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**Field device integration (FDI) –
Part 103-4: Profiles – PROFINET**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE INTEGRATION (FDI) –

Part 103-4: Profiles – PROFINET

FOREWORD

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International Standard IEC 62769-103-4 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/623/CDV	65E/686A/RVC 65E/686/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- withdrawn,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
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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;~~
- ~~d) extensible device object model, see Patent Family US12/893,680;~~

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FIELD DEVICE INTEGRATION (FDI) –

Part 103-4: Profiles – PROFINET

1 Scope

This part of IEC 62769 specifies an FDI profile of IEC 62769 for IEC 61784-2_CP 3/4, IEC 61784-2_CP3/5 and IEC 61784-2_CP3/6 (PROFINET¹).

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 61158-5-10, *Industrial communication networks - Fieldbus specifications - Part 5-10: Application layer service definition - Type 10 elements*

IEC 61784-2, *Industrial communication networks - Profiles - Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC/IEEE 8802-3*

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

IEC 62541-100:2015, *OPC Unified Architecture - Part 100: ~~OPC UA for Devices~~ Device Interface*

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

~~NOTE 1 – IEC 62769-2 is technically identical to FDI-2022.~~

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

~~NOTE 2 – IEC 62769-4 is technically identical to FDI-2024.~~

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

~~NOTE 3 – IEC 62769-5 is technically identical to FDI-2025.~~

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

~~NOTE 4 – IEC 62769-6 is technically identical to FDI-2026.~~

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

~~NOTE 5 – IEC 62769-7 is technically identical to FDI-2027.~~

1 PROFINET is the trade name of the non-profit consortium PROFIBUS & PROFINET International. 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.

PI Order No.: 2.122:2008, *Specification for PROFIBUS – Device Description and Device Integration – Volume 1: GSD, V5.1, July 2008: GSD*; available at <www.PROFIBUS.com>

PI Order No.: 2.352:2014, *GSDML Specification for PROFINET IO*; available at <www.profibus.com>

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 61158-5-10, IEC 61784-2, IEC 61804 (all parts), IEC 62541-100, IEC 62769-2, IEC 62769-4, IEC 62769-5, IEC 62769-6, IEC 62769-7 and PI Order No.: 2.352:2014 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>

3.2 Abbreviated terms **and acronyms**

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

DCP	Discovery and basic configuration protocol (according to IEC 61158-5-10)
DNS	Domain name system
EDD	Electronic Device Description
EDDL	Electronic Device Description Language (see IEC 61804)
GSD	General station description (see PI Order No.: 2.122:2008)
GSDML	GSD markup language (see PI Order No.: 2.352:2014)
IP	Internet protocol (IETF RFC 791)
UIP	User Interface plug-in
UUID	Universal unique identifier (see ISO/IEC 11578)
XML	Extensible markup language (see REC-xml-20081126)

3.3 Conventions

3.3.1 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.

3.3.2 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">

3.3.3 Capitalizations

IEC 62769 (all parts) 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:

- Communication Servers, or
- Profile for Package.

Parameter names or attributes are concatenated to a single term, where the original terms starting 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:

- PROFILE_ID, or
- Profinet_PA_Network.

4 Profile for PROFINET

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

4.2 Catalog profile

4.2.1 Protocol support file

4.2.1.1 FDI Device Package

A GSD file is a mandatory Attachment for FDI Device Packages representing PROFINET IO devices.

Protocol specific attachments are mentioned in the Package Catalog as defined in IEC 62769-5. A communication feature list mark-up language (GSDML) file according to PI Order No.: 2.352:2014 is a mandatory attachment for FDI Device Packages representing PROFINET devices. Table 1 specifies the parameters of ProtocolSupportFile in the FDI Device Package.

Table 1 – ProtocolSupportFile for FDI Device Packages

Parameter	Description
Content Type	text/xml
Root Namespace	Empty
Source Relationship	http://fdi-cooperation.com/2010/relationship/attachment-protocol
Filename	According to PI Order No.: 2.352:2014

4.2.1.2 FDI Communication Package

A GSDML file as specified in ISO 15745 4:2003/AMD1:2006, is an optional attachment for FDI Communication Packages representing PROFINET IO devices. Table 2 specifies the parameters of ProtocolSupportFile for FDI Communication Packages.

Table 2 – ProtocolSupportFile for FDI Communication Packages

Parameter	Description
Content Type	text/xml
Root Namespace	Empty
Source Relationship	http://fdi-cooperation.com/2010/relationship/attachment-protocol
Filename	According to PI Order No.: 2.352:2014

4.2.2 CommunicationProfile definition

IEC 62769-4 defines a CommunicationProfileT-~~enumeration type~~ string for the Catalog XML schema. The PROFINET specific value ~~defined inside this enumeration is~~ shall be "profinet_io".

