IEC 62453-315

Edition 1.0 2009-07

INTERNATIONAL STANDARD

Field device tool (FDT) interface specification – Part 315: Communication profile integration – IEC 61784 CPF 15

IEC 62453-315:2009(E)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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.

- Catalogue of IEC publications: www.iec.ch/searchpub

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 It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

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

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

IEC 62453-315

Edition 1.0 2009-07

INTERNATIONAL STANDARD

Field device tool (FDT) interface specification – Part 315: Communication profile integration – IEC 61784 CPF 15

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRICE CODE XA

ICS 25.040.40; 35.100.05; 35.110

ISBN 978-2-88910-725-4

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 315: Communication profile integration – IEC 61784 CPF 15

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
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 62453-315 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This part, in conjunction with the other parts of the first edition of the IEC 62453 series cancels and replaces IEC/PAS 62453-1, IEC/PAS 62453-2, IEC/PAS 62453-3, IEC/PAS 62453-4 and IEC/PAS 62453-5 published in 2006, and constitutes a technical revision.

Each part of the IEC 62453-3xy series is intended to be read in conjunction with IEC 62453-2.

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

FDIS	Report on voting
65E/131/FDIS	65E/144/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 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 maintenance result 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.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

This part of IEC 62453 is an interface specification for developers of FDT (Field Device Tool) components for function control and data access within a client/server architecture. The specification is a result of an analysis and design process to develop standard interfaces to facilitate the development of servers and clients by multiple vendors that need to interoperate seamlessly.

With the integration of fieldbusses into control systems, there are a few other tasks which need to be performed. In addition to fieldbus- and device-specific tools, there is a need to integrate these tools into higher-level system-wide planning- or engineering tools. 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.

A device-specific software component, called DTM (Device Type Manager), is supplied by the field device manufacturer with its device. The DTM is integrated into engineering tools via the FDT interfaces defined in this specification. The approach to integration is in general open for all kinds of fieldbusses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Figure 1 shows how IEC 62453-315 is aligned in the structure of the IEC 62453 series.

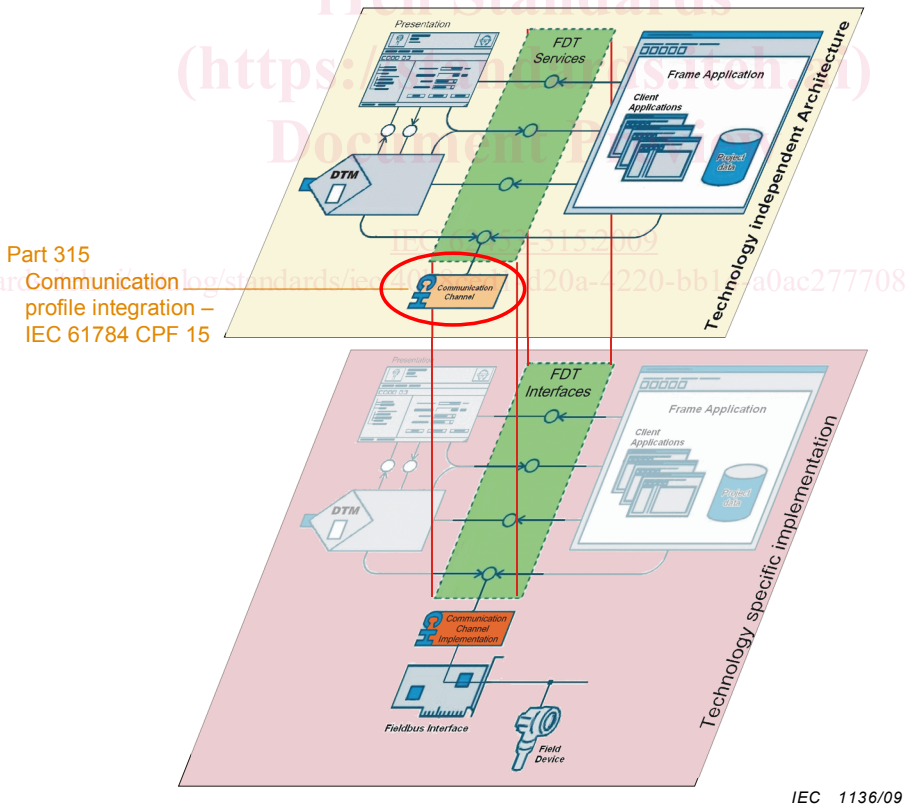

Figure 1 – Part 315 of the IEC 62453 series

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 315: Communication profile integration – IEC 61784 CPF 15

1 Scope

Communication Profile Family 15 (commonly known as Modbus[1]) defines communication profiles based on IEC 61158-5-15 and IEC 61158-6-15. The basic profile CP 15/1 (Modbus TCP) is defined in IEC 61784-1. An additional communication profile (Modbus Serial Line) is defined in [2].

