuration / internal parameters to match the new PND.

The Slave DTM shall check whether the new values are according to the capabilities of the device. The call to SetNetworkData shall be refused (by throwing an exception of type Fdt.FdtInvalidValueException) if the device can not handle the new values.

6.5.2.2 Creating the PND

This subclause explains the meaning of the individual elements of the PND in detail.

The PND may be generated from the GSD information of a PROFIBUS device.

The explanations reference the PROFIBUS specification and use the GSD keywords

6.5.2.2.1 Slave bus parameter set

All values are provided by the Slave DTM. It is the responsibility of the Slave DTM to be compatible with the Slave GSD. The Master DTM can overwrite some of these initial values sent by Slave DTM if they depend on the capabilities of the master.

Example

Within the GSD file, it is stated that a device supports the Freeze Mode by the keyword “Freeze_Mode_supp”. The master sets the value “PrmDataFreezeMode” within the Slave Bus Parameter Set because only the master knows whether it supports this mode.

The following table explains which component is the source of the parameter values (“Information source ”). Some of the values can be changed by the system or by user interaction. If possible, the default values for the parameters are defined (“Default Value”).

Table 6 – PROFIBUS Network Information

Member Name	Type	Information source and meaning	Default Value
DeviceDescriptionReference	Document	Slave DTM Path reference to GSD file.	-
SlaveFlagExtraAlarmSap	Boolean	Slave DTM false – master acknowledges alarms via SAP51 true - master acknowledges alarms via SAP50	Extra_Alarm_SAP_supp (GSD)
SlaveFlagDpv1DataTypes	Boolean	Slave DTM false - DP slave CFG data of EN 50170 true - DP slave CFG data of DP-V1	DPV1_Data_Types (GSD)
SlaveFlagDpv1Slave	Boolean	Slave DTM false - slave does not support DP-V1 true - slave does support DP-V1	DPV1_Slave (GSD)
SlaveFlagPublisherSupport	Boolean	Slave DTM false - no publisher support true - DP slave supports publisher functionality	Publisher_supp (GSD)
SlaveFlagFailSafe	Boolean	Slave DTM false - DP slave receives zero data in CLEAR mode true - DP slave receives no data in CLEAR mode	Fail_Safe or Fail_Safe_required (GSD)
SlaveFlagNaToAbort	Boolean	Slave DTM false - no abort when NA occurs true - abort if NA (no response from FDL) occurs	0
SlaveFlagIgnoreAutoClear	Boolean	Slave DTM false - process the auto clear function true - ignore the auto clear function	0
MaxDiagDataLen	Byte	Slave DTM	Max_Diag_Data_Len (GSD)
MaxAlarmLen	Byte	Length of the alarm structure see [2] table 5 Slave DTM, Conditions: One of GSD keywords:- Diagnostic_Alarm_supp - Process_Alarm_supp - Pull_Plug_Alarm_supp - Status_Alarm_supp - Updata_Alarm_supp - Manufacturer_Specific_Alarm_supp OR - Alarm_Type_Mode_supp	Is calculated on the base of the different GSD values.

Member Name	Type	Information source and meaning	Default Value
MaxChannelDataLen	Byte	Slave DTM: This field defines how much data can be transferred between slave and master. In this case the maximum of these values shall be calculated and set by the slave DTM. Rule for calculation: Max_Data_Len or C1_Max_Data_Len plus 4 Bytes (Function Num, Slot_Number, Length)	Value within Slave GSD
DiagUpdateDelay	Byte	Slave DTM	Slave GSD [3] Diag_Update_Delay
AlarmMode	Byte	Slave DTM	Slave GSD [3] Alarm_Sequence_Mode_Count
C1ResponseTimeout	Word	Slave DTM	Slave GSD [3] C1_Response_Timeout
PrmDataWdOn	Boolean	Master defines that watchdog is used or not. If watchdog is enabled, the master has also to set WD_Fact_1 and WD_Fact_2	0
PrmDataFreezeMode	Boolean	Slave DTM shows with this bit that the feature is supported	Freeze_Mode_supp within GSD
PrmDataSyncMode	Boolean	Slave DTM shows with this bit that the feature is supported	Sync_Mode_supp within GSD
PrmDataLockReq	Boolean	Master DTM	0
PrmDataUnlockReq	Boolean	Master DTM	0
PrmDataWdFact1	Byte	Depending on PrmDataWdBase1ms Watchdog_Time = 10 ms * WD_Fact_1 * WD_Fact_2 OR Watchdog_Time = 1 ms * WD_Fact_1 * WD_Fact_2	1
PrmDataWdFact2	Byte	Depending on PrmDataWdBase1ms Watchdog_Time = 10 ms * WD_Fact_1 * WD_Fact_2 OR Watchdog_Time = 1 ms * WD_Fact_1 * WD_Fact_2	1
PrmDataMinTsdr	Byte	Slave DTM	11
PrmDataIdentNumber	Word	Slave DTM	Slave GSD [3] IDENT_NUMBER
PrmDataGroupIdent	Byte	Indicates to what groups the device belongs. It is set by the master.	0 (not assigned to any group)
PrmDataWdBase1ms	Boolean	See PrmDataWdFact1 and PrmDataWdFact2 false - watchdog time base is 10 ms true - watchdog time base is 1 ms	WD_Base_1ms_supp within GSD
PrmDataFailSafe	Boolean	Slave DTM shows with this bit that the feature is supported	Fail_safe within GSD

Member Name	Type	Information source and meaning	Default Value
PrmDataFailSafeRequired	Boolean	Slave DTM shows with this bit that the master is expected to support this feature true - master must support fail safe mode false - fail safe mode is optional If set to true, then PrmDataFailSafe must be set to true too.	Fail_Safe_required within GSD
PrmDataDpv1Enable	Boolean	Slave DTM	Slave GSD (If the GSD minimum include one of these setting : C1_Read_Write_supp = 1 or Diagnostic_Alarm_supp = 1 or Process_Alarm_supp = 1 or Pull_Plug_Alarm_supp = 1 or Status_Alarm_supp = 1 or Update_Alarm_supp = 1 or Manufacturer_Specific_Alarm_supp = 1 . The slave supports DP-V1 and then the PrmDataDpv1Enable should be true
PrmDataCheckCfgMode	Boolean	Slave DTM shows with this bit that the feature is supported	Check_Cfg_Mode within GSD
PrmDataUpdateAlarmRequired	Boolean	Slave DTM shows with this bit that the master is required to support this feature true - master must support update alarm false - update alarm is optional If set to true, then PrmDataUpdateAlarm must be set to true too.	Update_Alarm_required within GSD
PrmDataUpdateAlarm	Boolean	Slave DTM shows with this bit that the feature is supported	Update_Alarm_supp within GSD
PrmDataStatusAlarmRequired	Boolean	Slave DTM shows with this bit that the master is required to support this feature true - master must support status alarm false - status alarm is optional If set to true, then PrmDataStatusAlarm must be set to true too.	Status_Alarm_required within GSD
PrmDataStatusAlarm	Boolean	Slave DTM shows with this bit that the feature is supported	Status_Alarm_supp within GSD

Member Name	Type	Information source and meaning	Default Value
PrmDataManufacturerSpecificAlarm Required	Boolean	Slave DTM shows with this bit that the master is required to support this feature true - master must support manufacturer specific alarm false - manufacturer specific alarm is optional If set to true, then PrmDataManufacturerSpecificAlarm must be set to true too.	Manufacturer_Specific_Alarm_required within GSD
PrmDataManufacturerSpecificAlarm	Boolean	Slave DTM shows with this bit that the feature is supported	Manufacturer_Specific_Alarm_supp within GSD
PrmDataDiagnosticAlarmRequired	Boolean	Slave DTM shows with this bit that the master is required to support this feature true - master must support diagnostic alarm false - diagnostic alarm is optional If set to true, then PrmDataDiagnosticAlarm must be set to true too.	Diagnostic_Alarm_required within GSD
PrmDataDiagnosticAlarm	Boolean	Slave DTM shows with this bit that the feature is supported	Diagnostic_Alarm_supp within GSD
PrmDataProcessAlarmRequired	Boolean	Slave DTM shows with this bit that the master is required to support this feature true - master must support process alarm false - process alarm is optional If set to true, then PrmDataProcessAlarm must be set to true too.	Process_Alarm_required within GSD
PrmDataProcessAlarm	Boolean	Slave DTM shows with this bit that the feature is supported	Process_Alarm_supp within GSD
PrmDataPullPlugAlarmRequired	Boolean	Slave DTM shows with this bit that the master is required to support this feature true - master must support pull plug alarm false - pull plug alarm is optional If set to true, then PrmDataPullPlugAlarm must be set to true too.	Pull_Plug_Alarm_required within Slave GSD
PrmDataPullPlugAlarm	Boolean	Slave DTM shows with this bit that the feature is supported	Pull_Plug_Alarm_supp within Slave GSD
PrmDataBlockStructure	Boolean	Slave DTM shows with this bit that the feature is supported	Prm_Block_Structure_supp within GSD

Member Name	Type	Information source and meaning	Default Value
PrmDataBlockStructureRequired	Boolean	Slave DTM shows with this bit that the master is expected to support this feature true - master must support block structure false - block structure is optional If set to true, then PrmDataBlockStructure must be set to true too.	Prm_Block_Structure_req within GSD
PrmDataIsochronMode	Boolean	Slave DTM shows with this bit that the feature is supported	Isochron_Mode_supp within GSD
PrmDataIsochronModeRequired	Boolean	Slave DTM shows with this bit that the master is expected to support this feature true - master must support isochrone mode false - isochrone mode is optional If set to true, then PrmDataIsochronMode must be set to true too.	Isochron_Mode_required within GSD
PrmDataPrmCmd	Boolean	Slave DTM shows with this bit that the feature is supported	PrmCmd_supp within GSD
PrmDataUsrPrmData	Byte Array[1]	Calculated by Slave DTM	Data within GSD
CfgData	Byte Array[1]	Slave DTM, Depending on Module Configuration	Data within Slave GSD (Module, EndModule)
AddTabData	Byte Array[1]	Address assignment Table (only for DP-V0 Masters) Calculated by the Communication DTM	
SlaveUserData	Byte Array[1]	Calculated by the Communication DTM	Data within GSD
ExtPrmData	Byte Array[1]	Slave DTM	Data within GSD
MaxModules	Word	Slave DTM	Data within GSD
MaxInputLen	Word	Slave DTM	Data within GSD
MaxOutputLen	Word	Slave DTM	Data within GSD
MaxDataLen	Word	Slave DTM	Data within GSD
CurrentInputLen	Word	Calculated by Slave DTM for current configuration	Data within GSD
CurrentOutputLen	Word	Calculated by Slave DTM for current configuration	Data within GSD

[1] If this data is not applicable to the device (i.e. the service is not supported), the ByteArray has zero length.

6.5.2.3 Modification of the PND

6.5.2.3.1 Propagation of changes

The PND includes parameter and configuration data. The slave DTM or the Frame Application may modify the PND.

The system has to ensure that the Communication Channel representing the PROFIBUS master is aware of these changes. This is achieved by sending the event NetworkDataInfoChanged from the Slave DTM to report the change of the PND. All changes should be reported as soon as possible, but not before the changes are persistent. The Frame Application informs the Parent DTM via NetworkDataInfoChanged event that parameters of a child have been changed. Then the Communication DTM can get the new PND of the Slave DTM.

