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PAS 62453-4

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First edition  
2006-05

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**Field Device Tool (FDT) interface specification –**

**Part 4:  
HART communication**

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**Field Device Tool (FDT) interface specification –****Part 4: HART communication**

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IEC-PAS 62453-4 has been processed by subcommittee 65C: Digital communications, of IEC technical committee 65: Industrial-process measurement and control.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
65C/398A/NP	65C/411/RVN

Following publication of this PAS, which is a pre-standard, the technical committee or subcommittee concerned will transform it into an International Standard.

This PAS shall remain valid for an initial maximum period of three years starting from 2006-05. The validity may be extended for a single three-year period, following which it shall be revised to become another type of normative document or shall be withdrawn.

IEC 62453 consists of the following parts under the general title *Field Device Tool (FDT) interface specification*:

Part 1: Concepts and detailed description

Part 2: INTERBUS communication

Part 3: PROFIBUS communication

Part 4: HART communication

Part 5: FOUNDATION FIELDBUS communication

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## INTRODUCTION

This PAS is an interface specification for developers of FDT components for Function Control and Data Access within a Client Server architecture. The specification is a result of an analysis and design process to develop standard interfaces to facilitate the development of servers and clients by multiple vendors that shall inter-operate seamlessly.

With the integration of fieldbuses into control systems, there are a few other tasks which must be performed. This applies to fieldbuses in general. Although there are fieldbus- and device-specific tools, there is no unified way to integrate those tools into higher level system-wide planning or engineering tools. In particular, for use in extensive and heterogeneous control systems, typically in the area of the process industry, the unambiguous definition of engineering interfaces that are easy to use for all those involved, is of great importance.

A device-specific software component, called DTM (Device Type Manager), is supplied by the field device manufacturer with its device. The DTM is integrated into engineering tools via the FDT interfaces defined in this specification. The approach to integration is in general open for all kind of fieldbuses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

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WITHDRAWN

## Field Device Tool (FDT) interface specification –

### Part 4: HART communication

#### 1 Scope

This part of IEC 62435 provides information for integrating the HART<sup>1</sup> protocol into the FDT interface specification (IEC 62453-1). This PAS neither contains the FDT specification nor modifies it.

#### 2 Normative references

The following referenced documents are indispensable for the application of this PAS. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies

IEC 62453-1: *Field Device Tool (FDT) interface specification – Part 1: Concepts and detailed description*

#### 3 Provided data

##### 3.1 Interface IDtmParameter

The minimum set of provided data should be:

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

##### 3.2 SingleDataAccess interfaces

At least all parameters of the Universal and Common Practice (as far as the device supports the function) commands must be exposed via the interfaces IDtmSingleDeviceDataAccess and IDtmSingleInstanceDataAccess.

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

#### 4 Protocol specific usage of XML attributes

The following Table 1 shows how general attributes are used with HART devices.

**Table 1 – Protocol specific usage of XML attributes**

Attribute	Description for use in HART
address	The address attribute (defined in FDTDataTypesSchema.xml) is not mandatory for the exposed parameters in the DTMs. But if the address attribute is used the string must be constructed according to the rules of the semanticId. That means the attribute 'semanticId' is always the same as the attribute 'address'
busCategory	See Clause 5

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



Attribute	Description for use in HART
deviceTypeId	The attribute "fdt:DtmDeviceType/@deviceTypeId" must contain the DeviceTypeID of the supported physical device according to the HCF online product catalog
manufacturerId	Enter manufacturer according to HCF list
semanticId applicationDomain	<p>The applicationDomain attribute is: FDT_HART</p> <p>The semanticId for HART protocol-related parameter is directly related to the protocol specification. The definition of the HART commands is the base for the semanticId. The semanticId for a parameter follows the following definition:</p> <p style="text-align: center;">CMDxxBy</p> <p>and</p> <p style="text-align: center;">CMD31EXTENDEDxxBy</p> <p>for extended HART 6 device family commands.</p> <p>The semanticIds for the Response Byte 0 and 1 defined in the HART specification are:</p> <p>CMDxxRESPONSE_BYTE_0 CMDxxRESPONSE_BYTE_1</p> <p>xx: represents the command number, getting the parameter via HART protocol or the device family command number y: start byte within the command definition xx, yy are based on decimal format without leading '0'</p>
subDeviceType	Enter manufacturer-specific value

## 5 Bus category

HART protocol is identified by the following unique identifier in busCategory attributes within XML BusCategory elements.

BusCategory Element	Description
036D1498-387B-11D4-86E1-00E0987270B9	Support of HART protocol

## 6 FDT sequence charts

### 6.1 HART burst mode subscription

A subscription of device initiated data transfer can be requested by sending a TransactionRequest with SubscribeRequest content (see Figure 1). The Communication Channel may detect if the device is already in Burst Mode. In HART 5 this can be detected only when HART Burst frames are received from the device. In HART 6 the Burst mode can be detected using HART command 105. The Communication Channel answers on a SubscribeRequest by calling OnTransactionResponse with a SubscribeResponse content. If HART Burst frames are received, the device is in Burst mode and burstModeDetected value is set to TRUE. This means that device DTM will start to receive Burst messages via OnTransactionResponse mechanism. In case no burst messages were received, burstModeDetected value is set to FALSE. It is up to device DTM to set device into Burst mode. Then device DTM may call TransactionRequest with SubscribeRequest content again in order to receive Burst messages.

