

DIN EN 62769-7

ICS 35.240.50

**Feldgeräteintegration (FDI) –
Teil 7: FDI-Kommunikationsgeräte
(IEC 62769-7:2015);
Englische Fassung EN 62769-7:2015**

Field Device Integration (FDI) –
Part 7: FDI Communication Devices
(IEC 62769-7:2015);
English version EN 62769-7:2015

Intégration des appareils de terrain (FDI) –
Partie 7: Appareils de communication FDI
(IEC 62769-7:2015);
Version anglaise EN 62769-7:2015

Gesamtumfang 68 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

Anwendungsbeginn

Anwendungsbeginn für die von CENELEC am 2015-06-16 angenommene Europäische Norm als DIN-Norm ist 2016-03-01.

Nationales Vorwort

Vorausgegangener Norm-Entwurf: E DIN EN 62769-7:2013-01.

Für dieses Dokument ist das nationale Arbeitsgremium K 956 „Feldbus“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE (www.dke.de) zuständig.

Die enthaltene IEC-Publikation wurde vom SC 65E „Devices and integration in enterprise systems“ erarbeitet.

Das IEC-Komitee hat entschieden, dass der Inhalt dieser Publikation bis zu dem Datum (stability date) unverändert bleiben soll, das auf der IEC-Website unter „<http://webstore.iec.ch>“ zu dieser Publikation angegeben ist. Zu diesem Zeitpunkt wird entsprechend der Entscheidung des Komitees die Publikation

- bestätigt,
- zurückgezogen,
- durch eine Folgeausgabe ersetzt oder
- geändert.

Für den Fall einer undatierten Verweisung im normativen Text (Verweisung auf ein Dokument ohne Angabe des Ausgabedatums und ohne Hinweis auf eine Abschnittsnummer, eine Tabelle, ein Bild usw.) bezieht sich die Verweisung auf die jeweils aktuellste Ausgabe des in Bezug genommenen Dokuments.

Für den Fall einer datierten Verweisung im normativen Text bezieht sich die Verweisung immer auf die in Bezug genommene Ausgabe des Dokuments.

Der Zusammenhang der zitierten Dokumente mit den entsprechenden Deutschen Dokumenten ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für die vorliegende Norm erfüllt.

Da sich die Benutzer der vorliegenden Norm der englischen Sprache als Fachsprache bedienen, wird die Englische Fassung der EN 62769-7 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA der vorliegenden Norm hinzugefügt. Für die meisten der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Diese Norm steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Das Original-Dokument enthält Bilder in Farbe, die in der Papierversion in einer Graustufen-Darstellung wiedergegeben werden. Elektronische Versionen dieses Dokuments enthalten die Bilder in der originalen Farbdarstellung.

Nationaler Anhang NA (informativ)

1 Anwendungsbereich^{N1)}

Dieser Teil von IEC 62769 legt die Elemente fest, mit denen die Kommunikationsleistungen erbracht und die als Kommunikationsgeräte bezeichnet werden (IEC 62769-5).

Die gesamtheitliche FDI-Architektur ist in Bild 1 dargestellt. Die im Anwendungsbereich dieses Dokuments liegenden Architekturkomponenten sind in diesem Bild hervorgehoben. Der Anwendungsbereich des Dokumentes hinsichtlich der FDI-Pakete ist auf die Kommunikationsgeräte begrenzt. Der in Bild 1 dargestellte Kommunikationsserver ist ein Beispiel für ein spezifisches Kommunikationsgerät.