This part of the IEC 62453 provides information for integrating Modbus TCP® and Modbus Serial Line® protocol support into FDT based systems.

NOTE This part of IEC 62453 only specifies the mapping of Modbus parameters to FDT data types. For restrictions of protocol specific parameters concerning allowed values and concerning limitations of arrays used in the definition of FDT data types, refer to IEC 61158-5-15 and the MODBUS Application Protocol Specification.

2 Normative references

The following referenced documents are indispensable for the application 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 61131-3, *Programmable controllers – Part 3: Programming languages*

IEC 61158-5-15, *Industrial communication networks – Fieldbus specifications – Part 5-15: Application layer service definition – Type 15 elements*

IEC 61158-6-15, *Industrial communication networks – Fieldbus specifications – Part 6-20: Application layer protocol specification – Type 15 elements*

IEC 61784-1, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

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

IEC 62453-1:2009, *Field Device Tool (FDT) interface specification – Part 1: Overview and guidance*

IEC 62453-2:2009, *Field Device Tool (FDT) interface specification – Part 2: Concepts and detailed description*

RFC 791, *Internet Protocol (available at <http://www.ietf.org/rfc/rfc0791.txt)*

---

1) Modbus is the trademark of Schneider Automation Inc. It is registered in the United States of America. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by IEC of the trademark holder or any of its products. Compliance to this profile does not require use of the trademark Modbus. Use of the trademark Modbus requires permission from Schneider Automation Inc.

3 Terms, definitions, symbols, abbreviated terms and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62453-1, IEC 62453-2 and the following apply.

3.2 Abbreviated terms

For the purposes of this document, the abbreviations given in IEC 62453-1, IEC 62453-2 and the following apply.

ASCII	American Standard Code for Information Interchange
DTM	Device Type Manager
FA	Frame Application
IP	Internet Protocol
RFC	Request For comment
TCP	Transmission Control Protocol

3.3 Conventions

3.3.1 Data type names and references to data types

The conventions for naming and referencing of data types are explained in IEC 62453-2 Clause A.1

3.3.2 Vocabulary for requirements

The following expressions are used when specifying requirements.

– Usage of “shall” or “mandatory”	– No exceptions allowed.
– Usage of “should” or “recommended”	– Strong recommendation. It may make sense in special exceptional cases to differ from the described behaviour.
– Usage of “can’ or “optional’	– Function or behaviour may be provided, depending on defined conditions.

4 Bus category

The Modbus protocol is identified in the protocolId element of the structured data type 'fdt:BusCategory' by the following unique identifiers (see Table 1).

Table 1 – Protocol identifiers

Identifier value	ProtocolId name	Description
59629a40-285f-11db-a98b-0800200c9a66	‘Modbus over Serial Line’	Modbus over Serial Line
59629a41-285f-11db-a98b-0800200c9a66	‘Modbus over TCP’	Modbus over TCP

5 Access to instance and device data

5.1 Process Channel objects provided by DTM

For Modbus no minimum set of parameters is defined which must be provided by a DTM. If a DTM provides process values, the process variables should be modeled as Process Channels.

5.2 DTM services to access instance and device data

Not applicable.

6 Protocol specific behavior

6.1 General

This clause specifies how unconfirmed Modbus requests shall be handled in FDT. Two types of unconfirmed Modbus requests are supported in FDT:

- broadcasts;
- unconfirmed private Modbus requests.

6.2 Broadcasting

In broadcast mode, a DTM can send a Modbus request to all devices connected to the bus. This mode is only supported for devices, which are connected via Modbus Serial Line. The connection can either be a direct connection or a connection via a gateway. The broadcast mode must be initiated by a fdtmodbus:ConnectRequest with the slave address of the target device set to 0 (slaveAddress=0). For more detailed information about the address information which has to be provided for broadcast mode, see Table 2.

