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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Field device integration (FDI) – Part 150-1: Profiles – ISA100 WIRELESS

Intégration des appareils de terrain (FDI) – Partie 150-1: Profils – ISA100 WIRELESS

IEC 62769-150-1:2021-02(en-fr)

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Intégration des appareils de terrain (FDI) – Partie 150-1: Profils – ISA100 WIRELESS

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FIELD DEVICE INTEGRATION (FDI) –

Part 150-1: Profiles – ISA100 WIRELESS

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This document is based on FCG_TS62769-150-1_Profiles – ISA100_1.1.0.3, a specification of the FieldComm Group, PROFIBUS Nutzerorganisation e. V., OPC Foundation and FDT Group.

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

FDIS	Report on voting
65E/765/FDIS	65E/775/RVD

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.

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FIELD DEVICE INTEGRATION (FDI) –

Part 150-1: Profiles – ISA100 WIRELESS

1 Scope

This part of IEC 62769 specifies an FDI profile for IEC 62734 (ISA100 WIRELESS)[1].

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 62734:2014, *Industrial networks – Wireless communication network and communication profiles – ISA 100.11a*

IEC 61804 (all parts), *Function blocks (FB) for process control and electronic device description language (EDDL)*

IEC 62541-6, *OPC Unified Architecture – Part 6: Mappings*

IEC 62541-100:2015, *OPC unified architecture – Part 100: Device Interface*

IEC 62769-2, *Field Device Integration (FDI) – Part 2: FDI Client*

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

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

IEC 62769-6, *Field Device Integration (FDI) – Part 6: FDI Technology Mapping*

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

3 Terms, definitions, abbreviated terms and acronyms

3.1 Terms and definitions

No terms and definitions are listed in this document.

For the purposes of this document, the terms and definitions given in IEC 62734, IEC 61804 (all parts), IEC 62541-100, IEC 62769-4, IEC 62769-5, and IEC 62769-7 and the following apply.

[1] ISA100 WIRELESS™ is a trade name of the non-profit consortium Wireless Compliance Institute. 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 name. Use of the trade name requires permission of the trade name holder.

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3.2 Abbreviated terms and acronyms

For the purposes of this document, the following abbreviated terms and acronyms apply.

EDD	Electronic Device Description
EDDL	Electronic Device Description Language (see IEC 61804)
FDI	Field Device Integration
FCG	FieldComm Group
XML	Extensible markup language (see REC-xml-20081126)
CFF	Common file format
UAP	User Application Process
UAPMO	User Application Process Management Object
DMO	Device Management Object
IM	Information Model
SM	System Manager
WCI	Wireless Compliance Institute

4 Conventions

4.1 EDDL syntax

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

4.2 Capitalizations

IEC 62769 (all parts) uses capitalized terms to emphasize that these terms have a FDI specific meaning.

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

- FDI Client, or
- FDI Server.

Some of these terms are compound terms such as:

- 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.

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

- DEVICE_REV, or
- DEVICE_MODEL.

5 Profile for ISA100 WIRELESS

5.1 General

This profile specifies the protocol specifics needed for FDI Packages describing communication servers, gateways and devices. Requirements for Direct Access transfer service parameters are given in Annex B.

5.2 Catalog profile

5.2.1 Protocol support file

5.2.1.1 Capability file

Each ISA100 WIRELESS FDI Device Package shall contain a capability file. The capability file part is described in Table 1.

Table 1 – Capability file part

Parameter	Description
Content Type:	txt/plain
Root Namespace:	Not applicable
Source Relationship:	http://fdi-cooperation.com/2010/relationships/attachment-protocol
Filename:	Use file extension .CFF

5.2.1.2 FDI Communication Packages

The same rules as for FDI Device Packages applies.

5.2.2 CommunicationProfile definition

IEC 62769-4 defines a CommunicationProfileT string for the Catalog XML schema. The ISA100 WIRELESS specific value shall be "ISA100_Wireless".

5.2.3 Profile device

Not supported in this document.

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 the element type VersionT.

