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Industrial automation systems and integration — Open systems application integration framework —

Part 2: Reference description for ISO 11898-based control systems

Systèmes d'automatisation industrielle et intégration — Cadres d'intégration d'application pour les systèmes ouverts —

Partie 2: Description de référence pour les systèmes de contrôle fondés sur l'ISO 11898

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15745-2 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration,* Subcommittee SC 5, *Architecture, communications and integration frameworks*.

ISO 15745 consists of the following parts, under the general title *Industrial automation systems and integration — Open systems application integration framework:*

— *Part 1: Generic reference description*

— *Part 2: Reference description for ISO 11898-based control systems*

— *Part 3: Reference description for IEC 61158-based control systems*

— *Part 4: Reference description for Ethernet-based control systems*

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Introduction

The application integration framework (AIF) described in ISO 15745 defines elements and rules that facilitate:

— the systematic organization and representation of the application integration requirements using integration models;

— the development of interface specifications in the form of application interoperability profiles (AIPs) that enable both the selection of suitable resources and the documentation of the "as built" application.

ISO 15745-1 defines the generic elements and rules for describing integration models and AIPs, together with their component profiles - process profiles, information exchange profiles, and resource profiles. The context of ISO 15745 and a structural overview of the constituents of an AIP are given in Figure 1 of ISO 15745-1:2003.

This part of ISO 15745 extends the generic AIF described in ISO 15745-1 by defining the technology specific elements and rules for describing both communication network profiles and the communication related aspects of device profiles specific to ISO 11898-based control systems (DeviceNet[1] , CANopen[2]).

In particular, this part of ISO 15745 describes technology specific profile templates for the device profile and the communication network profile. Within an AIP, a device profile instance or a communication network profile instance is part of the resource profile defined in ISO 15745-1. The device profile and the communication network profile XML instance files are included in a resource profile XML instance using the ProfileHandle_DataType as specified in ISO 15745-1:2003, 7.2.5.

AIFs specified using the elements and rules of ISO 15745-1 can be easily integrated with the component profiles defined using the elements and rules specified in this part.

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1) DeviceNet™ is a trade name of Open DeviceNet Vendor Association, Inc. This information is given for the convenience of users of ISO 15745 and does not constitute an endorsement by ISO of the trademark holder or any of its products. Compliance to this standard does not require use of the trade name DeviceNet™. Use of the trade name DeviceNet™ requires permission of the Open DeviceNet Vendor Association, Inc.

2) CANopen is a trade name used to describe EN 50325-4. This information is given for the convenience of users of ISO 15745 and does not constitute an endorsement by ISO of the trademark, or any related products. Compliance to this standard does not require use of the trade name CANopen.

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Industrial automation systems and integration — Open systems application integration framework —

Part 2:
Reference description for ISO 11898-based control systems

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1 Scope

This part of ISO 15745 defines the technology specific elements and rules for describing both communication network profiles and the communication related aspects of device profiles specific to ISO 11898-based control systems.

NOTE Generic elements and rules for describing integration models and application interoperability profiles, together with their component profiles (process profiles, information exchange profiles, and resource profiles) are specified in ISO 15745-1.

This part of ISO 15745 is to be used in conjunction with ISO 15745-1 to describe an application integration framework.

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.

ISO 639-1:2002, *Codes for the representation of names of languages – Part 1: Alpha-2 code*

ISO 639-2:1998, *Codes for the representation of names of languages – Part 2: Alpha-3 code*

ISO 3166-1:1997, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes*

ISO/IEC 10646-1:2000, *Information technology – Universal Multiple-Octet Coded Character Set (UCS) – Part 1: Architecture and Basic Multilingual Plane*

ISO 11898:1993, *Road Vehicles – Interchange of digital information – Controller area network (CAN) for high-speed communication*

ISO 15745-1:2003, *Industrial automation and systems integration – Open systems application integration framework – Part 1 : Generic reference description*

IEC 61158 (all parts), *Digital data communications for measurement and control – Fieldbus for use in industrial control systems*

IEC 61784-1:2003, *Digital data communications for measurement and control – Part 1: Profile sets for continuous and discrete manufacturing relative to fieldbus use in industrial control systems*

IEC 62026-3:2000, *Low-voltage switchgear and controlgear – Controller-device interfaces (CDIs) – Part 3: DeviceNet*™

EN 50325-4 : 2002, *Industrial communications subsystem based on ISO 11898 (CAN) for controller-device interfaces – Part 4 : CANopen*

IEEE Std 754-1985 (R1990), *IEEE Standard for Binary Floating-Point Arithmetic*

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REC-xml-20001006, *Extensible Markup Language (XML) 1.0 Second Edition – W3C Recommendation 6 October 2000*

REC-xmlschema-1-20010502, *XML Schema Part 1: Structures – W3C Recommendation 02 May 2001*

REC-xmlschema-2-20010502, *XML Schema Part 2: Datatypes – W3C Recommendation 02 May 2001*

RFC 1738:1994, *Uniform Resource Locators (URL) – Internet Engineering Task Force (IETF), Request for Comments (RFC)*

RFC 1759:1995, *Printer MIB – Internet Engineering Task Force (IETF), Request for Comments (RFC)*

UML V1.4, *OMG - Unified Modeling Language Specification (Version 1.4, September 2001)*

3 Terms and definitions

NOTE The UML terminology and notation used in this document is described in Annex A of ISO 15745-1:2003.

For the purposes of this document, the terms and definitions given in ISO 15745-1 apply.