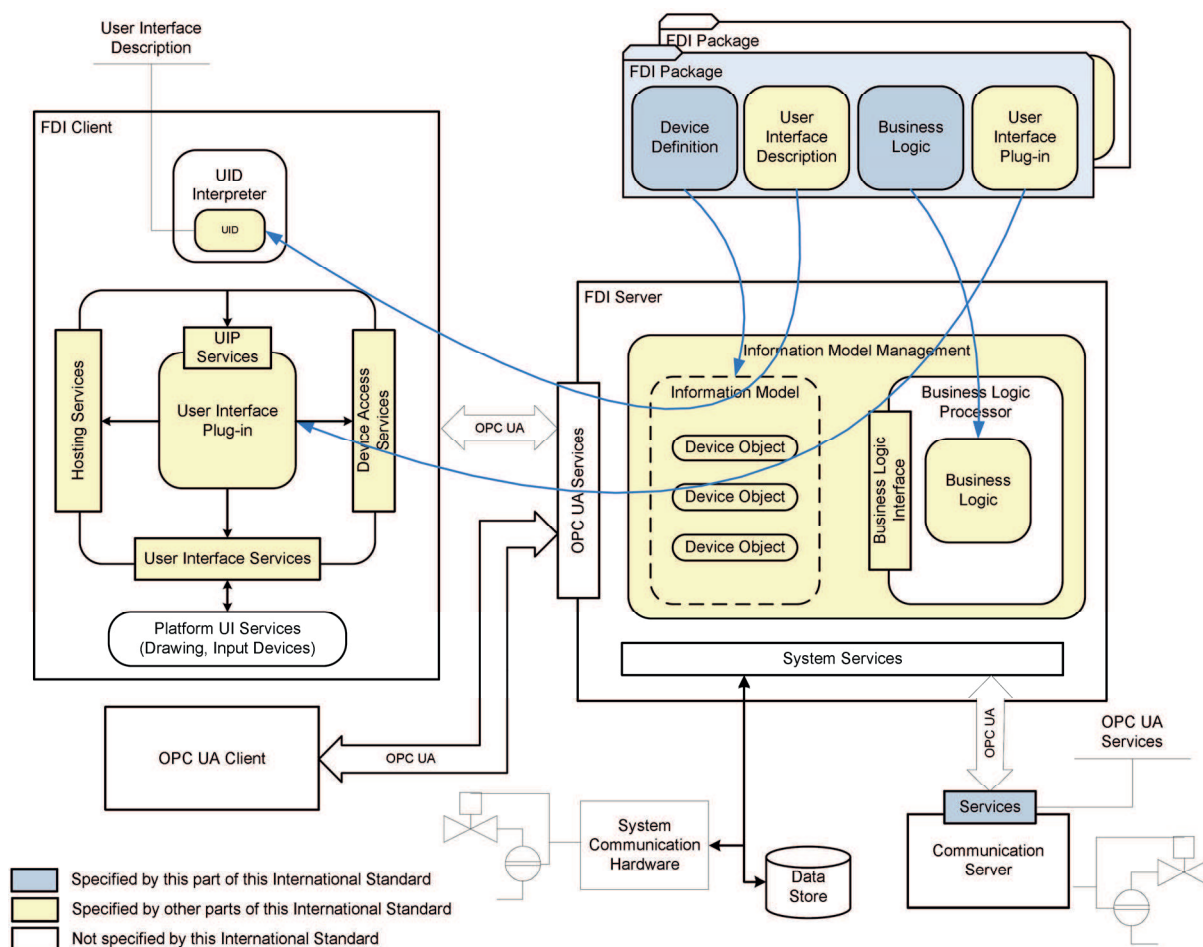


Bild 1 – FDI-Architektur

^{N1)} Nationale Fußnote: Die Nummerierung der IEC 62769-7:2015 wurde beibehalten.

3 Begriffe, Abkürzungen und Konventionen^{N2)}

3.1 Begriffe

Für die Anwendung dieses Dokuments gelten die Begriffe nach IEC 62769-1 und die folgenden Begriffe.

3.1.1

Gateway

(en: gateway)

Kommunikationsgerät, welches die Verbindung zwischen verschiedenen physikalischen Netzen oder verschiedenen Protokollen ermöglicht

^{N2)} Die deutschen Übersetzungen haben Empfehlungscharakter und können nur die ungefähre Begrifflichkeit in Deutsch wiedergeben. Unter Experten wird empfohlen, ausschließlich die englischen Fachbegriffe zu verwenden, um die Gefahr von Missverständnissen zu reduzieren.

English Version

Field Device Integration (FDI) - Part 7: FDI Communication
Devices
(IEC 62769-7:2015)

Intégration des appareils de terrain (FDI) - Partie 7:
Appareils de communication FDI
(IEC 62769-7:2015)

Feldgeräteintegration (FDI) - Teil 7:
FDI-Kommunikationsgeräte
(IEC 62769-7:2015)

This European Standard was approved by CENELEC on 2015-06-16. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 65E/350/CDV, future edition 1 of IEC 62769-7, prepared by SC 65E "Devices and integration in enterprise systems" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62769-7:2015.

The following dates are fixed:

- latest date by which the document has to be (dop) 2016-03-16
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2018-06-16
standards conflicting with the
document have to be withdrawn

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62769-7:2015 was approved by CENELEC as a European Standard without any modification.

CONTENTS

1	Scope.....	8
2	Normative references	9
3	Terms, definitions, abbreviated terms, acronyms and conventions	9
3.1	Terms and definitions	9
3.2	Abbreviated terms and acronyms.....	10
3.3	Conventions for graphical notation.....	10
4	General	10
5	FDI Communication Package	12
5.1	General.....	12
5.2	EDD.....	12
5.2.1	General rules	12
5.2.2	Device component	13
5.2.3	CommunicationDevice component.....	14
5.2.4	Communication service provider component	15
5.2.5	Connection Point component.....	16
5.2.6	Connection Point collection	17
5.2.7	Network component	17
5.2.8	ValidateNetwork.....	19
5.2.9	ValidateModules	19
5.2.10	UIP specifics.....	20
5.2.11	Deployment	20
6	Communication relations.....	20
7	FDI Communication Server definition	22
7.1	General.....	22
7.2	General characteristics.....	22
7.3	Information Model	22
7.3.1	General	22
7.3.2	CommunicationServerType	25
7.3.3	ServerCommunicationDeviceType	29
7.3.4	ServerCommunicationServiceType	33
7.4	OPC UA Server Profile for FDI Communication Server	37
7.5	Mapping the FDI Server IM to the FDI Communication Server IM	37
7.5.1	General	37
7.5.2	Information Model differences	37
7.6	Installer	39
7.7	FDI Communication Package.....	39
7.7.1	General	39
7.7.2	EDD for Lightweight Communication Server.....	39
7.7.3	EDD for Multi-Channel Communication Server	40
7.7.4	Documentation.....	40
7.8	Handling and behavior	40
7.8.1	General	40
7.8.2	Deployment	41
7.8.3	Server configuration.....	41
7.8.4	Start up	42