6.5.2.3.2 When it is allowed to change the PND

According to the FDT specification, it is allowed to change the parameters of a DTM starting from “running” state (see FDT3.0 core specification).

The PND can be changed multiple times, but only if the DTM is in offline mode and if the data set can be locked.

If a Slave DTM wants to change parameters in online mode it shall use DP-V0 or DP-V1 transaction requests. If there is no way of changing the parameters by transaction requests, the DTM shall disable configuration and parameterization in the online state.

6.5.2.3.3 Parameter data

If the user changes User Parameters of the BIM or one module (for example via user interface) and this affects the PND; the DTM has to update the PND. In addition to this, it shall request a save and inform the Frame Application via NetworkDataInfoChanged. The Frame Application shall distribute the information to all relevant components.

6.5.2.3.4 Configuration data

Configuration data will change every time if the user adds/removes modules or changes the module type, etc.

In the case of the modular DTM, the BIM will be informed when the user adds or removes modules via the service <ChildAdded> and service <ChildRemoved>. Changes of the parameters in a module will be reported by service NetworkDataInfoChanged.

The monolithic DTM or the BIM DTM update their PND data, request a save and inform the Frame Application via NetworkDataInfoChanged .

NOTE 1 Changes that affect the PND often take effect on the internal topology and the Process Data Items. This information shall be updated by the DTMs too.

NOTE 2 The PND may be changed by the Slave DTM and by the Communication DTM. The Communication DTM shall not change the configuration data and the user parameters parts of the PND.

6.5.2.4 Special cases related to the PND

6.5.2.4.1 DP-V1 support

In the GSD file there are two flags regarding DP-V1. At first, the “DPV1_Slave” value: This means that the slave has the possibility to work as a DP-V1 slave. If this value exists and the

value is “1” then the SlaveFlagDpv1Slave shall be set to true. For older systems, there should also be the possibility to work as a DP-V0 slave.

Only the Communication DTM knows that its master device is able to provide acyclic services.

After building the Slave Bus Parameter Set, the Communication DTM will receive the slave’s initial PND. If, the SlaveFlagDpv1Slave is set to true, the Master DTM shall set the highest bit in the first byte of Extended DP-V1 Status. Now the slave works as a DP-V1 slave.

6.5.2.4.2 Extended DP-V1 status

All the PrmData<...> bits are set by the Communication DTM for the master. A Slave DTM shall accept these settings and adapt its functionality if necessary.

6.5.3 GSD Information

6.5.3.1 General

The GSD information is not stored with single slave instances or in a global accessible file. It is provided by the DTM via the PND in the service GetNetworkDataInfo.

Some existing DCS use the GSD file directly to obtain information about the possible configuration and parameters of a DP Slave. This behavior is not recommended for developing future DCS.

Besides the information about modules and its parameters, a GSD file contains additional information about the slave, such as the supported baud rates.

This information is useful for a DCS system to configure an entire network according to the capabilities of different slaves.

In order to support DCS, a DTM of a PROFIBUS device shall provide a separate GSD file. It shall be referenced as a document of type TechnicalDocumentation in the DeviceDescriptionReference property of the PND. The MediaType of the document shall be “text/plain”.

Besides the GSD file must be listed in the protocol independent DeviceInformationDocuments of the NetworkData class. The properties shall have the same values compared to the PND but additionally the Label property of the document shall be set to the GSD file name including the extension. For each language specific *.GS? file a separate document shall be referenced. The Language property of the document shall be set as following:

Table 7 – Language mapping of GSD file extensions

*.gsd	`CultureInfo.InvariantCulture`
*.gse	en-US
*.gsf	fr-FR
*.gsg	de-DE
*.gsi	it-IT
*.gsp	pt-PT

*.gss	es-ES

6.5.3.2 GSD for gateway devices

6.5.3.2.1 Types of PROFIBUS gateway devices

There are two types of gateway devices.

- The visible gateway devices work as a PROFIBUS slave (with a PROFIBUS station address) and to the underlying network they act as a master. Slave devices behind such a visible gateway have a separate address space and are addressed by extended addressing from the PROFIBUS master.
- The transparent gateway devices just transform the PROFIBUS network to the underlying network. Slave devices behind an invisible gateway share the address space with the devices on the rest of the PROFIBUS segment. They are addressed via normal station address by the PROFIBUS master.

For both types of devices there is a need for special GSD files to support legacy DCS as mentioned before.

6.5.3.2.2 Visible gateway devices

Visible gateway devices are shipped without a GSD file. Instead they have a proprietary software suite that configures and parameterizes it or they are shipped with a tool that creates a GSD for parameterization software. The GSD tool creates a GSD for the gateway device depending on the underlying network configuration or bus settings (for example baud rates).

The DTMs for such visible gateway devices (Gateway DTM) should provide the functionality of the GSD tool. If the GSD is configuration-dependent, the DTM could call service GetNetworkDataInfo for each of its children, extract the GSD information and create configuration-dependent GSD information in the same way the tool does. After initialization of the DTM, it should deliver PND according to the linking device itself. Every time a child is added or removed, this leads to a change in the network data or process data or both of the Gateway DTM.

If the GSD depends on bus settings, a DTM's configuration or parameterization dialog could be used to change bus settings. Based on these settings, updated GSD information can be inserted in the DTM information. Here again the DTM has to request a save and raise a ProcessDataChanged event if process data was changed and NetworkDataInfoChanged event if network data was changed.

6.5.3.2.3 Transparent gateway devices

There are transparent linking devices on the market (PROFIBUS FMS/DP and PROFIBUS PA) performing a baudrate transformation. This requires a special handling of the slave specific GSD files. There are tools available which are able to adapt existing GSD files according to the higher baudrate (so called 'GSD Converter').

The GSD information shall be delivered by the DTM for the device. In order to support this kind of linking devices, a slave DTM shall expose the GSD file on hard drive.

6.5.4 Process Data Items

A device can offer a number of process values depending on the actual configuration. Information about these values is provided via Process Data Items. The protocol specific classes for this purpose are described in chapter 11 Datatypes for process data information.

If the process data is also accessible as Device Data Info or there is a relation to a communication channel (for instance for gateway DTMs), these relations shall be made available as IOSignalRefs.

7 Protocol specific usage of general FDT3.0 datatypes

The FDT3.0 specification already defines a set of datatypes that can be used to identify a device and to provide device information. This chapter describes how these datatypes are used with PROFIBUS.

Table 8 – Usage of general datatypes

Property	Description for use in PROFIBUS
Address	The station address of the PROFIBUS slave device. Shall be formatted as a decimal number without leading zeros when represented as string.
DeviceTypeId	The DeviceTypeId shall contain the Ident_Number of the supported physical device. The IDENT_NUMBER shall be represented in hexadecimal format with 4 hex digits, i.e. "0x0815.
HardwareRevision	The hardware revision of the physical device.
ManufacturerId	Manufacturer according to Profile specification. For example in PROFIBUS PA : Physical Block Index 10 : DEVICE_MAN_ID
PhysicalLayer	See chapter 4
ProtocolId	See chapter 4
ProtocolIdentificationProfile	Identifies the protocol specific profile that was used for device identification. It contains one of the values "DP", "PA", “IM-PA” and "IM".

7.1 Protocol specific handling of the datatype STRING

PROFIBUS uses strings in the form of character arrays. These arrays usually have a fixed length. For interaction with FDT the following rules shall apply:

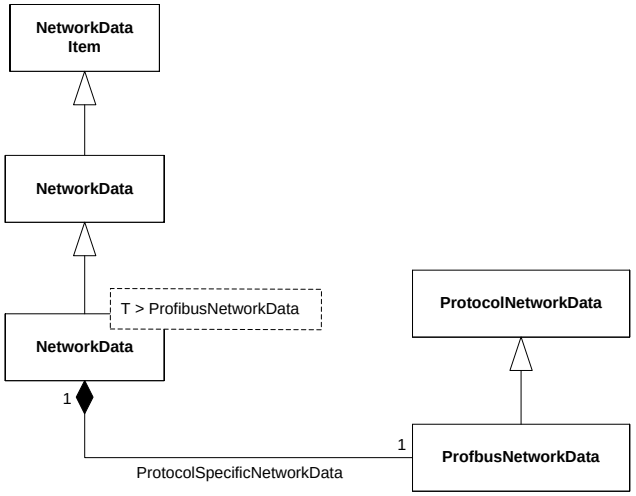
leading spaces are left trimmed
the arrays are to be filled with space characters (0x20)
non-printable characters in VisibleStrings shall be replaced by '?'

8 Protocol specific common datatypes

<Not applicable.>

9 Network management Datatypes

The data needed for management of the network are exposed by the Device DTM in the INetworkData interface (see Figure 2).



Used in:

INetworkData.GetNetworkDataInfo()

Figure 2 - ProfibusNetworkData

The properties of ProfibusNetworkData are described in Table 6.

9.1 General

The datatypes specified in this subclause are used in the following services:

GetNetworkDataInfo service;
SetNetworkData service.

The datatype ProfibusDeviceAddress is used for defining the network address of a device.

The protocol specific datatypes are based on definitions given in the IEC 61784 and IEC 61158 specifications. Furthermore, they contain additional information about the device that is needed by systems to configure CPF 3 links and to establish communication between the CPF 3 master device and the CPF 3 slave devices.

9.2 Configuration

The configuration of the device itself is done with the aid of the DTM's GUI. Downloading the configuration into the slave device is performed via the CPF 3 master device. To do that and in order to set up the bus communication, the master needs information from the DTM as there is:

GSD file
The GSD information is type-specific information and not instance-specific (with the exception of certain gateway devices as described earlier). It is not stored with single slave instances or in a global accessible file.
The master device can use the general type-specific information from the slave's GSD information like bus timing parameters, supported baud rates, etc.
CFG string (Cfg Data)

The CFG string provides the instance-specific information about the current configuration of the device. It defines the structure of the data frames that will be transmitted on the PROFIBUS. This structure depends on the modules that are actually configured.
The DTM provides the CFG string within the property CfgData that is part of the PROFIBUS Network Data available via service GetNetworkDataInfo.
The master device uses this information to set up communication with the slave device.

9.3 Process Data Items

In case of CPF 3 protocols, an FDT Process Data Item is a representative for a single date or a process value that can be accessed from a Frame Application via the master device. The information available at services for I/O related information describes how to access a data item via a PROFIBUS DP-V1 command or how to address a data item within a PROFIBUS DP frame for cyclic I/O. Besides all mandatory elements (which include id, BitPosition and BitLength) it is highly recommended that the DP-V1 address information is provided. This information (DP-V1 Slot) is used by some frames to manage the PROFIBUS device module information.

9.4 Parameterization

There are two options to write parameters set from the DTM's GUI to the CPF 3 slave device in the field:

- User Parameters
  User Parameters are part of the PROFIBUS-DP Slave-Bus-Parameter-Set. They contain manufacturer-specific data to characterize the DP slave. The DTM stores the User Parameters in property PrmDataUsrPrmData of the PROFIBUS Network Data. The User Parameters are stored with the master device during PROFIBUS master configuration and are automatically sent to the slave during set up of bus communication. (This is PROFIBUS-specific; for details, see IEC 61158 series.) When changing User Parameters at runtime, the DTM shall use a DP-V0 connection and the appropriate DP-V0 commands for parameter exchange as described in the datatypes.
- Writing Parameters with DP-V1 services (MSAC2 primitives)
  The DTM may use DP-V1 transport services to send its parameters to the slave device. For that, it has to use a DP-V1 connection and the corresponding communication commands. During setup of communication, DP-V1 services are not sent automatically. The Frame Application or a DTM shall invoke a download of parameters via DP-V1.

