

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Field device tool (FDT) interface specification –
Part 1: Overview and guidance**

**Spécification des interfaces des outils des dispositifs de terrain (FDT) –
Partie 1: Vue d'ensemble et guide**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2016 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 20 000 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

65 000 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 20 000 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

65 000 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 tool (FDT) interface specification –
Part 1: Overview and guidance**

**Spécification des interfaces des outils des dispositifs de terrain (FDT) –
Partie 1: Vue d'ensemble et guide**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 25.040.40; 35.100.05; 35.110

ISBN 978-2-8322-3745-8

**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.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms, definitions, symbols, abbreviations and conventions	8
3.1 Terms and definitions.....	8
3.2 Abbreviations	13
3.3 Conventions.....	14
4 FDT overview	14
4.1 State of the art.....	14
4.2 Objectives of FDT	15
4.2.1 General features.....	15
4.2.2 Device and module manufacturer benefits	15
4.2.3 System manufacturer and integrator benefits.....	16
4.2.4 Other applications	16
4.3 FDT model.....	16
4.3.1 General	16
4.3.2 Frame Applications.....	18
4.3.3 Device Type Manager.....	19
4.3.4 Communication Channel concept.....	20
4.3.5 Presentation object.....	22
5 Structure of the IEC 62453 series	22
5.1 Structure overview	22
5.2 Part 2 – Concepts and detailed description	24
5.3 Parts 3xy – Communication profile integration	24
5.3.1 General	24
5.3.2 Communication profile integration – IEC 61784 CPF 1.....	25
5.3.3 Communication profile integration – IEC 61784 CPF 2.....	25
5.3.4 Communication profile integration – IEC 61784 CP 3/1 and 3/2	25
5.3.5 Communication profile integration – IEC 61784 CP 3/4, CP 3/5 and 3/6.....	25
5.3.6 Communication profile integration – IEC 61784 CPF 6.....	25
5.3.7 Communication profile integration – IEC 61784 CPF 9.....	25
5.3.8 Communication profile integration – IEC 61784 CPF 15.....	25
5.4 Parts 4z – Object model integration profiles	26
5.4.1 General	26
5.4.2 Object model integration profile – Common object model (COM)	26
5.4.3 Object model integration profile – Common language infrastructure (CLI).....	26
5.5 Parts 51-xy/52-xy – Communication profile implementation.....	26
5.5.1 General	26
5.5.2 Communication profile implementation – IEC 61784 CPF 1.....	26
5.5.3 Communication profile implementation – IEC 61784 CPF 2.....	26
5.5.4 Communication profile implementation – IEC 61784 CP 3/1 and 3/2	27
5.5.5 Communication profile implementation – IEC 61784 CP 3/4, CP 3/5 and 3/6.....	27

5.5.6	Communication profile implementation – IEC 61784 CPF 6.....	27
5.5.7	Communication profile implementation – IEC 61784 CPF 9.....	27
5.5.8	Communication profile implementation – IEC 61784 CPF 15.....	27
5.6	Parts 6z – DTM styleguides	27
5.6.1	General	27
5.6.2	Device Type Manager (DTM) styleguide for common object model	27
5.6.3	Field Device Tool (FDT) styleguide for common language infrastructure	27
6	Relation of the IEC 62453 series to other standardization activities	27
7	Migration to DTM	31
8	How to read IEC 62453.....	32
8.1	Architecture	32
8.2	Dynamic behavior	32
8.3	Structured data types.....	33
8.4	Fieldbus communication.....	33
Annex A	(informative) UML notation.....	34
A.1	General.....	34
A.2	Class diagram.....	34
A.3	Statechart diagram.....	36
A.4	Use case diagram	37
A.5	Sequence diagram	38
Annex B	(informative) Implementation policy.....	39
Bibliography	40
Figure 1	– Different tools and fieldbuses result in limited integration.....	15
Figure 2	– Full integration of all devices and modules into a homogeneous system.....	16
Figure 3	– General architecture and components	17
Figure 4	– FDT software architecture	19
Figure 5	– General FDT client/server relationship	20
Figure 6	– Typical FDT channel architecture	21
Figure 7	– Channel/parameter relationship.....	22
Figure 8	– Structure of the IEC 62453 series	23
Figure 9	– Standards related to IEC 62453 in an automation hierarchy	28
Figure 10	– Standards related to IEC 62453 – Grouped by purpose	31
Figure 11	– DTM implementations.....	32
Figure A.1	– Note.....	34
Figure A.2	– Class	34
Figure A.3	– Association	34
Figure A.4	– Composition.....	35
Figure A.5	– Aggregation	35
Figure A.6	– Dependency.....	35
Figure A.7	– Abstract class, generalization and interface	35
Figure A.8	– Multiplicity	36
Figure A.9	– Elements of UML statechart diagrams.....	36

