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BSI Standards Publication

Field device tool (FDT) interface specification —

Part 302: Communication profile integration — IEC 61784 CPF 2

National foreword

This British Standard is the UK implementation of EN 62453-302:2009. It is identical to IEC 62453-302:2009.

The UK participation in its preparation was entrusted to Technical Committee AMT/7, Industrial communications: process measurement and control, including fieldbus.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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(IEC 62453-302:2009)

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CENELEC

European Committee for Electrotechnical Standardization
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Foreword

The text of document 65E/126/FDIS, future edition 1 of IEC 62453-302, 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 62453-302 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– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-08-01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.

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Endorsement notice

The text of the International Standard IEC 62453-302:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

[2] IEC 61131-3	NOTE	Harmonized as EN 61131-3:2003 (not modified).
[4] IEC/TR 62453-41	NOTE	Harmonized as CLC/TR 62453-41:2009 (not modified).
[5] IEC/TR 62453-502	NOTE	Harmonized as CLC/TR 62453-502:2009 (not modified).

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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.

Publication	Year	Title	EN/HD	Year
IEC 61158-2	–[1)]	Industrial communication networks - Fieldbus specifications - Part 2: Physical layer specification and service definition	EN 61158-2	2008[2)]
IEC 61158-3-2	–[1)]	Industrial communication networks - Fieldbus specifications - Part 3-2: Data-link layer service definition - Type 2 elements	EN 61158-3-2	2008[2)]
IEC 61158-4-2	–[1)]	Industrial communication networks - Fieldbus specifications - Part 4-2: Data-link layer protocol specification - Type 2 elements	EN 61158-4-2	2008[2)]
IEC 61158-5-2	2007	Industrial communication networks - Fieldbus specifications - Part 5-2: Application layer service definition - Type 2 elements	EN 61158-5-2	2008
IEC 61158-6-2	2007	Industrial communication networks - Fieldbus specifications - Part 6-2: Application layer protocol specification - Type 2 elements	EN 61158-6-2	2008
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 61784-3-2	2007	Industrial communication networks - Profiles - Part 3-2: Functional safety fieldbuses - Additional specifications for CPF 2	EN 61784-3-2	2008
IEC 62026-3	–[1)]	Low-voltage switchgear and controlgear - Controller-device interfaces (CDIs) - Part 3: DeviceNet	EN 62026-3	2009[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
ISO/IEC 19501	2005	Information technology - Open Distributed Processing - Unified Modeling Language (UML)	–	–

[1)] Undated reference.

[2)] Valid edition at date of issue.

Publication	Year	Title	EN/HD	Year
ISO 15745-2	2003	Industrial automation systems and integration - Open systems application integration framework - Part 2: Reference description for ISO 11898-based control systems	–	–
ISO 15745-3	2003	Industrial automation systems and integration - Open systems application integration framework - Part 3: Reference description for IEC 61158-based control systems	–	–

CONTENTS

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 62453-302 is aligned in the structure of the IEC 62453 series.

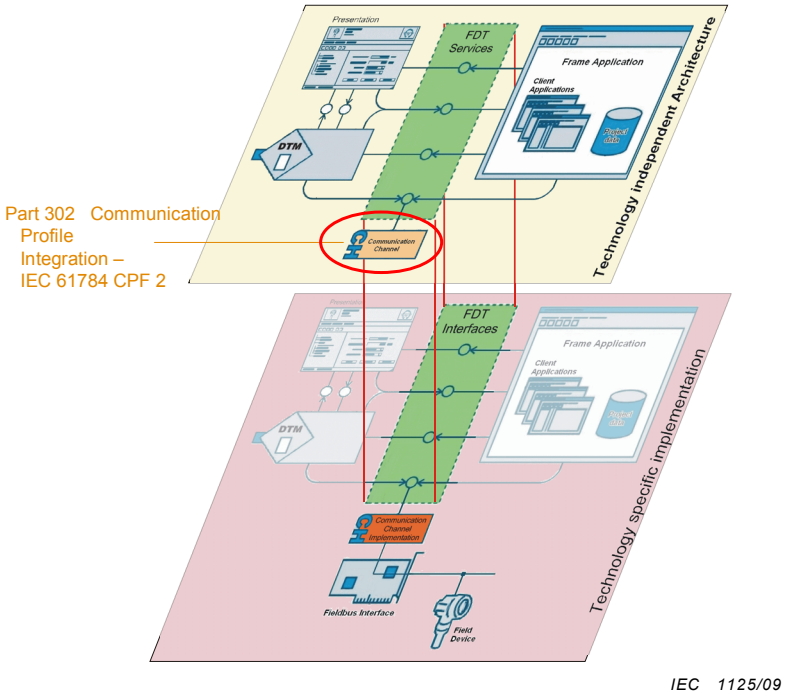

Figure 1 – Part 302 of the IEC 62453 series

FIELD DEVICE TOOL (FDT) INTERFACE SPECIFICATION –

Part 302: Communication profile integration – IEC 61784 CPF 2

1 Scope

Communication Profile Family 2 (commonly known as CIP™[1]) defines communication profiles based on IEC 61158-2 Type 2, IEC 61158-3-2, IEC 61158-4-2, IEC 61158-5-2, IEC 61158-6-2, and IEC 62026-3. The basic profiles CP 2/1 (ControlNet™[2]), CP 2/2 (EtherNet/IP™[3]), and CP 2/3 (DeviceNet™[1]) are defined in IEC 61784-1 and IEC 61784-2. An additional communication profile (CompoNet™[1]), also based on CIP™, is defined in [14].

This part of IEC 62453 provides information for integrating the CIP™ technology into the FDT interface specification (IEC 62453-2).

This part of IEC 62453 specifies communication and other services.

This specification neither contains the FDT specification nor modifies it.

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 61158-2, *Industrial communication networks – Fieldbus specifications – Part 2: Physical layer specification and service definition*

IEC 61158-3-2, *Industrial communication networks – Fieldbus specifications – Part 3-2: Data-link layer service definition – Type 2 elements*

IEC 61158-4-2, *Industrial communication networks – Fieldbus specifications – Part 4-2: Data-link layer protocol specification – Type 2 elements*

IEC 61158-5-2:2007, *Industrial communication networks – Fieldbus specifications – Part 5-2: Application layer service definition – Type 2 elements*

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1 CIP™ (Common Industrial Protocol), DeviceNet™ and CompoNet™ are trade names of Open DeviceNet Vendor Association, Inc (ODVA). This information is given for the convenience of users of this document and does not constitute an endorsement by IEC of the trade name holder or any of its products. Compliance to this standard does not require use of the trade names CIP™, DeviceNet™ or CompoNet™. Use of the trade names CIP™, DeviceNet™ or CompoNet™ requires permission of Open DeviceNet Vendor Association,Inc.

