

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Field Device Integration (FDI) –
Part 5: FDI Information Model**

**Intégration des appareils de terrain (FDI) –
Partie 5: Modèle d'Information FDI**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2015 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 60 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Field Device Integration (FDI) –
Part 5: FDI Information Model**

**Intégration des appareils de terrain (FDI) –
Partie 5: Modèle d'Information FDI**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 25.040.40; 35.100

ISBN 978-2-8322-2636-0

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references	10
3 Terms, definitions, abbreviated terms, acronyms and conventions.....	10
3.1 Terms and definitions.....	10
3.2 Abbreviated terms and acronyms	11
3.3 Conventions for graphical notation.....	11
4 Overview of OPC Unified Architecture	13
4.1 General.....	13
4.2 Overview of OPC UA Devices	13
5 Concepts	15
5.1 General.....	15
5.2 Device topology	15
5.3 Online/offline	17
5.4 Catalogue (Type Definitions).....	18
5.5 Communication.....	18
6 AddressSpace organization	18
7 Device Model for FDI.....	19
7.1 General.....	19
7.2 Online/offline	19
7.3 Device health.....	20
7.4 User interface elements	20
7.4.1 General	20
7.4.2 UI Description Type	21
7.4.3 UI Plug-in Type.....	21
7.5 Type-specific support information	23
7.6 Actions	23
7.6.1 Overview	23
7.6.2 Action Type.....	25
7.6.3 ActionService Type.....	25
7.6.4 ActionService Object	26
7.6.5 InvokeAction Method	26
7.6.6 RespondAction Method.....	27
7.6.7 AbortAction Method	28
8 Network and connectivity.....	28
9 Utility functions	29
9.1 Overview.....	29
9.2 Locking.....	29
9.3 EditContext.....	29
9.3.1 Overview	29
9.3.2 EditContext Type	30
9.3.3 EditContext Object.....	30
9.3.4 GetEditContext Method.....	30
9.3.5 RegisterNodes Method	31

9.3.6	Apply Method	32
9.3.7	Reset Method	33
9.3.8	Discard Method	34
9.4	Direct Device Access	34
9.4.1	General	34
9.4.2	DirectDeviceAccess Type	35
9.4.3	DirectDeviceAccess Object	36
9.4.4	InitDirectAccess Method	36
9.4.5	EndDirectAccess Method	37
9.4.6	Transfer Method	37
10	Parameter Types	38
10.1	General	38
10.2	ScalingFactor Property	39
10.3	Min_Max_Values Property	39
11	FDI StatusCodes	40
12	Specialized topology elements	40
13	Auditing	41
13.1	General	41
13.2	FDI Client-provided context information	41
13.3	LogAuditTrailMessage Method	41
14	FDI Server Version	42
15	Mapping FDI Package information to the FDI Information Model	42
15.1	General	42
15.2	Localization	43
15.2.1	Localized text	43
15.2.2	Engineering units	43
15.3	Device	43
15.3.1	General	43
15.3.2	Mapping to Attributes to a specific DeviceType Node	43
15.3.3	Mapping to Properties	43
15.3.4	Mapping to ParameterSet	44
15.3.5	Mapping to Functional Groups	44
15.3.6	Mapping to DeviceTypeImage	44
15.3.7	Mapping to Documentation	44
15.3.8	Mapping to ProtocolSupport	44
15.3.9	Mapping to ImageSet	44
15.3.10	Mapping to ActionSet	45
15.3.11	Mapping to MethodSet	45
15.4	Block	45
15.4.1	General	45
15.4.2	Mapping to Attributes	45
15.4.3	Mapping to ParameterSet	45
15.4.4	Mapping to Functional Groups	45
15.4.5	Mapping to ActionSet	46
15.4.6	Mapping to MethodSet	46
15.4.7	Instantiation rules	46
15.5	Parameter	46
15.5.1	General	46