Figure A.10 – Example of UML state chart diagram.....	37
Figure A.11 – UML use case syntax.....	37
Figure A.12 – UML sequence diagram	38
Table 1 – Overview of related standards	29

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 1: Overview and guidance

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.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62453-1 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 2009. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: introduction of a new implementation technology (defined in IEC 62453-42).

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

CDV	Report on voting
65E/333/CDV	65E/393A/RVC

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 of the IEC 62453 series, under the general title *Field Device Tool (FDT) interface specification*, 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.

INTRODUCTION

Enterprise automation requires two main data flows: a “vertical” data flow from enterprise level down to the field devices including signals and configuration data, and a “horizontal” communication between field devices operating on the same or different communication technologies.

With the integration of fieldbuses into control systems, there are a few additional tasks to be performed. They may result in a large number of fieldbus- and device-specific tools in addition to system and engineering tools. Integration of these tools into higher-level system-wide planning or engineering tools is an advantage. In particular, for use in extensive and heterogeneous control systems, typically in the area of the process industry, the unambiguous definition of engineering interfaces that are easy to use for all those involved is of great importance.

Several different manufacturer specific tools are used. The data in these tools are often invisible data islands from the viewpoint of system life-cycle management and plant-wide automation.

To ensure the consistent management of a plant-wide control and automation technology, it is important to fully integrate fieldbuses, devices and sub-systems as a seamless part of a wide range of automation tasks covering the whole automation life-cycle.

IEC 62453 provides an interface specification for developers of FDT (Field Device Tool) components to support function control and data access within a client/server architecture. The availability of this standard interface facilitates development of servers and clients by multiple manufacturers and supports open interoperation.

A device or module-specific software component, called a DTM (Device Type Manager) is supplied by a manufacturer with the related device type or software entity type. Each DTM can be integrated into engineering tools via defined FDT interfaces. This approach to integration is in general open for all fieldbuses and thus supports integration of different devices and software modules into heterogeneous control systems.

The IEC 62453 common application interface supports the interests of application developers, system integrators, and manufacturers of field devices and network components. It also simplifies procurement, reduces system costs and helps manage the lifecycle. Significant savings are available in operating, engineering and maintaining the control systems.

The objectives of the IEC 62453 series are to support:

- universal plant-wide tools for life-cycle management of heterogeneous fieldbus environments, multi-manufacturer devices, function blocks and modular sub-systems for all automation domains (e.g. process automation, factory automation and similar monitoring and control applications);
- integrated and consistent life-cycle data exchange within a control system including its fieldbuses, devices, function blocks and modular sub-systems;
- simple and powerful manufacturer-independent integration of different automation devices, function blocks and modular sub-systems into the life-cycle management tools of a control system.

The FDT concept supports planning and integration of monitoring and control applications, it does not provide a solution for other engineering tasks such as “electrical wiring planning”, “mechanical planning”. Plant management subjects such as “maintenance planning”, “control optimization”, “data archiving”, are not part of this FDT standard. Some of these aspects may be included in future editions of FDT publications.

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 1: Overview and guidance

1 Scope

This part of IEC 62453 presents an overview and guidance for the IEC 62453 series. It

- explains the structure and content of the IEC 62453 series (see Clause 5);
- provides explanations of some aspects of the IEC 62453 series that are common to many of the parts of the series;
- describes the relationship to some other standards.

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 61158 (all parts), *Industrial communication networks – Fieldbus specifications*

IEC 61784 (all parts), *Industrial communication networks – Profiles*

3 Terms, definitions, symbols, abbreviations and conventions

For the purposes of this document the following terms, definitions, abbreviations and conventions apply.

3.1 Terms and definitions

3.1.1

actor

coherent set of roles that users of use cases play when interacting with these use cases

Note 1 to entry: An actor has one role for each use case with which it communicates.

[SOURCE: ISO/IEC 19501:2005, 4.11.2.1]

3.1.2

address

communication protocol specific access identifier

3.1.3

application

software functional unit that is specific to the solution of a problem in industrial-process measurement and control

Note 1 to entry: An application may be distributed among resources, and may communicate with other applications.