

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Field Device Integration (FDI) –  
Part 109-1: Profiles – HART® and WirelessHART®**

**Intégration des appareils de terrain (FDI) –  
Partie 109-1: Profils – HART® et WirelessHART®**

IEC 62769-109-1:2015

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## FIELD DEVICE INTEGRATION (FDI) –

**Part 109-1: Profiles –  
HART® and WirelessHART®**

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

CDV	Report on voting
65E/356/CDV	65E/419/RVC

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

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

A list of all parts in the IEC 62769 series, published under the general title *Field Device Integration (FDI)*, can be found on the IEC website.

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## INTRODUCTION

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of patents concerning

- a) method for the supplying and installation of device-specific functionalities, see Patent Family DE10357276;
- b) method and device for accessing a functional module of automation system, see Patent Family EP2182418;
- c) methods and apparatus to reduce memory requirements for process control system software applications, see Patent Family US2013232186;
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## FIELD DEVICE INTEGRATION (FDI) –

### Part 109-1: Profiles – HART® and WirelessHART®

#### 1 Scope

This part of IEC 62769 specifies an FDI profile of IEC 62769 for IEC 61784-1\_CP 9/1 (HART®)<sup>1</sup> and IEC 61784-1\_CP 9/2 (WirelessHART®)<sup>1</sup>.

#### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62541-100, *OPC unified architecture – Part 100: Device Interface*

IEC 62769-4:2015, *Field Device Integration (FDI) – Part 4: FDI Packages*

NOTE IEC 62769-4 is technically identical to FDI-2024.

IEC 62769-5, *Field Device Integration (FDI) – Part 5: FDI Information Model*

NOTE IEC 62769-5 is technically identical to FDI-2025.

IEC 62769-7, *Field Device Integration (FDI) – Part 7: Communication Devices*

NOTE IEC 62769-7 is technically identical to FDI-2027.

#### 3 Terms, definitions, abbreviated terms and acronyms

##### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62541-100, IEC 62769-4, IEC 62769-5 and IEC 62769-7 apply.

##### 3.2 Abbreviated terms and acronyms

For the purposes of this document, the following abbreviations apply:

CP	Communication profile (see IEC 61784-1 or IEC 61784-2)
CPF	Communication profile family (see IEC 61784-1 or IEC 61784-2)
EDD	Electronic Device Description (see IEC 61804)
EDDL	Electronic Device Description Language (see IEC 61804)
FDI	Field Device Integration

<sup>1</sup> HART and WirelessHART are the trade names of the non-profit consortium HART Communication Foundation, Austin, Texas, USA. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance does not require use of the trade names. Use of the trade names requires permission of the trade name holder.

FSK	Frequency-Shift-Keying
HCF	HART Communication Foundation
ID	Identification
IM	Information Model
IP	Internet protocol
PDU	Protocol data unit
PSK	Phase-Shift-Keying
TCP	Transmission Control Protocol (see IETF RFC 793)
UDP	User Datagram Protocol (see IETF RFC 768)
XML	Extended markup language

## 4 Conventions

### 4.1 EDDL syntax

This document specifies content for the EDD component that is part of FDI Communication Packages. EDDL syntax uses the font Courier New. EDDL syntax is used for method signature, variable, data structure and component declarations.

### 4.2 XML syntax

XML syntax examples use font Courier New. The XML syntax is used to describe XML document schema.

Example: `<xs:simpleType name="ExampleT">`

### 4.3 Capitalizations

The IEC 62769 series uses capitalized terms to emphasize that these terms have an FDI specific meaning.

Some of these terms using an acronym as a prefix, for example

- FDI Client, or
- FDI Server.

Some of these terms are compound terms such as:

- FDI Communication Servers, or
- Profile Package.

Parameter names or attributes are concatenated to a single term, where the original terms start in this term with a capital letter such as:

- ProtocolSupportFile, or
- ProtocolType.

Parameter names or attributes can also be constructed by using an underscore character to concatenate two or more terms such as:

- PROFILE\_ID, or
- HART\_Network.

## 5 Profile for CP 9/1 (HART®) or CP 9/2 (WirelessHART®)

### 5.1 General

This profile document to the FDI specification in IEC 62769 specifies the protocol specifics needed for FDI Packages describing FDI Communication Servers, gateways and devices.

### 5.2 Catalog profile

#### 5.2.1 Protocol support file

No additional file is required for CP 9/1 or CP 9/2 FDI Device Packages.

#### 5.2.2 CommunicationProfile definition

IEC 62769-4 defines a CommunicationProfileT enumeration type for the Catalog XML schema. Table 1 defines the CP 9/1 specific values for this enumeration.