7.8.5	Shutdown	42
7.8.6	Watchdog	42
7.8.7	Establish the OPC UA connection	42
7.8.8	Instantiate the Communication Server	43
7.8.9	Configure the communication hardware	43
7.8.10	Configure the Network	43
7.8.11	Parameterize	43
7.8.12	Initialize.....	43
7.8.13	Create the communication service object.....	43
7.8.14	Communication relation	44
7.8.15	Connect.....	44
7.8.16	Disconnect	45
7.8.17	Abort indication.....	45
7.8.18	Scan.....	45
7.8.19	SetAddress.....	45
8	FDI Communication Gateway definition	45
8.1	General	45
8.2	Information Model	45
8.2.1	General	45
8.2.2	CommunicationGatewayType	46
8.2.3	GatewayCommunicationDeviceType.....	47
8.2.4	GatewayCommunicationServiceType.....	50
8.3	FDI Communication Package	54
8.3.1	General	54
8.3.2	EDD	54
8.4	Handling and behavior	56
8.4.1	General	56
8.4.2	Deployment	57
8.4.3	Start up	57
8.4.4	Configure the communication hardware.....	57
8.4.5	Configure the Network	57
8.4.6	Parameterize	57
8.4.7	Communication relation	57
8.4.8	Connect.....	57
8.4.9	Disconnect	57
8.4.10	Abort indication.....	57
8.4.11	Scan.....	58
8.4.12	Communication Error Handling.....	58
Annex A (informative)	Layered protocols	59
A.1	General	59
A.2	Convention for protocol specific annex creation	59
A.2.1	Connection Point	59
A.3	FDI Communication Package definition.....	60
A.3.1	Communication services	60
A.3.2	Connection Point	60
A.3.3	Network.....	60
A.4	Representation in the IM	61
Annex B (normative)	Namespace and Mappings	62

Bibliography	63
Annex ZA (normative) Normative references to international publications with their corresponding European publications	64
Figure 1 – FDI architecture diagram	8
Figure 2 – FDI communication infrastructure architecture.....	11
Figure 3 – Communication relation	21
Figure 4 – Communication relation state chart.....	22
Figure 5 – FDI Communication Server AddressSpace	24
Figure 6 – CommunicationServerType	25
Figure 7 – ServerCommunicationDeviceType	29
Figure 8 – ServerCommunicationServiceType	33
Figure 9 – Information Model differences (example).....	38
Figure 10 – FDI Communication Server state machine.....	41
Figure 11 – Communication relation state chart	44
Figure 12 – Gateway information model.....	46
Figure 13 – CommunicationGatewayType.....	47
Figure 14 – GatewayCommunicationDeviceType	48
Figure 15 – GatewayCommunicationServiceType	51
Figure 16 – Nested Communication.....	56
Table 1 – ValidateNetwork Action arguments.....	19
Table 2 – ValidateModules Action arguments	20
Table 3 – CommunicationServerType definition	25
Table 4 – MethodSet of CommunicationServerType.....	25
Table 5 – Reset Method arguments.....	26
Table 6 – Reset Method AddressSpace definition	26
Table 7 – Initialize Method arguments	27
Table 8 – Initialize Method AddressSpace definition	27
Table 9 – AddComponent Method arguments	28
Table 10 – AddComponent Method AddressSpace definition.....	28
Table 11 – RemoveComponent Method arguments	29
Table 12 – RemoveComponent Method AddressSpace definition	29
Table 13 – ServerCommunicationDeviceType definition.....	30
Table 14– MethodSet of ServerCommunicationDeviceType	30
Table 15 – Scan Method arguments	31
Table 16 – Scan Method AddressSpace definition	31
Table 17 – ResetScan Method arguments	31
Table 18 – ResetScan Method AddressSpace definition.....	32
Table 19 – SetAddress Method arguments	32
Table 20 – ServerCommunicationServiceType definition.....	33
Table 21 – MethodSet of ServerCommunicationServiceType.....	34
Table 22 – Connect Method arguments	35

Table 23 – Disconnect Method arguments	35
Table 24 – Transfer Method arguments	36
Table 25 – GetPublishedData Method arguments	37
Table 26 – <i>FDICommunicationServer_Facet</i> definition	37
Table 27 – CommunicationGatewayType definition	47
Table 28 – GatewayCommunicationDeviceType definition	48
Table 29– MethodSet of GatewayCommunicationDeviceType	48
Table 30 – Scan Method arguments	49
Table 31 – Scan Method AddressSpace definition	49
Table 32 – ScanNext Method arguments	50
Table 33 – ScanNext Method AddressSpace definition	50
Table 34 – GatewayCommunicationServiceType definition	51
Table 35 – MethodSet of GatewayCommunicationServiceType	52
Table 36 – Connect Method arguments	53
Table 37 – Transfer Method arguments	54

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.

IEC takes no position concerning the evidence, validity and scope of this patent right.

