



BSI Standards Publication

Field device tool (FDT) interface specification

Part 315: Communication profile integration — IEC 61784 CPF 15

National foreword

This British Standard is the UK implementation of EN 62453-315:2009+A1:2017. It is identical to IEC 62453-315:2009, incorporating amendment 1:2016. It supersedes BS EN 62453-315:2009, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by **A1** **A1**.

The UK participation in its preparation was entrusted to Technical Committee GEL/65/3, Industrial communications: process measurement and control, including fieldbus.

A list of organizations represented on this committee can be obtained on request to its secretary.

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© The British Standards Institution 2020
Published by BSI Standards Limited 2020

ISBN 978 0 539 02182 0

ICS 25.040.40; 35.100.05; 35.110

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2010.

Amendments/corrigenda issued since publication

Date	Text affected
30 June 2018	Implementation of IEC amendment 1:2016 with CENELEC endorsement A1:2017
30 June 2020	Figure image resolution corrected

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

Spécification des interfaces des outils
des dispositifs de terrain (FDT) -
Partie 315: Intégration des profils
de communication -
CEI 61784 CPF 15
(CEI 62453-315:2009)

Field Device Tool (FDT)-
Schnittstellenspezifikation -
Teil 315: Integration
von Kommunikationsprofilen -
Kommunikationsprofilfamilie (CPF) 15
nach IEC 61784
(IEC 62453-315:2009)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

European foreword

The text of document 65E/131/FDIS, future edition 1 of IEC 62453-315, prepared by SC 65E, Devices and integration in enterprise systems, of IEC TC 65, Industrial-process measurement, control and automation, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62453-315 on 2009-08-01.

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

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2010-05-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2012-08-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62453-315:2009 was approved by CENELEC as a European Standard without any modification.

European foreword to amendment A1

The text of document 65E/336/CDV, future IEC 62453-315:2009/A1, prepared by SC 65E "Devices and integration in enterprise systems" of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62453-315:2009/A1:2017.

The following dates are fixed:

- latest date by which the document has to be (dop) 2018-05-24
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2020-11-24
standards conflicting with the
document have to be withdrawn

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61131-3	— ¹⁾	Programmable controllers - Part 3: Programming languages	EN 61131-3	2003 ²⁾
IEC 61158-5-15	— ¹⁾	Industrial communication networks - Fieldbus specifications - Part 5-15: Application layer service definition - Type 15 elements	EN 61158-5-15	2008 ²⁾
IEC 61158-6-15	— ¹⁾	Industrial communication networks - Fieldbus specifications - Part 6-15: Application layer protocol specification - Type 15 elements	EN 61158-6-15	2008 ²⁾
IEC 61784-1	— ¹⁾	Industrial communication networks - Profiles - Part 1: Fieldbus profiles	EN 61784-1	2008 ²⁾
IEC 61784-2	— ¹⁾	Industrial communication networks - Profiles - Part 2: Additional fieldbus profiles for real-time networks based on ISO/IEC 8802-3	EN 61784-2	2008 ²⁾
IEC 62453-1	2009	Field device tool (FDT) interface specification - Part 1: Overview and guidance	EN 62453-1	2009
IEC 62453-2	2009	Field device tool (FDT) interface specification - Part 2: Concepts and detailed description	EN 62453-2	2009
IETF RFC 791	— ¹⁾	Internet Protocol - DARPA Internet Program Protocol Specification	-	-

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

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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.
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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.