For details on the different behavior of slaves depending on the kind of parameterization, refer to the IEC 61158 series.

DP-V1 connections and communication commands can also be used to execute commands at the slave. For details on the use of DP-V1, see also the IEC 61158 series.

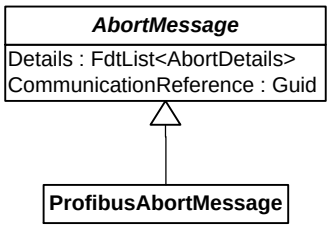
10 Communication datatypes

10.1 Introduction

The datatypes contain the address information and the communication data required to execute the respective request or to transport the response information.

10.2 ProfibusAbortMessage

This is the PROFIBUS specific implementation of the abstract AbortMessage class (see Figure 3).



Used in:

ICommunication.EndDisconnect()

Figure 3 - ProfibusAbortMessage

The properties of the ProfibusAbortMessage datatype are described in Table 9

Table 9 – ProfibusAbortMessage datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
Details	Details about the cause and source of the Abort.

10.3 DP-V0 Communication

Not all defined services are supported if the Master is not in cyclic data exchange with the slaves. In such cases, the following behavior is expected:

If a Communication Channel receives a request that cannot be supported, the ErrorInformation property of the Transaction response shall be set to "NotSupportedFeature".

Depending on the bus master type and on the returned ConnectStatus the following services are available (see Table 10).

Table 10 – Availability of services for Master Class 1 (C1)

	ConnectStatus		
Slave DTM Service Request	**MasterConnectedOnly**	**DeviceAtLifeList**	**DeviceInDataExchange**
Connect	✓	✓	✓
ReadUserParameter	O	O	O
WriteUserParameter	✓	✓	✓
ReadOutputData			✓
WriteOutputData			O
ReadInputData			✓
ReadDiagnosisData		✓	✓
ReadConfigurationData		✓	✓

NOTE
✓ : the service is available,
O : the service is optional and may be available, depending on the capabilities of the underlying master device.

For Master Class 2 (C2), not all connect states are available:

Table 11 – Availability of services for Master Class 2 (C2)

	ConnectStatus	
Slave DTM Action	**DeviceAtLifeList (no DP-V1 connection to device)**	**DeviceInDataExchange (DP-V1 connection to device)**
Connect	✓	✓
ReadUserParameter		
WriteUserParameter	O	O
ReadOutputData		O
WriteOutputData		
ReadInputData		✓
ReadDiagnosisData	✓	✓
ReadConfigurationData	O	O

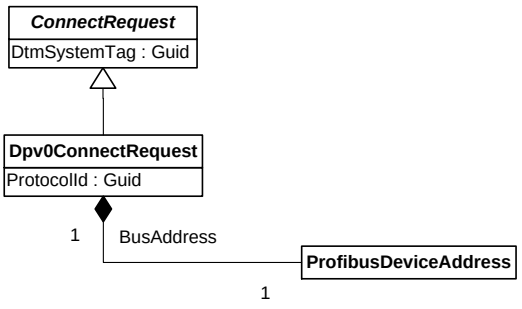
NOTE
✓ : the service is available,
O : the service is optional and may be available, depending on the capabilities of the underlying master device.

If the Master Class 2 communication component supports DP-V1 and DP-V0 and has established a DP-V1 connection to the device, a call to service Connect for DP-V0 shall return the status “DeviceInDataExchange” even if the device is not in status DataExchange.

If no DP-V1 connection is established, the Master Class 2 communication component shall verify the availability of the device (at least by service LifeList) prior to returning the result.

10.3.1 Dpv0ConnectRequest

This is the PROFIBUS DP-V0 specific implementation of the abstract class ConnectRequest (see Figure 4).



Used in:

ICommunication.BeginConnect()

Figure 4 - Dpv0ConnectRequest

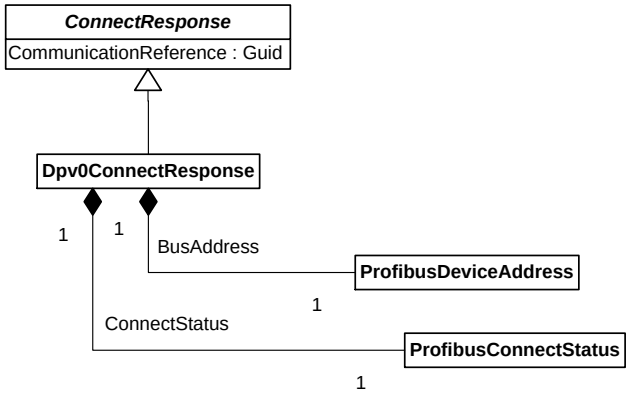
The properties of the Dpv0ConnectRequest datatype are described in Table 12

Table 12 – Dpv0ConnectRequest datatype

Property	Description
BusAddress	Station address information according to the PROFIBUS specification.
ProtocolId	Unique identifier of the PROFIBUS DP-V0 protocol.
DtmSystemTag	Unique identification of the DTM in the Frame Application.

10.3.2 Dpv0ConnectResponse

This is the PROFIBUS DP-V0 specific implementation of the abstract class ConnectResponse (see Figure 5).



Used in:

ICommunication.EndConnect()

Figure 5 - Dpv0ConnectResponse

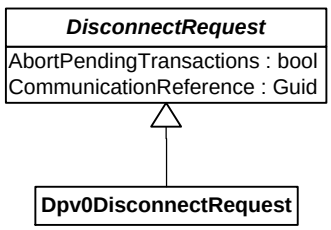
The properties of the Dpv0ConnectResponse datatype are described in Table 13

Table 13 – Dpv0ConnectResponse datatype

Property	Description
BusAddress	Address information according to the PROFIBUS specification.
CommunicationReference	Identifier for a communication link to a device.
ConnectStatus	Describes the connection status established by the communication component.

10.3.3 Dpv0DisconnectRequest

This is the PROFIBUS DP-V0 specific implementation of the abstract class DisconnectRequest (see Figure 6).



Used in:

ICommunication.BeginDisconnect()

Figure 6 - Dpv0DisconnectRequest

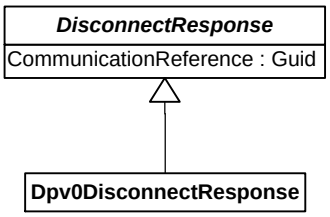
The properties of the Dpv0DisconnectRequest datatype are described in Table 14

Table 14 – Dpv0DisconnectRequest datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
AbortPendingTransactions	Indicates whether pending transactions shall be aborted.

10.3.4 Dpv0DisconnectResponse

This is the PROFIBUS DP-V0 specific implementation of the abstract class DisconnectResponse (see Figure 7).



Used in:

ICommunication.EndDisconnect()

Figure 7 - Dpv0DisconnectResponse

The properties of the Dpv0DisconnectResponse datatype are described in Table 15

Table 15 – Dpv0DisconnectResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.

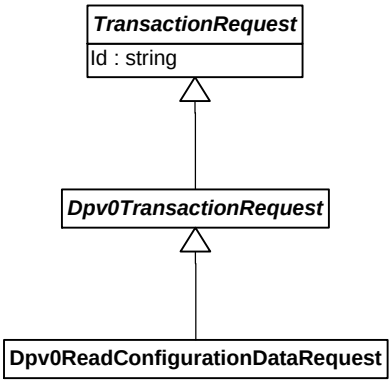
10.3.5 Dpv0TransactionRequest

The Dpv0TransactionRequest is the base class for PROFIBUS DPV0 transaction requests. The following classes inherit from this class:

Dpv0ReadConfigurationDataRequest
Dpv0ReadDiagnosisDataRequest
Dpv0ReadInputDataRequest
Dpv0ReadOutputDataRequest
Dpv0ReadUserParameterRequest
Dpv0WriteOutputDataRequest
Dpv0WriteUserParameterRequest

10.3.5.1 Dpv0ReadConfigurationDataRequest

This is the request for reading the Cfg Data from the device, derived from the base class Dpv0TransactionRequest (see Figure 8).



Used in:

ICommunication.BeginCommunicationRequest()

Figure 8 - Dpv0ReadConfigurationDataRequest

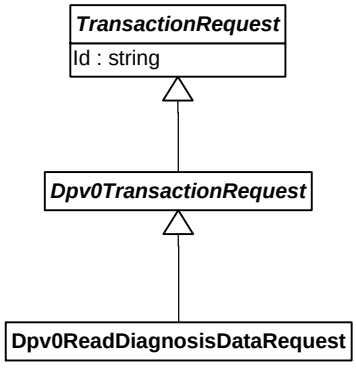
The properties of the Dpv0ReadConfigurationDataRequest datatype are described in Table 16

Table 16 – Dpv0ReadConfigurationDataRequest datatype

Property	Description
Id	[Optional] Identifier for a single Transaction Request.

10.3.5.2 Dpv0ReadDiagnosisDataRequest

This is the request for reading the device diagnosis data, derived from the base class Dpv0TransactionRequest (see Figure 9).



Used in:

ICommunication.BeginCommunicationRequest()

Figure 9 - Dpv0ReadDiagnosisDataRequest

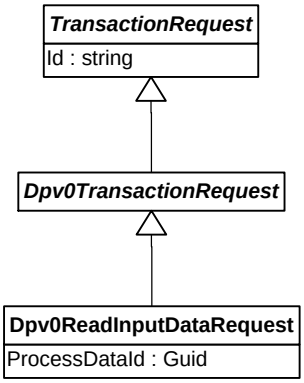
The properties of the Dpv0ReadDiagnosisDataRequest datatype are described in Table 17

Table 17 – Dpv0ReadDiagnosisDataRequest datatype

Property	Description
Id	[Optional] Identifier for a single Transaction Request.

10.3.5.3 Dpv0ReadInputDataRequest

This is the request for reading the device input data, derived from the base class Dpv0TransactionRequest (see Figure 10).



Used in:

ICommunication.BeginCommunicationRequest()

Figure 10 - Dpv0ReadInputDataRequest

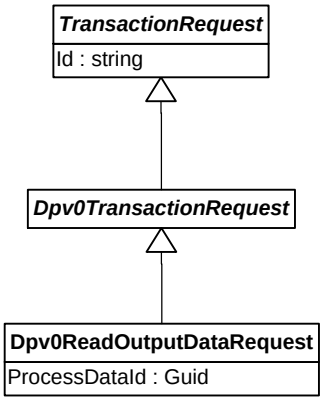
The properties of the Dpv0ReadInputDataRequest datatype are described in Table 18

Table 18 – Dpv0ReadInputDataRequest datatype

Property	Description
ProcessDataId	Reference to IO Signal defining the data properties.
Id	[Optional] Identifier for a single Transaction Request.

10.3.5.4 Dpv0ReadOutputDataRequest

This is the request for reading the device output data, derived from the base class Dpv0TransactionRequest (see Figure 11).