The holders of these patent rights have assured the IEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

- e) ABB Research Ltd
Claes Ryttoft
Affolterstrasse 4
Zurich, 8050
Switzerland
- f) Phoenix Contact GmbH & Co KG
Intellectual Property, Licenses & Standards
Flachsmarktstrasse 8, 32825 Blomberg
Germany
- g) Fisher Controls International LLC
John Dilger, Emerson Process Management LLLP
301 S. 1st Avenue, Marshalltown, Iowa 50158
USA
- h) Rockwell Automation Technologies, Inc.
1 Allen-Bradley Drive
Mayfield Heights, Ohio 44124
USA

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (www.iso.org/patents) and IEC (<http://patents.iec.ch>) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

FIELD DEVICE INTEGRATION (FDI) – Part 7: FDI Communication Devices

1 Scope

This part of IEC 62769 specifies the elements implementing communication capabilities called Communication Devices (IEC 62769-5).

The overall FDI architecture is illustrated in Figure 1. The architectural components that are within the scope of this document have been highlighted in this illustration. The document scope with respect to FDI Packages is limited to Communication Devices. The Communication Server shown in Figure 1 is an example of a specific Communication Device.

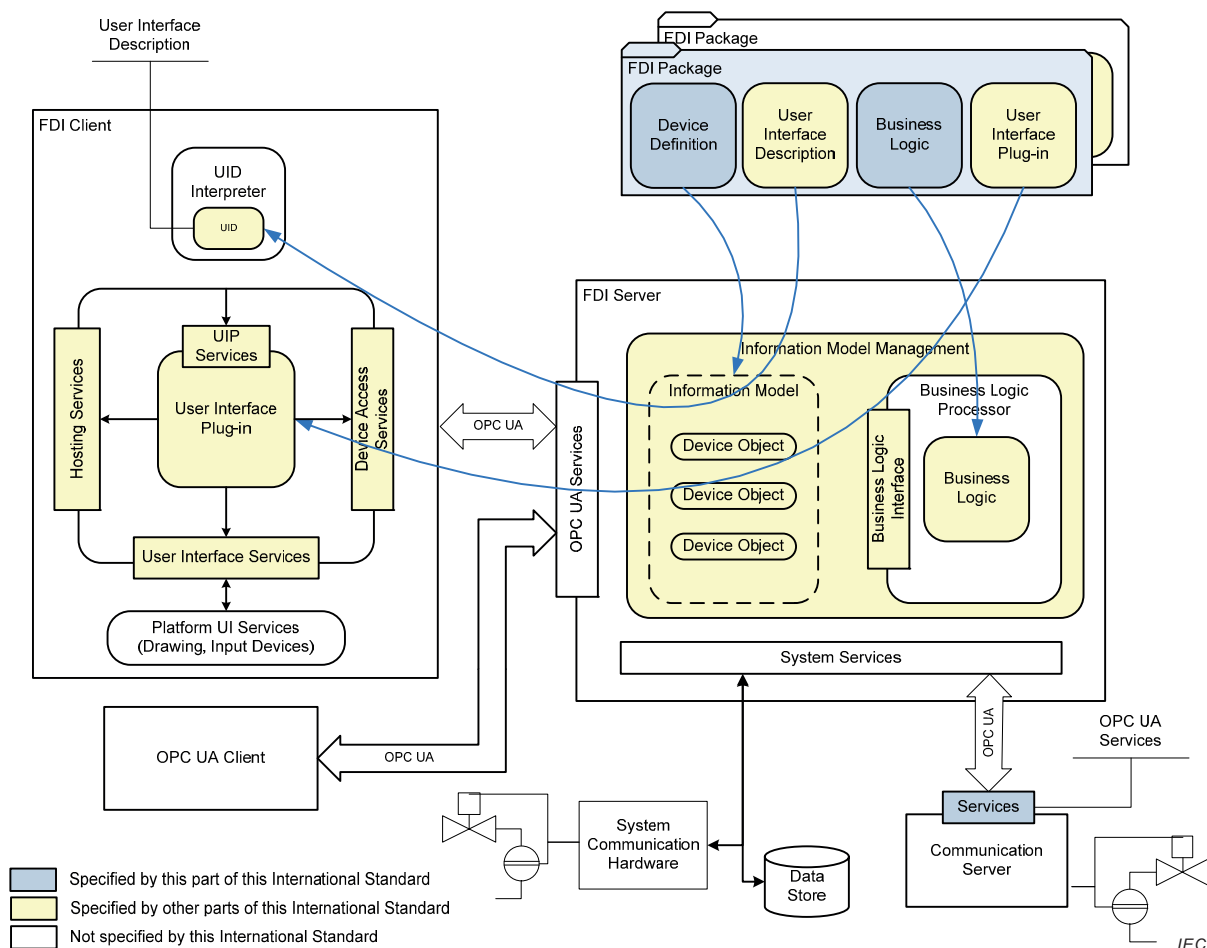


Figure 1 – FDI architecture diagram

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 61804-4, *Function blocks (FB) for process control and Electronic Device Description Language (EDDL) – Part 4: EDD interpretation*

IEC 62541 (all parts), *OPC Unified Architecture*

IEC TR 62541-1, *OPC Unified Architecture – Part 1: Overview and Concepts*

IEC 62541-4, *OPC Unified Architecture – Part 4: Services*

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

IEC 62541-7, *OPC Unified Architecture – Part 7: Profiles*

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

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

NOTE IEC 62769-1 is technically identical to FDI-2021.

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

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

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

NOTE IEC 62769-3 is technically identical to FDI-2023.

