

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Field device integration (FDI®) –
Part 100: Profiles – Generic Protocols**

**Intégration des appareils de terrain (FDI®) –
Partie 100: Profils – Protocoles Génériques 2023**

<https://standards.iteh.ai/catalog/standards/sist/ce29326d-6658-40f7-84f8-c6dd225f81d2/iec-62769-100-2023>

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CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms, definitions, abbreviated terms and acronyms	8
3.1 Terms and definitions.....	8
3.2 Abbreviated terms and acronyms	8
4 Conventions	8
4.1 EDDL syntax.....	8
4.2 XML syntax.....	8
4.3 Capitalizations	8
5 Profile for Generic Protocols.....	9
5.1 General.....	9
5.2 Catalog profile	9
5.2.1 Protocol support file.....	9
5.2.2 CommunicationProfile definition.....	9
5.2.3 Profile device.....	10
5.2.4 Protocol version information	10
5.3 Associating a Package with a device.....	10
5.3.1 Device type identification mapping.....	10
5.3.2 Device type revision mapping	11
5.4 Information Model mapping.....	12
5.4.1 ProtocolType definition	12
5.4.2 DeviceType mapping	12
5.4.3 FunctionalGroup identification definition	12
5.5 Topology elements.....	13
5.5.1 ConnectionPoint definition	13
5.5.2 Communication Device definition	14
5.5.3 Communication service provider definition	15
5.5.4 Network definition	16
5.6 Methods.....	16
5.6.1 Methods for FDI® Communication Servers	16
5.6.2 Methods for Gateways	20
Annex A (normative) Topology scan result schema	29
A.1 General.....	29
A.2 Network	29
A.3 GenericNetworkT	29
A.4 GenericConnectionPointT	30
A.5 GenericIdentificationT	30
A.6 GenericAddressT	31
A.7 GenericIdentificationExtendedT	31
Annex B (normative) Transfer service parameters.....	32
B.1 General.....	32
B.2 sendData	32
B.3 receiveData	32
B.4 TransferSendDataT.....	32
B.5 EddDataTypeInfoListT	33

B.6	EddDataTypeInfoT	33
B.7	EddDataTypeT	34
B.8	TransferResultDataT	35
Annex C (normative) Protocol specific definitions		36
C.1	General	36
C.2	Header	36
C.3	ProtocolIdentifier	36
C.4	Address	36
C.5	Manufacturer	37
C.6	DeviceModel	37
C.7	DeviceRevision	37
C.8	SerialNumber	37
C.9	Tag	37
C.10	ProfileId	38
C.11	Version	38
C.12	ProtocolSupportFile	38
C.13	ExtendedDeviceRevision	38
Bibliography		39
Table 1 – ProtocolSupportFile for FDI® Device Packages		9
Table 2 – Catalog values for profile devices		10
Table 3 – Device identification (information mapping)		11
Table 4 – Device revision information mapping		11
Table 5 – Protocol type GenericProtocol		12
Table 6 – Inherited DeviceType property mapping		12
Table 7 – Generic Protocol Device Types identification attributes		13
Table 8 – ConnectionPoint type for Generic Protocols		13
Table 9 – Method Connect arguments		17
Table 10 – Method Disconnect arguments		17
Table 11 – Method Transfer arguments		18
Table 12 – EddDataTypeInfo DataType Structure		19
Table 13 – EddDataTypeEnum Values		19
Table 14 – Method SetAddress arguments		20
Table 15 – Connect service arguments		22
Table 16 – Method Transfer arguments		24
Table 17 – Method SetAddress arguments		27
Table A.1 – Elements of GenericNetworkT		29
Table A.2 – Attributes of GenericConnectionPointT		30
Table A.3 – Elements of GenericConnectionPointT		30
Table A.4 – Attributes of GenericIdentificationT		31
Table A.5 – Attributes of GenericIdentificationExtendedT		31
Table B.1 – Attributes of TransferSendDataT		33
Table B.2 – Elements of TransferSendDataT		33
Table B.3 – Elements of EddDataTypeInfoListT		33
Table B.4 – Attributes of EddDataTypeInfoT		34

Table B.5 – Enumerations of EddDataTypeT 35
Table B.6 – Attributes of TransferResultDataT 35

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[IEC 62769-100:2023](https://standards.iteh.ai/catalog/standards/sist/ce29326d-6658-40f7-84f8-c6dd225f81d2/iec-62769-100-2023)

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FIELD DEVICE INTEGRATION (FDI®) –**Part 100: Profiles – Generic Protocols**

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IEC 62769-100 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This second edition cancels and replaces the first edition published in 2020. This edition constitutes a technical revision.