2 ControlNet™ is a trade name of ControlNet International, Ltd. 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 trade name ControlNet™. Use of the trade name ControlNet™ requires permission of ControlNet International, Ltd.

3 EtherNet/IP™ is a trade name of ControlNet International, Ltd. and Open DeviceNet Vendor Association, Inc. 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 trade name EtherNet/IP™. Use of the trade name EtherNet/IP™ requires permission of either ControlNet International, Ltd. or Open DeviceNet Vendor Association, Inc.

IEC 61158-6-2:2007, *Industrial communication networks – Fieldbus specifications – Part 6-2: Application layer protocol specification – Type 2 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 61784-3-2:2007, *Industrial communication networks – Profiles – Part 3-2: Functional safety fieldbuses – Additional specifications for CPF 2*

IEC 62026-3, *Low-voltage switchgear and controlgear – Controller-device interfaces (CDIs) – Part 3: DeviceNet*

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*

ISO/IEC 19501:2005, *Information technology – Open Distributed Processing – Unified Modeling Language (UML) Version 1.4.2*

ISO 15745-2:2003, *Industrial automation systems and integration – Open systems application integration framework – Part 2: Reference description for ISO 11898-based control systems*

ISO 15745-3:2003, *Industrial automation systems and integration – Open systems application integration framework – Part 3: Reference description for IEC 61158-based control systems*

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 and IEC 62453-2 apply.

3.2 Symbols and abbreviated terms

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

CIP™	Common Industrial Protocol	
CP	Communication Profile	[IEC 61784-1]
CPF	Communication Profile Family	[IEC 61784-1]
EDS	Electronic Data Sheet	[ISO 15745]
UML	Unified Modelling Language	[ISO/IEC 19501]

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 behavior.
Usage of “can’ or “optional’	Function or behavior may be provided, depending on defined conditions.

4 Bus category

IEC 61784 CPF 2 protocol is identified in the protocolId element of the structured data type 'fdt:BusCategory' by the following unique identifiers, as specified in Table 1.

Table 1 – Protocol identifiers

Identifier value	ProtocolId name	Description
19B91472-EDB9-4e8c-BB61-516EEC79C1C0	‘CIP DeviceNet’	Support for CP 2/3 (DeviceNet)
6CD80F51-019D-4e60-AEAC-B10144943B4B	‘CIP EthernetIP’	Support for CP 2/2 (EtherNet/IP)
C290CE23-62EA-478c-97F2-97EFEC602E05	‘CIP ControlNet’	Support for CP 2/1 (ControlNet)
089BB2BC-B75A-11DB-8314-0800200C9A66	‘CIP CompoNet’	Support for CompoNet

5 Access to instance and device data

The services InstanceDataInformation and DeviceDataInformation shall provide access at least to all parameters defined in the Params section of the EDS.

6 Protocol specific behavior

IEC 61784 CPF 2 protocol has specific requirements related to configuration of fieldbus masters.

It is very important to keep both data provider and consumer synchronized. Therefore data provider shall be informed if the provided data has been modified. For instance, in case the provided data is modified by the scanner/master DTM, then the slave/adapter DTM shall be provided with the new data set.

NOTE For a description of data exchange between DTMs, see 6.3 of IEC 62453-2 (Configuration of fieldbus master or communication scheduler).

7 Protocol specific usage of general data types

Table 2 shows how general data types, defined in IEC 62453-2 within the namespace ‘fdt’, are used with IEC 61784 CPF 2 devices.

According to IEC 62453-2, at least one set of semantic information (one per supported fieldbus protocol) shall be provided for each accessible data object, using the ‘SemanticInformation’ general data type. The corresponding data type ‘applicationDomain’ shall have the value “FDT_CIP” and the data type ‘semanticId’ shall have an appropriate value, as specified in Table 2).

Table 2 – Protocol specific usage of general data types

Data type	Description for use
fdt:address	The “address” data type is not mandatory for the exposed parameters in the DTMs. But if the address will be used, the string shall be constructed according to the rules of the semanticId. That means the data type “semanticId” is always the same as the data type “address”
fdt:protocolId	See Clause 4.
fdt:deviceTypeId	As defined in Identity object (see 6.2.1.2.2 of IEC 61158-5-2)
fdt:deviceTypeInformation	A CIP DTM shall provide the path to the device specific EDS file with this data type. For DTM certification, the path to the certified EDS file shall be provided here. NOTE The EDS information is accessible via • IDtmParameter::GetParameters() • IDtmInformation::GetInformation()
fdt:deviceTypeInformationPath	Path to the EDS file which is also provided via the attribute ‘deviceTypeInformation’ The attribute contains full path to the EDS file including the file name in URL notation. For CIP devices, it is mandatory to provide information for this data type. This attribute is specific to FDT 1.2.1(see IEC 62453-2 and [8]), therefore it shall not be provided if DTM is running in FDT 1.2 (see [7]) based Frame Applications
fdt:manufacturerId	As defined in Identity object (see 6.2.1.2.2 of IEC 61158-5-2)
fdt:semanticId fdt:applicationDomain	The applicationDomain is: FDT_CIP. The data that is contained in the objects are addressable via classId, instanceId and attributeId. This data may be variables or composed blocks of data. The semanticID is directly based on the CIP address information: The semanticId is: CLASSxx.INSTANCEyy.ATTRIBUTEzz xx classId yy instanceId zz attributeId xx, yy, zz are based on decimal format without leading ‘0’. Since ‘ATTRIBUTE’ is conditional in CIP in certain cases, it can be left out. In this case, the semanticId is: CLASSxx.INSTANCEyy
fdt:tag	CIP assembly, parameter name or name of a I/O connection (in the context of channel data)

8 Protocol specific common data types

Table 3 and Table 4 specify the protocol specific common data types, which are used in the definition of other data types.