IEC 62769-4:2015, *Field Device Integration (FDI) – Part 4: FDI Packages*

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

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

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

3 Terms, definitions, abbreviated terms, acronyms and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62769-1 as well as the following apply.

3.1.1

gateway

communication device that enables to bridge between different physical networks or different protocols

3.2 Abbreviated terms and acronyms

For the purposes of this document, the abbreviated terms and acronyms given in IEC 62769-1 and the following apply.

HTTP	Hypertext Transfer Protocol
IP	Internet Protocol
PHY	Physical communication hardware
SNMP	Simple Network Management Protocol
TCP	Transmission Control Protocol
URI	Uniform Resource Identifier

3.3 Conventions for graphical notation

This document uses the graphical notation defined in IEC 62769-5.

4 General

The abstract term FDI Communication Device represents an entity implementing communication functions over a network using a specific protocol. The group of FDI Communication Devices splits into two main groups.

- i) The FDI Communication Server is a dedicated OPC UA Server providing access to one or more field device networks. The FDI Communication Server is specified in Clause 7.
- j) The FDI Communication Gateway enables to bridge between different physical networks or different protocols. The bridging business logic is implemented in the EED component that is provided with an FDI Communication Package. The FDI Communication Gateway is specified in Clause 8.

NOTE The main differences between a Gateway and a Communication Server are: in terms of FDI the FDI Communication Server is a dedicated OPC UA Server providing access to one or more field device networks. A Gateway is a communication device that enables to bridge between different physical networks or different protocols. The logical representation of a Gateway device within the FDI Server hosted Information Model enables the FDI Server to process communication in heterogeneous network topologies.

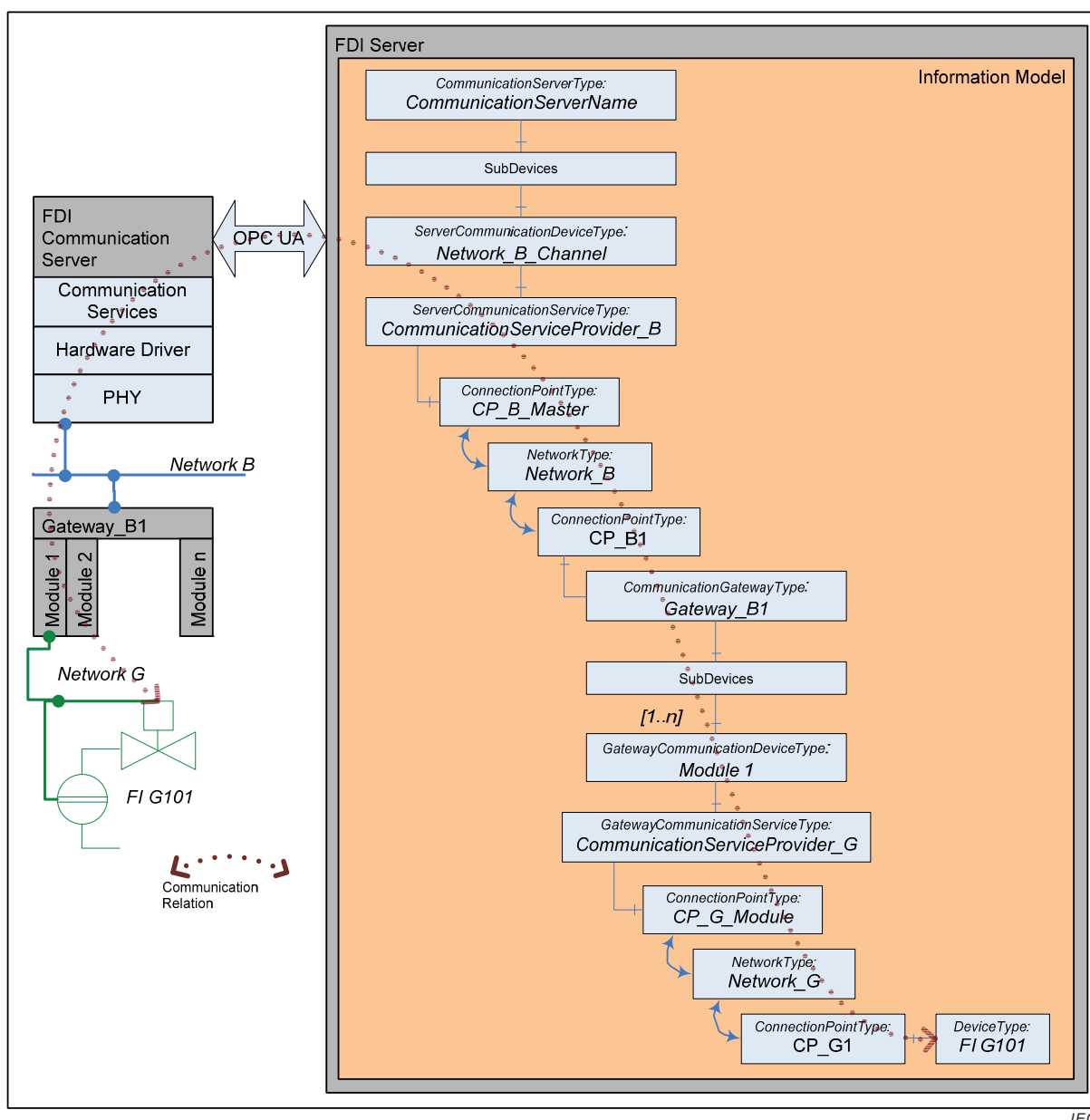


Figure 2 – FDI communication infrastructure architecture

The FDI Server hosted Information Model contains a representation of the network topology. (see also IEC 62769-5). The Information Model shown in Figure 2 is an example excerpt to illustrate how the Information Model used elements reflect the actual network topology.