Used in:

ICommunication.BeginCommunicationRequest()

Figure 11 - Dpv0ReadOutputDataRequest

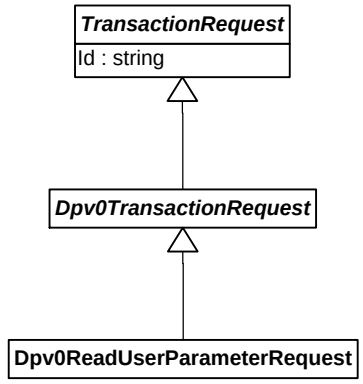
The properties of the Dpv0ReadOutputDataRequest datatype are described in Table 19

Table 19 – Dpv0ReadOutputDataRequest datatype

Property	Description
ProcessDataId	Reference to IO Signal defining the data properties.
Id	[Optional] Identifier for a single Transaction Request.

10.3.5.5 Dpv0ReadUserParameterRequest

This is the request for reading the User Prm Data from the device, derived from the base class Dpv0TransactionRequest (see Figure 12).



Used in:

ICommunication.BeginCommunicationRequest()

Figure 12 - Dpv0ReadUserParameterRequest

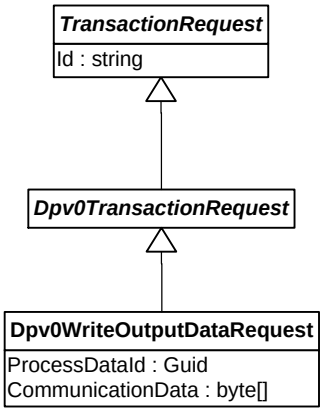
The properties of the Dpv0ReadUserParameterRequest datatype are described in Table 20

Table 20 – Dpv0ReadUserParameterRequest datatype

Property	Description
Id	[Optional] Identifier for a single Transaction Request.

10.3.5.6 Dpv0WriteOutputDataRequest

This is the request for writing the device output data, derived from the base class Dpv0TransactionRequest (see Figure 13).



Used in:

ICommunication.BeginCommunicationRequest()

Figure 13 - Dpv0WriteOutputDataRequest

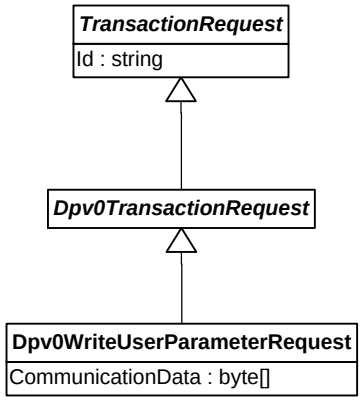
The properties of the Dpv0WriteOutputDataRequest datatype are described in Table 21

Table 21 – Dpv0WriteOutputDataRequest datatype

Property	Description
ProcessDataId	Reference to IO Signal defining the data properties.
CommunicationData	Array of bytes to be written.
Id	[Optional] Identifier for a single Transaction Request.

10.3.5.7 Dpv0WriteUserParameterRequest

This is the request for writing the User Prm Data, derived from the base class Dpv0TransactionRequest (see Figure 14).



Used in:

ICommunication.BeginCommunicationRequest()

Figure 14 - Dpv0WriteUserParameterRequest

The properties of the Dpv0WriteUserParameterRequest datatype are described in Table 22

Table 22 – Dpv0WriteUserParameterRequest datatype

Property	Description
CommunicationData	Array of bytes to be written.
Id	[Optional] Identifier for a single Transaction Request.

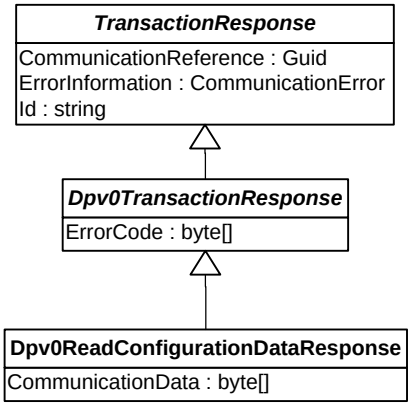
10.3.6 Dpv0TransactionResponse

This is the base class for PROFIBUS DP-V0 transaction responses containing the common property ErrorCode (see chapter 10.5). The following classes inherit from this class:

Dpv0ReadConfigurationDataResponse
Dpv0ReadDiagnosisDataResponse
Dpv0ReadInputDataResponse
Dpv0ReadOutputDataResponse
Dpv0ReadUserParameterResponse
Dpv0WriteOutputDataResponse
Dpv0WriteUserParameterResponse

10.3.6.1 Dpv0ReadConfigurationDataResponse

This is the response for reading the Cfg Data (see Figure 15).



Used in:

ICommunication.EndCommunicationRequest()

Figure 15 - Dpv0ReadConfigurationDataResponse

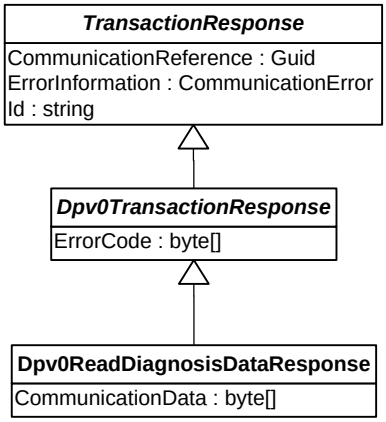
The properties of the Dpv0ReadConfigurationDataResponse datatype are described in Table 23

Table 23 – Dpv0ReadConfigurationDataResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
ErrorInformation	[Optional] Description of a fieldbus protocol independent error occurred during communication.
Id	[Optional] Identifier of the corresponding Transaction Request.
CommunicationData	Communication data received from the device.
ErrorCode	The result of the service call.

10.3.6.2 Dpv0ReadDiagnosisDataResponse

This is the response for reading the diagnosis data (see Figure 16).



Used in:

ICommunication.EndCommunicationRequest()

Figure 16 - Dpv0ReadDiagnosisDataResponse

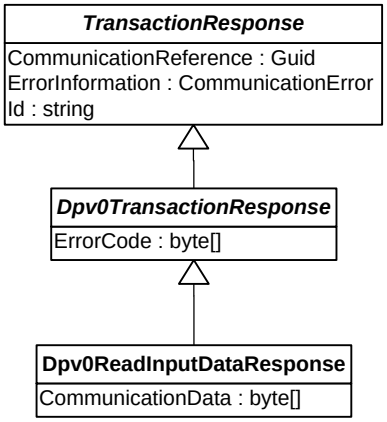
The properties of the Dpv0ReadDiagnosisDataResponse datatype are described in Table 24

Table 24 – Dpv0ReadDiagnosisDataResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
ErrorInformation	[Optional] Description of a fieldbus protocol independent error occurred during communication.
Id	[Optional] Identifier of the corresponding Transaction Request.
CommunicationData	Communication data received from the device.
ErrorCode	The result of the service call.

10.3.6.3 Dpv0ReadInputDataResponse

This is the response for reading the input data (see Figure 17).



Used in:

ICommunication.EndCommunicationRequest()

Figure 17 - Dpv0ReadInputDataResponse

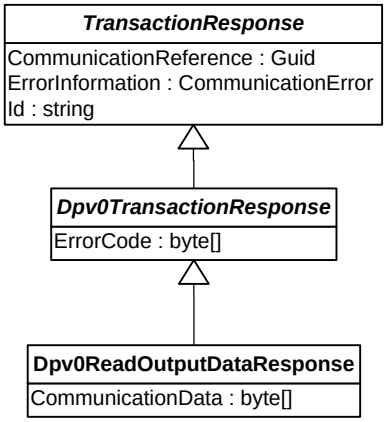
The properties of the Dpv0ReadInputDataResponse datatype are described in Table 25

Table 25 – Dpv0ReadInputDataResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
ErrorInformation	[Optional] Description of a fieldbus protocol independent error occurred during communication.
Id	[Optional] Identifier of the corresponding Transaction Request.
CommunicationData	Communication data received from the device.
ErrorCode	The result of the service call.

10.3.6.4 Dpv0ReadOutputDataResponse

This is the response for reading the output data (see Figure 18).



Used in:

ICommunication.EndCommunicationRequest()

Figure 18 - Dpv0ReadOutputDataResponse

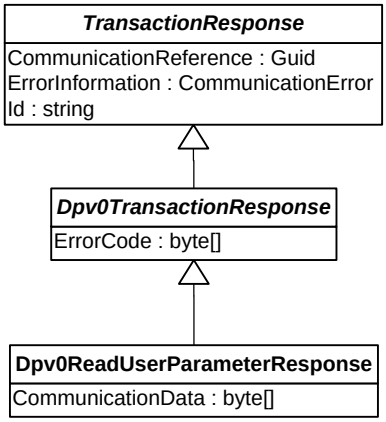
The properties of the Dpv0ReadOutputDataResponse datatype are described in Table 26

Table 26 – Dpv0ReadOutputDataResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
ErrorInformation	[Optional] Description of a fieldbus protocol independent error occurred during communication.
Id	[Optional] Identifier of the corresponding Transaction Request.
CommunicationData	Communication data received from the device.
ErrorCode	The result of the service call.

10.3.6.5 Dpv0ReadUserParameterResponse

This is the response for reading the Usr Prm Data (see Figure 19).



Used in:

ICommunication.EndCommunicationRequest()

Figure 19 - Dpv0ReadUserParameterResponse

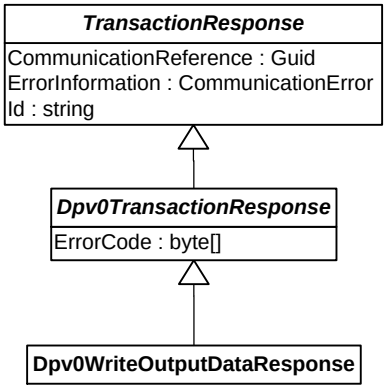
The properties of the Dpv0ReadUserParameterResponse datatype are described in Table 27

Table 27 – Dpv0ReadUserParameterResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
ErrorInformation	[Optional] Description of a fieldbus protocol independent error occurred during communication.
Id	[Optional] Identifier of the corresponding Transaction Request.
CommunicationData	Communication data received from the device.
ErrorCode	The result of the service call.

10.3.6.6 Dpv0WriteOutputDataResponse

This is the response for writing the output data (see Figure 20).



Used in:

ICommunication.EndCommunicationRequest()

Figure 20 - Dpv0WriteOutputDataResponse

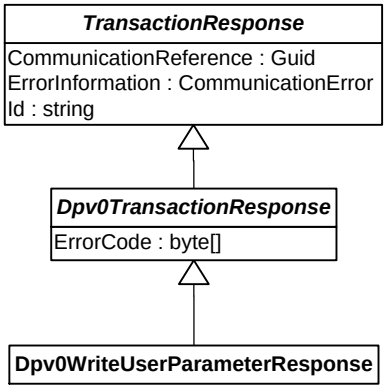
The properties of the Dpv0WriteOutputDataResponse datatype are described in Table 28

Table 28 – Dpv0WriteOutputDataResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
ErrorInformation	[Optional] Description of a fieldbus protocol independent error occurred during communication.
Id	[Optional] Identifier of the corresponding Transaction Request.
ErrorCode	The result of the service call.

10.3.6.7 Dpv0WriteUserParameterResponse

This is the response for writing the Usr Prm Data (see Figure 21).