ISA100 WIRELESS defines the version of the protocol as a value of the parameter DMO.Comm_SW_Minor_Version. A value of 0 indicates protocol version 2009 and a value of 1 indicates protocol version 2011. The general rule is to use the value of DMO.Comm_SW_Minor_Version parameter as the major version part of VersionT and the value "0" for the minor version and build parts. Table 2 shows the protocol version information.

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Table 2 – Protocol Version Information

Protocol Version	InterfaceT Version value
ISA100 WIRELESS 2009	1.0.0
ISA100 WIRELESS 2011	2.0.0
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 device

5.3.1 Device type identification mapping

The purpose of device type identification mapping is to enable FDI host systems to compare the scan result against the topology representation in the Information Model. FDI host systems shall also be enabled to determine the FDI Device Package that fits for a device entry contained in the scan result. This will enable the user of an FDI host system to synchronize the Information Model with the actual installation.

The Communication Server implemented scan service (defined in 5.6.1.7 provides the scan result through an XML document (the schema is defined in Clause A.5).

The scan result contains device type identification and device instance identification.

FDI host systems comparing the actual network topology configuration against the topology representation in the Information Model shall be enabled to handle the following situations:

a) The physical Device instance identified at a specific device address is not logically present in the Information Model (as Instance): Enable the FDI Host system to find the appropriate FDI Device Package according to the device catalog information.

b) The physical Device instance identified by the device address is logically present in the Information Model (as Instance): Enable the FDI Host system to compare device type information presented in scan result (see the identification in Clause A.5) and the device type specific information of the Instance present in the Information Model.

The FDI Device Package contains device type identification information that can be compared to scan result based on the Catalog Schema in IEC 62769-4 defining the XML (simple) element types "DeviceModel" and "Manufacturer".

As a result of the FDI Package deployment, the FDI Package information is then present in the Information Model as the specified FunctionalGroup Identification containing SerialNumber and Tag (see 5.4.3).

The mapping between different device identification data sources is described in Table 3. Since scan results provided by the Communication Server can convey data that is produced by the device (firmware), the device type identification mapping shall be supported by providing corresponding data in the FDI Device Package contained Catalog and Information Model.

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Table 3 – Device identification information mapping

FDI Device Package	Information Model	Communication Server provided scan result
Catalog specified type Manufacturer	FunctionalGroup: Identification Browse Name: Manufacturer	Element (path): ConnectionPoint/Identification Attribute: Manufacturer
Catalog specified type DeviceModel	FunctionalGroup: Identification Browse Name: DeviceModel	Element (path): ConnectionPoint/Identification Attribute: DeviceModel

ISA100 WIRELESS device types are uniquely identified by the parameters UAPMO.IDENT_NUMBER found in the UAPMO. The IDENT_NUMBER parameter contains the Vendor ID, Model ID and Device Revision. These parameters are used to associate a given device instance to an FDI Device Package. These parameters are mapped to the FDI Device Package Catalogue according to Table 4.

Table 4 – Device type catalog mapping

Catalog Element	ISA100 WIRELESS Mapping
Manufacturer element of InterfaceT (see IEC 62769-4)	UAPMO.IDENT_NUMBER 0x00FFFFFF00000000 String format "0xdddddd" where dddddd is theVendor ID number in hexadecimal format.
DeviceModel element of InterfaceT (see IEC 62769-4)	UAPMO.IDENT_NUMBER 0x00000000FFFF0000String format "0xdddd" where dddd is the Model ID number in hexadecimal format.
DeviceRevision element ListOfSupportedDeviceRevisionsT (see IEC 62769-4)	UAPMO.IDENT_NUMBER 0x000000000000FFFF String format "x.0.0" where x is the Device Revision in decimal format (no leading zeros).

5.3.2 Device type revision mapping

IEC 62769-4 envisions a concept that allows to determine the compatibility between an FDI Device Package and a Device. IEC 62769-4 specifies a life cycle management process bearing on a single version information provided for the entire device. Mapping of version information is defined in Table 4.

5.4 Information Model mapping

5.4.1 ProtocolType definition

In Table 5, a subtype of ProtocolType is defined to identify network communication using this profile.

Table 5 – Protocol type ISA100 WIRELESS

Attribute	Value				
BrowseName	ISA100_Wireless				
IsAbstract	False				
References	**NodeClass**	**BrowseName**	**DataType**	**TypeDefinition**	**ModellingRule**
Subtype of the 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.