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

- a) added ExtendedDeviceRevision implementing the FDI® Version scheme and the method ScanExtended.

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

Draft	Report on voting
65E/865/CDV	65E/922/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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^{®1} 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 PSD need to be defined per protocol so that FDI[®] Device Packages, FDI[®] Communication Packages for Gateways and FDI[®] Communication Servers, FDI[®] Communication Server, Gateways and Devices supporting such a protocol can work together in a host not aware about this specific protocol.

NOTE A host not using FDI[®] Communication Server but a proprietary mechanism for communication needs to define 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), *Devices and integration in enterprise systems – Function blocks (FB) for process control and Electronic Device Description Language (EDDL)*

IEC 61804-3, *Devices and integration in enterprise systems – 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: Device Interface*

IEC 62769-1, *Field Device Integration (FDI[®]) – Part 1: Overview*

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

IEC 62769-3, *Field Device Integration (FDI[®]) – Part 3: Server*

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: Communication Devices*

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IEC 62769-151-1, *Field Device Integration (FDI®) – Part 151-1: Profiles – OPC UA*

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 61804 series, IEC 62541-100, IEC 62769-2, IEC 62769-3, IEC 62769-4, IEC 62769-5, and IEC 62769-7 apply.

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

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

3.2 Abbreviated terms and acronyms

EDD	Electronic Device Description
EDDL	Electronic Device Description Language (see IEC 61804 series)
FDI®	Field Device Integration
FCG	FieldComm Group
PSD	Protocol-specific definitions
XML	Extensible markup language (see REC-xml-20081126)

4 Conventions

4.1 EDDL syntax

This part of IEC 62769 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.

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="ExampleType">`

4.3 Capitalizations

Capitalization of the first letter of words is used in the IEC 62769 series to emphasize an FDI® defined term.

EDD language elements are written with all letters in uppercase.

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:

- 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:

- DEVICE_REV, or
- DEVICE_MODEL.

5 Profile for Generic Protocols

5.1 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.

This document also defines protocol specifics for Communication Servers as these need to be considered in the Communication Servers hosted Information Model.

Annex B defines the XML schema for Direct Access Services.

5.2 Catalog profile

5.2.1 Protocol support file

5.2.1.1 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 PSD 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

5.2.1.2 FDI® Communication Packages

The same rules as for FDI® Device Packages apply.

5.2.2 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).

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
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.

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

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 Gateway implemented scan service (defined in 5.6.2.7) provides the scan result by means of the Information Model that contains data structures created from EDD content as specified in 5.6.2.7.

Common for both ways of presenting the scan result is 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 scan result 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 5.4.3).

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 FDI[®] Device Package contained Catalog and Information Model.

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 might be used to assign the desired FDI[®] package to the device, e.g., by user interaction.

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

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. This is captured in the DeviceRevision (see Table 4). The DeviceRevision might be available as single number or as a string. Mapping of version information is protocol-specific and needs to be defined in the PSD (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

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 GenericProtocol

Attribute	Value				
BrowseName	GenericProtocol				
IsAbstract	False				
References	NodeClass	BrowseName	Data Type	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 5.2.2. The string is protocol specific and defined as ProfileIdentifier in the PSD (see Annex C).

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

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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.	

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

Table 7 – Generic Protocol Device Types identification attributes

BrowseName	Data Type	Mandatory/Optional
Manufacturer	String	Mandatory
DeviceModel	String	Mandatory
SerialNumber	String	Optional
Tag	String	Optional
DeviceRevision	UInt16	Optional
ExtendedDeviceRevision	String	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.

5.5 Topology elements

5.5.1 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	Data Type	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 PSD (see Annex C) shall be used as PROTOCOL name in the EDD.