- k) The instance of CommunicationServerType (named CommunicationServerName) represents the FDI Communication Server. The FDI Communication Server implements physical communication network access (Communication hardware). Clause 7 describes related Information Model specifics, required FDI Communication Package content and handling of elements therein. (For subdevices see IEC 62769-5).
- l) The instance of ServerCommunicationDeviceType and ServerCommunication-ServiceType (named Network_B_Channel) maps to the FDI Communication Server implemented communication services. The ServerCommunicationDeviceType is specified in 7.3.3. The ServerCommunicationServiceType is specified in 7.3.4.
- m) The instance of CommunicationGatewayType (named Gateway_B1) represents the physical Gateway. Clause 8 describes the related Information Model specifics, the required FDI Package content and the handling of elements therein.

- n) The instance of GatewayCommunicationDeviceType (named Module 1) maps to a physical or logical module enabling communication to the network to which this module is connected. The GatewayCommunicationDeviceType is specified in 8.3.2.3. The related Gateway specifics are described in Clause 8.
- o) The instance of GatewayCommunicationServiceType (named CommunicationServiceProvider_G) represents the Gateways' ability to process communication services. The Gateway specific implementation of GatewayCommunicationServiceType is based on Business Logic that enables to run communication services in heterogeneous communication networks.
- p) A communication relation (more details are described in Clause 6) between a physical device and the device representation managed by the FDI Server is always associated to communication service objects that are instances of a GatewayCommunicationServiceType or ServerCommunicationServiceType. The ability of instantiating multiple communication service objects supports protocols enables to operate multiple logical connections between a bus master and a device.
- q) The Information Model represents the connections between the physical devices shown on the left side of Figure 2 based on instances of ConnectionPointType NetworkType and the depicted relations. ConnectionPointType and NetworkType are specified in IEC 62769-5.

5 FDI Communication Package

5.1 General

The FDI Server imports the FDI Communication Package like any other FDI Device Package. Clause 5 specifies the FDI Communication Package details.

5.2 EDD

5.2.1 General rules

The FDI Communication Package contained EDD is not restricted, but bound to a protocol specific annex (IEC 62769-4:2015, Annex F).

The EDD elements as specified in IEC 62769-4:2015, Annex F, and provided with an FDI Communication Package shall describe:

- r) Parameter and parameter structures. Mandatory protocol specific parameter definitions are found in IEC 62769-4:2015, Annex F. The parameter shall contain any parameter that requires adjustment for proper communication service operation.
- s) Physical Layer identification. Protocol specific definitions are found in IEC 62769-4:2015, Annex F.
- t) Communication devices modularity: The modularity information shall be based on using the EDDL constructs COMPONENT (see IEC 61804-3).

FDI envisions communication device modularity to cope with communication hardware providing multiple physical or logical communication channels to access multiple logical or physical communication networks. Each module element of the whole communication device shall be described by a separate EDD element.
- u) The COMPONENT definition shall be used to support the system implemented topology configuration. Protocol specific definitions are found in IEC 62769-4:2015, Annex F. The related COMPONENT definitions are described in 5.2.2, 5.2.3, 5.2.4, and 5.2.7.
- v) The Business Logic shall contain a method enabled to validate the network (see 5.2.8). The validation function considers the elements only directly connected to the network. The validation function shall be referred by the EDDL specified CHECK_CONFIGURATION attribute.
- w) The Business Logic can contain a method enabled to validate the module configuration (see 5.2.9) or the network configuration (see 5.2.8). The validation function considers the elements only directly connected to the related parent element in the topology. The validation function shall be referred by the EDDL specified CHECK_CONFIGURATION attribute.

- x) **Connection Point data:** The Connection Point (see 5.2.4 and 5.2.6) shall be described through EDDL constructs COMPONENT, COLLECTION and VARIABLE. The COMPONENT definition associates the Connection Point element to the Communication Device. The VARIABLE definitions represent the properties of a specific Connection Point. The COLLECTION represents the Connection Point structure as such. Protocol specific definitions are found in IEC 62769-4:2015, Annex F.
- y) **MENU:**
The Menu structure shall follow the Menu conventions for PC based applications according to IEC 61804-4 enabling access to
- 1) **FDI Communication Device Type (Bus) parameters:** These parameters shall be made accessible by means of "offline_root_menu".
 - 2) **Topology Configuration Dialogs** shall be made available by means of the menu entry point "topology_configuration". Protocol specific definitions are found in IEC 62769-4:2015, Annex F.