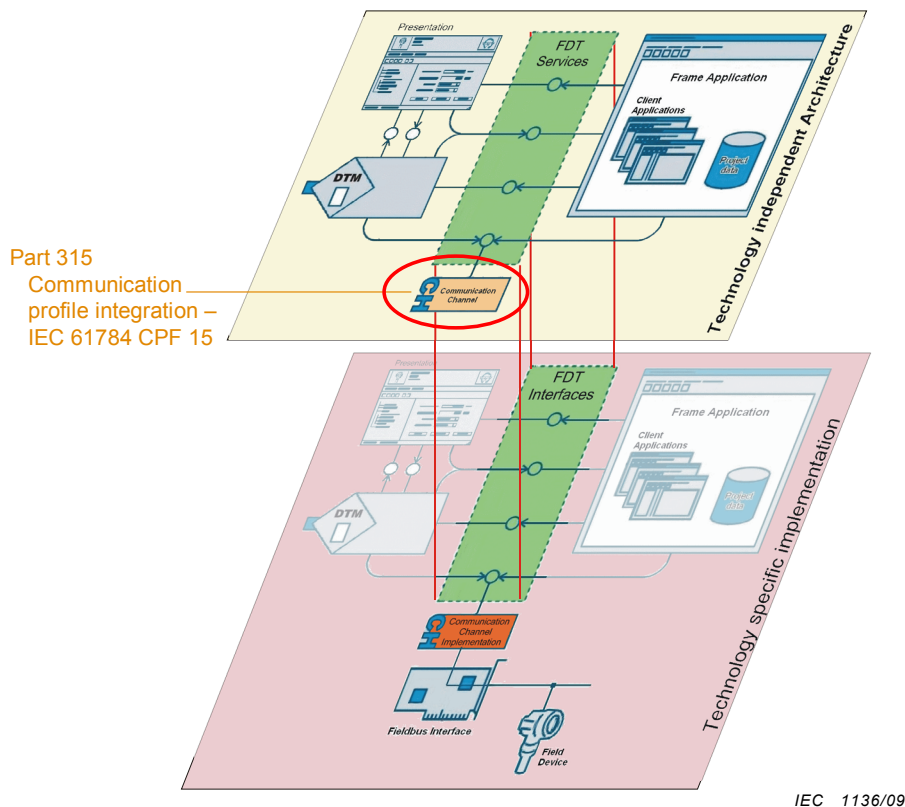


Figure 1 – Part 315 of the IEC 62453 series

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 315: Communication profile integration – IEC 61784 CPF 15

1 Scope

Communication Profile Family 15 (commonly known as Modbus¹) 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”
- Usage of “should” or “recommended”
- Usage of “can” or “optional”
- No exceptions allowed.
- Strong recommendation. It may make sense in special exceptional cases to differ from the described behaviour.
- 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

 Modbus TCP is using the following unique identifiers in physicalLayer members within PhysicalLayer data type (see Table 103):

Table 103 – Physical layer identifiers for Modbus TCP

Identifier value	Description
307DD810-C010-11DB-90E7-0002B3ECDCBE	100BaseTXFD (default for Media Type Copper)
307DD812-C010-11DB-90E7-0002B3ECDCBE	100BaseFXFD (default for Media Type Fiber Optic)
307DD813-C010-11DB-90E7-0002B3ECDCBE	100BaseLX10
307DD816-C010-11DB-90E7-0002B3ECDCBE	1000BaseXFD
307DD818-C010-11DB-90E7-0002B3ECDCBE	1000BaseLXFD
307DD81A-C010-11DB-90E7-0002B3ECDCBE	1000BaseSXFD
307DD81C-C010-11DB-90E7-0002B3ECDCBE	1000BaseTFD
307DD81D-C010-11DB-90E7-0002B3ECDCBE	10GbaseFX
307DD81E-C010-11DB-90E7-0002B3ECDCBE	10GbaseLX4
307DD81F-C010-11DB-90E7-0002B3ECDCBE	10GBaseR
307DD820-C010-11DB-90E7-0002B3ECDCBE	10GbaseER
307DD821-C010-11DB-90E7-0002B3ECDCBE	10GbaseLR
307DD822-C010-11DB-90E7-0002B3ECDCBE	10GbaseSR
307DD823-C010-11DB-90E7-0002B3ECDCBE	10GbaseW
307DD824-C010-11DB-90E7-0002B3ECDCBE	10GbaseEW
307DD824-C010-11DB-90E7-0002B3ECDCBE	10GbaseLW
307DD825-C010-11DB-90E7-0002B3ECDCBE	10GbaseSW
307DD826-C010-11DB-90E7-0002B3ECDCBE	10GbaseCX4
307DD827-C010-11DB-90E7-0002B3ECDCBE	2BaseTL
307DD828-C010-11DB-90E7-0002B3ECDCBE	10PassTS
307DD829-C010-11DB-90E7-0002B3ECDCBE	100BaseBX10D
307DD82A-C010-11DB-90E7-0002B3ECDCBE	100BaseBX10U
307DD82B-C010-11DB-90E7-0002B3ECDCBE	100BaseLX10
307DD82C-C010-11DB-90E7-0002B3ECDCBE	1000BaseBX10D
307DD82D-C010-11DB-90E7-0002B3ECDCBE	1000BaseBX10U
307DD82F-C010-11DB-90E7-0002B3ECDCBE	1000BaseLX10
307DD830-C010-11DB-90E7-0002B3ECDCBE	1000BasePX10D
307DD831-C010-11DB-90E7-0002B3ECDCBE	1000BasePX10U
307DD832-C010-11DB-90E7-0002B3ECDCBE	1000BasePX20D
307DD833-C010-11DB-90E7-0002B3ECDCBE	1000BasePX20U
307DD834-C010-11DB-90E7-0002B3ECDCBE	10GBaseT or 100BasePXFD
307DD835-C010-11DB-90E7-0002B3ECDCBE	10GBaseLRM
307DD836-C010-11DB-90E7-0002B3ECDCBE	1000BaseKX
307DD837-C010-11DB-90E7-0002B3ECDCBE	1000BaseKX4
307DD838-C010-11DB-90E7-0002B3ECDCBE	1000BaseKR
307DD839-C010-11DB-90E7-0002B3ECDCBE	10G1GBasePRXD1
307DD83A-C010-11DB-90E7-0002B3ECDCBE	10G1GBasePXR2D
307DD83B-C010-11DB-90E7-0002B3ECDCBE	10G1GBasePXR3D
307DD83C-C010-11DB-90E7-0002B3ECDCBE	10G1GBasePRXU1
307DD83D-C010-11DB-90E7-0002B3ECDCBE	10G1GBasePXR2U
307DD83E-C010-11DB-90E7-0002B3ECDCBE	10G1GBasePXR3U
307DD83F-C010-11DB-90E7-0002B3ECDCBE	10GBasePRD1
307DD840-C010-11DB-90E7-0002B3ECDCBE	10GBasePRD2

