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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Field device integration (FDI) – Part 1: Overview

Intégration des appareils de terrain (FDI) – Partie 1: Vue d'ensemble

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Field device integration (FDI) – Part 1: Overview

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FIELD DEVICE INTEGRATION (FDI) –

Part 1: Overview

FOREWORD

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International Standard IEC 62769-1 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) digital signature now include trusted timestamping for long term validation of FDI Package;
c) support of new protocols.

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

FDIS	Report on voting
65E/758/FDIS	65E/768/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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The IEC 62769 series has the general title *Field Device Integration (FDI)* and the following parts:

– Part 1: Overview
– Part 2: FDI Client
– Part 3: FDI Server
– Part 4: FDI Packages
– Part 5: FDI Information Model
– Part 6: FDI Technology Mapping
– Part 7: FDI Communication Devices
– Part 100: Profiles – Generic Protocol Extensions
– Part 101-1: Profiles – Foundation Fieldbus H1
– Part 101-2: Profiles – Foundation Fieldbus HSE
– Part 103-1: Profiles – PROFIBUS
– Part 103-4: Profiles – PROFINET
– Part 109-1: Profiles – HART and WirelessHART
– Part 115-2: Profiles – Protocol-specific Definitions for Modbus RTU
– Part 150-1: Profiles – ISA 100.11a

FIELD DEVICE INTEGRATION (FDI) –

Part 1: Overview

1 Scope

This part of IEC 62769 describes the concepts and overview of the Field Device Integration (FDI) specifications. The detailed motivation for the creation of this technology is also described (see 4.1). Reading this document is helpful to understand the other parts of this multi-part standard.

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

IEC 62541-3, *OPC Unified Architecture – Part 3: Address Space Model*

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

IEC 62541-5, *OPC Unified Architecture – Part 5: Information Model*

IEC 62541-100, *OPC Unified Architecture – Part 100: Device Interface*

3 Terms, definitions, abbreviated terms and conventions

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions given in IEC TR 62541-1, IEC 62541-3, IEC 62541-4, IEC 62541-5, IEC 62541-100, as well as the following 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

3.1.1
Field Device Integration
FDI
device integration and device management technology, combining base concepts and technology aspects of the Electronic Device Description Language (EDDL) according to IEC 61804 and Field Device Tool (FDT®) according to IEC 62453, as well as in IEC 62541-1 (OPC UA)

Note 1 to entry: The combination of those different proven technologies ensures a secure life cycle and the ability to address all challenges of Device Integration and Device Management in a scalable manner.

3.1.2
Action
procedure that requires collaboration between an FDI Client and an FDI Server

3.1.3
Business Logic
descriptive element of an FDI Package that specifies the device-specific behavior and/or mapping logic for a Nested Communication

3.1.4
Business Logic Interface
interface through which Business Logic is integrated with the Information Model

3.1.5
Communication Device
physical device that provides access to networks and devices

Note 1 to entry: Gateways and routers are examples of communication devices.

3.1.6
Connection Point
logical representation of a connection of a communication end point to a communication network

3.1.7
Device Access Services
set of services through which a User Interface Plug-in accesses the Information Model of an FDI Server

3.1.8
Device Definition
required element of an FDI Package that provides the core definition of a device

3.1.9
Device Instance
representation of a specific device in the Information Model of an FDI Server

3.1.10
Device Tool
standalone application that contains both an FDI Client and an FDI Server

3.1.11
Device Topology
arrangement of communication networks and devices that forms a network

3.1.12
Device Type
representation of a type of device in the Information Model of an FDI Server

3.1.13
FDI Client
software component that uses the Information Model, interprets user interface descriptions, and hosts user interface plug-ins

3.1.14
FDI Communication Server
OPC UA server that is used by an FDI Server to access non-native networks

3.1.15
FDI Package
collection of components that provide all the information necessary to integrate a type of device into a system

3.1.16
FDI Server
software component that implements the Information Model, executes Business Logic, and communicates with device via Native Communication and/or Nested Communication

3.1.17
FDI Technology Version
version number that identifies to a specific revision of the overall FDI technology

3.1.18
Hosting Services
set of services through which a User Interface Plug-in interacts with an FDI Client

3.1.19
Information Model
set of objects, variables, and methods exposed by an FDI Server

3.1.20
Modular Device
device that is composed of one or more subdevices

3.1.21
Native Communication
communication with devices that are an integral part of the system

3.1.22
Nested Communication
communication with devices through a series of communication devices

3.1.23
Offline Data
device information maintained by an FDI Server that is stored in an FDI Server-specific database

3.1.24
Online Data
device information maintained by an FDI Server that is retrieved from a physical device

3.1.25
User Interface Services
UI Services
set of services through which a User Interface Plug-in accesses the operating system

3.1.26
Platform User Interface Services
platform UI services

user interface services provided natively by the operating system

3.1.27
User Interface Description
UID
descriptive element of an FDI package that is used by an FDI Client to render user interface

3.1.28
User Interface Description Interpreter
UID interpreter
software component in an FDI Client that renders user interface descriptions and invokes actions

3.1.29
User Interface Plug-In
UIP
executable element of an FDI package that is executed by an FDI Client

3.1.30
User Interface Plug-In Services
UIP services
set of services through which an FDI Client interacts with a user interface plug-in

3.2 IEC TR 62541-1 terms (OPC UA)

For the purposes of this document, the following terms and definitions given in IEC TR 62541-1 apply.

AddressSpace
Attribute
Client
Method
Node
NodeClass
Notification
Object
ObjectType
Reference
ReferenceType
Server
Service Set
Session
Subscription
Variable

3.3 IEC 62541-3 (OPC UA) terms

For the purposes of this document, the following terms and definitions given in IEC 62541-3 apply.