Table 2 – Address information for broadcast mode

Data type	Definition			Description
	Elementary data types	Usage	Multiplicity	
ModbusSerial	STRUCT			Address information for Modbus Serial Line
	slaveAddress	M	[1..1]	Shall be 0 for broadcast mode
ModbusTCP	STRUCT			Address information for Modbus TCP:
	slaveAddress	M	[1..1]	Shall be 0 for broadcast mode
	tcpAddress	M	[1..1]	IP address of the Modbus TCP/ Modbus Serial Line gateway
	tcpPort	O	[0..1]	Port for Modbus TCP connection (if no port information is provided, the default port 502 shall be used)

Because in broadcast mode no response will be returned by the device, the broadcast mode shall be used only with the transaction requests shown in Table 3:

Table 3 – Broadcast transaction requests

Broadcast transaction requests	Restrictions
WriteSingleCoilReq	None
WriteSingleRegisterReq	None
DiagnosticsReq	This transaction request shall be used in broadcast mode only with the following sub-functions: - 0x01: Restart Communication Option - 0x03: Change ASCII Input Delimiter - 0x04: Force Listen Only Mode - 0x0A: Clear Counters and Diagnostic Register - 0x14: Clear Overrun Counter and Flag
WriteMultipleCoilsReq	None
WriteMultipleRegistersReq	None
WriteFileRecordReq	None
MaskWriteRegisterReq	None
PrivateModbusReq	Shall be used only with private services where no response is required from the device

Although in broadcast mode no response will be returned by the target devices a transaction response, which corresponds to the transaction request shall be generated. This transaction response shall be generated in order to inform the DTM that the broadcast request was sent on the bus. If a Modbus Communication DTM is used to establish the communication, it has to provide this generated transaction response (see Figure 2 and Figure 3).

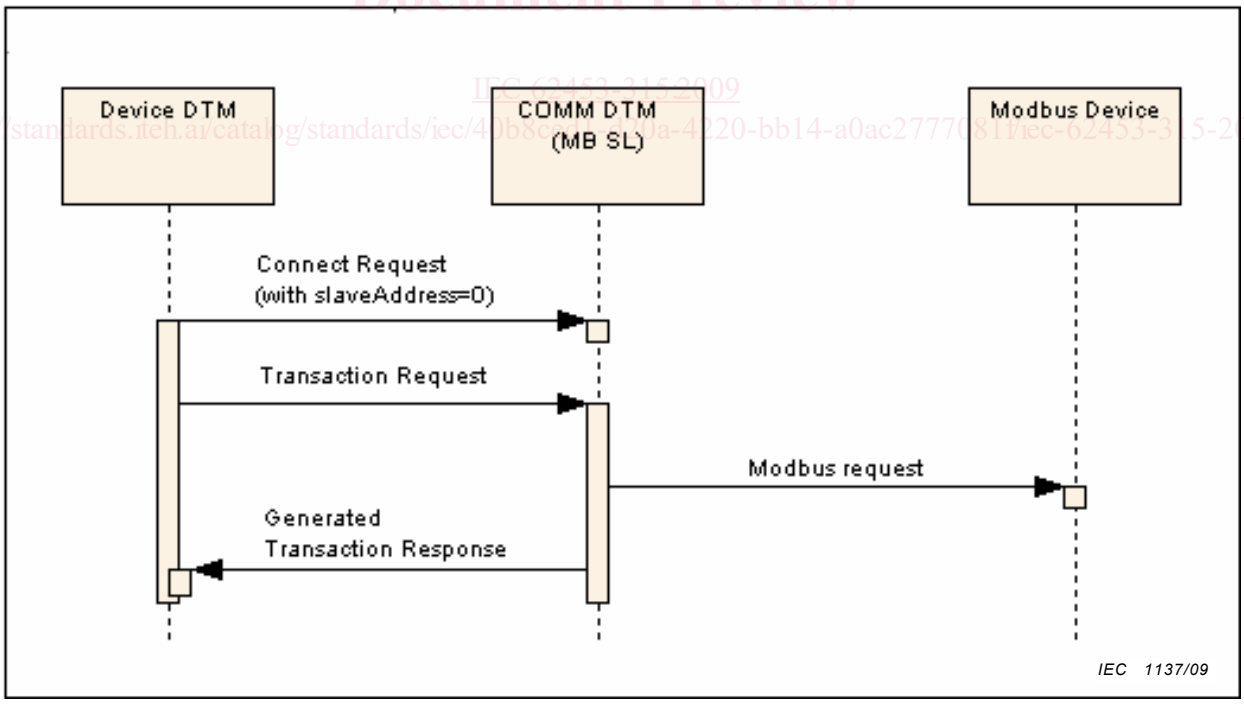

Figure 2 – Broadcast sequence with Modbus Serial Line Communication DTM