

This is a preview - click here to buy the full publication



IEC TR 62453-52-150

Edition 1.0 2017-06

TECHNICAL REPORT



**Field device tool (FDT) interface specification –
Part 52-150: Communication implementation for common language
infrastructure – IEC 61784 CPF 15**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 25.040.40; 35.100.05; 35.110

ISBN 978-2-8322-4336-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references	11
3 Terms, definitions, symbols, abbreviated terms and conventions	12
3.1 Terms and definitions.....	12
3.2 Symbols and abbreviated terms	12
3.3 Conventions.....	12
3.3.1 Datatype names and references to datatypes	12
3.3.2 Vocabulary for requirements	12
3.3.3 Use of UML	12
4 Bus category	12
5 Access to instance and device data	12
5.1 General.....	12
5.2 IO signals provided by DTM.....	13
5.3 Data interfaces	13
5.3.1 Common data set	13
5.3.2 Mapping of Modbus datatypes to FDT datatypes.....	13
5.3.3 SemanticInfo	13
6 Protocol specific behaviour.....	14
6.1 Modbus data and addressing model.....	14
6.2 Modbus-related information of a Device DTM.....	15
6.3 Broadcasting.....	15
6.4 Unconfirmed private Modbus request.....	16
7 Protocol specific usage of general datatypes	16
8 Protocol specific common datatype: ModbusDeviceAddress	17
9 Network management datatypes.....	18
9.1 General.....	18
9.2 Configuration	19
9.3 Process Data Items.....	19
9.4 Parameterization.....	19
10 Communication datatypes.....	19
10.1 General.....	19
10.2 ModbusConnectRequest	19
10.3 ModbusConnectResponse	20
10.4 ModbusDisconnectRequest.....	20
10.5 ModbusDisconnectResponse	21
10.6 ModbusAbortMessage.....	21
10.7 ModbusReadCoilsRequest	22
10.8 ModbusReadCoilsResponse	23
10.9 ModbusReadDiscreteInputsRequest	24
10.10 ModbusReadDiscreteInputsResponse	24
10.11 ModbusReadHoldingRegistersRequest	25
10.12 ModbusReadHoldingRegistersResponse.....	26
10.13 ModbusReadInputRegistersRequest	27
10.14 ModbusReadInputRegistersResponse.....	28

10.15	ModbusWriteSingleCoilRequest	29
10.16	ModbusWriteSingleCoilResponse	30
10.17	ModbusWriteSingleRegisterRequest	30
10.18	ModbusWriteSingleRegisterResponse	31
10.19	ModbusReadExceptionStatusRequest	32
10.20	ModbusReadExceptionStatusResponse	32
10.21	ModbusDiagnosticsRequest	33
10.22	ModbusDiagnosticsResponse	34
10.23	ModbusGetCommEventCounterRequest	35
10.24	ModbusGetCommEventCounterResponse	35
10.25	ModbusGetCommEventLogRequest	36
10.26	ModbusGetCommEventLogResponse	37
10.27	IModbusWriteMultipleCoilsRequest	38
10.28	ModbusWriteMultipleCoilsResponse	39
10.29	ModbusWriteMultipleRegistersRequest	39
10.30	ModbusWriteMultipleRegistersResponse	40
10.31	ModbusReportSlaveIDRequest	41
10.32	ModbusReportSlaveIDResponse	41
10.33	ModbusReadFileRecordRequest	42
10.34	ModbusReadFileSubRequest	43
10.35	ModbusReadFileRecordResponse	44
10.36	ModbusReadFileSubResponse	45
10.37	ModbusWriteFileRecordRequest	45
10.38	ModbusWriteFileSubRequest	46
10.39	ModbusWriteFileRecordResponse	47
10.40	ModbusMaskWriteRegisterRequest	47
10.41	ModbusMaskWriteRegisterResponse	48
10.42	ModbusReadWriteRegistersRequest	49
10.43	ModbusReadWriteRegistersResponse	50
10.44	ModbusReadFiFoQueueRequest	51
10.45	ModbusReadFiFoQueueResponse	52
10.46	ModbusEncapsulatedInterfaceTransportRequest	53
10.47	ModbusEncapsulatedInterfaceTransportResponse	53
10.48	ModbusReadDeviceIdentificationRequest	54
10.49	ModbusReadDeviceIdentificationResponse	55
10.50	ModbusPrivateRequest	58
10.51	ModbusPrivateResponse	58
10.52	ModbusUnconfirmedPrivateRequest	59
10.53	ModbusUnconfirmedPrivateResponse	60
10.54	ModbusExceptionResponse	61
11	Datatypes for process data information	62
11.1	General	62
11.2	ModbusIOSignalInfo	62
11.3	Mapping of Modbus datatypes to FDT datatypes	63
12	Device identification	63
12.1	General	63
12.2	ModbusDeviceScanInfo datatype	63
12.3	ModbusDeviceIdentInfo datatype	64
12.4	Mapping of Information Source	66