The data types described in this clause are defined for following namespace:
Namespace: cip

Table 3 – Simple protocol specific common data types

Data type	Definition	Description
attributeId	USINT	CIP attribute identifier
bitOffset	UDINT	Bit offset of a parameter in an assembly
cipStatus	UINT	cipStatus represents the Status (attribute 5) of the Identity object. See 6.2.1.2.2 of IEC 61158-5-2

Data type	Definition	Description
classId	UINT	CIP class identifier
constValue	UDINT	Represents the constant value used in the data type Constant
dataType	enumeration (byte | float | double | int | unsigned | enumerator | bitEnumerator | index | ascii | password | bitString | hexString | date | time | dateAndTime | duration | binary | structured | dtmSpecific)	Defines the different enumerations of the CIP data types
deviceType	UINT	Represents the DeviceType (attribute 2) of the Identity object. See 6.2.1.2.2 of IEC 61158-5-2
ePath	ARRAY OF USINT	CIP EPATH, see 4.1.9 of IEC 61158-6-2
extendedIdentifier	STRING	Represents the address of the CIP device in the CIPNodeID if the address used on this CIP network is a name or IP-address. The extendedIdentifier shall be used for CompoNet networks to cover the CompoNet MAC ID. See also shortIdentifier
instanceId	UINT	CIP object instance identifier
majorRevision	USINT	Represents the Major Revision (attribute 4.1) of the Identity object. See 6.2.1.2.2 of IEC 61158-5-2
minorRevision	USINT	Represents the Minor Revision (attribute 4.2) of the Identity object. See 6.2.1.2.2 of IEC 61158-5-2
portNumber	UINT	Represents the portnumber within a CIP bridging or routing device to route a message to another segment
productCode	UINT	Represents the Product code (attribute 3) of the Identity object. See 6.2.1.2.2 of IEC 61158-5-2
productName	STRING	Represents the Product name (attribute 7) of the Identity object. See 6.2.1.2.2 of IEC 61158-5-2
serialNumber	ARRAY OF USINT	Represents the Serialnumber (attribute 6) of the Identity object. See 6.2.1.2.2 of IEC 61158-5-2. If the serialNumber is not known because of offline configuration then a 0 should be returned
serviceCode	USINT	CIP service code. This is a function, or method, supported by a CIP object or attribute
serviceName	STRING	CIP service name. This is a function, or method, supported by a CIP object or attribute. This attribute provides additional human readable information about the related service code
shortIdentifier	USINT	Represents the address of the CIP device in the CIPNodeID if the address used on this CIP-network is a simple address. See also extendedIdentifier
symbolicAddress	STRING	Represents a name of a component inside the device
vendorID	UINT	Represents the Vendor ID (attribute 1) of the Identity object. See 6.2.1.2.2 of IEC 61158-5-2

Table 4 – Structured protocol specific common data types

Data type	Definition			Description
	Elementary data type	Usage	Multiplicity	
CIPDevice	STRUCT			Specifies a CIP device. CIPDevice contains manufacturer and device information (the Identity Object), which is present in every CIP node
	cipStatus	M	[1..1]	
	CIPPath	M	[1..1]	
	CIPDeviceIdentity	M	[1..1]	
CIPDeviceIdentity	STRUCT			Represents the static part of the Identity object of the CIP device. See 6.2.1.2.2 of IEC 61158-5-2
	vendorID	M	[1..1]	
	deviceType	M	[1..1]	
	productCode	M	[1..1]	
	majorRevision	M	[1..1]	
	minorRevision	M	[1..1]	
	serialNumber	M	[1..1]	
	productName	M	[1..1]	
CIPNodeID	STRUCT			Identifier used to identify a particular node (device) on a CIP network, e.g. CIP MAC (Media Access Control) ID (1 byte) for DeviceNet and ControlNet; IP address for EtherNet/IP. Since the size differs from protocol to protocol, structure is used which contains 2 attributes: extended identifier (n bytes string) and short identifier (1 byte unsigned integer) and only one of them shall be used
	choice of	M	[1..1]	
	ExtendedIdentifier	S	[1..1]	
	ShortIdentifier	S	[1..1]	
CIPObjectAddress	STRUCT			CIP object address as CIPObjectId, CIPSymbolicAddress or HexAddress
	choice of	M	[1..1]	
	CIPObjectId	S	[1..1]	
	CIPSymbolicAddress	S	[1..1]	
	HexAddress	S	[1..1]	
CIPObjectId	STRUCT			The CIP classId, instanceId and (conditional) attributeId 'address' information for a CIP object and attribute. If used in a Process Channel this is likely to be either an Assembly object or a Parameter object
	classId	M	[1..1]	
	instanceId	M	[1..1]	
	attributeId	O	[0..1]	

Data type	Definition			Description
	Elementary data type	Usage	Multiplicity	
CIPPath	STRUCT			The full 'address' of the CIP node (device). In general this consists of the Node ID stored in the CIPNodeID element. The RoutingPath element is used to transfer additional routing information that can be used by the CIP FDT communication component
	RoutingPath	O	[0..1]	
	CIPNodeID	M	[1..1]	
CIPSymbolicAddress	STRUCT			classId, instanceId and attributeId does not necessarily be known, a symbolic address could also be used. CIPSymbolicAddress, HexAddress or CIPObjectId could be used for DataExchangeRequest
	symbolicAddress	M	[1..1]	
Constant	STRUCT			A constant value
	constValue	M	[1..1]	
ExtendedIdentifier	STRUCT			See attribute extendedIdentifier
	extendedIdentifier	M	[1..1]	
HexAddress	STRUCT			CIP object address as ePath
	ePath	O	[0..1]	
LinkAddress	STRUCT			Represents the CIPNodeID within a Segment
	CIPNodeID	M	[1..1]	
ParameterReference	STRUCT			Reference to a description of a parameter
	fdt:idref	M	[1..1]	
	bitOffset	O	[0..1]	
ReservedBits	STRUCT			Used wherever reserved bits are needed
RoutingPath	STRUCT			Any additional CIP network routing information, which can be understood by the Communication Channel
	Segment	M	[1..1]	
Segment	STRUCT			Represents the path a message shall follow to reach the addressed CIP device
	portNumber	M	[1..1]	
	LinkAddress	M	[1..1]	
	Segment	O	[0..1]	
Service	STRUCT			CIP service identified by serviceCode and serviceName. CIP service code. This is a function, or method, supported by a CIP object or attribute
	serviceCode	M	[1..1]	
	serviceName	O	[0..1]	
ShortIdentifier	STRUCT			See attribute shortIdentifier
	shortIdentifier	M	[1..1]	

9 Network management data types

9.1 General

The data types specified in this clause are used at following services:

- NetworkManagementInfoRead service;
- NetworkManagementInfoWrite service.