4 Abbreviated terms

AIF Application Integration Framework

AIP Application Interoperability Profile

CAN Controller Area Network

CIP™[3] Common Industrial Protocol

EDS Electronic Data Sheet

IAS Industrial Automation Systems

OSI Open System Interconnection

UML Unified Modelling Language (see UML V1.4)

XML eXtensible Markup Language (see REC-xml-20001006)

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[3] CIP™ is a trade name of ControlNet International, Ltd. and Open DeviceNet Vendor Association, Inc. This information is given for the convenience of users of ISO 15745 and does not constitute an endorsement by ISO of the trademark holder or any of its products. Compliance to this standard does not require use of the trade name CIP™. Use of the trade name CIP™ requires permission of either ControlNet International, Ltd. or Open DeviceNet Vendor Association, Inc

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5 Technology specific elements and rules

5.1 Integration models and IAS interfaces

The AIP developer shall develop the integration model using the rules described in ISO 15745-1, and shall ensure that the ISO 11898-based device and communication network profiles (whether representing the interface requirements or those derived from existing devices/communication networks) include the necessary IAS interfaces. The IAS interfaces included in the profile shall be identified in the header section (see ISO 15745-1:2003, 7.2.2).

NOTE IAS interfaces are described in ISO 15745-1:2003, Annex B.

5.2 Profile templates

5.2.1 General

The ISO 11898-based technology specific profile templates are derived from the generic profile templates specified in ISO 15745-1:2003, clause 7.

5.2.2 Contents and syntax

ISO 15745 specifies profile templates that are XML schemas (REC-xmlschema-1-20010502 and REC-xmlschema-2-20010502) and use a common general structure. The device and communication network profiles based on these templates typically contain:

— information needed to identify the connected device;

— a description of device data that can be accessed via the network;

— a description of the communication capabilities supported by the device;

— additional vendor-specific information.

However, some ISO 11898-based technologies use specific legacy ASCII syntax. Hence, for backward compatibility, template definitions of any technology (Annex A to Annex B) include all or a relevant subset of the following:

— communication network and device profile templates, as defined in ISO 15745-1;

— ISO 15745 template to encapsulate files with legacy ASCII syntax ("wrapper");

— legacy ASCII syntax.

5.2.3 Header

The profile template header defined in ISO 15745-1:2003, 7.2.2, is used for ISO 11898 technology specific profile templates. Each technology uses one or more names to identify the technology or its particular component(s) (see Table 1). The selected name shall be stored in the ProfileTechnology attribute in the header section.

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Table 1 — ProfileTechnology names

ProfileTechnology name	Technology
DeviceNet	DeviceNet
CIP	DeviceNet
EDS	DeviceNet
CANopen	CANopen
COFDCML	CANopen

5.3 Technology specific profiles

The technology specific communication network profile structure and communication related aspects of device profile structure based on ISO 11898-based technologies are described in clause 6. The technologies included are:

— DeviceNet (see 6.1);

— CANopen (see 6.2).

The related profile template definitions are specified in Annex A and Annex B.

6 Device and communication network profiles for ISO 11898-based control systems

6.1 DeviceNet

6.1.1 Device profile

6.1.1.1 General

Figure 1 shows the class structure of the DeviceNet device profile.

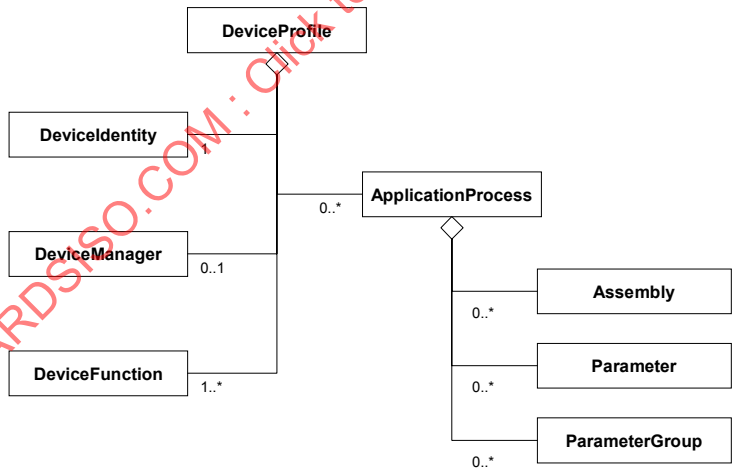

Figure 1 — DeviceNet device profile class diagram

The available formats for DeviceNet device profiles are described in A.2.

The XML schema representing the DeviceNet device profile template is defined in A.2.1.3.3. The file name of this XML schema shall be “CIP_Device_Profile.xsd”.

NOTE The DeviceNet device profile class diagram shown in Figure 1 defines the main classes. These classes are further decomposed ; details are defined in Annex A.

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The XML schema representing the encapsulation of a legacy DeviceNet EDS into the ISO 15745 device profile template is defined in A.2.2.2. The file name of this XML schema shall be “EDS_Device_Profile_wrapper.xsd”. The legacy EDS ASCII syntax itself is described in A.4.

6.1.1.2 Device identity

The DeviceIdentity class contains attributes which uniquely identify the device, and supports services which allow the retrieval of this information from the device.

These attributes provide in particular:

— manufacturer's identification (name and identification code);

— device identification (device type, product name, revision, serial number);

— device classification;

— location of storage of additional information (e.g. icons).

6.1.1.3 Device manager

The DeviceManager class contains attributes and supports services used to monitor and configure the device.

These attributes provide in particular:

— revision of the DeviceNet identity object;

— information on device structure (for devices integrated in a modular system).

Services allow:

— device reset;

— retrieval of DeviceManager attributes.

6.1.1.4 Device function

The DeviceFunction class contains attributes and supports services which enable the management (e.g. configuration) of a function of the device.

EXAMPLE Examples of DeviceFunction objects are Overload, Presence Sensing, Analogue Input, and Discrete Output objects.

NOTE The definition of specific DeviceFunction class is not defined in ISO 15745-2.

6.1.1.5 Application process

Figure 2 shows the class structure of the ApplicationProcess class.