Used in:

ICommunication.EndCommunicationRequest()

Figure 21 - Dpv0WriteUserParameterResponse

The properties of the Dpv0WriteUserParameterResponse datatype are described in Table 29

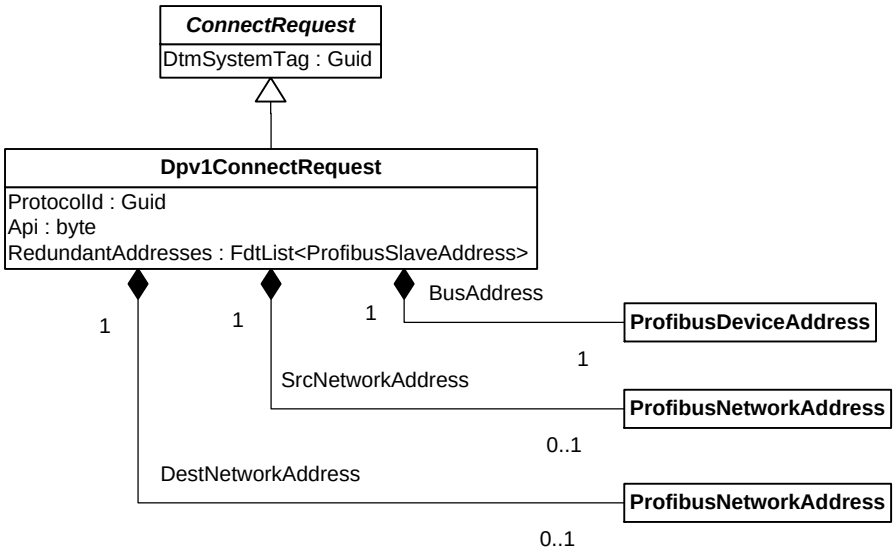
Table 29 – Dpv0WriteUserParameterResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
ErrorInformation	[Optional] Description of a fieldbus protocol independent error occurred during communication.
Id	[Optional] Identifier of the corresponding Transaction Request.
ErrorCode	The result of the service call.

10.4 DP-V1 Communication

10.4.1 Dpv1ConnectRequest

This is the PROFIBUS DP-V1 specific implementation of the abstract class ConnectRequest (see Figure 22).



Used in:

ICommunication.BeginConnect()

Figure 22 - Dpv1ConnectRequest

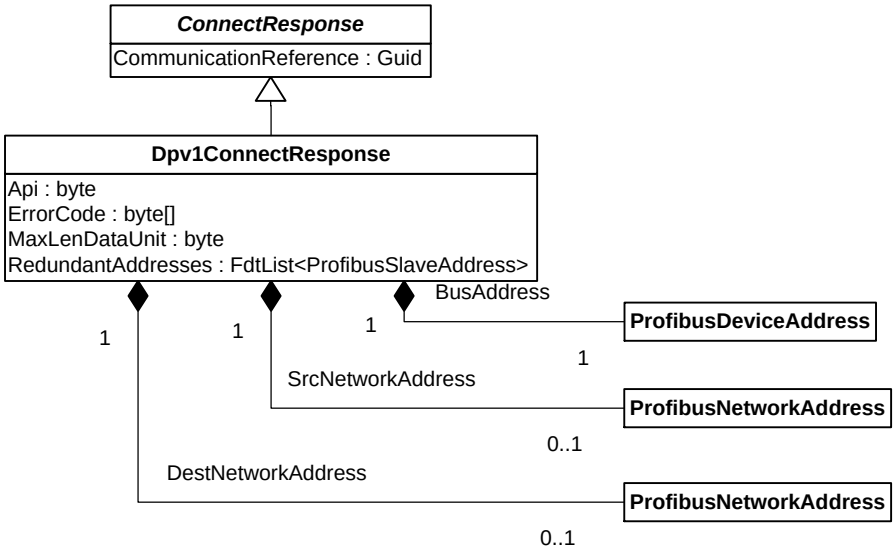
The properties of the Dpv1ConnectRequest datatype are described in Table 30

Table 30 – Dpv1ConnectRequest datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
ProtocolId	Unique identifier of the PROFIBUS DP-V1 protocol.
DtmSystemTag	Unique identification of the DTM in the Frame Application.
Api	Additional address information. If the device needs special values for the DPV1-Initiate, the DeviceDTM is responsible for providing the values in the ConnectRequest.
BusAddress	Address information according to the PROFIBUS specification.
SrcNetworkAddress	[optional] Describes the extended address of the source (required for inter-network addressing).
DestNetworkAddress	[optional] Describes the extended address of the destination (required for inter-network addressing).
RedundantAddresses	[optional] Within a connect request, a DTM of a PROFIBUS redundant slave can provide additional redundant slave addresses. The BusAddress property is to be used as the preferred address; the addresses in the RedundantAddresses property should be used in the order of the list if an alternative address is used to connect to the redundant slave.

10.4.2 Dpv1ConnectResponse

This is the PROFIBUS DP-V1 specific implementation of the abstract class ConnectResponse (see Figure 23).



Used in:

ICommunication.EndConnect()

Figure 23 - Dpv1ConnectResponse

The properties of the Dpv1ConnectResponse datatype are described in Table 31

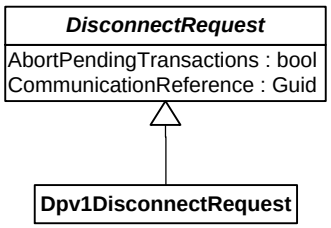
Table 31 – Dpv1ConnectResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
Api	Additional addressing information. If the device needs special values for the DPV1-Initiate, the DeviceDTM is responsible for providing the values in the ConnectRequest.
BusAddress	Address information according to the PROFIBUS specification.
MaxLenDataUnit	[optional] Describes the amount of data, which can be transferred via the established connection. If this property is not available, no special length restriction is announced. Each communication component within the chain of interfaces concerning nested communication could introduce this property. Each communication component should change the contents of the property based on the following rule: The new value is the minimum of the current value and the restriction of its own implementation. If a communication component has no restriction, it should hand over the given value. If a communication component is able to reuse an established connection concerning a new connect request, it should take into account the data length determined for the existing connection.
SrcNetworkAddress	[optional] Describes the extended address of the source.

Property	Description
DestNetworkAddress	[optional] Describes the extended address of the destination.
RedundantAddresses	[optional] Within a connect request, a DTM of a PROFIBUS redundant slave can provide additional redundant slave addresses. The BusAddress property is to be used as the preferred address; the addresses in the RedundantAddresses property should be used in the order of the list if an alternative address is used to connect to the redundant slave.
ErrorCode	The result of the service call.

10.4.3 Dpv1DisconnectRequest

This is the PROFIBUS DP-V1 specific implementation of the abstract class DisconnectRequest (see Figure 24).



Used in:

ICommunication.BeginDisconnect()

Figure 24 - Dpv1DisconnectRequest

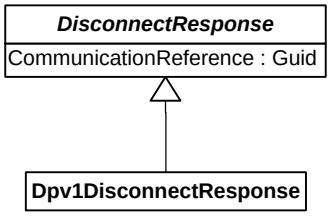
The properties of the Dpv1DisconnectRequest datatype are described in Table 32

Table 32 – Dpv1DisconnectRequest datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
AbortPendingTransactions	Indicates whether pending transactions shall be aborted.

10.4.4 Dpv1DisconnectResponse

This is the PROFIBUS DP-V1 specific implementation of the abstract class DisconnectResponse (see Figure 25).



Used in:

ICommunication.EndDisconnect()

Figure 25 - Dpv1DisconnectResponse

The properties of the Dpv1DisconnectResponse datatype are described in Table 33

Table 33 – Dpv1DisconnectResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.

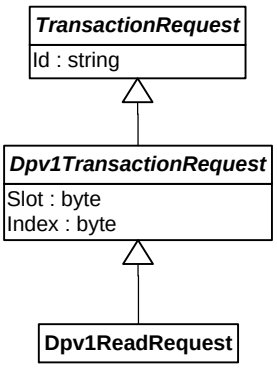
10.4.5 Dpv1TransactionRequest

This is the base class for PROFIBUS DP-V1 transaction requests containing the common properties slot and index. The following classes inherit from this class:

Dpv1ReadRequest
Dpv1WriteRequest

10.4.5.1 Dpv1ReadRequest

This is the request for reading data from the device (see Figure 26).



Used in:

ICommunication.BeginCommunicationRequest()

Figure 26 - Dpv1ReadRequest

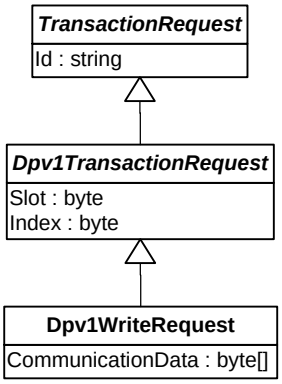
The properties of the Dpv1ReadRequest datatype are described in Table 34

Table 34 – Dpv1ReadRequest datatype

Property	Description
Slot	Address information according to the PROFIBUS specification.
Index	Address information according to the PROFIBUS specification.
Id	[Optional] Identifier for a single Transaction Request.

10.4.5.2 Dpv1WriteRequest

This is the request for writing data to the device (see Figure 27).



Used in:

ICommunication.BeginCommunicationRequest ()

Figure 27 - Dpv1WriteRequest

The properties of the Dpv1WriteRequest datatype are described in Table 35

Table 35 – Dpv1WriteRequest datatype

Property	Description
Slot	Address information according to the PROFIBUS specification.
Index	Address information according to the PROFIBUS specification.
CommunicationData	Array of bytes to be written.
Id	[Optional] Identifier for a single Transaction Request.

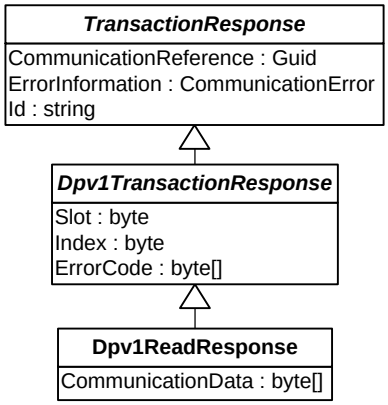
10.4.6 Dpv1TransactionResponse

This is the base class for PROFIBUS DP-V1 transaction responses containing the common properties slot, index and error code. The following classes inherit from this class:

Dpv1ReadResponse
Dpv1WriteResponse

10.4.6.1 Dpv1ReadResponse

This is the response for reading data from the device (see Figure 28).



Used in:

ICommunication.EndCommunicationRequest ()

Figure 28 - Dpv1ReadResponse

The properties of the Dpv1ReadResponse datatype are described in Table 36

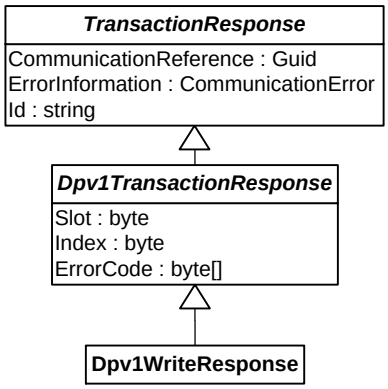
Table 36 – Dpv1ReadResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.

Property	Description
ErrorInformation	[Optional] Description of a fieldbus protocol independent error occurred during communication.
Id	[Optional] Identifier of the corresponding Transaction Request.
Slot	Address information according to the PROFIBUS specification.
Index	Address information according to the PROFIBUS specification.
CommunicationData	Array of bytes read from device.
ErrorCode	The result of the service call (see chapter 10.5).