5.2.2 Device component

Each FDI Communication Package shall contain an EDD element describing the device.

```
COMPONENT <DeviceComponentId>
{
    LABEL "<Label>";
    CAN_DELETE TRUE;
    CHECK_CONFIGURATION <ValidateModules>;
    CLASSIFICATION NETWORK_COMPONENT;
    COMPONENT_RELATIONS
    {
        <CommunicationDeviceRelationId>
    }
}

COMPONENT_RELATION <CommunicationDeviceRelationId>
{
    LABEL "Relation type description";
    RELATION_TYPE CHILD_COMPONENT;
    ADDRESSING {<AddressVar>}
    COMPONENTS
    {
        <CommunicationDeviceComponentId>
        {
            AUTO_CREATE <autoCreate>;
            REQUIRED_RANGES
            {
                <AddressVar>{ MIN_VALUE <AddrMin>; MAX_VALUE <AddrMax>;}
            }
        }
    }
    MINIMUM_NUMBER <minNumber>;
    MAXIMUM_NUMBER <maxNumber>;
}
```

<DeviceComponentId>: The COMPONENT identifier identifies the component description for the device type.

<Label>: The string value shall contain a string that allows a human user to determine the function of the FDI Communication Server object.

<ValidateModules>: The Value refers to the METHOD implementing the module topology configuration validation function. (Implementation details are specified in 5.2.9.)

The attribute `COMPONENT_RELATIONS` allows to describe how modules can be connected. The definition of the `COMPONENT_RELATIONS` is optional. If used it shall describe the relations to the `CommunicationDevice` definitions. The construct enables to perform generic, FDI Server driven (device) topology configuration. Syntax details are described in IEC 61804-3. The subsequent text describes the semantic use of the `COMPONENT_RELATION` construct.

`<CommunicationDeviceRelationId>`: The attribute value identifies the `COMPONENT_RELATION` definition describing the relation between the device component and the `CommunicationDevice` component.

`<CommunicationDeviceComponentId>`: The attribute value has to match with a `COMPONENT` identifier used in a `COMPONENT` declaration that describes a `CommunicationDevice` (see 5.2.3).

`<autoCreate>`: The attribute value describes the number of `CommunicationDevice` components that can be automatically instantiated with the Device component.

`<minNumber>/<maxNumber>/<autoCreate>`: The attribute values define the instantiation constraints. The definition of these attributes is optional. The attribute values can contain conditional expressions.

The `RELATION_TYPE` shall be set to `COMPONENT_CHILD`.

`<AddressVar>`: The attribute value is a reference to a `VARIABLE` declaration. This `VARIABLE` holds the address value for a `CommunicationDevice` instance. The definition of this attribute is optional.

`<AddrMin>/<AddrMax>`: Values define the address value range for a `CommunicationDevice` instance. The value may for example correspond to a physical slot number. Usage of attributes `ADDRESSING` and `REQUIRED_RANGES` enables generic configuration routines.

5.2.3 CommunicationDevice component

Each FDI Communication Package shall contain at least one EDD element describing at least one `CommunicationDevice` component. A modular communication hardware structure shall be described by multiple `CommunicationDevice COMPONENT` descriptions:

```
COMPONENT <CommunicationDeviceComponentId>
```

```
{  
    LABEL "<Label>";  
    CAN_DELETE <CanDelete>;  
    CLASSIFICATION NETWORK_COMPONENT;  
    COMPONENT_RELATIONS  
    {  
        <CommunicationServiceProviderRelationId>  
    }  
}
```

```
COMPONENT_RELATION <CommunicationServiceProviderRelationId>
```

```
{  
    LABEL "Relation between CommunicationDevice and communication service provider";  
    RELATION_TYPE CHILD_COMPONENT;  
    ADDRESSING {<AddressVar>}  
    COMPONENTS  
    {  
        <CommunicationServiceProviderId>  
        {  
            AUTO_CREATE <autoCreate>;  
        }  
    }  
    MINIMUM_NUMBER 1;  
}
```

```

    MAXIMUM_NUMBER <maxNumber>;
}

```

<CommunicationDeviceComponentId>: The COMPONENT identifier identifies the CommunicationDevice component.

<Label>: The string value shall contain a human readable string that allows a user to easily determine the function of the CommunicationDevice component.

<CanDelete>: Allowed values are TRUE or FALSE. It depends on whether a CommunicationDevice needs explicit configuration or whether the related communication service provider object shall be automatically instantiated with the CommunicationDevice. If the attribute CAN_DELETE is set to FALSE the CommunicationDevice configuration is static.

The definition of the COMPONENT_RELATIONS is mandatory. It describes the relation to the communication service provider definition. The construct enables the FDI Server to instantiate communication service provider components according to communication processing demands. (Syntax details are described in IEC 61804-3.) The subsequent text describes the semantic use of the COMPONENT_RELATION construct.

<CommunicationServiceProviderRelationId> The attribute value identifies the COMPONENT_RELATION definition as such.

<CommunicationServiceProviderId>: The attribute value has to match with a COMPONENT identifier used in a COMPONENT declaration that describes a communication service provider (5.2.4).

<autoCreate>: The attribute value describes the number of communication service providers that can be automatically instantiated with the CommunicationDevice component.

The RELATION_TYPE shall be set to COMPONENT_CHILD.

The PROTOCOL attribute shall not be set.