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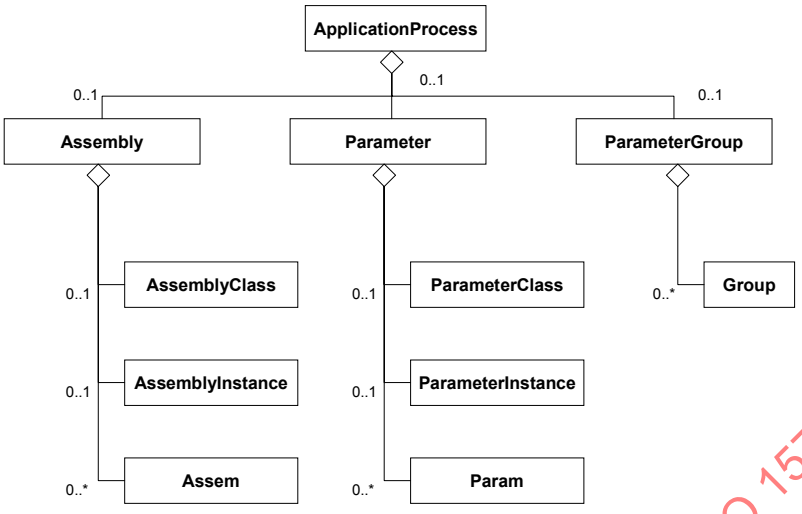

Figure 2 — DeviceNet ApplicationProcess class diagram

The Assembly class assembles several application process data items into a single block for optimisation of communications. The Parameter class provides a standardized interface for accessing individual application process data items. The ParameterGroup class specifies groups of related parameters for a specific purpose (e.g. configuration, monitoring). The Assembly class and the Parameter class support attributes and services both at the class and instance levels.

The Assem, Param and Group classes specify individual instances of the main classes.

NOTE The Assembly class and the Parameter class correspond to the DeviceNet Assembly object and Parameter objects. The Assembly object is fully specified in IEC 61158-5:2003 and IEC 61158-6:2003 (Type 2).

6.1.2 Communication network profile

6.1.2.1 General

Figure 3 shows the class structure of the DeviceNet communication network profile.

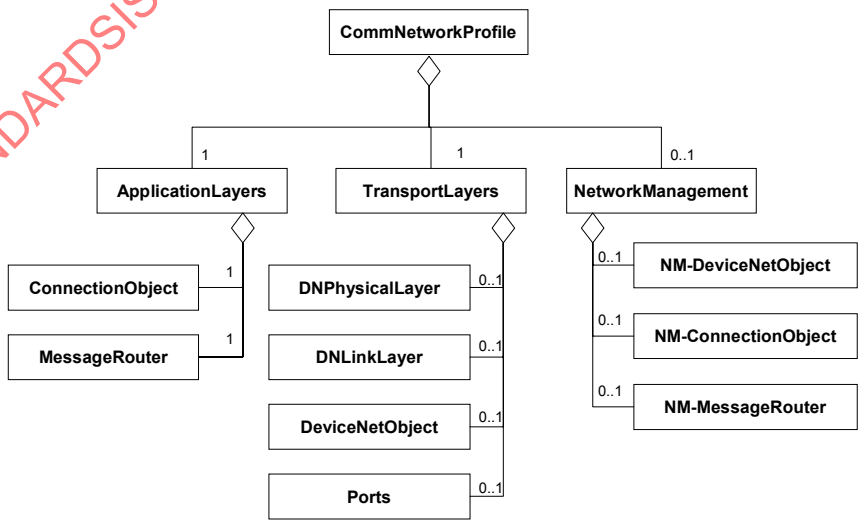

Figure 3 — DeviceNet communication network profile class diagram

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The available formats for DeviceNet communication network profiles are described in A.3.

The XML schema representing the DeviceNet communication network profile template is defined in A.3.1.3. The file name of this XML schema shall be “DNet_CommNet_Profile.xsd”.

The XML schema representing the encapsulation of a legacy DeviceNet EDS into the ISO 15745 communication network profile template is defined in A.3.2.2. The file name of this XML schema shall be “EDS_CommNet_Profile_wrapper.xsd”. The legacy EDS ASCII syntax itself is described in A.4.

6.1.2.2 Application layers

The DeviceNet ApplicationLayers class represents the combined profiles for the upper 3 OSI layers of the DeviceNet communication network integration model.

It is further divided into several classes, as shown in Figure 3:

— ConnectionObject defines the properties associated with connections and connection management;

— MessageRouter defines the properties associated with internal message routing in the device.

NOTE The corresponding Connection object and Message Router object are fully specified in IEC 62026-3:2000.

6.1.2.3 Transport layers

The DeviceNet TransportLayers class represents the combined profiles for the lower 4 OSI layers of the DeviceNet communication network integration model.

It is further divided into several classes, as shown in Figure 3:

— DNPhysicalLayer identifies the physical layer characteristics (e.g. connectors, baudrates, electrical characteristics);

— DNLinkLayer and DeviceNetObject define the properties associated with data link layer configuration and monitoring;

— Ports identifies the device ports which are able to route messages from one link to another link.

NOTE The corresponding DeviceNet object is fully specified in IEC 62026-3:2000.

6.1.2.4 Network management

The DeviceNet NetworkManagement class represents the network configuration and performance adjustment capabilities of the DeviceNet communication network integration model.

It is further divided into several classes, as shown in Figure 3:

— NM-DeviceNetObject, NM-ConnectionObject and NM-MessageRouter define the properties associated with class management of the corresponding objects.

6.2 CANopen

6.2.1 Device profile

6.2.1.1 General

Figure 4 shows the class structure of the CANopen device profile.