Bibliography.....	68
Figure 1 – Part 52-150 of the IEC 62453 series	10
Figure 2 – Modbus data and addressing model	15
Figure 3 – ModbusDeviceAddress.....	17
Figure 4 – ModbusNetworkData	18
Figure 5 – ModbusConnectRequest	19
Figure 6 – ModbusConnectResponse.....	20
Figure 7 – ModbusDisconnectRequest.....	21
Figure 8 – ModbusDisconnectResponse	21
Figure 9 – ModbusAbortMessage	22
Figure 10 – ModbusReadCoilsRequest	22
Figure 11 – ModbusReadCoilsResponse.....	23
Figure 12 – ModbusReadDiscreteInputsRequest.....	24
Figure 13 – ModbusReadDiscreteInputsResponse	25
Figure 14 – ModbusReadHoldingRegistersRequest.....	26
Figure 15 – ModbusReadHoldingRegistersResponse	27
Figure 16 – ModbusReadInputRegistersRequest.....	28
Figure 17 – ModbusReadInputRegistersResponse	28
Figure 18 – ModbusWriteSingleCoilRequest	29
Figure 19 – ModbusWriteSingleCoilResponse.....	30
Figure 20 – ModbusWriteSingleRegisterRequest	31
Figure 21 – ModbusWriteSingleRegisterResponse.....	31
Figure 22 – ModbusReadExceptionStatusRequest.....	32
Figure 23 – ModbusReadExceptionStatusResponse	33
Figure 24 – ModbusDiagnosticsRequest	34
Figure 25 – ModbusDiagnosticsResponse.....	34
Figure 26 – ModbusGetCommEventCounterRequest.....	35
Figure 27 – ModbusGetCommEventCounterResponse	36
Figure 28 – ModbusGetCommEventLogRequest	37
Figure 29 – ModbusGetCommEventLogResponse	37
Figure 30 – ModbusWriteMultipleCoilsRequest	38
Figure 31 – ModbusWriteMultipleCoilsResponse.....	39
Figure 32 – ModbusWriteMultipleRegistersRequest	40
Figure 33 – ModbusWriteMultipleRegistersResponse.....	40
Figure 34 – ModbusReportSlaveIDRequest.....	41
Figure 35 – ModbusReportSlaveIDResponse	42
Figure 36 – ModbusReadFileRecordRequest	43
Figure 37 – ModbusReadFileSubRequest	43
Figure 38 – ModbusReadFileRecordResponse.....	44
Figure 39 – ModbusReadFileSubResponse.....	45
Figure 40 – ModbusWriteFileRecordRequest	46
Figure 41 – ModbusWriteFileSubRequest	46