Identifier value	Description
307DD841-C010-11DB-90E7-0002B3ECDCBE	10GBasePRD3
307DD842-C010-11DB-90E7-0002B3ECDCBE	10GBasePRU1
307DD843-C010-11DB-90E7-0002B3ECDCBE	10GBasePRU3
307DD844-C010-11DB-90E7-0002B3ECDCBE	40GbaseKR4
307DD845-C010-11DB-90E7-0002B3ECDCBE	40GbaseCR4
307DD845-C010-11DB-90E7-0002B3ECDCBE	40GbaseSR4
307DD846-C010-11DB-90E7-0002B3ECDCBE	40GbaseFR
307DD847-C010-11DB-90E7-0002B3ECDCBE	40GbaseLR4
307DD848-C010-11DB-90E7-0002B3ECDCBE	100GbaseCR10
307DD849-C010-11DB-90E7-0002B3ECDCBE	100GbaseSR10
307DD84A-C010-11DB-90E7-0002B3ECDCBE	100GbaseLR4
307DD84B-C010-11DB-90E7-0002B3ECDCBE	100GbaseER4
307DD84C-C010-11DB-90E7-0002B3ECDCBE	100BasePXFD
307DD84D-C010-11DB-90E7-0002B3ECDCBE	Radio Communication
307DD84E-C010-11DB-90E7-0002B3ECDCBE	Speed of 100 Mbit/s (and more) and full duplexity

Modbus Serial is using the following unique identifiers in physicalLayer members within PhysicalLayer data type (see Table 104):

Table 104 – Physical layer identifiers for Modbus Serial

Identifier value	Description
C0458028-F240-45A5-8664-70DC84FDC6FE	RS-232
3BF008DC-5A44-4220-8C3E-3C46A589A0B4	RS-422
036D1591-387B-11D4-86E1-00E0987270B9	RS-485

The DataLinkLayer property is not applicable for Modbus and has to be set to null. ^(A1)

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	U s a g e	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: <ul style="list-style-type: none"> - 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).