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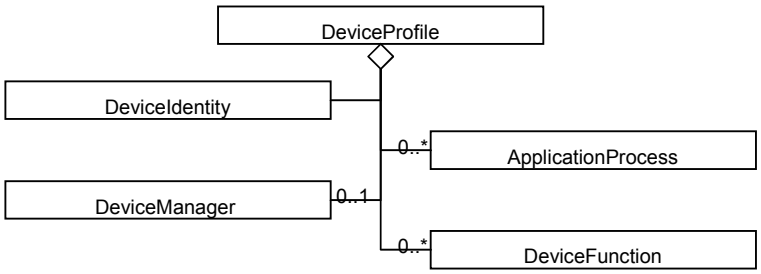

Figure 4 — CANopen device profile class diagram

The required format for CANopen device profiles is described in B.1. The XML schema representing the CANopen device profile template is defined in B.1.5.1. The file name of the XML schema shall be 'COFDCML.xsd'.

NOTE 1 For better readability the CANopen DeviceProfile class diagram has been divided in five class diagrams.

NOTE 2 All these classes are mapped to the same XML schema defined in B.1.5.1.

NOTE 3 The CANopen device profile class diagrams shown in Figure 4 to Figure 10 define the main classes. Some classes are further decomposed; details are defined in Annex B.

6.2.1.2 Device identity

The DeviceIdentity class is defined in Figure 5.

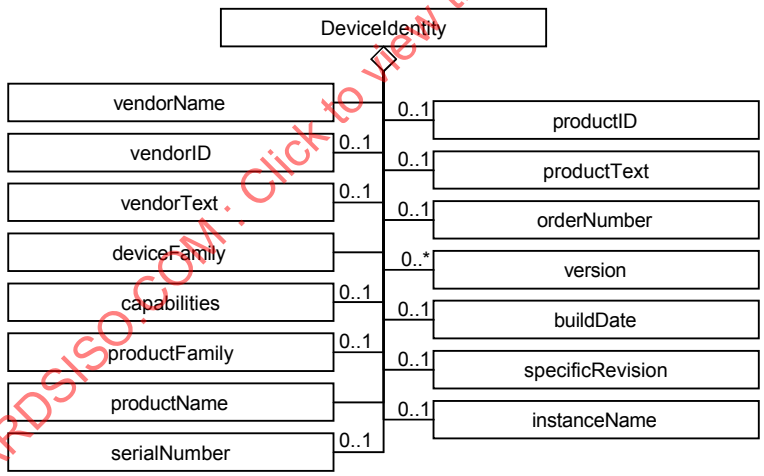

Figure 5 – DeviceIdentity class diagram

The DeviceIdentity class shall consist of the child classes shown in Figure 5 and specified in Table 2.

Table 2 - Decomposition of Device identity object class

Class	Description	Profile	Type	Instance
vendorName	name of the manufacturer or vendor of the device	X	X	X
vendorID	IEEE OUI (Organizationally Unique Identifier) (see[6])		X	X
vendorText	can be used to provide further information on the vendor	X	X	X
deviceFamily	the definition of this class is is not defined in this standard	X	X	X

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Class	Description	Profile	Type	Instance
capabilities	the definition of this class is not defined in this standard		X	X
productFamily	vendor specific product family (brand name) of the device		X	X
productName	vendor specific name of the product	X	X	X
productID	unique ID, identifying the device type, the format is at the vendor's discretion		X	X
productText	can be used to provide further information on the device	X	X	X
orderNumber	vendor specific order number of the product		X	X
version	vendor specific product version, the versionType attribute allows the distinction of multiple versions (i.e. Hardware, Firmware)		X	X
buildDate	build date of the firmware of software constituting the major functionality of the device		X	X
specificationRevision	revision of the specification to which this device conforms	X	X	X
instanceName	name of device instance			X
serialNumber	serial number of device instance			X
NOTE The columns Profile, Type and Instance indicate whether a certain child class is suitable for usage in a device profile, device type description or device instance description.				

6.2.1.3 Device manager

6.2.1.3.1 General

Figure 6 shows the CANopen representation of the DeviceManager object.

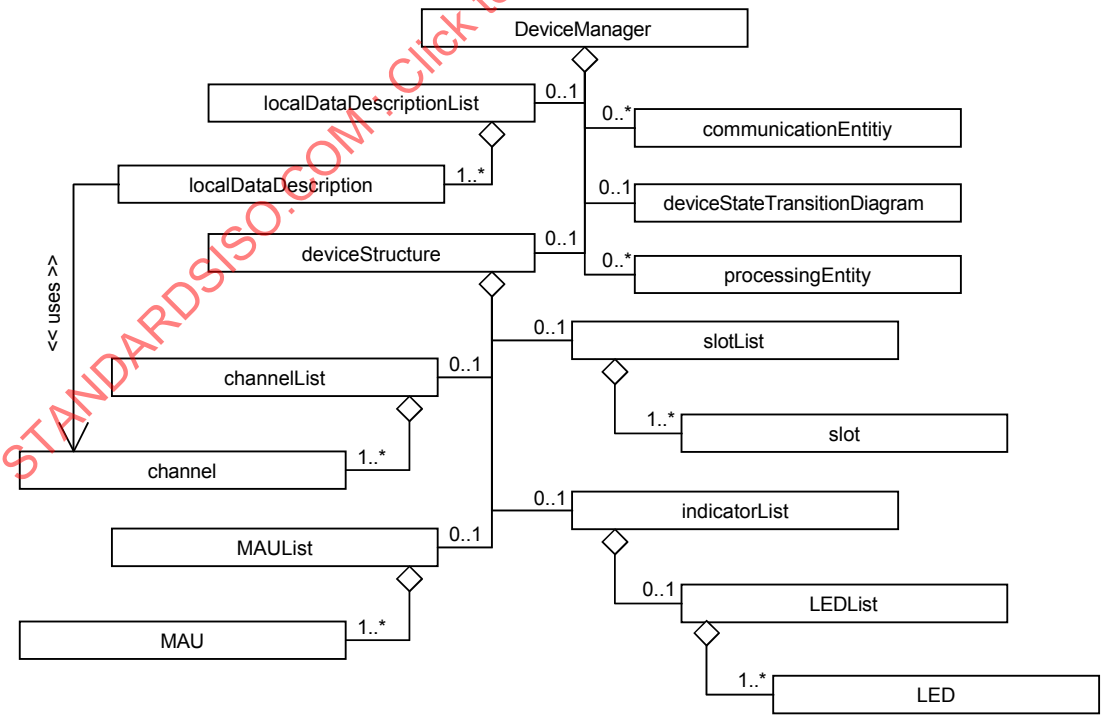

Figure 6 – DeviceManager class diagram

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6.2.1.3.2 localDataDescriptionList, localDataDescription

The localDataDescriptionList object shall be a collection of localDataDescription objects. A localDataDescription object shall describe data objects that are used only within the device context.