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
Manufacturer	—	Empty
DeviceModel	—	<p>Allowed profile identifier values (PROFILE_ID) are provided by PROFIBUS & PROFINET International (PI). PI provides and maintains a XML file (Profile_ID_Table) containing the assignment of PROFILE_ID to profiles.</p> <p>It is available at <http://www.profibus.com/IM/Profile_ID_Table.xml></p> <p>The file can be downloaded by any engineering or service tool whenever it's connected to the Internet.</p> <p>NOTE More information is provided in PI Order No.: 3.502 (I&M Profile) and related profile definitions referred therein.</p> <p>The string format shall be hexadecimal starting with 0x, e.g. '0x3D00'.</p>

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 has to follow the IEC 62769-4 defined version information schema defined in the element type VersionT. Table 4 describes how to apply the currently known protocol versions defined by the non-profit consortium PROFIBUS & PROFINET International. The general rule is to apply the value "0" for parts of the version information according to IEC 62769-4 that are not used in currently known protocol versions.

Table 4 – Version mapping examples

Protocol / Version	InterfaceT Version value
PROFINET Version 2.3	2.3.0
NOTE 1 This Table is just an example since this document cannot foresee how future protocol versions will be defined.	
NOTE 2 The currently known PROFINET protocol revision information provides major and minor version information. Leading zeros are not considered in version value evaluation since only the actual decimal values are relevant.	

4.3 Associating a Package with a device

4.3.1 Device type identification mapping

The purpose of a 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 a scan result through an XML document (schema defined in Annex A).

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

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:

- 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 catalogue information.
- 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 the device type information presented in the scan result (see the identification in Clause A.5 and 4.6.2.7) 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 result based on the Catalog Schema in IEC 62769-4 which defines the XML element (simple) type “DeviceModel” and “Manufacturer”. Both types are used in (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 specified FunctionalGroup Identification containing VendorID and DeviceID (see 4.4.3).

The mapping between different device identification data sources is described in Table 5. 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 5 – 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: VendorID	Element (path): ConnectionPoint/Identification Attribute: VendorID	COLLECTION ConnectionPoint. Identification.VendorID
Catalog specified type DeviceModel	FunctionalGroup: Identification Browse Name: DeviceID	Element (path): ConnectionPoint/Identification Attribute: DeviceID	COLLECTION ConnectionPoint. Identification.DeviceID

4.3.2 Device type revision mapping

IEC 62769-4 envisions a concept that allows determining 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.

PROFINET IO related specifications, for example PI Order No.: 2.352:2011 (GSDML) and PI Order No.: 3.502 (I&M), split the device revision into software and hardware related information. These specifications do not outline any rules whether the GSD, GSDML or I&M specified HARDWARE_REVISION is independent from SOFTWARE_REVISION.

The goal of 4.3.2 is to describe the translation rules between the PROFINET IO related specifications describing their way of providing version information and the IEC 62769-4 specified way of containing version information that can be compared against the version read from the device. The purpose is to determine compatibility between an FDI Device Package and a Device (Figure 1 depicts the problem).

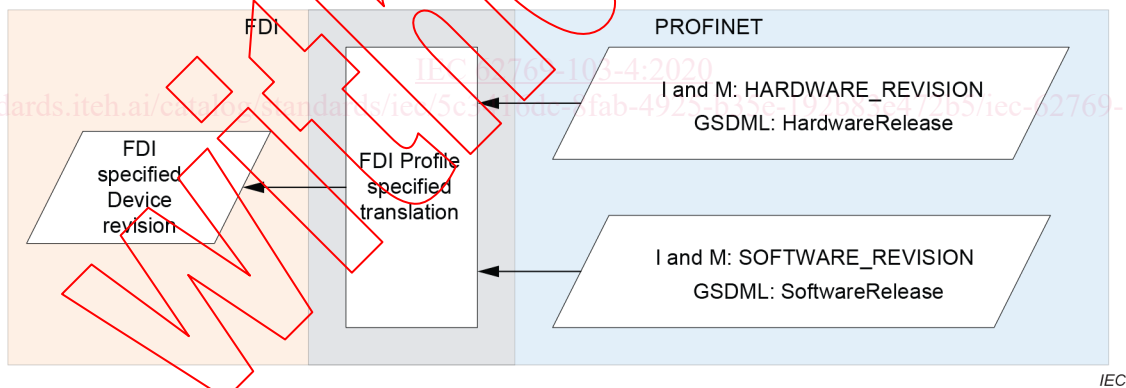


Figure 1 – Version mapping problem

The firmware of a device implements the data exchange interface which shall be described by means of the FDI Device Package content (EDD). A device firmware that implements the GSD, GSDML or I&M profile enables reading the values SOFTWARE_REVISION and HARDWARE_REVISION. The access to these values shall be described in the FDI Device Package contained EDD.

Firmware modifications that affect the firmware implemented data exchange interface shall be reflected in the FDI Device Package. Such firmware and device description modification shall be visible in the SOFTWARE_REVISION.

Hardware related modifications shall be captured in the HARDWARE_REVISION value. Hardware related modifications do not necessarily require always a firmware update. Thus HARDWARE_REVISION cannot be used to determine compatibility between a device and the