9.2 Node address

The CIPNodeID will be stored in the busAddress element of the fdt:DeviceAddress data type. This is not used for CompoNet because the master has a fixed address – since this is a mandatory element, the recommendation is to use the value “0”.

9.3 Scanner/master – Bus parameter set (CIP)

Information is sent to the CIP scanner/master within the UserDefinedBus element of the NetworkInfo data type, using the data types specified in Table 5 and Table 6. This information shall be set to configure the scan list of scanner/master.

The data types described in this clause are defined for following namespace:
Namespace: cippar

Table 5 – Simple fieldbus configuration data types

Data type	Definition	Description
async	USINT	See Table 7-2.3 of [13]. This is a CIP Safety exclusive field. Only applies to producing connections. Field should be empty for consuming connections. Used to calculate Network Reaction Time
base	UINT	Scaling parameters. See A.4.1.4.6 of ISO 15745-2
class0	BOOL	See Table A.25 of ISO 15745-3
class1	BOOL	
class2	BOOL	
class3	BOOL	
class4	BOOL	
class5	BOOL	
class6	BOOL	
compoNetDeviceCategory	USINT	Defines the different categories of CompoNet devices. See [14], Chapter 7-4
compoNetIOLength	UINT	See [14], Chapter 7-5
compoNetIOLengthUnit	USINT	
connectionNameString	STRING	See Table A.24 of ISO 15745-3
connectionTypeMulticast	BOOL	See Table A.26 of ISO 15745-3
connectionTypeNULL	BOOL	
connectionTypePoint2Point	BOOL	
consumedConnectionSize	UINT	Maximum number bytes received across this connection
defaultConnection	BOOL	Indicates whether the CIPConnection is default or not
defaultSafetyConnections	USINT	See Table 7-2.2 of [13]. Instance Number
defaultValue	STRING	Represents the value of the attribute when in offline state
div	UINT	Scaling parameters. See A.4.1.4.6 of ISO 15745-2

Data type	Definition	Description
expectedPacketRate	UINT	Scanner determines this parameter. There might be some reason that the slave provides this parameter to the master
fixedSizeSupported	BOOL	See Table A.26 of ISO 15745-3
helpString	STRING	See Table A.24 of ISO 15745-3
inhibitTime	UINT	Optional for COS, for other connection types it is not valid. Scanner determines this parameter. There might be some reason that the slave provides this parameter to the master
maxCIPConnections	UINT	Communication capacity, See Chapter 7-3.6.11.7 of [9]
maxConsumerNumber	USINT	See Table 7-2.3 of [13]. This is a CIP Safety exclusive field. When safety devices wish to define multi-cast connections and need to restrict the maximum number of consumers to a value less than the default maximum of 15, this field can define the product limit. If this field is empty, the SNCT shall always use the default value of 15 for the maximum number of multi-cast connections. This field can be left empty for single-cast connections
maxEMConnections	UINT	Communication capacity. See Chapter 7-3.6.11.7 of [9]
maxIOConnections	UINT	
maxSafetyConnections	USINT	See Table 7-2.2 of [13]. Optional
maxSafetyInputCnxns	USINT	
maxSafetyOutputCnxns	USINT	
multiplier	UINT	Scaling parameters. See A.4.1.4.6 of ISO 15745-2
offset	INT	
precision	UINT	
priorityHigh	BOOL	See Table A.26 of ISO 15745-3
priorityLow	BOOL	
priorityScheduled	BOOL	
producedConnectionSize	UINT	Maximum number of bytes transmitted across this connection
realTimeTransferFormat	USINT	See Table A.26 of ISO 15745-3
rpi	UDINT	See Table A.24 of ISO 15745-3
scId	ARRAY OF USINT	Safety Configuration Identifier. See 6.6.5.17 of IEC 61784-3-2
server	BOOL	See Table A.25 of ISO 15745-3
transportTypeExclusiveOwner	BOOL	
transportTypeInputOnly	BOOL	
transportTypeListenOnly	BOOL	
transportTypeRedundantOwner	BOOL	
triggerApplication	BOOL	
triggerChangeOfState	BOOL	
triggerCyclic	BOOL	
unId	ARRAY OF USINT	See 6.6.5.18 of IEC 61784-3-2
variableSizeSupported	BOOL	See Table A.26 of ISO 15745-3

Table 6 – Structured fieldbus configuration data types

Data type	Definition			Description
	Elementary data types	Usage	Multiplicy	
AssemblyMemberDefinition	STRUCT			Represents all members of an assembly
	fdt:id	O	[0..1]	
	fdt:tag	M	[1..1]	
	fdt:descriptor	O	[0..1]	
	cip:dataType	M	[1..1]	
	defaultValue	O	[0..1]	
	Scaling	O	[0..1]	
	cip:CIPObjectAddress	O	[0..1]	
	fdt:BitEnumeratorEntries	O	[0..1]	
	fdt:EnumeratorEntries	O	[0..1]	
	fdt:Unit	O	[0..1]	
	fdt:Ranges	O	[0..1]	
	fdt:SubstituteValue	O	[0..1]	
AssemblyMemberDefinitions	STRUCT			See AssemblyMember definition
	AssemblyMemberDefinition	O	[0..*]	
BitStrobeConnection	STRUCT			Represents the Bitstrobe IO connection
	MasterSlaveConnection	M	[1..1]	
Capacity	STRUCT			Communication capacity, See Chapter 7-3.6.11.7 of [9]
	MaxCIPConnections	O	[0..1]	
	MaxIOConnections	O	[0..1]	
	MaxEMConnections	O	[0..1]	
CIPConnection	STRUCT			Defines one supported CIP connection Contains attributes, see Table A.24 of ISO 15745-3 For safety devices, see Chapter 7-2.2.4.3, Table 7-2-3 of [13]
	connectionNameString	M	[1..1]	
	helpString	M	[1..1]	
	cip:ePath	M	[1..1]	
	defaultConnection	O	[0..1]	
	Config1	O	[0..1]	
	Config2	O	[0..1]	
	TriggerAndTransport	M	[1..1]	
	Originator2TargetParameters	M	[1..1]	
	Target2OriginatorParameters	M	[1..1]	

