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Vključitev procesne naprave (FDI) - 109-1. del: Profili - HART® in brezžični HART®

Field Devices Integration (FDI) - Part 109-1: Profiles - HART® and WirelessHART®

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

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TITLE:

Field Devices 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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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:

FDIS	Report on voting
65E/XX/FDIS	65E/XX/RVD

48

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

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

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

- 55 • reconfirmed,
- 56 • withdrawn,
- 57 • replaced by a revised edition, or
- 58 • amended.

59

60 The National Committees are requested to note that for this document the stability date is 2023.

61 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE
62 PUBLICATION STAGE.

63

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64

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FIELD DEVICE INTEGRATION (FDI) –

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

66
67
68
69

1 Scope

70

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

2 Normative references

73

74 The following documents are referred to in the text in such a way that some or all of their content
75 constitutes requirements of this document. For dated references, only the edition cited applies. For
76 undated references, the latest edition of the referenced document (including any amendments) applies.

77 IEC 62541-100:–, *OPC Unified Architecture Specification – Part 100: OPC Device Interface*

78 IEC 62769-4:–, *Field device integration (FDI) – Part 4: FDI Packages*

79 IEC 62769-5, *Field device integration (FDI) – Part 5: FDI Information Model*

80 IEC 62769-7, *Field device integration (FDI) – Part 7: Communication Devices*

81

3 Terms, definitions, abbreviated terms and conventions

82

3.1 Terms and definitions

83

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

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

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

89

3.2 Abbreviated terms and acronyms

90

91 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

¹ HART® and wirelessHART® are 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 product named. Equivalent products may be used if they can be shown to lead to the same results.

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

92

93 **3.3 Conventions**94 **3.3.1 EDDL syntax**

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

98 **3.3.2 XML syntax**

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

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

102 **3.3.3 Capitalizations**

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

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

- 106 • FDI Client or
- 107 • FDI Server.

108 Some of these terms are compound terms such as:

- 109 • FDI Communication Servers or
- 110 • Profile Package.

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

- 113 • ProtocolSupportFile or
- 114 • ProtocolType.

115 Parameter names or attributes can also be constructed by using an underscore character to concatenate
 116 two or more terms like:

- 117 • PROFILE_ID or
- 118 • HART_Network

119 **4 Profile for CP 9/1 (HART®) or CP 9/2 (WirelessHART®)**120 **4.1 General**

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

123 **4.2 Catalog profile**

124 **4.2.1 Protocol support file**

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

126 **4.2.2 CommunicationProfile definition**

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

129 **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.	

130 <https://standards.iteh.ai/catalog/standards/sist/f8215613-d9dd-47f3-8ec3-2b77a55752e1/sist-en-iec-62769-109-1-2020>

131 **4.2.3 Profile device**

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

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

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

136

137 **4.2.4 Protocol version information**

138 **IEC 62769-4** defines an element type named InterfaceT for the Catalog XML Schema. Element type
139 InterfaceT contains an element named Version which is supposed to provide version information about
140 the applied communication protocol profile. The value has to follow the **IEC 62769-4** defined version
141 information schema defined in element type VersionT. Subclause 5.2.4 describes how to apply the
142 currently known protocol versions for CP 9/1 or CP 9/2 entries in the device catalog. The general rule is
143 to use the Universal Revision of the protocol for the major version part of VersionT, and the value “0” for
144 the minor version and build parts. Table 3 shows the Protocol Version Information.

145

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.	

146

4.3 Associating a Package with a CP 9/1 device

147

4.3.1 Device type identification mapping

148

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

152

Table 4 – Device type catalog mapping

Catalog element	CP mapping (See Table A.1)
Manufacturer element of InterfaceT (IEC 62769-4:–, Clause E.11)	Manufacturer String format “0xddd” where dddd is the MANUFACTURER_ID in hexadecimal format.
DeviceModel element of InterfaceT (IEC 62769-4:–, Clause E.11)	Model String format “0xddd” where dddd is the DEVICE_TYPE in hexadecimal format.
DeviceRevision element ListOfSupportedDeviceRevisionsT (IEC 62769-4:–, Clause E.21)	DeviceRevision String format “x.0.0” where x is the DEVICE_REVISION in decimal format (no leading zeros).