Figure 42 – ModbusWriteFileRecordResponse	47
Figure 43 – ModbusMaskWriteRegisterRequest	48
Figure 44 – ModbusMaskWriteRegisterResponse	49
Figure 45 – ModbusReadWriteRegistersRequest	50
Figure 46 – ModbusReadWriteRegistersResponse	51
Figure 47 – ModbusReadFiFoQueueRequest	52
Figure 48 – ModbusReadFiFoQueueResponse	52
Figure 49 – ModbusEncapsulatedInterfaceTransportRequest	53
Figure 50 – ModbusEncapsulatedInterfaceTransportResponse	54
Figure 51 – ModbusReadDeviceIdentificationRequest	55
Figure 52 – ModbusReadDeviceIdentificationResponse	56
Figure 53 – ModbusIdentificationObject	56
Figure 54 – ModbusPrivateRequest	58
Figure 55 – ModbusPrivateResponse	59
Figure 56 – ModbusUnconfirmedPrivateRequest	60
Figure 57 – ModbusUnconfirmedPrivateResponse	60
Figure 58 – ModbusExceptionResponse	61
Figure 59 – ModbusIOSignalInfo	62
Figure 60 – ModbusDeviceScanInfo	64
Figure 61 – ModbusDeviceIdentInfo	65
Table 1 – Mapping of datatypes	13
Table 2 – Usage of general datatypes	14
Table 3 – Usage of broadcasts in transaction requests	16
Table 4 – Protocol specific usage of general datatypes	17
Table 5 – ModbusDeviceAddress	18
Table 6 – ModbusDeviceSerialAddress	18
Table 7 – ModbusDeviceTcpAddress	18
Table 8 – Modbus Network Data	19
Table 9 – ModbusConnectRequest datatype	20
Table 10 – ModbusConnectResponse datatype	20
Table 11 – ModbusDisconnectRequest datatype	21
Table 12 – ModbusDisconnectResponse datatype	21
Table 13 – ModbusAbortMessage datatype	22
Table 14 – ModbusReadCoilsRequest datatype	23
Table 15 – ModbusReadCoilsResponse datatype	23
Table 16 – ModbusReadDiscreteInputsRequest datatype	24
Table 17 – ModbusReadDiscreteInputsResponse datatype	25
Table 18 – ModbusReadHoldingRegistersRequest datatype	26
Table 19 – ModbusReadHoldingRegistersResponse datatype	27
Table 20 – ModbusReadInputRegistersRequest datatype	28
Table 21 – ModbusReadInputRegistersResponse datatype	29
Table 22 – ModbusWriteSingleCoilRequest datatype	29

Table 23 – ModbusWriteSingleCoilResponse datatype.....	30
Table 24 – ModbusWriteSingleRegisterRequest datatype	31
Table 25 – ModbusWriteSingleRegisterResponse datatype.....	32
Table 26 – ModbusReadExceptionStatusRequest datatype.....	32
Table 27 – ModbusReadExceptionStatusResponse datatype	33
Table 28 – ModbusDiagnosticsRequest datatype	34
Table 29 – ModbusDiagnosticsResponse datatype	35
Table 30 – ModbusGetCommEventCounterRequest datatype	35
Table 31 – ModbusGetCommEventCounterResponse datatype.....	36
Table 32 – ModbusGetCommEventLogRequest datatype	37
Table 33 – ModbusGetCommEventLogResponse datatype	38
Table 34 – ModbusWriteMultipleCoilsRequest datatype	39
Table 35 – ModbusWriteMultipleCoilsResponse datatype	39
Table 36 – ModbusWriteMultipleRegistersRequest datatype	40
Table 37 – ModbusWriteMultipleRegistersResponse	41
Table 38 – ModbusReportSlaveIDRequest datatype	41
Table 39 – ModbusReportSlaveIDResponse	42
Table 40 – ModbusReadFileRecordRequest datatype	43
Table 41 – ModbusReadFileSubRequest datatype	44
Table 42 – ModbusReadFileRecordResponse	45
Table 43 – ModbusReadFileSubResponse	45
Table 44 – ModbusWriteFileRecordRequest datatype	46
Table 45 – ModbusWriteFileSubRequest datatype	47
Table 46 – ModbusWriteFileRecordResponse	47
Table 47 – ModbusMaskWriteRegisterRequest datatype.....	48
Table 48 – ModbusMaskWriteRegisterResponse	49
Table 49 – ModbusReadWriteRegistersRequest datatype	50
Table 50 – ModbusReadWriteRegistersResponse	51
Table 51 – ModbusReadFiFoQueueRequest datatype.....	52
Table 52 – ModbusReadFiFoQueueResponse	53
Table 53 – ModbusEncapsulatedInterfaceTransportRequest datatype.....	53
Table 54 – ModbusEncapsulatedInterfaceTransportResponse	54
Table 55 – ModbusReadDeviceIdentificationRequest datatype	55
Table 56 – ModbusReadDeviceIdentificationResponse	57
Table 57 – ModbusIdentificationObject	58
Table 58 – ModbusPrivateRequest datatype	58
Table 59 – ModbusPrivateResponse	59
Table 60 – ModbusUnconfirmedPrivateRequest datatype.....	60
Table 61 – ModbusUnconfirmedPrivateResponse	61
Table 62 – ModbusExceptionResponse.....	62
Table 63 – ModbusIOSignalInfo datatype.....	63
Table 64 – ModbusDeviceScanInfo datatype.....	64
Table 65 – ModbusDeviceIdentInfo datatype.....	65

Table 66 – Protocol specific mapping of scan information	66
Table 67 – Profile specific mapping of identification information.....	67

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 52-150: Communication implementation for common language infrastructure – 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 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.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 62453-52-150, which is a technical report, has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

Each part of the IEC 62453-52-xy series is intended to be read in conjunction with its corresponding part in the IEC 62453-3xy series. This document corresponds to IEC 63453-315.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
65E/440/DTR	65E/514/RVC

Full information on the voting for the approval of this technical report 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.

