

**AMERICAN NATIONAL STANDARD**

**ANSI/ISA-62769-109-1-2016**

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

**Approved 21 March 2016**



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**ANSI/ISA-62769-109-1-2016, *Field device integration (FDI) – Part 109-1: Profiles – HART® and WirelessHART®***

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## FIELD DEVICE INTEGRATION (FDI) –

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

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

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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;
- d) extensible device object model, see Patent Family US12/893,680.

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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) |
|----|--------------------------------------------------------|

<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.

|      |                                                               |
|------|---------------------------------------------------------------|
| 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                                      |
| 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<br>String format “0xdddd” where dddd is the Manufacturer number in hexadecimal format.         |
| DeviceModel element of InterfaceT (IEC 62769-4:2015, Clause E.11)                         | Model<br>String format “0xdddd” where dddd is the Model number in hexadecimal format.                       |
| DeviceRevision element<br>ListOfSupportedDeviceRevisionsT (IEC 62769-4:2015, Clause E.21) | DeviceRevision<br>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 | Data Type | 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.<br>-1 (not defined) for HART revision 5 devices                                                                                                                                                                                 |
| Manufacturer                                                                      | For HART revision 7 or higher devices:<br>2-byte manufacturer code of a device, returned in bytes 17 and 18 of Command 0 or Command 11 or Command 21.<br>For HART revision 6 or lower devices:<br>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. |                                                                                                                                                                                                                                                                                                                                            |