IEC 62769-100

Edition 1.0   2020-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Field device integration (FDI) –
Part 100: Profiles – Generic protocols

Intégration des appareils de terrain (FDI) –
Partie 100: Profils – Protocoles génériques

IEC 62769-100:2020-09(en-fr)

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FIELD DEVICE INTEGRATION (FDI) –

Part 100: Profiles – Generic protocols

FOREWORD

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FCG TS62769-100 Edition 1.1, *Field Device Integration Part 100: Profiles – Generic Protocols*, a specification of the FieldComm Group, PROFIBUS Nutzerorganisation e. V., OPC Foundation and FDT Group, serves as a basis for the elaboration of this standard.

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

FDIS	Report on voting
65E/739/FDIS	65E/743/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.

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

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FIELD DEVICE INTEGRATION (FDI) –

Part 100: Profiles – Generic protocols

1 Scope

This part of IEC 62769 specifies an FDI profile of IEC 62769 for generic protocols. That means that all interfaces are defined, and a host can add support for more protocols without changing its implementation. Nevertheless, there are some protocol-specific definitions (PSD) that need to be specified per protocol using this profile. Annex C specifies what PSDs need to be defined per protocol so that FDI Device Packages, FDI Communication Packages for Gateways and FDI Communication Servers, FDI Communication Servers, Gateways and Devices supporting such a protocol can work together in a host not aware about this specific protocol.

NOTE   A host not using an FDI Communication Server but a proprietary mechanism for communication defines its own means to deal with this profile to support several protocols without changing its implementation. This is specific to the proprietary way how the communication driver is bound to the host.

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 61804 (all parts), *Function blocks (FB) for process control and Electronic Device Description Language (EDDL)*

IEC 61804-3, *Function blocks (FB) for process control and Electronic Device Description Language (EDDL) – Part 3: EDDL syntax and semantics*

IEC 62541-100:2015, *OPC Unified Architecture – Part 100: OPC UA for Devices*

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

3 Terms, definitions, abbreviated terms and conventions

For the purposes of this document, the terms and definitions given in IEC 61804 series, IEC 62541-100, IEC 62769-2, 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

3.1 Abbreviated terms

EDD   electronic device description

EDDL   Electronic Device Description Language (see IEC 61804)

FDI™   Field Device Integration™[1]

FCG   FieldComm Group

XML   Extensible Markup Language (see FCG TS62769-100, Edition 1.1, Field Device Integration Part 100: Profiles – Generic Protocols, available at https://fieldcommgroup.org)

3.2 Conventions

3.2.1 EDDL syntax

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

3.2.2 XML syntax

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

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

3.2.3 Capitalizations

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

Some of these terms use an initialism 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 into 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:

* DEVICE_REV or
* DEVICE_MODEL

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[1] Field Device Integration (FDI) is the trademark of a product supplied by 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.

4 Profile for Generic Protocols

4.1 General

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

For Communication Servers, this document defines protocol specifics as these need to be considered in the Information Model hosted by the Communication Servers.

4.2 Catalog profile

4.2.1 Protocol support file

4.2.1.1 FDI Device Package

Protocol-specific attachments are mentioned in the Package Catalog as defined in IEC 62769-5. As this document defines a profile generically suitable for many protocols, it does not define requirements for any protocol-specific attachments. However, it does also not prevent the usage of protocol-specific attachments. The PSDs (see Annex C) define the requirements on the need of ProtocolSupportFiles for a specific protocol. However, the configuration of a device using an FDI Device Package shall not require the usage of a protocol-specific attachment. Table 1 specifies the parameters of the ProtocolSupportFile in the FDI Device Package in case one or many are provided.

Table 1 – ProtocolSupportFile for FDI Device Packages

Parameter	Description
Content Type	text/plain
Root Namespace	empty
Source Relationship	http://fdi-cooperation.com/2010/relationship/attachment-protocol
Filename	Not defined

4.2.1.2 FDI Communication Packages

The same rules as for FDI Device Packages apply.