10.4.6.2 Dpv1WriteResponse

This is the response for writing data to the device (see Figure 29).



Used in:

ICommunication.EndCommunicationRequest ()

Figure 29 - Dpv1WriteResponse

The properties of the Dpv1WriteResponse datatype are described in Table 37

Table 37 – Dpv1WriteResponse datatype

Property	Description
CommunicationReference	Identifier for a communication link to a device.
ErrorInformation	[Optional] Description of a fieldbus protocol independent error occurred during communication.
Id	[Optional] Identifier of the corresponding Transaction Request.
Slot	Address information according to the PROFIBUS specification.
Index	Address information according to the PROFIBUS specification.
ErrorCode	The result of the service call (see chapter 10.5).

10.5 Error information provided by Communication Channel

In every transaction response datatype of FDT PROFIBUS specification a property ‘ErrorCode’ is provided. According to PROFIBUS, the error code is standardized to consist of 3 bytes, where each byte carries a meaning.

Since the error code is exchanged between different DTMs (e.g. Communication-DTM and Device-DTM) and since the receiver of the error code will try to understand the error code, the provider shall use the standard format:

standard length 3 bytes;
if the device provides error codes, these error codes are provided (and not local error codes from the Master).
If no error occurred, the property ‘ErrorCode’ shall be filled with 3 zero bytes.

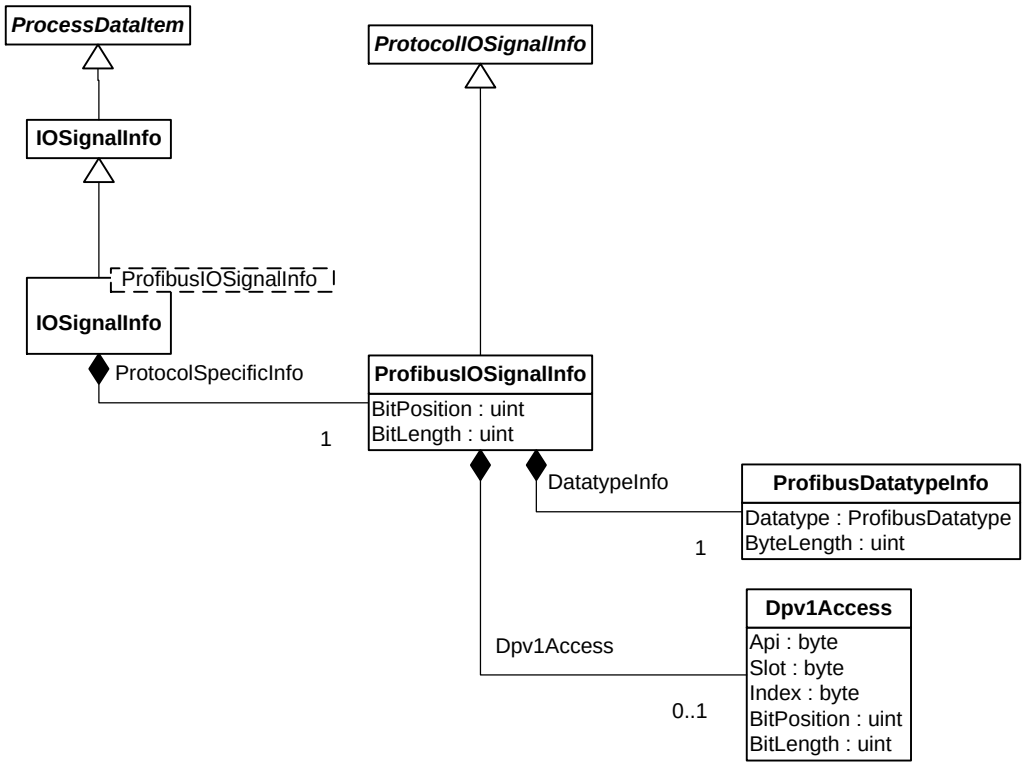
11 Datatypes for process data information

11.1 General

The process data information of a DTM represents the “Device Variables”, available on that device. A Process Control System (i.e. some external system which monitors values on a device) can query the DTM's process data information via the IProcessData interface. The process data describes the process values such that an external system can use the information to access and interpret the values from the device during normal device runtime. The external system might not use FDT to access the values.

11.2 ProfibusIOSignalInfo

This is the PROFIBUS specific implementation of the abstract class ProtocolIOSignalInfo (see Figure 30).



Used in:

IProcessData.<ProcessData>()
IProcessData.SetIOSignalInfo()

Figure 30 - ProfibusIOSignalInfo

The properties of the ProfibusIOSignalInfo datatype are described in Table 38

Table 38 – ProfibusIOSignalInfo datatype

Property	Description
DatatypeInfo	The datatype of the IO signal.
BitPosition	The position in the addressed data stream.
BitLength	The length of the data.
Dpv1Access	[optional] Describes how to access the IO data with DP-V1 protocol.
Api	The API value to access the value with DP-V1 protocol.
Slot	The slot part of the DP-V1 data address.
Index	The index part of the DP-V1 data address.
BitPosition	[optional] The position in the addressed data stream. If omitted, 0 shall be assumed.
BitLength	[optional] The length of the data. When omitted, the default length of the datatype shall be assumed.

12 Device identification

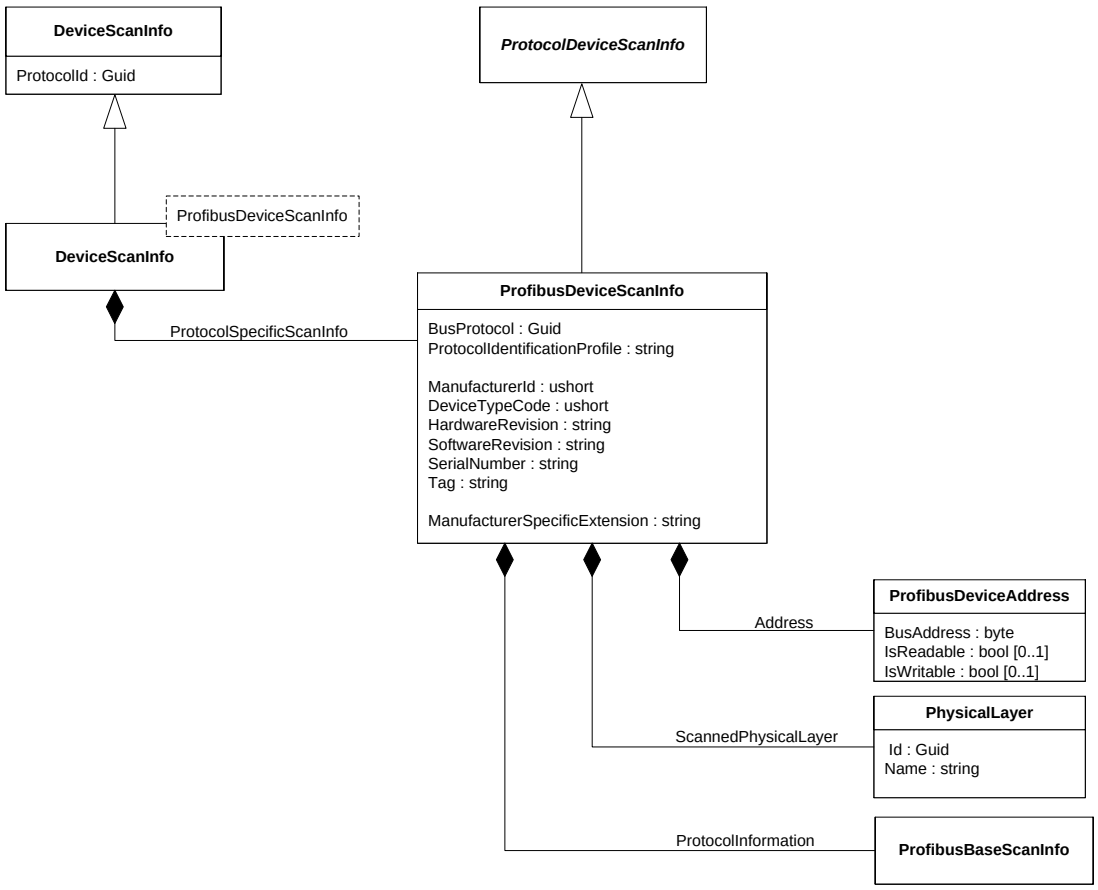
This chapter defines identification relevant protocol specific datatypes.

A PROFIBUS scan may detect different device types: I&M devices, PROFIBUS PA devices or pure DP devices. Depending on the detected device type, not all properties of ProfibusDeviceScanInfo or ProfibusDeviceIdentInfo are available and will be filled with default values. The ProtocolIdentificationProfile property of the DeviceScanInfo or DeviceIdentInfo instances shall be set to either "DP", "PA", “IM-PA” or "IM" to indicate the identification type for the device.

12.1 ProfibusDeviceScanInfo datatype

12.1.1 General

This is the PROFIBUS specific implementation of the abstract class ProtocolDeviceScanInfo (see Figure 31).



Used in:

IDtmScanning.EndScanRequest()

Figure 31 - ProfibusDeviceScanInfo

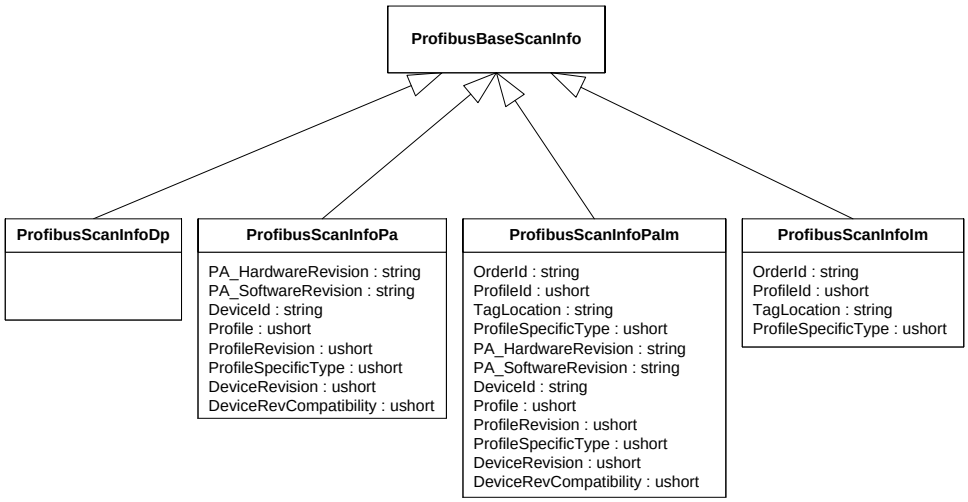
The properties of the ProfibusDeviceScanInfo datatype are described in Table 39. Protocol specific properties will be stored as key-value pairs in the property DeviceScanInfo.ProtocolSpecificProperties. Device specific properties will be stored as key-value pairs in the property DeviceScanInfo.DeviceSpecificProperties.