**Table 1 – CommunicationProfile definition**

CommunicationProfile	Description
hart_fsk	CP 9/1 device type that supports an FSK physical layer (Frequency-Shift-Keying on a pair of wires).
hart_psk	CP 9/1 device type that supports a PSK physical layer (Phase-Shift-Keying on a pair of wires). Devices supporting PSK are required to also inherently support FSK, and therefore PSK will always be used only in combination with at least FSK.
hart_wirelesshart	CP 9/2 device type that supports a wireless physical layer (communication between device and gateway).
hart_ip	CP 9/1 device type that supports Internet Protocol (these devices support both TCP and UDP).
hart_rs485	CP 9/1 device type that supports EIA-485 digital communication.
hart_ir	CP 9/1 device type that supports an Infrared physical layer (designed to be transparent to FSK masters – included only as information to indicate that the device supports IR connection).
NOTE	It is possible for a single CP 9/1 device to support more than one CP.

#### 5.2.3 Profile device

A Profile Package shall provide the catalog values for profile devices, enabling the FDI Server to leverage a generic device description, if a specific one is not available. The definitions in Table 2 focus on catalog content that is vendor independent.

**Table 2 – Catalog values for profile devices**

Element	Attribute	Content
PackageType	—	Profile
DeviceModel	—	Empty
Manufacturer	—	Empty

#### 5.2.4 Protocol version information

IEC 62769-4 defines an element type named InterfaceT for the Catalog XML Schema. The element type InterfaceT contains an element named Version which is supposed to provide version information about the applied communication protocol profile. The value has to follow the IEC 62769-4 defined version information schema defined in element type VersionT. Subclause 5.2.4 describes how to apply the currently known protocol versions for CP 9/1 or CP 9/2 entries in the device catalog. The general rule is to use the Universal Revision of the

protocol for the major version part of VersionT, and the value “0” for the minor version and build parts. Table 3 shows the Protocol Version Information.

**Table 3 – Protocol Version Information**

Protocol Version	InterfaceT Version value
HART Universal Revision 5	5.0.0
HART Universal Revision 6	6.0.0
HART Universal Revision 7	7.0.0
The Protocol Version defined in a package is provided for informational purposes only, and shall not be used to determine the compatibility or applicability of a package to a device.	

**5.3 Associating a Package with a CP 9/1 device**

**5.3.1 Device type identification mapping**

CP 9/1 device types are uniquely identified by parameters Manufacturer, Model and DeviceRevision. These parameters are used to associate a given device instance to an FDI Device Package. These parameters are mapped to the FDI Device Package Catalog according to Table 4.

**Table 4 – Device type catalog mapping**

Catalog element	CP mapping (see 5.4.2)
Manufacturer element of InterfaceT (IEC 62769-4:2015, Clause E.11)	Manufacturer String format “0xdddd” where dddd is the Manufacturer number in hexadecimal format.
DeviceModel element of InterfaceT (IEC 62769-4:2015, Clause E.11)	Model String format “0xdddd” where dddd is the Model number in hexadecimal format.
DeviceRevision element ListOfSupportedDeviceRevisionsT (IEC 62769-4:2015, Clause E.21)	DeviceRevision String format “x.0.0” where x is the DeviceRevision in decimal format (no leading zeros).

**5.3.2 Device type revision mapping**

Each device type is identified as per 5.3.1. If a package with matching DeviceRevision is not available, any CP 9/1 FDI package for a corresponding manufacturer and model shall always be compatible with a field device as long as the device revision of the field device is equal to or greater than the device revision specified in the FDI package.

**5.4 Information Model mapping**

**5.4.1 ProtocolType definition**

Table 5 defines the ProtocolType used to identify CP 9/1 network communications.

**Table 5 – ProtocolType HART definition**

Attribute	Value				
BrowseName	HART				
IsAbstract	False				
References	NodeClass	BrowseName	DataType	TypeDefinition	ModellingRule
Inherits the properties of ProtocolType defined in IEC 62541-100.					

### 5.4.2 DeviceType mapping

Each device type inherits the properties of DeviceType. The mapping of the inherited properties from DeviceType is defined in Table 6.

**Table 6 – Inherited DeviceType Property mapping**

Property	Foundation mapping
SerialNumber	3-byte unique ID of a device, returned in bytes 9 to 11 of Command 0 or Command 11 or Command 21
RevisionCounter	2-byte configuration change counter, returned in bytes 14 and 15 of Command 0 or Command 11 or Command 21. -1 (not defined) for HART revision 5 devices
Manufacturer	For HART revision 7 or higher devices: 2-byte manufacturer code of a device, returned in bytes 17 and 18 of Command 0 or Command 11 or Command 21. For HART revision 6 or lower devices: Most significant byte shall be fixed to 0, and the least significant byte is returned in byte 1 of Command 0 or Command 11 or Command 21
Model	2-byte extended device type of a device, returned in bytes 1 and 2 of Command 0 or Command 11 or Command 21
DeviceManual	Entry text string (not supported) <sup>a</sup>
DeviceRevision	1-byte device revision level of a device, returned in byte 5 of Command 0 or Command 11 or Command 21
SoftwareRevision	1-byte software revision level of a device, returned in byte 6 of Command 0 or Command 11 or Command 21
HardwareRevision	1-byte hardware revision level of a device, returned in byte 7 (only 5 most significant bits) of Command 0 or Command 11 or Command 21
<sup>a</sup> Device manuals are exposed as attachments of the FDI Device Package.	