6.2.1.3.3 deviceStructure

6.2.1.3.3.1 Overview

The deviceStructure object shall be a container of all physical objects of the device. Such an object can be a channel (physical or logical I/O point), a MAU (Medium Attachment Unit), a slot for the connection of additional modules (as part of the device) or a LED (light-emittig diode).

6.2.1.3.3.2 channelList, channel

A channelList shall be a collection of channel objects. Channel objects shall describe physical or logical I/O points of a device.

6.2.1.3.3.3 MAUList, MAU

The MAUList shall be a collection of MAU objects. These objects shall describe the access points to network medias.

6.2.1.3.3.4 slotList, slot

A slotList object shall be a collection of slot objects. A slot object shall contain a reference to an external CANopen device profile exchange description.

NOTE Slots are used to describe modular devices or distinct combinations of devices.

6.2.1.3.3.5 indicatorList, LEDList, LED

A LEDList object shall be a collection of LED objects. A LED object shall describe a LED of a device..

NOTE The indicatorList class may be extended in future editions of ISO 15745-2.

6.2.1.3.4 communicationEntity

6.2.1.3.4.1 General

Figure 7 shows the definition of the communicationEntity class.

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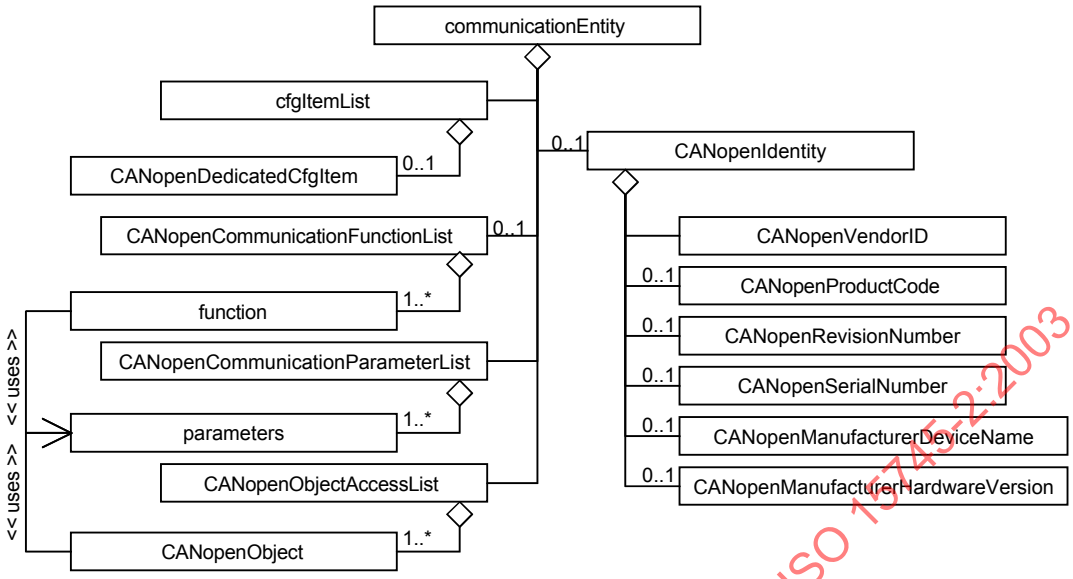

Figure 7 - communicationEntity class diagram

The communicationEntity shall describe an entity of a device, capable of communicating with entities of other devices and shall contain a complete set of predefined configuration items and communication object descriptions. There may be more than one communicationEntity in a device.

6.2.1.3.4.2 cfgItemList (configuration item list)

The cfgItemList shall consist of a CANopenDedicatedCfgItem object.

6.2.1.3.4.3 CANopenDedicatedCfgItem (CANopen dedicated configuration item)

A CANopenDedicatedCfgItem shall be a collection of configuration items.

NOTE The definition of additional configuration item classes is outside the scope of ISO 15745-2.

6.2.1.3.4.4 CANopenIdentity

The CANopenIdentity class consists of several object that are required to identify a device within a CANopen network. This includes objects for a CANopenVendorID, CANopenProductCode, CANopenRevisionNumber, and CANopenSerialNumber as well as CANopenManufacturerDeviceName, CANopenManufacturerHardwareVersion, and CANopenManufacturerSoftwareVersion.

NOTE The corresponding identity object is specified in EN 50325-4.

6.2.1.3.4.5 CANopenCommunicationFunctionList, function

The CANopenCommunicationFunctionList shall be a collection of function objects. Each function object describes a CANopen functionality from the CANopen communication area by use of the CANopenCommunicationParameterList.

6.2.1.3.4.6 CANopenCommunicationParameterList, parameters

The CANopenCommunicationParameterList shall be a collection of parameter objects. Each parameter object describes a parameter from the CANopen communication area.

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6.2.1.3.4.7 CANopenObjectAccessList, CANopenObject

The CANopenObjectAccessList shall be a collection of CANopenObject objects. Each CANopenObject object describes a parameter from the DeviceFunction view or from the CANopenCommunicationParameterList in respect of the CANopen object dictionary.