4.2.2 CommunicationProfile definition

IEC 62769-4 defines a CommunicationProfileT string for the Catalog XML schema. The string is protocol-specific and defined as ProfileIdentifier in the PSD (see Annex C).

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 2 focus on catalog content that is vendor-independent.

Table 2 – Catalog values for profile devices

Element	Attribute	Content
PackageType	—	Profile
Manufacturer	—	Empty
DeviceModel	—	The format of the DeviceModel is protocol specific and details on the format are defined in the PSD (see Annex C).
		In order to assign a scan result with a profile package the ProfileId of the scan result shall be mapped to the DeviceModel of the profile package.

4.2.4   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 shall follow the IEC 62769-4 defined version information schema defined in the element type VersionT. The PSDs (see Annex C) define the mapping of versions of a specific protocol to this field.

4.3   Associating a Package with a device

4.3.1   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 4.6.1.7) provides the scan result through an XML document (the schema is defined in Clause A.5).

The Gateway implemented scan service (defined in 4.6.2.7) provides the scan result by means of the Information Model that contains data structures created from EDD content as specified in 4.6.2.7.

For both ways of presenting the scan result, it is common that scan results contain 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 the scan results based on the Catalog Schema in IEC 62769-4 defining the XML (simple) element types "DeviceModel" and "Manufacturer". Both types are used in the (complex) element types "Protocol" and "RegDeviceType".

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 4.4.3).

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

Table 3 – Device identification information mapping

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

Since not all protocols that are intended to be used with this profile for generic protocols might support a mandatory discovery mechanism allowing to identify the type of device (Manufacturer and DeviceModel), the scan results provide the capability to exclude the identification of the device and only provide the address. In that case, some host-specific mechanisms can be used to assign the desired FDI package to the device, for example by user interaction.

Since some protocols do not even have the mandatory capabilities to identify if there is a device at all for a specific protocol, address hosts should provide the capability for some users to add devices by manually specifying address information.

4.3.2   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 lifecycle management process bearing on a single version information provided for the entire device. This is captured in the DeviceRevision (see Table 4). Mapping of version information is protocol-specific and needs to be defined in the PSDs (see Annex C).

Table 4 – Device revision information mapping

FDI Device Package	Information Model	Communication Server provided scan result	Gateway provided scan result
Catalog specified type ListOfSupportedDeviceRevisions	FunctionalGroup: Identification Browse Name: DeviceRevision	Element (path): ConnectionPoint/Identification Attribute: DeviceRevision	COLLECTION ConnectionPoint. Identification. DeviceRevision

4.4   Information Model mapping

4.4.1   ProtocolType definition

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

Table 5 – Protocol type GenericProtocol

Attribute	Value				
BrowseName	GenericProtocol				
IsAbstract	False				
References	**NodeClass**	**BrowseName**	**DataType**	**TypeDefinition**	**ModellingRule**
Subtype of the ProtocolType defined in IEC 62541-100.					
HasProperty	Variable	ProtocolIdentifier	String	PropertyType	Mandatory

The mandatory Variable ProtocolIdentifier defines which concrete protocol is represented using the GenericProtocol type. It shall match the ProtocolIdentifier defined for the CommunicationProfile in 4.2.2. The string is protocol-specific and defined as ProfileIdentifier in the PSDs (see Annex C).

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 6. Note that only the attributes defined in Annex C, and therefore expected by each generic protocol, are used. Specific protocols can provide, for example, a SoftwareRevsion, but since this is not accessible for the host, this profile does not make use of it.

Table 6 – Inherited DeviceType property mapping

Property	Generic Protocol Mapping
SerialNumber	SerialNumber (see Annex C)
RevisionCounter	1 (not defined)
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	DeviceRevision (see Annex C)
SoftwareRevision	empty string (not defined)
HardwareRevision	empty string (not defined)
[a] Device manuals are exposed as attachments of the FDI Device Package.	