The 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 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.

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

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

This part of IEC 62453 is an interface specification for developers of Field Device Tool (FDT) 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 fieldbuses 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 Device Type Manager (DTM), 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 kind of fieldbuses and thus meets the requirements for integrating different kinds of devices into heterogeneous control systems.

Figure 1 shows how this part of the IEC 62453-52-xy series is aligned in the structure of the IEC 62453 series.

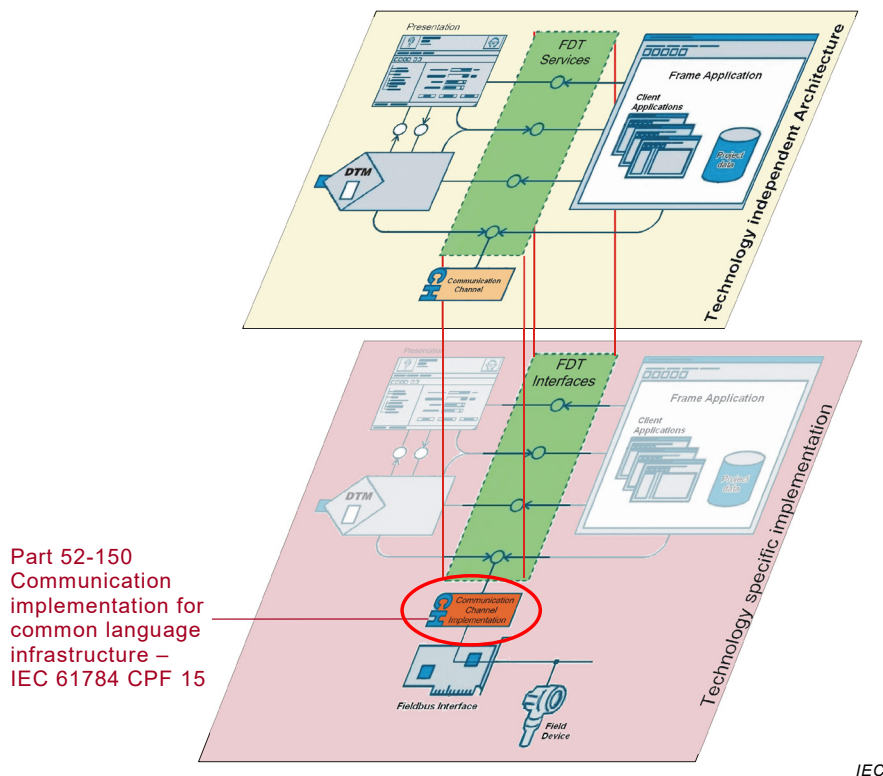


Figure 1 – Part 52-150 of the IEC 62453 series

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 52-150: Communication implementation for common language infrastructure – IEC 61784 CPF 15

1 Scope

This part of the IEC 62453-52-xy series, which is a Technical Report, provides information for integrating the Modbus®¹ technology into the CLI-based implementation of FDT interface specification (IEC TR 62453-42).

This part of IEC 62453 specifies the implementation of communication and other services based on IEC 62453-315.

This document neither contains the FDT specification nor modifies it.

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 61131-3:2013, *Programmable controllers – Part 3: Programming languages*

IEC 61158-5-15:2010, *Industrial communication networks – Fieldbus specifications – Part 5-15: Application layer service definition – Type 15 elements*

IEC 61784-1:2014, *Industrial communication networks – Profiles – Part 1: Fieldbus profiles*

IEC 62453-1:2016, *Field device tool (FDT) interface specification – Part 1: Overview and guidance*

IEC 62453-2:2016, *Field device tool (FDT) interface specification – Part 2: Concepts and detailed description*

IEC TR 62453-42:2016, *Field device tool (FDT) interface specification – Part 42: Object model integration profile – Common language infrastructure*

IEC 62453-315:2009, *Field device tool (FDT) interface specification – Part 315: Communication profile integration – IEC 61784 CPF 15*

IEC 62453-315:2009/AMD1:2016

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 document 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.