NOTE The CANopenObjectAccessList is correponding to the CANopen object dictionary in EN 50325-4.

6.2.1.3.5 processingEntity

6.2.1.3.5.1 General

Figure 8 shows the definition of the processingEntity class.

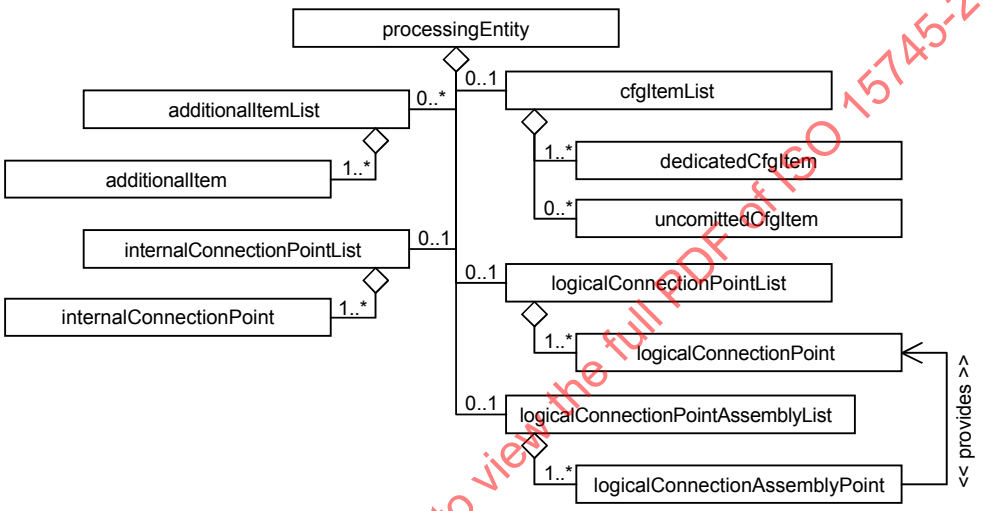

Figure 8 - processingEntity class diagram

A processingEntity shall describe any device entity that is not a communication entity.

EXAMPLE A resource capable of executing programs.

6.2.1.3.5.2 additionalItemList, additionalItem

The additionalItemList shall be a collection of user defined additionalItem objects. An additionalItem object can be used to describe device properties other than configuration properties or communication objects.

NOTE The definition of the additionalItemType of additional items is outside the scope of this International Standard.

EXAMPLE Device documentation.

6.2.1.3.5.3 logicalConnectionPointList, logicalConnectionPoint

The logicalConnectionPointList shall be a collection of logicalConnectionPoint objects. A logicalConnectionPoint describes a connection.

NOTE It is assumed, that only connections between connection endpoints of the same type are used.

6.2.1.3.5.4 logicalConnectionPointAssemblyList, logicalConnectionPointAssembly

The logicalConnectionPointAssemblyList shall be a collection of logicalConnectionPointAssembly objects. A logicalConnectionPointAssembly shall be a description of a group of logicalConnectionPoint objects.

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6.2.1.3.5.5 internalConnectionPointList, internalConnectionPoint

The internalConnectionPointList shall be a collection of internalConnectionPoint objects, which define internal connections between multiple communicationEntity and/or resourceEntity objects in the same device.

6.2.1.3.5.6 cfgItemList (configuration item list)

The cfgItemList may consist of dedicatedCfgItem objects and uncomittedCfgItem objects.

6.2.1.3.5.7 dedicatedCfgItem (dedicated configuration item)

A dedicatedCfgItem shall be a configuration Item with a dedicatedCfgItemType. A dedicatedCfgItem shall be used to specify the corresponding configuration properties.

6.2.1.3.5.8 uncommittedCfgItem (uncommitted configuration item)

An uncommittedCfgItem shall be a configuration item without a dedicatedCfgItemType attribute. An uncommittedCfgItem shall be used to specify configuration properties that cannot be described by a dedicatedCfgItem.

NOTE The definition of uncommitted configuration items is outside the scope of ISO 15745-2.

EXAMPLE A description of a DIP-Switch which changes the ID code of a device.

6.2.1.4 Device function

6.2.1.4.1 General

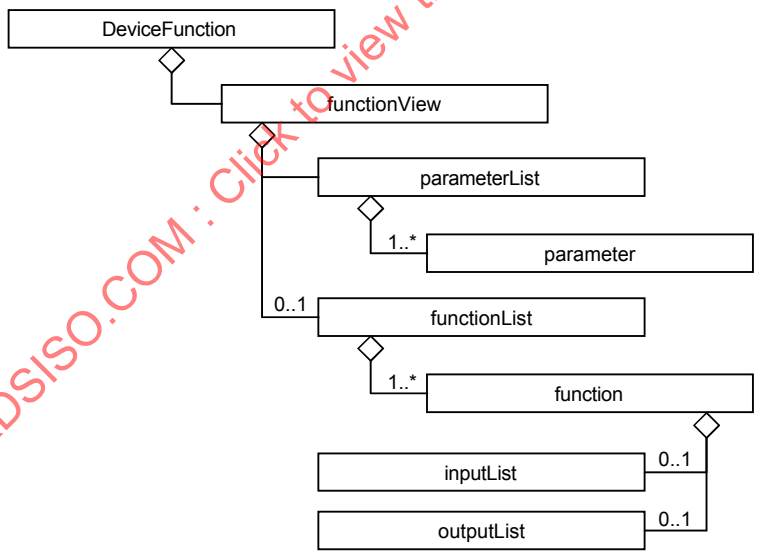

Figure 9 - DeviceFunction class diagram

To allow multiple representations of the device function, an additional XML schema is used to describe the DeviceFunction. The file name of this XML schema shall be “FDCMLISO15745DeviceFunction.xsd”. The DeviceFunction XML schema is defined in Annex B.