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Table 6 – Inherited DeviceType property mapping

Property	ISA100 WIRELESS Mapping
SerialNumber	DMO.EUI_64 – 8 byte Extended Unique Identifier defined in DMO
RevisionCounter	UAPMO.Static_Revision_Level – 2 byte revision counter defined in UAPMO
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	Empty text string (not supported) [a]
DeviceRevision	DEV_REV (UAPMO)
SoftwareRevision	Empty string (not defined)
HardwareRevision	Empty string (not defined)
[a] Device manuals are exposed as attachments of the FDI Device Package.	

5.4.3 FunctionalGroup identification definition

As defined in IEC 62541-100:2015, 5.3, each device representation in the FDI Server hosted Information Model shall contain a protocol specific FunctionalGroup named Identification. This FunctionalGroup organizes variables found in the UAPMO of the device type instance. The FunctionalGroup Identification for ISA100 WIRELESS is defined in Table 7.

Table 7 – ISA100 WIRELESS device types identification attributes

BrowseName	DataType	Mandatory/Optional
MANUFAC_ID	UInt32	Mandatory
DEV_TYPE	UInt16	Mandatory
DEV_REV	UInt16	Mandatory
HARDWARE_REV	String	Optional
SOFTWARE_REV	String	Optional
ITS_VER	UInt16	Mandatory

5.4.4 BlockType property mapping

ISA100 WIRELESS device types are object oriented referred as block-oriented according to IEC 62541-100. IEC 62769-5 specifies the mapping of EDDL BLOCK_A elements to block types and instances.

The BLOCK_A maps as a subtype of the topology element BlockType and inherits the properties per IEC 62541-100. The mapping of the inherited properties of the BlockType is specified in Table 8.

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Table 8 – Inherited BlockType property mapping

Property	ISA100 Wireless Mapping (Object ParameterSet)
RevisionCounter	ST_REV
ActualMode	MODE_BLK.ACTUAL
PermittedMode	MODE_BLK.PERMITTED
NormalMode	MODE_BLK.NORMAL
TargetMode	MODE_BLK.TARGET

5.4.5 Mapping to Object ParameterSet

The ParameterSet is relative to each Object. The ParameterSet includes all the parameters found in the PARAMETERS, LOCAL_PARAMETERS and LIST_ITEMS.

The browse name of the parameters found in the PARAMETERS and LOCAL_PARAMETERS is the member name in the respective lists. For example, ST_REV is the browse name of the Static Revision parameter. LIST_ITEMS do not have member names; therefore, the browse name of each LIST in the LIST_ITEMS is the item name of the list.

5.5 Topology elements

5.5.1 ConnectionPoint definition

The ConnectionPoint type ConnectionPoint_ISA100_Wireless shall be used to identify ISA100 WIRELESS network communication and is defined in Table 9. The ConnectionPoint type ConnectionPoint_ISA100_Wireless is a sub type of the abstract type ConnectionPointType defined in IEC 62541-100.

The DevAddr property shall be the IPV6 (16 bytes) address of the device.

The DevMfg property shall be the 4-byte UAPMO.IDENT_NUMBER.VendorID, 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 UAPMO.IDENT_NUMBER.ModelID, 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 UAPMO.UAPMO.IDENT_NUMBER.DeviceRevision, 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 DMO.Tag_Name (16 characters).

The DevPollAddr property shall be the DMO.Short_Address (2 bytes).

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Table 9 – ConnectionPointType ConnnectionPoint_ISA100_Wireless definition

Attribute	Value				
BrowseName	ConnectionPoint_ISA100_Wireless				
IsAbstract	False				
References	**NodeClass**	**BrowseName**	**DataType**	**TypeDefinition**	**ModellingRule**
Inherits the properties of ConnectionPointType defined in IEC 62541-100.					
HasProperty	Variable	IPAddress	ByteString	PropertyType	Mandatory
HasProperty	Variable	DevMfg	UInt32	PropertyType	Optional
HasProperty	Variable	DevType	UInt16	PropertyType	Optional
HasProperty	Variable	DevRev	UInt16	PropertyType	Optional
HasProperty	Variable	DevTag	String	PropertyType	Optional
HasProperty	Variable	DevPollAddr	UInt16	PropertyType	Optional