Data type	Definition			Description
	Elementary data types	Usage	Multiplicy	
CIPNode	STRUCT			Represents all connection information of the device
	fdt:readAccess	O	[0..1]	
	fdt:writeAccess	O	[0..1]	
	fdtpar:configurationData	O	[0..1]	
	scId	O	[0..1]	
	unId	O	[0..1]	
	cip:CIPDeviceIdentity	M	[1..1]	
	cip:CIPNodeID	M	[1..1]	
	PossibleConnections	M	[1..1]	
	CurrentConnections	M	[1..1]	
	AssemblyMemberDefinitions	O	[0..1]	
CompoNetIO	STRUCT			Defines the IO of a CompoNet device. See [14], Chapter 7-2
	CompoNetInputInfo	O	[0..1]	
	CompoNetOutputInfo	O	[0..1]	
	compoNetDeviceCategory	M	[1..1]	
CompoNetInputInfo	STRUCT			Represents the Inputs of the CompoNet device
	CompoNetIOInfo	M	[1..1]	
CompoNetIOInfo	STRUCT			Represents the Inputs or Outputs of the CompoNet device
	compoNetIOLengthUnit	M	[1..1]	
	compoNetIOLength	M	[1..1]	
CompoNetOutputInfo	STRUCT			Represents the Outputs of the CompoNet device
	CompoNetIOInfo	M	[1..1]	
Config	STRUCT			Contains elements Size and Format
	Size	O	[0..1]	
	Format	O	[0..1]	
Config1	STRUCT			See Table A.24 of ISO 15745-3
	Config	M	[1..1]	
Config2	STRUCT			See Table A.24 of ISO 15745-3
	Config	M	[1..1]	

Data type	Definition			Description
	Elementary data types	Usage	Multiplicy	
ConnectionParameters	STRUCT			Represents the Connection Parameters keyword of the Connection Manager Section of an EDS-file. See A.4.1.4.9 of ISO 15745-3
	FixedSizeSupported	O	[0..1]	
	VariableSizeSupported	O	[0..1]	
	RealTimeTransferFormat	O	[0..1]	
	ConnectionTypeNULL	O	[0..1]	
	ConnectionTypeMulticast	O	[0..1]	
	ConnectionTypePoint2Point	O	[0..1]	
	PriorityLow	O	[0..1]	
	PriorityHigh	O	[0..1]	
	PriorityScheduled	O	[0..1]	
	cip:ReservedBits	O	[0..1]	
ConsumedAssemblyReference	STRUCT			Gives CIPObjectAddress of the data consumed on this IO connection To reference what is the I/O assembly attached to this connection to allow the scanner to understand the members of the consumed assembly
	cip:CIPObjectAddress	M	[1..1]	
COSConnection	STRUCT			Represents the COS IO connection. It is mutual exclusive with the Cyclic IO connection
	MasterSlaveConnection	M	[1..1]	
CurrentConnections	STRUCT			Represents all default connections of this device.
	CIPConnection	O	[0..*]	
	MasterSlaveConnectionSet	O	[0..1]	
	CompoNetIO	O	[0..1]	
CyclicConnection	STRUCT			CyclicConnection Represents the Cyclic IO connection. It is mutual exclusive with the COS IO connection
	MasterSlaveConnection	M	[1..1]	
Format	STRUCT			See Table A.24 of ISO 15745-3
	choice of	M	[1..1]	
	cip:ParameterReference	S	[1..1]	
	fdt:ChannelReference	S	[1..1]	

Data type	Definition			Description
	Elementary data types	Usage	Multiplicy	
MasterSlaveConnection	STRUCT			Defines one supported MasterSlave connection
	producedConnectionSize	M	[1..1]	
	consumedConnectionSize	M	[1..1]	
	expectedPacketRate	O	[0..1]	
	inhibitTime	O	[0..1]	
	ConsumedAssemblyReference	O	[0..1]	
	ProducedAssemblyReference	O	[0..1]	
MasterSlaveConnectionSet	STRUCT			Zero or more MasterSlaveConnection. MasterSlaveConnection elements can be combined according to the CIP specification (see IEC 62026-3). This element shall be provided for DeviceNet. If device does not support I/O connections through the MasterSlave connection set, this list shall be empty
	PolledIOConnection	O	[0..1]	
	BitStrobeConnection	O	[0..1]	
	choice of	O	[0..1]	
	COSConnection	S	[1..1]	
	CyclicConnection	S	[1..1]	
	MulticastPollingConnection	O	[0..1]	
MulticastPollingConnection	STRUCT			Represents the Multicast Polled IO connection
	MasterSlaveConnection	M	[1..1]	
Originator2TargetParameters	STRUCT			Originator to target connection parameters. See Table A.24 of ISO 15745-3
	rpi	O	[0..1]	
	ConnectionParameters	M	[1..1]	
	choice of	M	[1..*]	
	Size	S	[1..1]	
	Format	S	[1..1]	
PolledIOConnection	STRUCT			Represents the Polled IO connection
	MasterSlaveConnection	M	[1..1]	

Data type	Definition			Description
	Elementary data types	Usage	Multiplicy	
PossibleConnections	STRUCT			Represents all possible connections that can be made to this device
	maxSafetyConnections	O	[0..1]	
	maxSafetyInputCnxns	O	[0..1]	
	maxSafetyOutputCnxns	O	[0..1]	
	defaultSafetyConnections	O	[0..1]	
	Capacity	O	[0..1]	
	CIPConnection	O	[0..*]	
	PolledIOConnection	O	[0..1]	
	BitStrobeConnection	O	[0..1]	
	COSConnection	O	[0..1]	
	CyclicConnection	O	[0..1]	
	MulticastPollingConnection	O	[0..1]	
	SafetyInputConnection	O	[0..*]	
	SafetyOutputConnection	O	[0..*]	
	CompoNetIO	O	[0..1]	
ProducedAssemblyReference	STRUCT			Gives CIPObjectAddress of the data produced on this IO connection To reference what is the I/O assembly attached to this connection to allow the scanner to understand the members of the produced assembly
	cip:CIPObjectAddress	M	[1..1]	
Target2OriginatorParameters	STRUCT			Target to originator connection parameters. See Table A.24 of ISO 15745-3
	rpi	O	[0..1]	
	ConnectionParameters	M	[1..1]	
	choice of	M	[1..*]	
	Size	S	[1..1]	
	Format	S	[1..1]	
TransportTypeExclusiveOwner	STRUCT			See transportTypeExclusiveOwner
	transportTypeExclusiveOwner	M	[1..1]	
TransportTypeInputOnly	STRUCT			See transportTypeInputOnly
	transportTypeInputOnly	M	[1..1]	
TransportTypeListenOnly	STRUCT			See transportTypeListenOnly
	transportTypeListenOnly	M	[1..1]	
TransportTypeRedundantOwner	STRUCT			See transportTypeRedundantOwner
	transportTypeRedundantOwner	M	[1..1]	