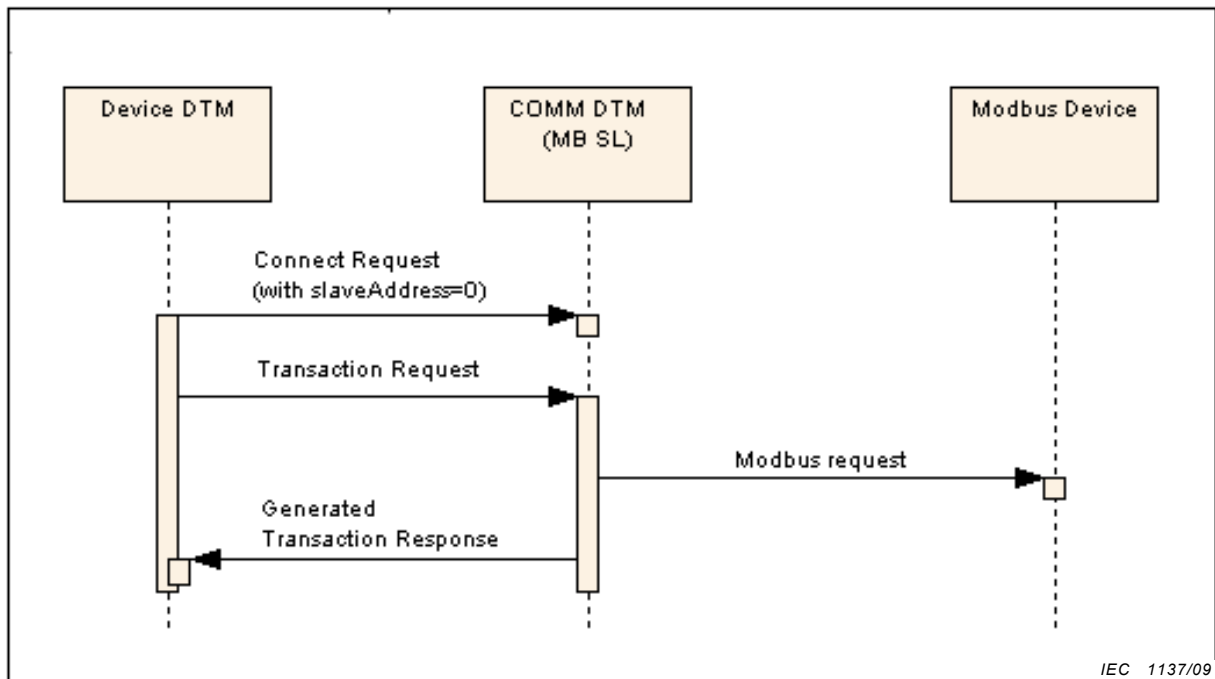


Figure 2 – Broadcast sequence with Modbus Serial Line Communication DTM

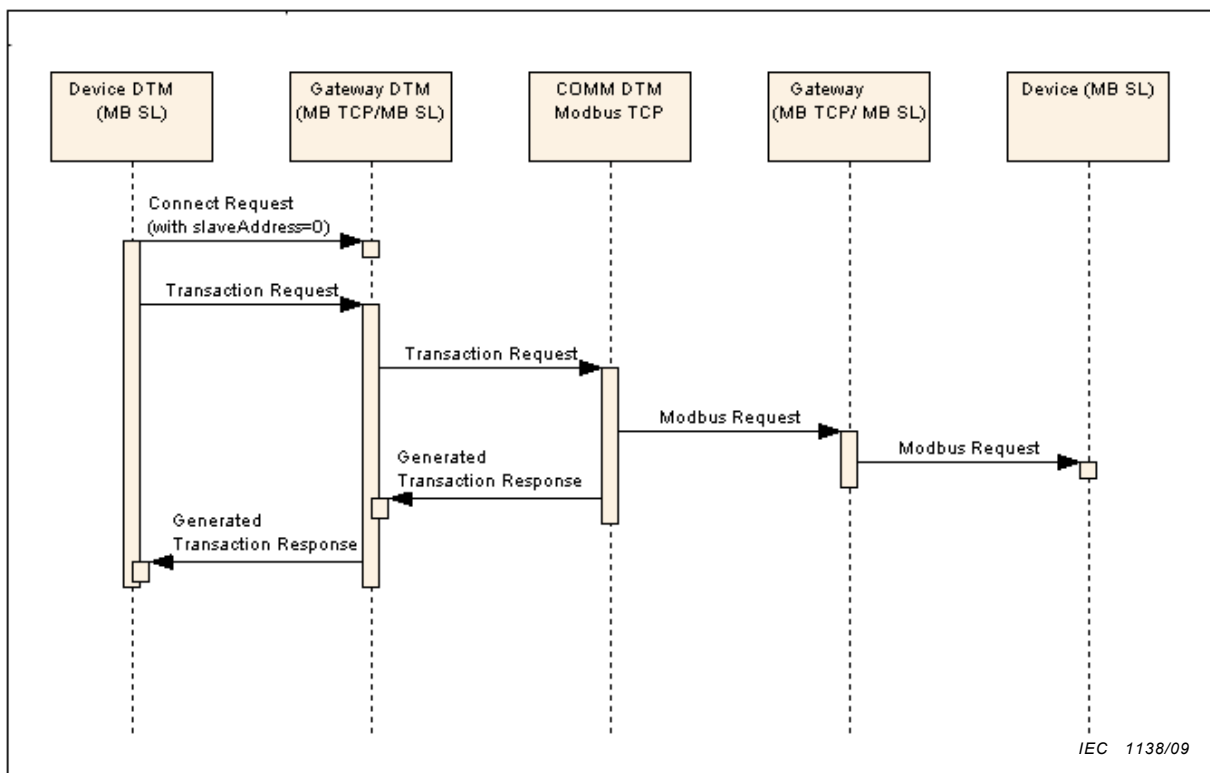


Figure 3 – Broadcast sequence with Modbus TCP Communication DTM