The ConnectionPoint type ISA100_Wireless shall be described by an EDD element contained in a Communication Device related FDI Package that can drive an ISA100 Wireless network. Actual ConnectionPoint properties are declared by VARIABLE constructs grouped together in a COLLECTION named ConnectionPoint_ISA100_Wireless_Properties. The following EDDL source code is an example describing ISA100 WIRELESS connection point.

```
COMPONENT ConnectionPoint_ISA100_Wireless
{
  LABEL "ISA100 Wireless Connection point";
  CLASSIFICATION NETWORK_CONNECTION_POINT;
  CAN_DELETE FALSE;
  PROTOCOL ISA100_Wireless;
  CONNECTION_POINT ConnectionPoint_ISA100_Wireless_Properties;
}

COLLECTION ConnectionPoint_ISA100_Wireless_Properties
{
  LABEL "ISA100 Wireless Connection Point data";

  MEMBERS
  {
    ADDRESS,   IPAddress,   "Device Address";
    MFG,       DevMfg,      "Manufacturer";
    DEV_TYPE,  DevType,     "Device Type";
    DEV_REV,   DevRev,      "Device Revision";
    TAG,       DevTag,      "Device Tag";
    POLL_ADDR, DevPollAddr, "Poll Address";
  }
}

VARIABLE IPAddress
{
  LABEL "ISA100 Wireless Node Address";
  HELP "Address of the ISA100 Node";
  CLASS DEVICE;
  TYPE OCTET (16 );

  HANDLING READ & WRITE;
}


VARIABLE DevMfg
{
```

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```
  LABEL "Manufacturer";
  CLASS DEVICE;
  TYPE UNSIGNED_INTEGER(4);
  HANDLING READ & WRITE;
}

VARIABLE DevType
{
  LABEL "Model Id";
  CLASS DEVICE;
  TYPE UNSIGNED_INTEGER(2);
  HANDLING READ & WRITE;
}

VARIABLE DevRev
{
  LABEL "Device Revision";
  CLASS DEVICE;
  TYPE UNSIGNED_INTEGER(2);
  HANDLING READ & WRITE;
}

VARIABLE DevTag
{
  LABEL "Tag";
  CLASS DEVICE;
  TYPE ASCII(16);
  HANDLING READ & WRITE;
}

VARIABLE DevPollAddr
{
  LABEL "Poll Address";
  HELP "Short address of the device";
  CLASS DEVICE;
  TYPE UNSIGNED_INTEGER(2)
  {
    MIN_VALUE 01; //Define appropriate min value for various revisions
  }
  HANDLING READ & WRITE;
}
```

5.5.2 Communication Device definition

According to IEC 62769-7, each FDI Communication Package shall contain an EDD element describing the communication device. The following EDDL source code in is an example describing a Communication Server.

```
COMPONENT ISA100_Wireless_Communication_Server
{
  LABEL "ISA100 Wireless communication server",
  PRODUCT_URI "urn:Wireless Compliance Institute:ISA100 Wireless
Communication   Server";
  CAN_DELETE TRUE;
  CLASSIFICATION NETWORK_COMPONENT;
  COMPONENT_RELATIONS
  {
      ISA100_Wireless_Communication_Device_Setup
  }
}
```

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```
COMPONENT_RELATION ISA100_Wireless_Communication_Device_Setup
{
  LABEL "Relation between Device and communication device";
  RELATION_TYPE CHILD_COMPONENT;
  ADDRESSING {IPAddress}
  COMPONENTS
  {
    ISA100_Wireless_Communication_Device{AUTO_CREATE 1;}
  }
}
```

Semantics of the EDDL constructs shown with the EDDL source code above are described in IEC 62769-7. The EDDL COMPONENT will be utilized by the FDI server and FDI Communication Server to create an instance of type CommunicationServerType as described in IEC 62769-7.