Data type	Definition			Description
	Elementary data types	Usage	Multiplicy	
TriggerAndTransport	STRUCT			Represents the Trigger and Transport keyword of the Connection Manager Section of an EDS-file. See A.4.1.4.9 of ISO 15745-3
	class0	O	[0..1]	
	class1	O	[0..1]	
	class2	O	[0..1]	
	class3	O	[0..1]	
	class4	O	[0..1]	
	class5	O	[0..1]	
	class6	O	[0..1]	
	triggerCyclic	O	[0..1]	
	triggerChangeOfState	O	[0..1]	
	triggerApplication	O	[0..1]	
	server	O	[0..1]	
	choice of	M	[1..1]	
	TransportTypeListenOnly	S	[1..1]	
	TransportTypeInputOnly	S	[1..1]	
	TransportTypeExclusiveOwner	S	[1..1]	
	TransportTypeRedundantOwner	S	[1..1]	
	cip:ReservedBits	O	[0..1]	
SafetyInputConnection	STRUCT			Defines one supported CIP Safety Input connection
	async	M	[1..1]	
	maxConsumerNumber	O	[0..1]	
	CIPConnection	M	[1..1]	
SafetyOutputConnection	STRUCT			Defines one supported CIP Safety Output connection
	maxConsumerNumber	O	[0..1]	
	CIPConnection	M	[1..1]	
Scaling	STRUCT			Scaling of a parameter. See A.4.1.4.6 of ISO 15745-2
	offset	M	[1..1]	
	base	M	[1..1]	
	multiplier	M	[1..1]	
	div	M	[1..1]	
	precision	O	[0..1]	
Size	STRUCT			See Table A.24 of ISO 15745-3
	choice of	M	[1..1]	
	cip:Constant	S	[1..1]	
	cip:ParameterReference	S	[1..1]	

Data type	Definition			Description
	Elementary data types	Usage	Multiplicy	
UserDefinedBus	STRUCT			Represents the CIP protocol specific part of NetworkInfo
	CIPNode	M	[1..1]	

10 Communication data types

The data types specified in this clause are used with the following services:

- Connect service
- Transaction service
- Disconnect service
- Abort service
- Sequence service.

The service arguments contain the address information and the communication data (explained in Table 7 and Table 8).

The data types described in this clause are defined for the following namespace.
Namespace: fdtcipcomm

Table 7 – Simple communication data types

Data type	Definition	Description
communicationReference	UUID	Mandatory internal FDT value which uniquely identifies a connection to a device. It is allocated by the Communication Channel during the ConnectRequest. The value is used by subsequent communication calls up to and including DisconnectRequest or Abort
delayTime	UDINT	Delay time in [ms] between two communication calls
extendedStatusCode	ARRAY OF USINT	CIP extended status code further elaborates upon the CIP status code and may be present in an Error Response message from a CIP object. (CIP range: 0-255 words) (DeviceNet: 1 byte) This information is formatted as a hex string to cover the CIP extended status codes. This information is protocol specific
sequenceTime	UDINT	Period of time in [ms] for the whole sequence
statusCode	USINT	CIP status code, which is present in the General Status Code field of a Response message from a CIP object. For DeviceNet, this is provided only in error cases

Table 8 – Structured communication data types

Data type	Definition			Description
	Elementary data type	Usage	Multiplicity	
Abort	STRUCT			Describes the abort. An abort cancels all outstanding requests and closes the connection
	communicationReference	M	[1..1]	
ConnectRequest	STRUCT			Element used with ConnectRequest call to identify the CIP node (device) with which a communication connection should be established
	cip:CIPPath	M	[1..1]	
ConnectResponse	STRUCT			Element used with the ConnectResponse call used to convey a unique value - the communicationReference - which should be used in subsequent calls on this communication connection. ConnectResponse contains the CIPDevice element as defined in DTMCIPDataTypeSchema.xml, which is used to acknowledge that the connection to the requested nodeID is actually established
	communicationReference	M	[1..1]	
	cip:CIPDevice	M	[1..1]	
DataExchangeRequest	STRUCT			Element used with the TransactionRequest call to describe the communication request to a particular object within the CIP node (the CIP node is associated with the connection identified by the connectionReference). The object address is specified using the CIPObjectAddress element. The service to perform is specified using the Service element. If data is required by the service it is stored in the fdt:CommunicationData element
	communicationReference	M	[1..1]	
	cip:serviceCode	M	[1..1]	
	cip:CIPObjectAddress	M	[1..1]	
	fdt:CommunicationData	O	[0..1]	
DataExchangeResponse	STRUCT			Element used with the TransactionResponse call to return the result of a TransactionRequest. Depending on the network, result codes are returned in the ServiceResponse
	communicationReference	M	[1..1]	
	ServiceResponse	M	[1..1]	
	fdt:CommunicationData	O	[0..1]	
DisconnectRequest	STRUCT			Element used with the DisconnectRequest call to identify the connection, which should be terminated
	communicationReference	M	[1..1]	

Data type	Definition			Description
	Elementary data type	Usage	Multiplicity	
DisconnectResponse	STRUCT			Element used with DisconnectResponse to indicate that the connection identified by the communicationReference has been terminated
	communicationReference	M	[1..1]	
SequenceBegin	STRUCT			Describes the sequence begin
	sequenceTime	O	[0..1]	
	delayTime	O	[0..1]	
	communicationReference	M	[1..1]	
SequenceEnd	STRUCT			Describes the sequence end
	communicationReference	M	[1..1]	
SequenceStart	STRUCT			Describes the sequence start
	communicationReference	M	[1..1]	
ServiceResponse	STRUCT			CIP service response and status codes. All error codes are described in 4.1.11 of IEC 61158-6-2
	cip:serviceCode	M	[1..1]	
	statusCode	M	[1..1]	
	extendedStatusCode	O	[0..1]	

11 Channel parameter data types

The data types specified in this clause are used with the following services:

- ReadChannelData service;
- WriteChannelData service.