### 5.4.3 FunctionalGroup Identification definition

As defined in IEC 62541-100, each device representation in the FDI Server hosted Information Model shall contain a protocol specific FunctionalGroup called Identification. This FunctionalGroup organizes variables found in the device type instance. The FunctionalGroup Identification for CP 9/1 is defined in Table 7.

**Table 7 – Identification parameters**

BrowseName	Data Type	Optional/Mandatory
MANUFACTURER_ID	UInt16	Mandatory
DEVICE_TYPE	UInt16	Mandatory
DEVICE_REVISION	UInt8	Mandatory
UNIVERSAL_REVISION	UInt8	Optional
SERIAL_NUMBER	UInt24	Optional
HARDWARE_REVISION	UInt8	Optional
SOFTWARE_REVISION	UInt8	Optional
REVISION_COUNTER	UInt16	Optional

## 5.5 Topology elements

### 5.5.1 ConnectionPoint definition

#### 5.5.1.1 General

CP 9/1 devices can support up to five different ConnectionPoint types that are used for network communications.

### 5.5.1.2 HART\_TP5, HART\_TP6, HART\_TP7

The ConnectionPoint types HART\_TP5, HART\_TP6, and HART\_TP7 shall be used to identify CP 9/1 token passing network communication and are defined in Table 8. HART\_TP5, HART\_TP6, and HART\_TP7 all contain the same properties, but each provides different qualification information for some of the properties (described below). The Protocol Version (UNIVERSAL\_REVISION) described in 5.2.3 can be used as an aid to determine which of the three token passing Connection Point types is the most appropriate. CP 9/1 token passing communications can be used on a variety of physical layers. FSK, PSK, RS485, and Infrared physical layer connections shall all use the HART\_TP connection type. The ConnectionPoint types HART\_TP5, HART\_TP6, and HART\_TP7 are subtypes of abstract type ConnectionPointType defined in IEC 62769-5.

The DevAddr property shall be the long address (5 bytes) for the device, and is the only parameter necessary to communicate with the field device.

The DevMfg property shall be the 2-byte Manufacturer ID, and can be used to help automate the process of assigning live devices in the scan list to offline placeholders.

The DevType property shall be the 2-byte extended device type, and can be used to help automate the process of assigning live devices in the scan list to offline placeholders.

The DevRev property shall be the device revision, and can be used to help automate the process of assigning live devices in the scan list to offline placeholders.

The DevTag property shall be the long tag for HART<sup>®</sup> protocol version 6 or 7 devices. The DevTag property shall be the tag for protocol version 5 devices. The DevTag property can be used to help automate the process of assigning live devices in the scan list to offline placeholders. HART\_TP5 Connection Points shall limit the DevTag to 8 characters in length. HART\_TP6 and HART\_TP7 Connection Points shall limit the DevTag to 32 characters in length.

The DevPollAddr property shall be the poll address, and can be used to identify which device is located at a specific poll address. HART\_TP5 Connection Points shall be limited to values between 0 and 15 for the DevPollAddr property. HART\_TP6 Connection Points shall be limited to values between 0 and 31 for the DevPollAddr property. HART\_TP7 Connection Points shall be limited to values between 0 and 63 for the DevPollAddr property.

For forward compatibility, a lower revision HART\_TP Connection Point is compatible and can be used for a higher universal revision device connection. For example, if a future HART universal revision 8 device is encountered, and no HART\_TP8 is available in the FDI server, HART\_TP7 will be compatible and shall be used to connect to the device. If the Protocol Version (i.e. the Universal Revision) is unknown for any reason, the HART\_TP5 Connection Point can be used, and will be forward compatible to later universal revisions.

**Table 8 – ConnectionPointType HART\_TP definition**

Attribute	Value				
BrowseName	ConnectionPoint_HART_TP5 or ConnectionPoint_HART_TP6 or ConnectionPoint_HART_TP7				
IsAbstract	False				
References	NodeClass	BrowseName	Data Type	TypeDefinition	ModellingRule
Inherits the properties of ConnectionPointType defined in IEC 62769-5.					
HasProperty	Variable	DevAddr	UInt40	PropertyType	Mandatory
HasProperty	Variable	DevMfg	UInt16	PropertyType	Optional
HasProperty	Variable	DevType	UInt16	PropertyType	Optional
HasProperty	Variable	DevRev	UInt16	PropertyType	Optional
HasProperty	Variable	DevTag	String	PropertyType	Optional
HasProperty	Variable	DevPollAddr	UInt8	PropertyType	Optional