15.5.2	Private Parameters	49
15.5.3	MIN_Value and MAX_Value	49
15.5.4	Engineering units	49
15.5.5	Enumerated Parameters	50
15.5.6	Bit-enumerated Parameters	50
15.5.7	Representation of records	50
15.5.8	Representation of arrays, and lists of Parameters with simple data types	51
15.5.9	Representation of values arrays, and lists of RECORD Parameters	52
15.5.10	Representation of COLLECTION and REFERENCE ARRAY	52
15.5.11	SCALING_FACTOR	52
15.6	Functional Groups	53
15.7	AXIS elements in UIDs	53
15.8	Actions	54
15.9	UIPs	54
15.10	Protocols, Networks and Connection Points	54
Annex A (normative)	Namespace and Mappings	55
Bibliography	56
Figure 1	– FDI architecture diagram	9
Figure 2	– OPC UA Graphical Notation for NodeClasses	11
Figure 3	– OPC UA Graphical Notation for References	11
Figure 4	– OPC UA Graphical Notation Example	12
Figure 5	– Optimized Type Reference	12
Figure 6	– OPC UA Devices Example: Functional Groups	14
Figure 7	– OPC UA Devices example: Configurable components	15
Figure 8	– Example of an automation system	16
Figure 9	– Example of a Device topology	17
Figure 10	– Example Device Types representing a catalogue	18
Figure 11	– Online component for access to device data	20
Figure 12	– Hierarchy of user interface Types	21
Figure 13	– Integration of Actions within a TopologyElement	24
Figure 14	– Action Service	26
Figure 15	– EditContext type and instance	30
Figure 16	– DirectDeviceAccessType	35
Figure 17	– DirectDeviceAccess instance	36
Figure 18	– OPC UA VariableTypes including OPC UA DataAccess	39
Figure 19	– Example: Complex variable representing a RECORD	51
Figure 20	– Complex variable representing a VALUE_ARRAY of RECORDs	52
Table 1	– UIDescriptionType Definition	21
Table 2	– UIPlugInType Definition	22
Table 3	– TopologyElementType with additions for Actions	24
Table 4	– FunctionalGroupType with additions for Actions	25
Table 5	– ActionType Definition	25
Table 6	– ActionServiceType Definition	25

Table 7 – InvokeAction Method Arguments	27
Table 8 – InvokeAction Method AddressSpace Definition	27
Table 9 – RespondAction Method Arguments	27
Table 10 – RespondAction Method AddressSpace Definition	28
Table 11 – AbortAction Method Arguments	28
Table 12 – AbortAction Method AddressSpace Definition	28
Table 13 – EditContextType Definition	30
Table 14 – GetEditContext Method Arguments	31
Table 15 – GetEditContext Method AddressSpace Definition	31
Table 16 – RegisterNodes Method Arguments	31
Table 17 – RegisterNodes Method AddressSpace Definition	32
Table 18 – RegistrationParameters DataType Structure	32
Table 19 – RegisterNodesResult DataType Structure	32
Table 20 – Apply Method Arguments	33
Table 21 – Apply Method AddressSpace Definition	33
Table 22 – ApplyResult DataType Structure	33
Table 23 – Reset Method Arguments	34
Table 24 – Reset Method AddressSpace Definition	34
Table 25 – Discard Method Arguments	34
Table 26 – Discard Method AddressSpace Definition	34
Table 27 – DirectDeviceAccessType Definition	35
Table 28 – DirectDeviceAccess Instance Definition	36
Table 29 – InitDirectAccess Method Arguments	37
Table 30 – InitDirectAccess Method AddressSpace Definition	37
Table 31 – EndDirectAccess Method Arguments	37
Table 32 – EndDirectAccess Method AddressSpace Definition	37
Table 33 – Transfer Method Arguments	38
Table 34 – Transfer Method AddressSpace Definition	38
Table 35 – ScalingFactor Property Definition	39
Table 36 – Min_Max_Values Property Definition	40
Table 37 – Variant_Range DataType Structure	40
Table 38 – Variant_Range Definition	40
Table 39 – Good operation level result codes	40
Table 40 – LogAuditTrailMessage Method Arguments	42
Table 41 – LogAuditTrailMessage Method AddressSpace Definition	42
Table 42 – FDIServerVersion Property Definition	42
Table 43 – DeviceType Property Mapping	44
Table 44 – Setting OPC UA Variable Attributes from EDDL variable attributes	47
Table 45 – Correspondence between EDDL and OPC UA standard data types	47

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE INTEGRATION (FDI) –

Part 5: FDI Information Model

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.

International Standard IEC 62769-5 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this standard is based on the following documents:

CDV	Report on voting
65E/348/CDV	65E/425/RVD

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

This publication 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 publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication 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.

Withdrawn

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:

- a) ABB Research Ltd
Claes Ryttoft
Affolterstrasse 4
Zurich, 8050
Switzerland
- b) Phoenix Contact GmbH & Co KG
Intellectual Property, Licenses & Standards
Flachsmarktstrasse 8, 32825 Blomberg
Germany
- c) Fisher Controls International LLC
John Dilger, Emerson Process Management LLLP
301 S. 1st Avenue, Marshalltown, Iowa 50158
USA
- d) 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.