Table 39 – ProfibusDeviceScanInfo datatype

Property	Description
Address	The bus address of the device.
BusProtocol	Can be set to either DP-V0 or DP-V1. This information is provided by the Communication Channel (based on the ScanRequest)
ProtocolIdentificationProfile	Indicates the identification type for the device ("DP", "PA", “IM-PA” or "IM").
ScannedPhysicalLayer	Information about the physical layer that was scanned. This information is provided by the Communication Channel (based on knowledge of the fieldbus)
ManufacturerId	Manufacturer identification number. Available for PA and I&M only.
DeviceTypeId	The IDENT_NUMBER of the device.
HardwareRevision	The hardware version revision of the device. Available for PA and I&M only.
SoftwareRevision	The software version revision of the device. Available for PA and I&M only.
SerialNumber	The serial number of the specific device. Available for PA and I&M only.
Tag	Identifying tag for a device. Available for PA and I&M only.
ProtocolSpecificProperties:	
ProtocolInformation	Profile specific information (provided by derived datatypes). The information of this member is mapped into DeviceScanInfo.ProtocolSpecificProperties.
DeviceSpecificProperties:	
ManufacturerSpecificExtension	Can be used by DTM for vendor specific device identification information, e.g. by combining a number of device parameter values into one string value. This can be used to identify a specific device variant.

12.1.2 Datatypes derived from ProfibusBaseScanInfo

This is the profile specific implementation of the abstract class ProfibusBaseScanInfo (see Figure 32).



Used in:

IDtmScanning.EndScanRequest()

Figure 32 – Datatypes derived from ProfibusBaseScanInfo

The properties of the Datatypes derived from ProfibusBaseScanInfo are described in Table 40.

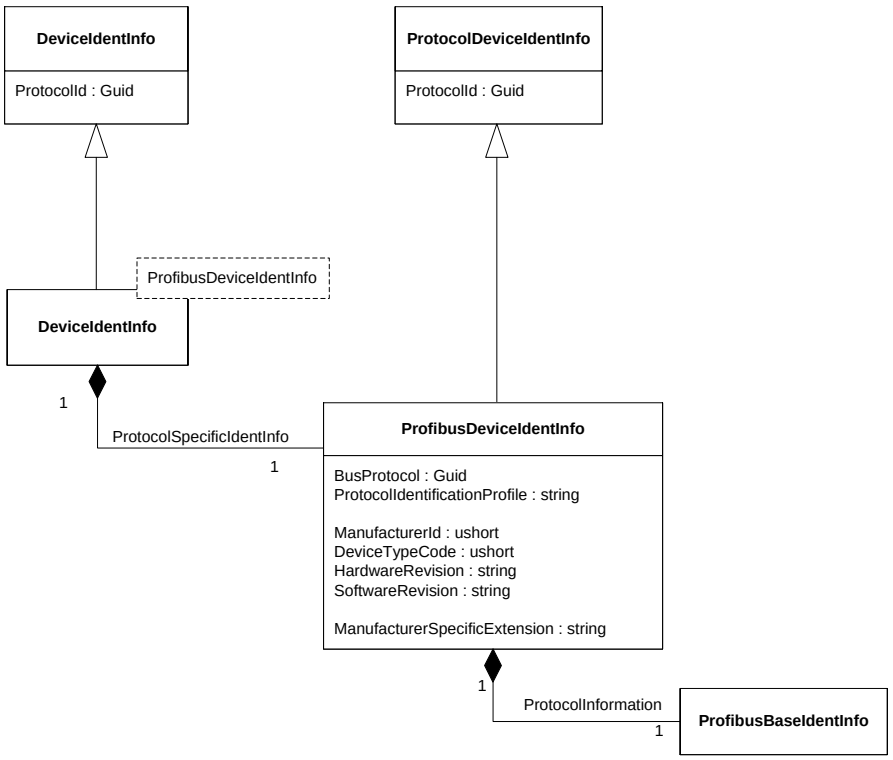
Table 40 – Datatypes derived from ProfibusBaseScanInfo

Property	Description
ProfibusScanInfoDP	
<none>	
ProfibusScanInfoPa	
DeviceId	The PA specific device type identification. (Physical Block - Index 11)
DeviceRevision	The revision of the device. (Physical Block - Index 0, 2 bytes starting at byte offset 4)
DeviceRevCompatibility	The device revision compatibility for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 6)
PA_HardwareRevision	The PA hardware revision for the device (Physical Block - Index 9).
PA_SoftwareRevision	The PA software revision for the device. (Physical Block - Index 8)
Profile	The profile identification for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 10)
ProfileRevision	The profile revision for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 12)
ProfileSpecificType	Additional profile identification information of the device. (first Transducer Block - Index 0, 1 byte at byte offset 2)

Property	Description
ProfibusScanInfoPalm	
OrderId	The complete order number or at least the relevant part that allows unambiguous identification of the device within the manufacturer's web site. (I&M 0 Element 2)
ProfileId	I&M defined Profile identifier. (I&M 0 Element 7)
ProfileSpecificType	Additional profile identification information of the device. (I&M 0 Element 8)
TagLocation	I&M defined location specific of the device. (I&M 1 Element 2)
DeviceId	The PA specific device type identification. (Physical Block - Index 11)
DeviceRevision	The revision of the device. (Physical Block - Index 0, 2 bytes starting at byte offset 4)
DeviceRevCompatibility	The device revision compatibility for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 6)
PA_HardwareRevision	The PA hardware revision for the device (Physical Block - Index 9).
PA_SoftwareRevision	The PA software revision for the device. (Physical Block - Index 8)
Profile	The profile identification for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 10)
ProfileRevision	The profile revision for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 12)
ProfileSpecificType	Additional profile identification information of the device. (first Transducer Block - Index 0, 1 byte at byte offset 2)
ProfibusScanInfoIm	
OrderId	The complete order number or at least the relevant part that allows unambiguous identification of the device within the manufacturer's web site. (I&M 0 Element 2)
ProfileId	I&M defined Profile identifier. (I&M 0 Element 7)
ProfileSpecificType	Additional profile identification information of the device. (I&M 0 Element 8)
TagLocation	I&M defined location specific of the device. (I&M 1 Element 2)

12.2 ProfibusDeviceIdentInfo datatype

PROFIBUS DTMs that may connect to a PROFIBUS Communication Channel (e.g. Device DTMs and Gateway DTMs) shall provide information, which may be used to identify the corresponding devices on the fieldbus. This section describes the offline information (see Figure 33).



Used in:

IDtmInformation.GetDeviceIdentInfo()

Figure 33 - ProfibusDeviceIdentInfo

The properties of the ProfibusDeviceIdentInfo datatype are described in Table 41. Protocol specific properties will be stored as key-value pairs in the property DeviceIdentInfo.ProtocolSpecificProperties. Device specific properties will be stored as key-value pairs in the property DeviceIdentInfo.DeviceSpecificProperties.

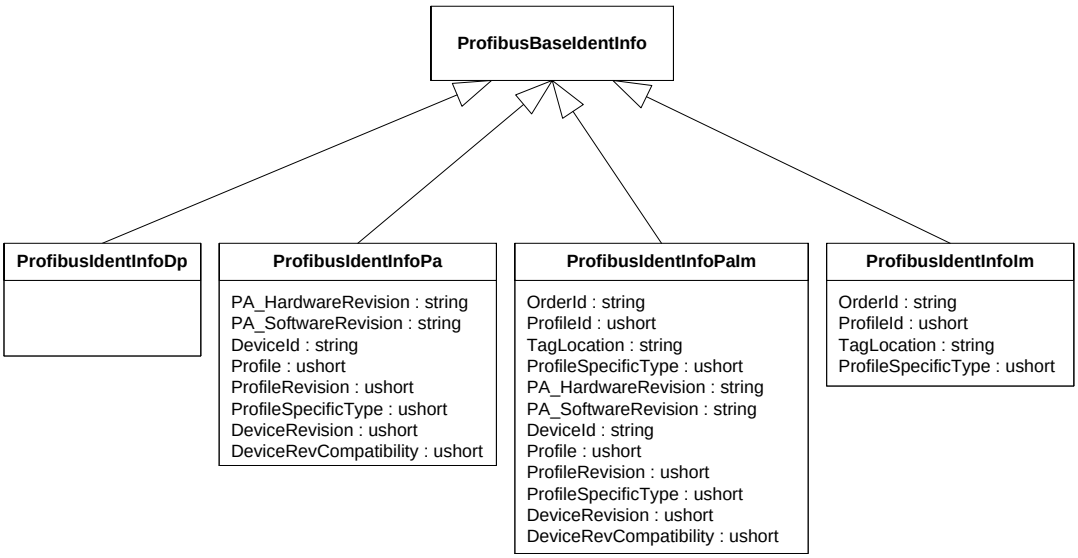
Table 41 – ProfibusDeviceIdentInfo datatype

Property	Description
BusProtocol	The unique identifier of either DP-V0 or DP-V1.
ProtocolIdentificationProfile	Indicates the identification type for the device ("DP", "PA", “IM-PA”, or "IM").
ManufacturerId	Manufacturer identification number.
DeviceTypeId	The IDENT_NUMBER of the device.
SoftwareRevision	The software version revision of the device.
HardwareRevision	The hardware version revision of the device.
ProtocolSpecificProperties:	
ProtocolInformation	Profile specific information (provided by derived datatypes). The information of this member is mapped into DeviceScanInfo.ProtocolSpecificProperties.
DeviceSpecificProperties:	
ManufacturerSpecificExtension	Can be used by DTM for vendor specific device identification information, e.g. by combining a number of device parameter values into one string value. This can be used to identify a specific device variant.

The information described here will be used to match with the information retrieved from Communication Channels via the method ICommunication.<ScanRequest()>. This match is executed by device independent software. That is why it is important to provide in ProfibusDeviceIdentInfo information that can be matched with the ProfibusDeviceScanInfo information. Developers of DTMs need to consider which information the devices will provide (see 12.3).

12.2.1 Datatypes derived from ProfibusBaseIdentInfo

This is the profile specific implementation of the abstract class ProfibusBaseIdentInfo (see Figure 32).



Used in:

IDtmScanning.EndScanRequest()

Figure 34 – Datatypes derived from ProfibusBaseIdentInfo

The properties of the datatypes derived from ProfibusBaseIdentInfo are described in Table 40.

Table 42 – Datatypes derived from ProfibusBaseIdentInfo

Property	Description
ProfibusIdentInfoDP	
<none>	

Property	Description
ProfibusIdentInfoPa	
DeviceId	The PA specific device type identification. (Physical Block - Index 11)
DeviceRevision	The revision of the device. (Physical Block - Index 0, 2 bytes starting at byte offset 4)
DeviceRevCompatibility	The device revision compatibility for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 6)
PA_HardwareRevision	The PA hardware revision for the device (Physical Block - Index 9).
PA_SoftwareRevision	The PA software revision for the device. (Physical Block - Index 8)
Profile	The profile identification for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 10)
ProfileRevision	The profile revision for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 12)
ProfileSpecificType	Additional profile identification information of the device. (first Transducer Block - Index 0, 1 byte at byte offset 2)
ProfibusIdentInfoPaIm	
OrderId	The complete order number or at least the relevant part that allows unambiguous identification of the device within the manufacturer's web site. (I&M 0 Element 2)
ProfileId	I&M defined Profile identifier. (I&M 0 Element 7)
ProfileSpecificType	Additional profile identification information of the device. (I&M 0 Element 8)
TagLocation	I&M defined location specific of the device. (I&M 1 Element 2)
DeviceId	The PA specific device type identification. (Physical Block - Index 11)
DeviceRevision	The revision of the device. (Physical Block - Index 0, 2 bytes starting at byte offset 4)
DeviceRevCompatibility	The device revision compatibility for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 6)
PA_HardwareRevision	The PA hardware revision for the device (Physical Block - Index 9).
PA_SoftwareRevision	The PA software revision for the device. (Physical Block - Index 8)
Profile	The profile identification for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 10)
ProfileRevision	The profile revision for the device. (Physical Block - Index 0, 2 bytes starting at byte offset 12)
ProfileSpecificType	Additional profile identification information of the device. (first Transducer Block - Index 0, 1 byte at byte offset 2)
ProfibusIdentInfoIm	
OrderId	The complete order number or at least the relevant part that allows unambiguous identification of the device within the manufacturer's web site. (I&M 0 Element 2)
ProfileId	I&M defined Profile identifier. (I&M 0 Element 7)
ProfileSpecificType	Additional profile identification information of the device. (I&M 0 Element 8)
TagLocation	I&M defined location specific of the device. (I&M 1 Element 2)

12.3 Mapping of Information Source

PROFIBUS Communication DTMs shall provide identification properties according to the supported device profile.