NOTE The definition of additional XML schemas describing the DeviceFunction classes is outside the scope of ISO 15745-2.

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6.2.1.4.2 parameterList, parameter

The parameterList shall be a collection of parameter objects. A parameter object describes a device parameter from a functional perspective. It is connected with a communication object in the communicationEntity.

6.2.1.4.3 functionList, function, inputsList, outputsList

The functionList shall be a collection of function objects. A function object shall consist of an inputList and an outputList. These lists shall contain a list of references to parameter objects.

6.2.1.5 Application process

6.2.1.5.1 General

The ApplicationProcess object may be represented by one or more suitable XML schemas.

NOTE The definition of these XML schemas are not defined in ISO 15745-2.

6.2.1.5.2 textualDescription

The textualDescription object explains the function of a device in a human readable textual form.

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6.2.2 Communication network profile

6.2.2.1 General

Figure 10 shows the class structure of the CANopen communication network profile.

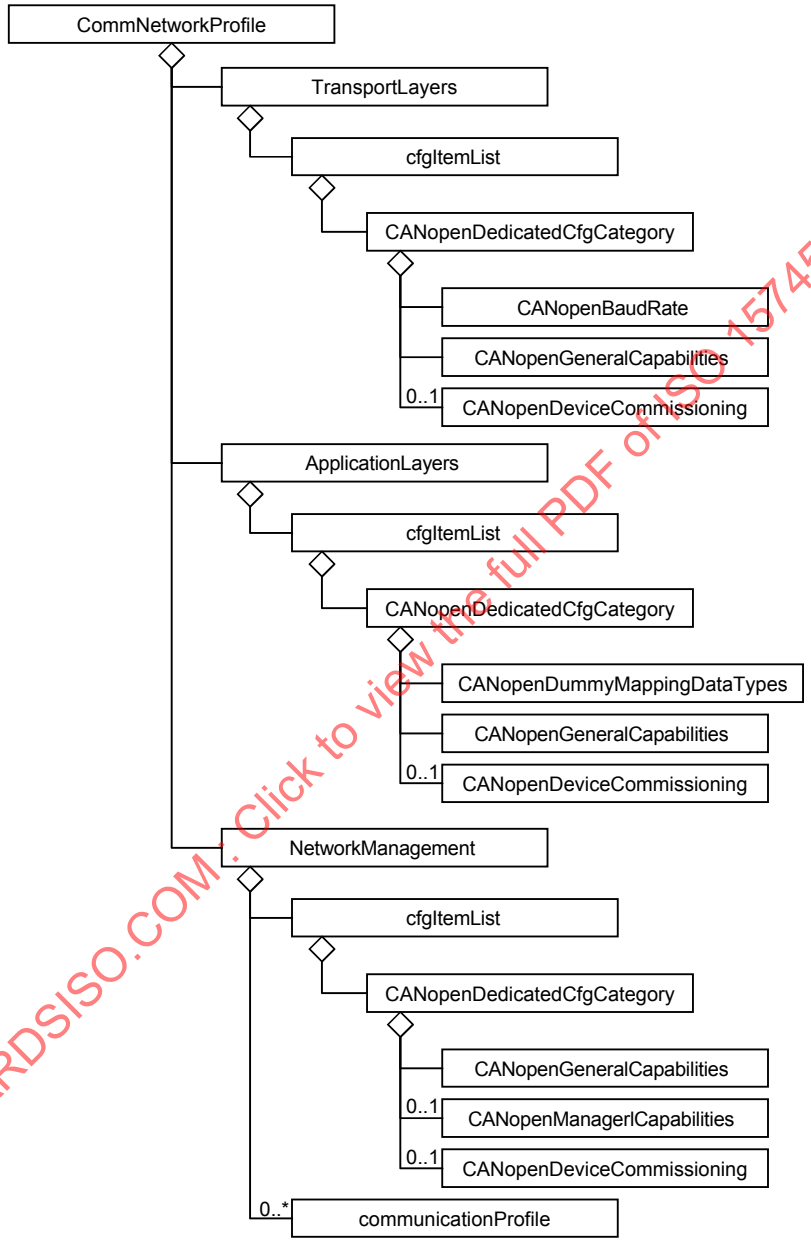

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Figure 10 - CANopen communication network profile class diagram

The XML schema representing the CANopen communication network profile is defined in Annex B. The file name of the XML schema shall be “COCommNetworkProfile.xsd”.

6.2.2.2 communicationProfile

The communicationProfile shall state the usable communication profile identifiers. Communication profiles and their identifiers are defined in IEC 61784-1:2003 clause 10.1. An AIP designer may specify additional communication profiles, the identifiers for such new communication profiles shall be a three digit number between 680 and 699.

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6.2.2.3 Transport layers

6.2.2.3.1 General

A TransportLayers object shall represent the combined profiles for the lower 4 OSI layers of the communication network integration model. The TransportLayers object shall contain a cfgItemList object.

6.2.2.3.2 cfgItemList, CANopenDedicatedCfgCategory

The cfgItemList shall be a collection of configuration items related to the lower 4 OSI layers of the communication network integration model. This includes a specific category dedicated to CANopn related configuration items, e.g. Baudrates, general capabilities as well as device commissioning.

NOTE This CANopenDedicatedCfgCategory describes the supported services for data transimission (e.g. process data objects and service data objects) as well as the supported baudrates as defined in EN 50325-4.

6.2.2.4 Application layers

6.2.2.4.1 General

An ApplicationLayers object shall represent the combined profiles for the upper 3 OSI layers of the communication network integration model. The ApplicationLayers object shall contain a cfgItemList object.

6.2.2.4.2 cfgItemList, CANopenDedicatedCfgCategory

The cfgItemList shall be a collection of configuration items related to the upper 3 OSI layers of the communication network integration model. This includes a specific category dedicated to CANopen related configuration items, e.g. supported data types for dummy mapping, general capabilities as well as device commissioning.

