

# INTERNATIONAL STANDARD



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

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## CONTENTS

|  |          |
|--|----------|
| FOREWORD.....  | 4        |
| <b>INTRODUCTION.....</b>   | <b>4</b> |
| 1 Scope.....   | 7        |
| 2 Normative references .....   | 7        |
| 3 Terms, definitions, abbreviated terms and <del>acronyms</del> conventions..... | 7        |
| 3.1 Terms and definitions.....   | 7        |
| 3.2 Abbreviated terms and acronyms .....   | 8        |
| 3.3 Conventions.....   | 8        |
| 3.3.1 EDDL syntax.....   | 8        |
| 3.3.2 XML syntax.....  | 8        |
| 3.3.3 Capitalizations.....   | 8        |
| 4 Profile for CP 9/1 (HART®) or CP 9/2 (WirelessHART®).....                      | 9        |
| 4.1 General.....   | 9        |
| 4.2 Catalog profile .....  | 9        |
| 4.2.1 Protocol support file.....   | 9        |
| 4.2.2 CommunicationProfile definition.....                                       | 9        |
| 4.2.3 Profile device.....  | 10       |
| 4.2.4 Protocol version information.....  | 10       |
| 4.3 Associating a Package with a CP 9/1 device.....                              | 10       |
| 4.3.1 Device type identification mapping.....                                    | 10       |
| 4.3.2 Device type revision mapping.....  | 11       |
| 4.4 Information Model mapping.....   | 11       |
| 4.4.1 ProtocolType definition.....   | 11       |
| 4.4.2 DeviceType mapping .....   | 11       |
| 4.4.3 FunctionalGroup Identification definition.....                             | 12       |
| 4.5 Topology elements.....   | 13       |
| 4.5.1 ConnectionPoint definition .....   | 13       |
| 4.5.2 Communication Device definition .....                                      | 19       |
| 4.5.3 Communication service provider definition.....                             | 20       |
| 4.5.4 Network definition.....  | 20       |
| 4.6 Methods.....   | 21       |
| 4.6.1 Methods for FDI Communication Servers.....                                 | 21       |
| 4.6.2 Methods for Gateways .....   | 25       |
| Annex A (normative) Topology scan schema.....                                    | 33       |
| A.1 General.....   | 33       |
| A.2 IdentificationType .....   | 33       |
| A.3 AddressTypeTP .....  | 35       |
| A.4 AddressTypeIP .....  | 35       |
| A.5 AddressTypeTDMA.....   | 36       |
| A.6 AddressType.....   | 36       |
| A.7 ConnectionPointType.....   | 37       |
| A.8 NetworkType.....   | 38       |
| A.9 Network .....  | 38       |
| Annex B (normative) Transfer service parameters.....                             | 39       |
| B.1 General.....   | 39       |
| B.2 receiveData .....  | 39       |

|           |   |    |
|-----------|---|----|
| B.3       | sendData .....                                  | 39 |
| B.4       | TransferResultDataT.....                        | 39 |
| B.5       | TransferSendDataT.....                          | 40 |
|           | Bibliography.....                               | 41 |
|           |   |    |
| Table 1   | – Device Information Files .....                | 9  |
| Table 2   | – CommunicationProfile definition .....         | 9  |
| Table 3   | – Catalog values for profile devices.....       | 10 |
| Table 4   | – Protocol Version Information .....            | 10 |
| Table 5   | – Device type catalog mapping.....              | 11 |
| Table 6   | – ProtocolType HART definition .....            | 11 |
| Table 7   | – Inherited DeviceType Property mapping .....   | 12 |
| Table 8   | – Identification parameters .....               | 12 |
| Table 9   | – ConnectionPointType HART_TP definition.....   | 14 |
| Table 10  | – ConnectionPointType HART_IP Definition .....  | 16 |
| Table 11  | – ConnectionPointType HART_TDMA Definition..... | 18 |
| Table 12  | – Method Connect arguments.....                 | 22 |
| Table 13  | – Method Disconnect arguments .....             | 22 |
| Table 14  | – Method Transfer arguments.....                | 23 |
| Table 15  | – Method GetPublishedData arguments.....        | 24 |
| Table 16  | – Method SetAddress arguments.....              | 25 |
| Table 17  | – Method Connect arguments.....                 | 26 |
| Table 18  | – Method Disconnect arguments.....              | 27 |
| Table 19  | – Method Transfer arguments.....                | 28 |
| Table 20  | – Method GetPublishedData arguments.....        | 29 |
| Table 21  | – Method SetAddress arguments.....              | 30 |
| Table A.1 | – Attributes of IdentificationT .....           | 34 |
| Table A.2 | – Elements of AddressTypeTP .....               | 35 |
| Table A.3 | – Elements of AddressTypeIP .....               | 36 |
| Table A.4 | – Elements of AddressTypeTDMA.....              | 36 |
| Table A.5 | – Elements of AddressT .....                    | 37 |
| Table A.6 | – Elements of ConnectionPointT .....            | 37 |
| Table A.7 | – Elements of NetworkT .....                    | 38 |
| Table B.1 | – Attributes of TransferResultDataT .....       | 39 |
| Table B.2 | – Attributes of TransferSendDataT.....          | 40 |

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### FIELD DEVICE INTEGRATION (FDI) –

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

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International Standard IEC 62769-109-1 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) support for generic protocol extension for faster adoption of other technologies;
- b) support for Package Developers to build EDDs targeted for today's EDD bases system under a single development tool.