In order to unsubscribe, the device DTM sends a TransactionRequest with a UnsubscribeRequest. The Communication Channel answers by calling OnTransactionResponse with a SubscribeResponse where burstModeDetected value is set to FALSE. Device DTM will not receive any more Burst information via OnTransactionResponse mechanism. The Communication Channel does not switch off the Burst Mode in the device. The device DTM may switch Burst Mode on or off by using normal TransactionRequests (HART command 109). This is independent of the subscription.

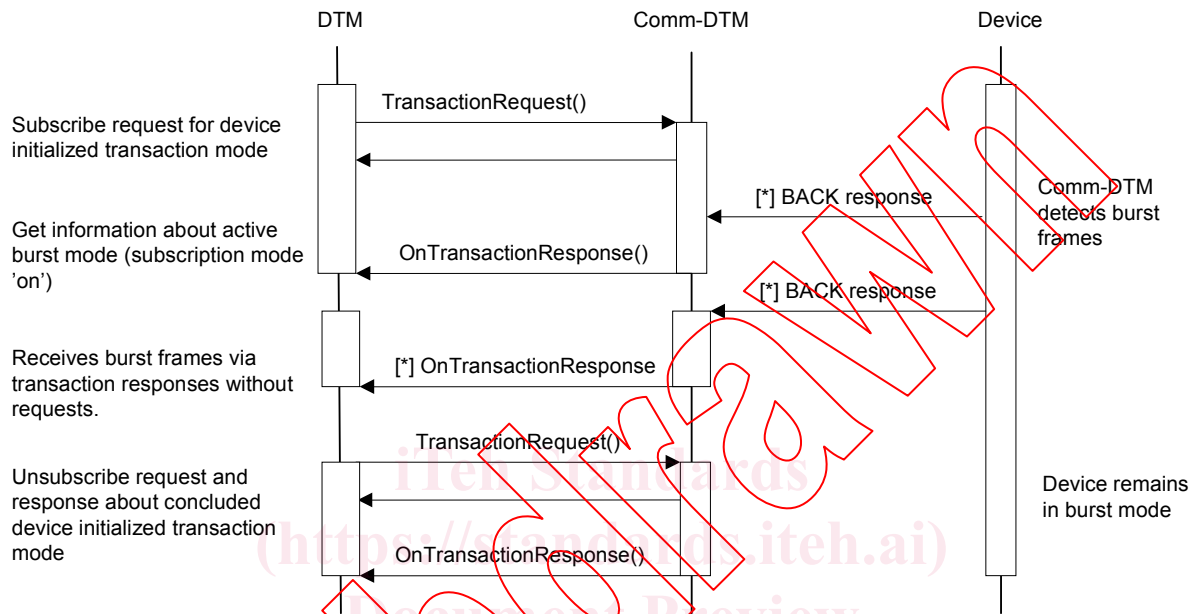


Figure 1 – HART burst mode subscription

Used methods:

IFdtCommunication::TransactionRequest()

IFdtCommunication::OnTransactionResponse()

## 7 HARTCommunicationSchema

Used at: IFdtCommunication::ConnectRequest()

IFdtCommunicationEvents2::OnConnectResponse2()

IFdtCommunication::DisconnectRequest()

IFdtCommunicationEvents::OnDisconnectResponse ()

IFdtCommunication::TransactionRequest()

IFdtCommunicationEvents::OnTransactionResponse()

The XML document contains the address information and the communication data which are explained in Table 2.

**Table 2 – HARTCommunicationSchema – attributes and elements**

Attribute	Description
address1	Address information according to the HART specification
address2	Address information according to the HART specification
address3	Address information according to the HART specification
burstFrame	Information whether the HART response is a Burst frame (message or not)
burstModeDetected	Indicates whether the Communication Channel has detected that the device is already in burst mode. This is detected during a subscription request
commandNumber	Address information according to the HART specification
communicationReference	Mandatory identifier for a communication link to a device. This identifier is allocated by the communication component during the connect. The address information has to be used for all following communication calls
delayTime	Minimum delay time in [ms] between two communication calls
deviceStatus	Changed description Status information. This is the second status byte returned in HART command responses according to the HART specification
deviceTypeId	Address information according to the HART specification
longFrameRequired	Address information according to the HART specification
manufacturerId	Address information according to the HART specification (see table relating to MANUFACTURER IDENTIFICATION CODES)
preambleCount	At the connect request the attribute is optional and contains a hint for the communication component about the number of preambles, required by the device type. At the connect response the attribute is mandatory and contains the information about the currently used preambleCount
primaryMaster	At the connect request the attribute is optional and contains a hint for a communication component that a DTM requires communication as primary or secondary master. At the connect response the attribute is mandatory contains the information about the current state of the master
schemaVersion	Defines the version of the schema
sequenceTime	Period of time in [ms] for the whole sequence
shortAddress	Address information according to the HART specification. This value is accessible via the attribute slaveAddress defined within the DTMPParameterSchema. SlaveAddress is part of the BusInformation structure. These values must be set by the responsible component as described in clause Nested Communication of IEC/PAS 62453-1
value	Variable for status information
systemTag	System Tag of a DTM. It is strongly recommended to provide the attribute in the Request document