5.2.4 Communication service provider component

Each FDI Communication Package describing a Communication Device shall contain at least one EDD element describing the communication service provider. The EDD component shall not define any configuration parameter.

```

COMPONENT <CommunicationServiceProviderId>
{
    LABEL "<Label>";
    BYTE_ORDER <byteOrder>;
    CAN_DELETE <CanDelete>;
    CLASSIFICATION NETWORK_COMMUNICATION_SERVICE_PROVIDER;
    COMPONENT_RELATIONS <CommunicationServiceProvidersConnectionPointRelationId>
    {
        <ConnectionPointRelationId>
    }
}

```

```

COMPONENT_RELATION <CommunicationServiceProvidersConnectionPointRelationId>
{
    LABEL "Relation between communication service provider and connection point";
    RELATION_TYPE CHILD_COMPONENT;
    ADDRESSING {<AddressVar>}
    COMPONENTS
    {

```

```
< ConnectionPointId>
{
    AUTO_CREATE 1;
}
}
MINIMUM_NUMBER 1;
MAXIMUM_NUMBER 1;
}
```

<CommunicationServiceProviderId>: The COMPONENT identifier identifies the communication service provider.

<Label>: The string value shall contain a human readable string that allows a user to easily determine the function of the communication service provider object.

<CanDelete>: Allowed values are TRUE or FALSE. It depends on whether a communication service provider can be flexibly instantiated according to the communication processing demands. If the attribute CAN_DELETE is set to FALSE the number of communication service provider component instantiations is static. The instantiation constraints declared through the attributes AUTO_CREATE, MINIMUM_NUMBER and MAXIMUM_NUMBER correspond to the capabilities of currently supported protocols.

<byteOrder>: The value enables generic integration of n-byte data types (e.g. 4-byte Integer) into the communication message payload. The attribute value describes the byte order and shall be either BIG_ENDIAN or LITTLE_ENDIAN.

The definition of the COMPONENT_RELATIONS is mandatory. It describes the relation to the Connection Point definition. The construct enables to perform generic, FDI Server driven topology configuration. (Syntax details are described in IEC 61804-3.) The subsequent text describes the semantic use of the COMPONENT_RELATION construct.

The Connection Point shall automatically be instantiated with the communication service provider and there shall be exactly one (1) Connection Point instance connected to the communication service provider. The instantiation constraints declared through the attributes AUTO_CREATE, MINIMUM_NUMBER and MAXIMUM_NUMBER correspond to the capabilities of currently supported protocols.

<CommunicationServiceProvidersConnectionPointRelationId> The attribute value identifies the COMPONENT_RELATION declaration as such.

<ConnectionPointId>: The attribute value has to match with a COMPONENT identifier used for a COMPONENT declaration that describes a Connection Point (see 5.2.5).

The RELATION_TYPE shall be set to COMPONENT_CHILD.

The PROTOCOL attribute shall not be set.

5.2.5 Connection Point component

Each FDI Communication Package describing a Communication Device shall contain one EDD element describing one Connection Point for each of the protocols that are supported by the Communication Device:

```
COMPONENT <ConnectionPointId>
{
    LABEL "<Label>";
    CAN_DELETE FALSE;
    CLASSIFICATION NETWORK_CONNECTION_POINT;
```

```

    PROTOCOL <ProtocolId>;
    CONNECTION_POINT <ConnectionPointCollectionId>;
}

```

<ConnectionPointId>: The COMPONENT identifier identifies the Connection Point component declaration.

<Label>: The string value shall contain a string that allows a human user to determine the function of the Connection Point component.

<ProtocolId>: The value of this attribute indicates the communication capability which allows the FDI Server to find other device types that can be connected to the network using the same type of protocol. For standardized protocols the value is defined by the related field bus organization.

<ConnectionPointCollectionId>: The attribute value is a reference to a COLLECTION declaration that describes the data structure of the Connection Point as described in 5.2.6 .

5.2.6 Connection Point collection

Each EDD describing the Connection Point of a communication device shall describe the COLLECTION element that describes the attributes that shall appear in the Information Model representation of the Connection Point. The protocol specific data exposed by the Connection Point identifies the device type and its network address.

```

COLLECTION <ConnectionPointCollectionId>
{
    LABEL "<Label>";
    MEMBERS
    {
        <AddressAttributeName> <AddressAttributeVariableId>;
        VALID <VALID_VariableId>;
    }
}

```

<ConnectionPointCollectionId>: The identifier of the COLLECTION is referred by the CONNECTION_POINT attribute value defined in 7.7.3.5.

<Label>: The label identifies the Connection Point in a human readable way.

<AddressAttributeName>/<AddressAttributeVariableId>: The MEMBER section refers to the VARIABLE definitions describing the address attributes implemented by a Connection Point. The content of the MEMBER section is protocol specific.

<VALID>/<VALID_VariableId> is a Collection member referring a Boolean VARIABLE holding the validation status that shall be set by the ValidateNetwork Action (see 5.2.8).

5.2.7 Network component

Each FDI Communication Package describing a Communication Device shall contain one EDD element describing one Network for each of the protocols that are supported by the Communication Device. The definition supports the network topology engineering:

```

COMPONENT <NetworkComponentId>
{
    LABEL "<Label>";
    CAN_DELETE TRUE;
    CHECK_CONFIGURATION <Validate>;
    CLASSIFICATION NETWORK;
    PROTOCOL <ProtocolId>;
    COMPONENT_RELATIONS
    {
        <NetworksConnectionPointRelationId>

```