According to IEC 62769-7, each FDI Communication Package shall contain at least one EDD element describing at least one Communication Device component. The following EDDL source code is an example for an ISA100 WIRELESS communication device.

```
COMPONENT ISA100_Wireless_Communication_Device
{
  LABEL "ISA100 Wireless communication device";
  CAN_DELETE TRUE;
  CLASSIFICATION NETWORK_COMPONENT;
  COMPONENT_RELATIONS
  {
      ISA100_Wireless_Service_Provider_Relation
  }
}

COMPONENT_RELATION ISA100_Wireless_Service_Provider_Relation
{
  LABEL "ISA100 Wireless communication service provider”;
  RELATION_TYPE CHILD_COMPONENT;
  COMPONENTS
  {
      ISA100_Wireless_Service_Provider{AUTO_CREATE 1;}
  }
  MINIMUM_NUMBER 1;
  MAXIMUM_NUMBER 1;
}
```

Semantics of the EDDL constructs shown with the EDDL source code above are described in IEC 62769-7. The EDDL COMPONENT will be utilized by the FDI server and FDI Communication Server to create an instance of type ServerCommunicationDeviceType as described in IEC 62769-7.

5.5.3 Communication service provider definition

According to IEC 62769-7, each FDI Communication Package shall contain at least one EDD element describing at least one communication service provider component. The following EDDL source code below is an example for an ISA100 WIRELESS communication service provider component:

The component reference (ConnectionPoint_ISA100_Wireless) corresponds to the related connection point definition in 5.5.

```
COMPONENT ISA100_Wireless_Service_Provider
```

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```
{
  LABEL "ISA100 Wireless communication service provider";
  CAN_DELETE FALSE;
  CLASSIFICATION NETWORK_COMMUNICATION_SERVICE_PROVIDER;
  COMPONENT_RELATIONS
  {
    ISA100_Wireless_Connection_Point_Relation
  }
  BYTE_ORDER BIG_ENDIAN;
}

COMPONENT_RELATION
ISA100_Wireless_Service_Provider_Connection_Point_Relation
{
  LABEL "Relation between communication service provider and
connection point";
  RELATION_TYPE CHILD_COMPONENT;
  ADDRESSING {IPAddress}
  COMPONENTS
  {
    ConnectionPoint_ISA100_Wireless{ AUTO_CREATE 1;}
  }
  MINIMUM_NUMBER 1;
  MAXIMUM_NUMBER 1;
}
```

Semantics of the EDDL constructs shown with the EDDL source code above are described in IEC 62769-7. The EDDL COMPONENT will be utilized by the FDI server and FDI Communication Server to create an instance of type ServerCommunicationServiceType as described in IEC 62769-7.

5.5.4 Network definition

According to IEC 62769-7, each FDI Communication Package shall contain at least one EDD element describing network configuration constraints using the component construct.

```
COMPONENT Network_ISA100_Wireless
{
  LABEL "ISA100 Network";
  CAN_DELETE TRUE;
  CLASSIFICATION NETWORK;
  PROTOCOL ISA100_WIRELESS;
  COMPONENT_RELATIONS
  {
    ISA100_Wireless_Network_Connection_Point_Relation
  }

COMPONENT_RELATION ISA100_Wireless_Network_Connection_Point_Relation
{
  LABEL "Relation between network and connection point";
  RELATION_TYPE CHILD_COMPONENT;
  ADDRESSING {IPAddress}
  COMPONENTS
  {
    ConnectionPoint_ISA100_Wireless
  }
  MINIMUM_NUMBER 1;
  MAXIMUM_NUMBER 1;
}
```

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Semantics of the EDDL constructs shown with the EDDL source code above are described in IEC 62769-7. The EDDL COMPONENT will be utilized by the FDI server and FDI Communication Server to create an instance of type NetworkType as described in IEC 62541-100.

5.6 Methods

5.6.1 Methods for FDI Communication Servers

5.6.1.1 General

The Communication Server contained Information Model shall implement services according to method signatures described in 5.6.1.

5.6.1.2 Connect

Table 10 shows the Method Connect arguments.

Signature:

Connect (

```
[in]   ByteString       CommunicationRelationId,
[in]   ByteString       IPAddress,
[in]   UInt32           ConnectType,
[out]  Int32            ServiceError);
```

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