Aggregates
ArrayDimensions
AuditEvent
AuditUpdateMethodEvent
BrowseName
ByteString
DataType
DataVariable

Folder
HasComponent
HasProperty
HasSubType
HasTypeDefinition
ModellingRule
NodeId
Property
UserAccessLevel
UserExecutable
Value
ValueRank

3.4 IEC 62541-4 (OPC UA) terms

For the purposes of this document, the following terms and definitions given in IEC 62541-4 apply.

AddReferences
Browse
BrowseNext
Call
CreateSession
NodeManagement
Read
Request Header
Response Header
StatusCode
TranslateBrowsePathsToNodeIds
UserIdentityToken
Write

3.5 IEC 62541-5 (OPC UA) terms

For the purposes of this document, the following terms and definitions given in IEC 62541-5 apply.

BaseObjectType
PropertyType

3.6 IEC 62541-100 (OPC UA for Devices) terms

For the purposes of this document, the following terms and definitions given in IEC 62541-100 apply.

Block
Device
DeviceType
Parameter

3.7 Abbreviated terms

DTM	Device Type Manager
EDD	Electronic Device Description
EDDL	Electronic Device Description Language
FB	Function blocks
FDI	Field Device Integration
FDT®[1]	Field Device Tool (see IEC 62453)
GUI	Graphical User Interface
n/a	Not applicable
OPC	Open packaging conventions
OPC UA	OPC Unified Architecture (see IEC 62541)
PC	Personal computer
PNO	PROFIBUS Nutzerorganisation e. V. (is a regional organization of the PROFIBUS and PROFINET International consortium)
RPC	Remote Procedure Call
UI	User Interface
UID	User Interface Description
UIP	User Interface Plug-in
UUID	Universally unique identifier
XML	Extensible markup language
ZVEI	Zentralverband Elektrotechnik- und Elektronikindustrie e. V.

3.8 Conventions

Capitalization of the first letter of words beyond those defined in ISO/IEC Directives Part 2 is used in the IEC 62769 series to emphasize an FDI-specific meaning. It is used for the following cases:

- Defined terms
- Names of Services defined in IEC 62769-2
- Names of FDI Package elements defined in IEC 62769-4
- Names of Information Model elements defined in IEC 62769-5

EDD language elements are written with all letters in uppercase.

4 Background

4.1 Motivation

In today's automation systems, field devices from many different suppliers have to be integrated into the system, which results in additional effort for installation, version management and operation of these devices. This challenge is best met with an open and standardized device integration solution.

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[1] FDT logo is a trade name of the non-profit organization FDT Group AISBL. This information is given for the convenience of users of this part of IEC 62769 and does not constitute an endorsement by IEC of the trade names holder or any of its products. Compliance does not require use of the registered trade name. Use of the trade names requires permission of the trade name holder.

Two different device integration technologies exist: the Electronic Device Description Language (EDDL) in accordance with IEC 61804 and the Field Device Tool (FDT®) in accordance with IEC 62453. While these technologies take different approaches to solve the problem, there is a lot of overlap between them. This has led to a situation where the technologies compete instead of complementing each other. As a result, system suppliers have taken their positions, device suppliers have had to double their efforts in order to support EDDL and FDT®, and the end users have become frustrated because they want the best of both technologies.

For all parties involved, the ideal solution looks different. System suppliers want to achieve robustness while assuring a high level of technology and platform independence. Device suppliers want to support only one technology instead of two in order to reduce cost and effort, and they want to provide the optimal means for operating their devices. End users want to avoid false investments and therefore demand only one future-proof solution that offers all the advantages of the competing technologies.

4.2 Electronic Device Description Language (EDDL)

The Electronic Device Description Language (EDDL) is a language for describing the behavior of field devices. It enables systems to configure, calibrate, troubleshoot, and operate a field device without any prior knowledge of the device.

Device descriptions written in EDDL describe the capabilities of the field device; it is up to the system to determine how to utilize these capabilities. These device descriptions enable systems to access all the data and properties of all devices, which simplifies the maintenance, support, and operation of the devices. It works well for small handheld applications and large integrated automation systems. It works well for embedded systems and systems running on commercial operating systems.

With EDDL, the device supplier can organize the device's data, properties, and procedures for access by the end user. This provides the system guidance in dynamically creating a user interface for the device. The capabilities of this user interface can vary significantly for different classes of devices, and it can be as simple or complex as the device being described.

In the early 1990s, the first version of EDDL was created and was used to describe HART field devices. In 1996, the EDDL was used to describe FOUNDATION Fieldbus devices. Then in 2000, it was used to describe PROFIBUS devices. All three versions of EDDL can trace their lineage back to the original HART version. Therefore, all three versions are largely the same, with some differences due to differences in the underlying communication protocols. EDDL was standardized first as part of IEC 61804-3 and IEC 61804-4 in March 2004.

4.3 Field Device Tool (FDT®)

FDT® is an interface specification that standardizes the interface between the device software and the systems. It provides independence from the communication protocol and establishes a clear boundary between the software provided by the device supplier and the software provided by the system supplier.

In FDT®, field devices are delivered with a device-specific software component called a Device Type Manager (DTM), which is only functional when used in conjunction with an FDT®-specific environment called a "frame application". A frame application interacts with a DTM through a set of standard FDT® interfaces.

A device supplier can develop a DTM for each of its devices, or it can develop a DTM for a group of devices. A DTM can be used to access Device Parameters, configure and operate the device, and diagnose problems. A DTM can range from a simple Graphical User Interface (GUI) for setting Device Parameters to a highly sophisticated application for performing complex calculations for diagnosis.