Following rule shall be applied by PROFIBUS Communication Channels:

- if the device supports I&M information as well as PA profile information (PROFILE_ID has value 0x9700), then the Communication Channel shall create combined I&M and PA identification (define ProtocolIdentificationProfile="IM-PA" and map the information corresponding to entry "For IM-PA:" in Table 43), otherwise
- if the device supports I&M information, then the Communication Channel shall create I&M identification (define ProtocolIdentificationProfile=”IM” and map the information corresponding to entry "For IM:" in Table 43), otherwise
- if the device supports PA profile information, then the Communication Channel shall create PA identification (define ProtocolIdentificationProfile=”PA” and map the information corresponding to entry "For PA:" in Table 43), otherwise
- the Communication Channel shall create DP identification (define ProtocolIdentificationProfile=”DP” and map the information corresponding to entry "For DP:" in Table 43).

Table 43 shows the mapping of device properties to predefined ProfibusDeviceScanInfo properties.

Table 43 – Profile specific mapping of identity information

ProfibusDeviceScanInfo ProfibusDeviceIdentInfo, Property Name	Mapped DeviceScanInfo Property Name	Data Request in physical device	Protocol Specific Name	PROFIBUS Data Format	Specific Reference
-	ProtocolIdentificationProfile	"IM" or “IM-PA” or “PA” or “DP”	-	-	-
SlaveAddress	Address. BusAddress	Bus address is provided as part of live list by a PROFIBUS master. Service: FMA1/2_LIVE_LIST	Slave Address	-	[7]Part 3, Section 4.2.3.6
BusProtocol	ProtocolId	Set by CommunicationChannel	-	-	-
ScannedPhysicalLayer	PhysicalLayer	Set by CommunicationChannel	-	-	-
ManufacturerId	ManufacturerId	For “IM”: I&M 0 Element 1	MANUFACTURER_ID	Unsigned16	[5] Section 3.2.2
		For “IM-PA”: I&M 0 Element 1	MANUFACTURER_ID	Unsigned16	[5] Section 3.2.2
		For “PA”: Physical Block - Index 10	DEVICE_MAN_ID	Unsigned16	[4] Section 5.2.8
		For “DP”: null (not available)	-	-	-

ProfibusDeviceScanInfo ProfibusDeviceIdentInfo, Property Name	Mapped DeviceScanInfo Property Name	Data Request in physical device	Protocol Specific Name	PROFIBUS Data Format	Specific Reference
DeviceTypeId	DeviceTypeId	IDENT_NUMBER can be requested by: DP Service DDLM_SLAVE_DIAG Allowed values are: Profile IDENT_NUMBER: 0x9700 (0x9700 to 0x9742) or manufacturer specific IDENT_NUMBER	IDENT_NUMBER	Unsigned16 Displayed as hex number	[7] Part 8, Section 9.3.1
HardwareRevision	HardwareRevision	For “IM”: I&M 0 Element 4. int16 formatted as string.	HARDWARE_REVISION	16 Octets VisibleString	[5] Section 3.2.5
		For “IM-PA”: I&M 0 Element 4. int16 formatted as string.	HARDWARE_REVISION	16 Octets VisibleString	[5] Section 3.2.5
		For “PA”: Physical Block - Index 9	HARDWARE_REVISION	16 Octets VisibleString	[4] Section 5.2.8
		For “DP”: "N/A" (not available)	-	-	-
SoftwareRevision	SoftwareRevision	For “IM”: I&M 0 Element 5. int16 formatted as string.	SOFTWARE_REVISION	16 Octets VisibleString	[5] Section 3.2.6
		For “IM-PA”: I&M 0 Element 5. int16 formatted as string.	SOFTWARE_REVISION	16 Octets VisibleString	[5] Section 3.2.6
		For “PA”: Physical Block - Index 8	SOFTWARE_REVISION	16 Octets VisibleString	[4] Section 5.2.8
		For “DP”: "N/A" (not available)	-	-	-
Tag	Tag	For “IM”: I&M 1 Element 1	TAG_FUNCTION	32 Octets VisibleString	[5] Section 3.2.12
		For “IM-PA”: I&M 1 Element 1	TAG_FUNCTION	32 Octets VisibleString	[5] Section 3.2.12
		For “PA”: Physical Block - Index 2	TAG_DESC	32 Octets VisibleString	[4] Section 3.11
		For “DP”: "N/A" (not available)	-	-	-
SerialNumber	SerialNumber	For “IM”: I&M 0 Element 3	SERIAL_NUMBER	16 Octets VisibleString	[5] Section 3.2.4
		For “IM-PA”: I&M 0 Element 3	SERIAL_NUMBER	16 Octets VisibleString	[5] Section 3.2.4
		For “PA”: Physical Block - Index 12	DEVICE_SER_NUM	16 Octets VisibleString	[4] Section 5.2.8
		For “DP”: "N/A" (not available)	-	-	-

ProfibusDeviceScanInfo ProfibusDeviceIdentInfo, Property Name	Mapped DeviceScanInfo Property Name	Data Request in physical device	Protocol Specific Name	PROFIBUS Data Format	Specific Reference
ProtocolSpecificProperties:					
PA_HardwareRevision		For “IM”: not available	-	-	-
		For“IM-PA”: Physical Block - Index 9	HARDWARE_REVISION	16 Octets VisibleString	[4] Section 5.2.8
		For “PA”: Physical Block - Index 9	HARDWARE_REVISION	16 Octets VisibleString	[4] Section 5.2.8
		For “DP”: not available	-	-	-
PA_SoftwareRevision		For “IM”: not available	-	-	-
		For “IM-PA”: Physical Block - Index 8	SOFTWARE_REVISION	16 Octets VisibleString	[4] Section 5.2.8
		For “PA”: Physical Block - Index 8	SOFTWARE_REVISION	16 Octets VisibleString	[4] Section 5.2.8
		For “DP”: not available	-	-	-
OrderId		For “IM”: I&M 0 Element 2	ORDER_ID	20 Octets VisibleString	[5] Section 3.2.3
		For “IM-PA”: I&M 0 Element 2	ORDER_ID	20 Octets VisibleString	[5] Section 3.2.3
		For “PA”: not available	-	-	-
		For “DP”: not available	-	-	-
DeviceId		For “IM”: not available	-	-	-
		For “IM-PA”: Physical Block - Index 11	DEVICE_ID	16 Octets VisibleString	[4] Section 5.2.8
		For “PA”: Physical Block - Index 11	DEVICE_ID	16 Octets VisibleString	[4] Section 5.2.8
		For “DP”: not available	-	-	-
ProfileId		For “IM”: I&M 0 Element 7	PROFILE_ID	Unsigned16	[5] Section 3.2.8
		For “IM-PA”: I&M 0 Element 7	PROFILE_ID	Unsigned16	[5] Section 3.2.8
		For “PA”: not available	-	-	-
		For “DP”: not available	-	-	-

ProfibusDeviceScanInfo ProfibusDeviceIdentInfo, Property Name	Mapped DeviceScanInfo Property Name	Data Request in physical device	Protocol Specific Name	PROFIBUS Data Format	Specific Reference
Profile		For “IM”: not available	-	-	-
		For “IM-PA”: Block structure of physical block - element 8 (Physical Block - Index 0, 2 bytes starting at byte offset 10)	Profile	Unsigned16	[4] Section 5.2.3.2
		For “PA”: Block structure of physical block - element 8 (Physical Block - Index 0, 2 bytes starting at byte offset 10)	Profile	Unsigned16	[4] Section 5.2.3.2
		For “DP”: not available	-	-	-
ProfileRevision		For I&M: not available	-	-	-
		For “IM-PA”: Block structure of physical block - element 9 (Physical Block - Index 0, 2 bytes starting at byte offset 12)	Profile Revision	Unsigned16	[4] Section 5.2.3.2
		For “PA”: Block structure of physical block - element 9 (Physical Block - Index 0, 2 bytes starting at byte offset 12)	Profile Revision	Unsigned16	[4] Section 5.2.3.2
		For “DP”: not available	-	-	-
ProfileSpecificType	-	For “IM”: I&M 0 Element 8	PROFILE_SPECIFIC_TYPE	Unsigned16	[5] Section 3.2.9
		For “IM-PA”: Block structure of first transducer block - element 3 (first Transducer Block - Index 0, 1 byte at byte offset 2)	PROFILE_SPECIFIC_TYPE	Unsigned16	[4] Section 5.2.3.2
		For “PA”: Block structure of first transducer block - element 3 (first Transducer Block - Index 0, 1 byte at byte offset 2)	PROFILE_SPECIFIC_TYPE	Unsigned16	[4] Section 5.2.3.2
		For DP: not available	-	-	-
TagLocation	-	For “IM”: I&M 1 Element 2	TAG_LOCATION	22 Octets VisibleString	[5] Section 3.2.13
		For “IM-PA”: I&M 1 Element 2	TAG_LOCATION	22 Octets VisibleString	[5] Section 3.2.13
		For “PA”: not available	-	-	-
		For “DP”: not available	-	-	-

ProfibusDeviceScanInfo ProfibusDeviceIdentInfo, Property Name	Mapped DeviceScanInfo Property Name	Data Request in physical device	Protocol Specific Name	PROFIBUS Data Format	Specific Reference
DeviceRevision	-	For “IM”: not available	-	-	-
		For “IM-PA”: Block structure of physical block - element 5 (Physical Block - Index 0, 2 bytes starting at byte offset 4)	Dev_Rev	Unsigned16	[4] Section 5.2.3.2 [4] Section 5.5.4.2.1
		For “PA”: Block structure of physical block - element 5 (Physical Block - Index 0, 2 bytes starting at byte offset 4)	Dev_Rev	Unsigned16	[4] Section 5.2.3.2 [4] Section 5.5.4.2.1
		For “DP”: not available	-	-	-
DeviceRevCompatibility	-	For “IM”: not available	-	-	-
		For “IM-PA”: Block structure of physical block - element 6 (Physical Block - Index 0, 2 bytes starting at byte offset 6)	Dev_Rev_Comp	Unsigned16	[4] Section 5.2.3.2 [4] Section 5.5.4.2.1
		For “PA”: Block structure of physical block - element 6 (Physical Block - Index 0, 2 bytes starting at byte offset 6)	Dev_Rev_Comp	Unsigned16	[4] Section 5.2.3.2 [4] Section 5.5.4.2.1
		For “DP”: not available	-	-	-
DeviceSpecificProperties					
		depends on the DTM implementation	-	-	-

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