4.4.3   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. The Parameters of this FunctionalGroup are defined for generic protocol device types as follows:

Table 7 – Generic Protocol Device Types identification attributes

BrowseName	DataType	Mandatory/Optional
Manufacturer	String	Mandatory
DeviceModel	String	Mandatory
SerialNumber	String	Optional
Tag	String	Optional
DeviceRevision	UInt16	Optional
ProfileId	String	Optional

The BaseDataVariable instances shall be created from VARIABLE declarations with identifiers that correspond to the browse names listed in Table 7.

4.5 Topology elements

4.5.1 ConnectionPoint definition

The ConnectionPoint type GenericConnectionPoint shall be used to parameterize network access points using the generic protocols. The ConnectionPoint type GenericConnectionPoint is a sub type of the abstract type ConnectionPointType defined in IEC 62541-100. Table 8 specifies the representation of the GenericConnectionPoint in the AddressSpace.

Table 8 – ConnectionPoint type for Generic Protocols

Attribute	Value				
BrowseName	GenericConnectionPoint				
IsAbstract	False				
References	**NodeClass**	**BrowseName**	**DataType**	**TypeDefinition**	**ModellingRule**
Sub type of the ConnectionPointType defined in IEC 62541-100.					
HasProperty	Variable	Address	String	PropertyType	Mandatory
HasProperty	Variable	ProtocolIdentifier	String	PropertyType	Mandatory

The ConnectionPoint type GenericConnectionPoint shall be described by an EDD element contained in a Communication Device related FDI Package that can drive a generic protocol network. Actual ConnectionPoint properties are declared by VARIABLE constructs grouped together in a COLLECTION named ConnectionPoint. For this profile, it shall only contain the CONNECTION_POINT_ADDRESS, mapped to the OPC UA Property Address. In addition, the PROTOCOL specified by the COMPONENT shall be mapped to the ProtocolIdentifier Property. The following EDDL source code is an example describing a Connection Point for an ExampleProtocol. The ProtocolIdentifier defined by the PSDs (see Annex C) shall be used as the PROTOCOL name in the EDD.

```
COMPONENT ConnectionPoint_Generic
{
  LABEL "Generic Connection Point";
  CLASSIFICATION NETWORK_CONNECTION_POINT;
  CAN_DELETE FALSE;
  PROTOCOL ExampleProtocol;
  CONNECTION_POINT ConnectionPoint;
}

VARIABLE Address
{
```

```
  LABEL "Address";
  HELP "Address of the device";
  TYPE EUC(<protocol-specific>);
  CLASS LOCAL;
}


COLLECTION ConnectionPoint
{
  LABEL "Connection Point";
  MEMBERS
  {
    CONNECTION_POINT_ADDRESS, Address;
  }
}
```

4.5.2   Communication Device definition

In accordance with 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 Generic_Communication_Server
{
  LABEL "Generic communication server";
  PRODUCT_URI "urn:Company Name:Product Name";
  CAN_DELETE TRUE;
  CLASSIFICATION NETWORK_COMPONENT;
  COMPONENT_RELATIONS
  {
    Generic_Communication_Device_Setup;
  }
}

COMPONENT_RELATION Generic_Communication_Device_Setup
{
   LABEL "Relation between Device and communication device";
   RELATION_TYPE CHILD_COMPONENT;
   COMPONENTS
   {
      Generic_Communication_Device{AUTO_CREATE 1;}
   }
   MINIMUM_NUMBER 1;
   MAXIMUM_NUMBER 4;
}
```

In accordance with 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 in is an example for a generic protocol communication device:

```
COMPONENT Generic_Communication_Device
{
  LABEL "Generic communication device";
  CAN_DELETE TRUE;
  CLASSIFICATION NETWORK_COMPONENT;
  COMPONENT_RELATIONS { Generic_Service_Provider_Relation }
}


COMPONENT_RELATION Generic_Service_Provider_Relation
{
   LABEL "Relation to communication service provider";
   RELATION_TYPE CHILD_COMPONENT;
   COMPONENTS
   {
      Generic_Service_Provider{AUTO_CREATE 1;}
   }
```