Channels in a DTM can be used to represent the “Process values” available on that device. These are sometimes called Process Channels. A process control system (i.e. some external system which monitors values on a device) can query each of the DTM’s channels for its channel parameters. The channel parameter schema describes the process values so that an external system can use the information to access and interpret the values from the device during normal device runtime. The external system might not use FDT to access the values.

Information about the available channels (if there are any) is included in the information returned from the GetChannels service call.

Data types used by the services ReadChannelData and WriteChannelData are specified in Table 9 and Table 10.

These data types can be used by a DTM (e.g. slave/adapter device's DTM) to describe its I/O assemblies – data format and constituent Params (providing similar information to that found in the [IO_Info]/[Variant_IO_Info]/[Connection Manager], [Assembly] and [Params] sections of an EDS file) – and by a master/scanner device’s DTM to describe the objects used to access a shadow of the slave device's I/O data. The Process Channel of the master DTM also refers to the child DTM and the Process Channel of the child DTM, which describes the assembly data layout within the master device.

The data types described in this clause are defined for following namespace.
Namespace: cipchannel

Table 9 – Simple channel parameter data types

Data type	Definition	Description
assemblySize	USINT	Length of the assembly data in bytes
frameApplicationTag	STRING	Frame Application specific tag used for identification and navigation
gatewayBusCategory	UUID	Unique identifier for a supported bus type (DeviceNet, Ethernet/IP, ControlNet or CompoNet) according to the specific CATID
helpMessage	STRING	CIP assembly, parameter or I/O connection help string
memberPosition	UDINT	Zero based bit offset. Position of the member data in the assembly data. This has to be calculated from the Assembly structure information
memberSize	UDINT	Number of bits. Length of the member data in the assembly data
protectedByChannelAssignment	BOOL	This flag is set by the client. If the flag is set, DTM is not allowed to change the I/O connection definition

Table 10 – Structured channel parameter data types

Data type	Definition			Description
	Elementary data type	Usage	Multiplicity	
AssemblyMember	STRUCT			Describes a member of an assembly. Provided is the bitPosition from the start of the assembly data block and the bitLength in bits, and the FDT channel reference of the channel which describes the member data. The reference to the data of the AssemblyMember can be: a) a ParameterReference to the list of parameters derived from the deviceDTM by GETParametersList; b) an AssemblyMemberReference references another Assembly. So this is then a nested assembly; c) an FDT ChannelReference points to a channel provide by the Device DTM; d) a CIPObject Address points to the attribute holding the data in the CIP way of addressing. If the member is a constant, it is expressed in this way
	memberPosition	M	[1..1]	
	memberSize	M	[1..1]	
	choice of	M	[1..1]	
	AssemblyMemberReference	S	[0..1]	
	fdt:ChannelReference	S	[0..1]	
	cip:CIPObjectAddress	S	[1..1]	
	cip:Constant	S	[1..1]	
AssemblyMemberReference	STRUCT			Reference to the description of an assembly member
	fdt:idref	M	[1..1]	
	cip:bitOffset	O	[0..1]	

Data type	Definition			Description
	Elementary data type	Usage	Multiplicity	
AssemblyMembers	STRUCT			The collection of AssemblyMembers. This member is available only if the FDT channel object represents an assembly; otherwise channel represents a CIP object
	AssemblyMember	O	[0..*]	
ChannelReference	STRUCT			Refers to an FDT channel and an CIP object reference
	fdt:ChannelReference	M	[1..1]	
	cip:CIPObjectAddress	M	[1..1]	
	cip:bitOffset	M	[1..1]	
FDTChannel	STRUCT			Describes the Process Channel in detail
	fdt:tag	M	[1..1]	
	fdt:id	M	[1..1]	
	protectedByChannelAssignment	M	[1..1]	
	fdt:dataType	M	[1..1]	
	assemblySize	M	[1..1]	
	fdt:signalType	M	[1..1]	
	frameApplicationTag	O	[0..1]	
	helpMessage	O	[0..1]	
	fdt:SemanticInformation	O	[0..1]	
	ServiceSet	M	[1..1]	
	cip:CIPObjectAddress	M	[1..1]	
	AssemblyMembers	O	[0..1]	
FDTChannelType	STRUCT			Description of the channel component in case of channels with gateway functionality. States the version number of the DTM and, optionally, the fieldbus category ID
	gatewayBusCategory	O	[0..1]	
	fdt:VersionInformation	M	[1..1]	
ServiceSet	STRUCT			The collection of supported CIP Service Codes
	cip:Service	M	[1..*]	

12 Device identification

12.1 Device type identification data types

The IEC 61784 CPF 2 device type identification data types provide general data types with a protocol specific semantic (see Table 11) as well as data types without such a mapping (see Table 12).

The data types described in this subclause are defined for following namespace.
Namespace: cipident

Table 11 – Identification data types with protocol specific mapping

IEC 61784 CPF 2 attribute name	Semantic element name	Data request in physical device	Protocol specific name	IEC 61784 CPF 2 data format	FDT data type (display format)	Specific reference
busProtocol	IdBusProtocol	For all DeviceNet Devices: protocol_CIP_DeviceNet For all Ethernet/IP Devices: protocol_CIP_EthernetIP For all ControlNet Devices: protocol_CIP_ControlNet For all CompoNet Devices: protocol_CIP_CompoNet	-	-	Enumeration (protocol_CIP_DeviceNet | protocol_CIP_EthernetIP | protocol_CIP_ControlNet | protocol_CIP_CompoNet)	-

Table 12 – Simple identification data types with protocol independent semantics

Data type	Definition	Description
idDTMSupportLevel	enumeration (genericSupport | profileSupport | blockspecificProfileSupport | specificSupport | identSupport)	Enumeration(see IEC 62453-2)
match	STRING	Used by a DTM to define a regular expression, which shall match the scanned physical identification information
nomatch	STRING	Used by a DTM to define a regular expression, which shall not match the scanned physical identification information. Used by Device DTM to indicate if identification information may not match

Table 13 – Structured identification data types with protocol independent semantics

Data type	Definition			Description
	Elementary data type	Usage	Multiplicity	
RegExpr	STRUCT			Includes regular expression string – either for match or nomatch
	match	O	[0..1]	
	nomatch	O	[0..1]	

12.2 Topology scan data types

The data type CIPDevice (see Table 4), is used with the Scan service response.

This data type describes one entry in the list of scanned devices.

12.3 Scan identification data types

This subclause defines data types that are used to provide the scan response of a CIP network (see Table 14 and Table 15).