The text of this International Standard is based on the following documents:

| CDV         | Report on voting |
|-------------|------------------|
| 65E/624/CDV | 65E/687A/RVC     |

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

This document 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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

## 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 are referred to in the text in such a way that some or all of their content constitutes requirements 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 62541-100:2015, *OPC Unified Architecture Specification – Part 100: Device Interface*

IEC 62769-4:2015<sup>2</sup>, *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: FDI Communication Devices*

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

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

##### 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.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

<sup>1</sup> HART® and wirelessHART® are ~~the trade names of the non-profit consortium HART Communication Foundation, Austin, Texas, USA~~ the registered trademark of FieldComm Group. 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~~ the product named. ~~Compliance does not require use of the trade names. Use of the trade names requires permission of the trade name holder.~~ Equivalent products may be used if they can be shown to lead to the same results.

<sup>2</sup> Under preparation. Stage at the time of publication: IEC/RFDIS 62769-4:2020.

### 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                                      |
| 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  | <b>Extended</b> Extensible markup language                    |

### 3.3 Conventions

#### 3.3.1 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.

#### 3.3.2 XML syntax

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

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

#### 3.3.3 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 like:

- PROFILE\_ID or
- HART\_Network.

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

### 4.1 General

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

### 4.2 Catalog profile

#### 4.2.1 Protocol support file

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

Device information files provide metadata for the dynamic runtime data that is supplied by the device. This metadata is a subset of information that is contained in the EDD. The device information files may be extracted from the package by light-weight gateway or server implementations to exchange runtime device information with minimal implementation overhead. Device information files do not replace the need for the EDD part because device information files only contain a subset of the information from the EDD, and do not provide any user-interface elements.

The formats of the Device Information Files are described in Table 1.

**Table 1 – Device Information Files**

| Part                | Content   |
|---------------------|---|
| Content Type        | Not specified here  |
| Root Namespace      | Not specified here  |
| Source Relationship | http://fdi-cooperation.com/2010/relationships/attachment-protocol |
| Filename            | Not specified here  |

The Device Information Files are specified in FCG AG21073.

#### 4.2.2 CommunicationProfile definition

IEC 62769-4 defines a CommunicationProfileT ~~enumeration~~ string type for the Catalog XML schema. Table 2 defines the CP 9/1 specific values for this enumeration.

**Table 2 – 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. |

| CommunicationProfile | Description  |
|----------------------|--|
| 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.

### 4.2.3 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 3 focus on catalog content that is vendor independent.

**Table 3 – Catalog values for profile devices**

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

### 4.2.4 Protocol version information

IEC 62769-4 defines an element type named InterfaceT for the Catalog XML Schema. 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 4.2.4 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 4 shows the Protocol Version Information.

**Table 4 – 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.

## 4.3 Associating a Package with a CP 9/1 device

### 4.3.1 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 5.

**Table 5 – 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 "0xddd" where dddd is the Manufacturer number in hexadecimal format.          |
| DeviceModel element of InterfaceT (IEC 62769-4:2015, Clause E.11)                         | Model<br>String format "0xddd" 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). |

| Catalog element  | CP mapping (See Table A.)  |
|--|--|
| Manufacturer element of InterfaceT (IEC 62769-4:–, Clause E.10)                        | Manufacturer<br>String format "0xddd" where dddd is the MANUFACTURER_ID in hexadecimal format.               |
| DeviceModel element of InterfaceT (IEC 62769-4:–, Clause E.10)                         | Model<br>String format "0xddd" where dddd is the DEVICE_TYPE in hexadecimal format.                          |
| DeviceRevision element<br>ListOfSupportedDeviceRevisionsT (IEC 62769-4:–, Clause E.20) | DeviceRevision<br>String format "x.0.0" where x is the DEVICE_REVISION in decimal format (no leading zeros). |

### 4.3.2 Device type revision mapping

Each device type is identified as per 4.3.1. 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.

## 4.4 Information Model mapping

### 4.4.1 ProtocolType definition

Table 6 defines the ProtocolType used to identify CP 9/1 network communications.

**Table 6 – 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. |           |            |           |                |               |

### 4.4.2 DeviceType mapping

Each device type inherits the properties of DeviceType. The mapping of the inherited properties from DeviceType is defined in Table 7.

**Table 7 – 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. |  |

| Property  | Foundation mapping   |
|---|--|
| SerialNumber  | Unique ID of a device, mapped to SERIAL_NUMBER of IdentificationT.                     |
| RevisionCounter   | Configuration change counter, mapped to REV_COUNTER of IdentificationT                 |
| Manufacturer  | String taken from FDI package catalog (ManufacturerName from PackageT)                 |
| Model   | String taken from FDI package catalog (Name of DeviceTypeT, which is a localized name) |
| DeviceManual  | Entry text string (not supported) <sup>a</sup>   |
| DeviceRevision  | Device revision level of a device, mapped to DEVICE_REVISION of IdentificationT        |
| SoftwareRevision  | Software revision level of a device, mapped to SOFTWARE_REVISION of IdentificationT    |
| HardwareRevision  | Hardware revision level of a device, mapped to HARDWARE_REVISION of IdentificationT    |
| <sup>a</sup> Device manuals are exposed as attachments of the FDI Device Package. |  |

#### 4.4.3 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 8.

**Table 8 – Identification parameters**

| BrowseName      | Data Type | Optional/Mandatory |
|-----------------|-----------|--------------------|
| MANUFACTURER_ID | UInt16    | Mandatory          |