153

4.3.2 Device type revision mapping

154

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

4.4 Information Model mapping

159

4.4.1 ProtocolType definition

160

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

162

Table 5 – ProtocolType HART definition

Attribute	Value				
BrowseName	HART				
IsAbstract	False				
References	NodeClass	BrowseName	Data Type	Type Definition	Modelling Rule
Inherits the properties of ProtocolType defined in IEC 62541-100					

163

164 4.4.2 DeviceType mapping

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

167 **Table 6 – Inherited DeviceType Property mapping**

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) ^a
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
^a Device manuals are exposed as attachments of the FDI Device Package.	

168

169 4.4.3 FunctionalGroup Identification definition

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

174

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

175

176 4.5 Topology elements

177 4.5.1 ConnectionPoint definition

178 4.5.1.1 General

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

181 4.5.1.2 HART_TP5, HART_TP6, HART_TP7

182 The ConnectionPoint types HART_TP5, HART_TP6, and HART_TP7 shall be used to identify CP 9/1
183 token passing network communication and are defined in Table 8. HART_TP5, HART_TP6, and
184 HART_TP7 all contain the same properties, but each provides different qualification information for

185 some of the properties (described below). The Protocol Version (UNIVERSAL_REVISION) described in
 186 5.2.3 can be used as an aid to determine which of the three token passing Connection Point types is the
 187 most appropriate. CP 9/1 token passing communications can be used on a variety of physical layers.
 188 FSK, PSK, RS485, and Infrared physical layer connections shall all use the HART_TP connection type.
 189 The ConnectionPoint types HART_TP5, HART_TP6, and HART_TP7 are subtypes of abstract type
 190 ConnectionPointType defined in IEC 62769-5.

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

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

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

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

199 The DevTag property shall be the long tag for HART[®] protocol version 6 or 7 devices. The DevTag
 200 property shall be the tag for protocol version 5 devices. The DevTag property can be used to help
 201 automate the process of assigning live devices in the scan list to offline placeholders. HART_TP5
 202 Connection Points shall limit the DevTag to 8 characters in length. HART_TP6 and HART_TP7
 203 Connection Points shall limit the DevTag to 32 characters in length.

204 The DevPollAddr property shall be the poll address, and can be used to identify which device is located
 205 at a specific poll address. HART_TP5 Connection Points shall be limited to values between 0 and 15 for
 206 the DevPollAddr property. HART_TP6 Connection Points shall be limited to values between 0 and 31 for
 207 the DevPollAddr property. HART_TP7 Connection Points shall be limited to values between 0 and 63 for
 208 the DevPollAddr property.

209 For forward compatibility, a lower revision HART_TP Connection Point is compatible and can be used
 210 for a higher universal revision device connection. For example, if a future HART universal revision 8
 211 device is encountered, and no HART_TP8 is available in the FDI server, HART_TP7 will be compatible
 212 and shall be used to connect to the device. If the Protocol Version (i.e. the Universal Revision) is
 213 unknown for any reason, the HART_TP5 Connection Point can be used, and will be forward compatible
 214 to later universal revisions.

215

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	Type Definition	Modelling Rule
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

216

217 The ConnectionPoint type HART_TP5, HART_TP6, and HART_TP7 shall be described by an EDD
 218 element contained in a Communication Device related FDI Package that can drive a CP 9/1 network.
 219 Actual ConnectionPoint properties are declared by VARIABLE constructs grouped together in a
 220 COLLECTION named ConnectionPoint_HART_TP5, ConnectionPoint_HART_TP6, or