The data types described in this subclause are defined for following namespace.
Namespace: cipdevscanid

Table 14 – Simple scan identification data types

Data type	Definition	Description
configuredState	enumeration (configuredAndPhysicallyAvailable | configuredAndNotPhysicallyAvailable | availableButNotConfigured | notApplicable)	A communication master shall indicate in this attribute, if the scan response is related to a detected physical device, which is configured or unconfigured
resultState	enumeration (provisional | final | error)	Identifies if the result is one of the provisional results or the final result of the split scan results

Table 15 – Structured scan identification data types

Data type	Definition			Description
	Elementary data type	Usage	Multiplicity	
IdBusProtocol	STRUCT			This element contains exactly one attribute, which contains the value of the scanned physical device. This element has semantic meaning therefore has a prefix “Id” for better identification
	cipident:busProtocol	O	[0..1]	
	cipident:RegExpr	O	[0..*]	
ScanIdentification	STRUCT			These elements contain all elements for the appropriate protocol variant
	configuredState	O	[0..1]	
	fdt:CommunicationError	O	[0..1]	
	IdBusProtocol	M	[1..1]	
	cip:CIPDevice	M	[1..1]	
ScanIdentifications	STRUCT			Collection of ScanIdentification elements
	fdt:protocolId	M	[1..1]	
	resultState	M	[1..1]	
	ScanIdentification	O	[0..*]	

12.4 Device type identification data types

This subclause defines data types that are used to provide protocol specific information for device types (see Table 16).

The data types described in this subclause are defined for following namespace.
Namespace: cipdevid

Table 16 – Structured device type identification data types

Data type	Definition			Description
	Elementary data type	Usage	Multiplicity	
DeviceIdentification	STRUCT			This element contains all elements for the appropriate protocol variant
	cipident:idDTMSupportLevel	M	[1..1]	
	IdBusProtocol	M	[1..1]	
	cip:CIPDeviceIdentity	M	[1..1]	
DeviceIdentifications	STRUCT			Collection of DeviceIdentification elements
	fdt:protocolId	M	[1..1]	
	DeviceIdentification	O	[0..*]	
IdBusProtocol	STRUCT			This element contains exactly one attribute, which contains the value of the scanned physical device. This element has semantic meaning therefore has a prefix “Id” for better identification
	cipident:busProtocol	O	[0..1]	
	cipident:RegExpr	O	[0..*]	

Annex A
(informative)

Implementation hints

A.1 Addressing in CompoNet DTMs

In CompoNet the Node Address can be set on the device using switches (see [14], Chapter 9-3). This same address is used to set the Address on the DTM.

NOTE As a consequence, the DTM always uses the address which is set on the device using the switches.

As for all other CIP protocols, the "UserDefinedBus" Addressing is used in the DTM's Parameter Document. Since the CompoNet Node Address range is limited to 127, the "ShortIdentifier" can be used to specify the address within the "UserDefinedBus" data type.

CompoNet defines different types of devices, with are specified in the EDS file by the Device Category keyword (see [14], Chapter 7 and Table A.1).

The Node Address range depends on the Device Category, as defined in Table A.1.

The address used for communication on Layer 2 (Media Access Control Address, MAC), i.e. the MAC ID, is calculated from the Device Type and the Node address, in accordance to Table A.1 (see also [14], Chapters 1-4).

Table A.1 – CompoNet relationship between Device Category, Node Address, MAC ID

Device Category	Value	Node Address	Node Address length	Prefix coding bit 9-7	MAC ID
Master	0		6-bit	0x111	0x1C0
Word IN	1	0x00-0x3F	6-bit	0x000	0x0-0x3F
Word OUT	2	0x00-0x3F	6-bit	0x001	0x40-0x7F
Word MIX	3	0x00-0x3F	6-bit	0x000	0x0-0x3F
Bit IN	4	0x00-0x7F	7-bit	0x01*	0x80-0xFF
Bit OUT	5	0x00-0x7F	7-bit	0x10*	0x100-0x17F
Bit MIX	6	0x00-0x7F	7-bit	0x01*	0x80-0xFF
Repeater	7	0x00-0x3F	6-bit	0x110	0x180-0x1BF

The MAC ID shall be used for direct communication, and not the Node Address. Since the length of the MAC ID is 9 bits, the short identifier that is used within the "UserDefinedBus" element of the DTM's Parameter Document cannot be used, as it is limited to one octet.

The DTM will therefore uses for addressing the Node Address with a prefix. The Prefix depends on the Device Type as indicated in Table A.1. The prefix and the Node Address are combined to build the MAC ID, which is provided through the ExtendedIdentifier.

EXAMPLES

Word IN at Node Address 1	is MAC ID	0x0001
Word OUT at Node Address 5	is MAC ID	0x0045
Bit IN at Node Address 127	is MAC ID	0x00FF
Bit OUT at Node Address 127	is MAC ID	0x017F

When doing communication in FDT (slave request communication from master) this MAC ID is used in the ExtendedIdentifier. The notation is always in hexadecimal format.

A.2 Displaying addresses of CompoNet DTMs

As there are different types of devices according to the Device Category but they can have the same Node Address, there should be a way to distinguish devices of different Device Categories. The proposal is to add the Device Category in the name of the DTM, as shown for example in Figure A.1.

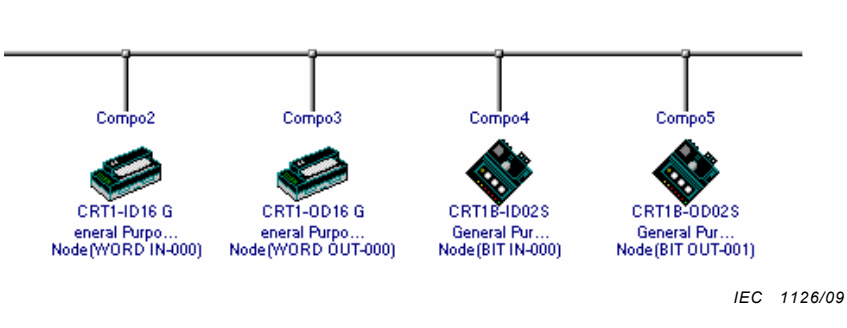

Figure A.1 – Examples of DTM naming for CompoNet

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NOTE See also the IEC Multilingual Dictionary – Electricity, Electronics and Telecommunications (available on CD-ROM and at <http://domino.iec.ch/iev>).

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