6.2.2.5 Network management

6.2.2.5.1 General

A NetworkManagement object shall represent network management functionality. The NetworkManagement object shall contain a cfgItemList object.

6.2.2.5.2 cfgItemList, CANopenDedicatedCfgCategory

The cfgItemList shall be a collection of configuration items related to the network management. This includes a specific category dedicated to CANopen related configuration items, e.g. CANopen manager capabilities, general capabilities as well as device commissioning.

NOTE This CANopenDedicatedCfgCategory specifies the supported network management services as specified in EN 50325-4.

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Annex A
(normative)

DeviceNet profile templates

A.1 General

The upper layers of the DeviceNet network are based on the Common Industrial Protocol (CIP). This protocol models all communication and application entities as objects. CIP specific messaging requests services to be performed on corresponding object instances (or their attributes). This scheme provides an explicit access to all configuration, status, and runtime variables data in a node. At the same time, I/O connections allow direct exchange with the I/O database, without intermediate processing. In both cases, all data references within a device are specified using a CIP path, i.e. an octet string stream that defines the application object instance, attribute and/or connection end-point.

Multiple options are available for remote configuration of devices with a CIP communication interface, including:

— device information saved in printed or electronic format;

— dedicated Parameter Objects, which provide a known public interface to individual configuration/parameter data values, and may also embed additional configuration information such as descriptive text, data type, data limits and default;

— dedicated Configuration Assembly, which allows bulk upload and download of configuration data by grouping individual configuration/parameter data values;

— combinations of the above methods.

Configuration tools currently available for CIP-based devices use a specially formatted ASCII file, referred to as the Electronic Data Sheet (EDS), which provides:

— information needed to identify the connected device;

— a description of device data that can be accessed via the network (e.g. configurable parameters);

— a description of the communication capabilities supported by the device (e.g. connections);

— additional vendor-specific information.

The EDS allows a configuration tool to automate the device configuration process. The EDS requirements provide an open, consistent and compatible approach for performing device configuration in the CIP environment.

The EDS information is very similar to the information required in both communication network and device profiles, hence the following subclauses specify format for:

— communication network and device profile templates, as defined in ISO 15745-1;

— encapsulation of legacy EDS files in the ISO 15745 templates (“wrappers”);

— the legacy Electronic Data Sheet, including common semantics information.

NOTE The DeviceNet EDS (Electronic Data Sheet) of a given device can be derived from the contents of the corresponding XML device and communication network profile files, using the appropriate style sheets.

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A.2 Device profile template description

A.2.1 Device profile template description – XML based

A.2.1.1 General

The device profile XML files shall comply with the device profile XML schema as specified in A.2.1.3.3.

Contents of this XML schema are derived from the device profile class diagrams shown in 6.1.1, and extended with additional elements to allow full description of device requirements or capabilities.

A.2.1.2 Semantics of XML schema elements

A.2.1.2.1 ProfileBody

This main element is associated with a set of attributes which provide additional information about the profile file.

The semantics of these attributes are specified in A.4.1.4.2.

A.2.1.2.2 DeviceIdentity

This element specifies the supported instance attributes and operations of the Identity Object (see IEC 62026-3:2000), together with additional information for full device identification. When appropriate, it also indicates the actual values of the instance attributes.

The semantics of the DeviceIdentity_InstanceAttributes sub-elements of the DeviceIdentity element are specified in Table A.1.

Table A.1 — DeviceIdentity_InstanceAttributes elements

XML schema elements	Object Attributes	Semantics
SpecificationConformance	No	String specifying the reference version of the DeviceNet specifications
VendCode, ProdType, ProdCode, ProdRevision	Yes	See A.4.1.4.3
VendName, ProdTypeStr, ProdName, Catalog, Icon, ExcludeFromAdapterRackConnection	No	See A.4.1.4.3
Status, SerialNumber, State, ConfigurationConsistencyValue, HeartbeatInterval	Yes	Not applicable
DeviceClassification	No	See A.4.1.4.4 and A.4.2.2.1

A.2.1.2.3 DeviceManager

This element specifies the supported class attributes and operations of the Identity Object(see IEC 62026-3:2000), together with additional information for device management. When appropriate, it also indicates the actual values of the instance attributes.

The semantics of the Modular sub-element of the DeviceManager element are specified in A.4.1.5.2.

A.2.1.2.4 DeviceFunction

The contents of this element are not detailed in this document.

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A.2.1.2.5 ApplicationProcess

A.2.1.2.5.1 Assembly

This element specifies the supported class and instance attributes and operations of the Assembly Object (see IEC 61158-5:2003 and IEC 61158-6:2003 (Type 2)), together with a description of the individual instances.

The semantics of the Assem, ProxyAssem and ProxiedAssem sub-elements of the Assembly element are specified in A.4.1.4.8 and A.4.1.5.3.2.

A.2.1.2.5.2 Parameter

This element specifies the supported class and instance attributes and operations of the Parameter Object, together with a description of the individual instances.

The semantics of the Parameter_ClassAttributes sub-element of the Parameter element are specified in A.4.1.4.5.

The semantics of the Param, ProxyParam and ProxiedParam sub-elements of the Parameter element are specified in A.4.1.4.6 and A.4.1.5.3.1.

A.2.1.2.5.3 ParameterGroup

This element specifies groups of related parameters for a specific purpose.

The semantics of the Group sub-element of the ParameterGroup element is specified in A.4.1.4.7.

A.2.1.3 XML schemas

A.2.1.3.1 MasterTemplateTypes.xsd

NOTE This XML schema contains all the styles defined as part of the master template in ISO 15745-1:2003.

```
<?xml version="1.0" encoding="UTF-8" ?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">

<!-- Target namespaces are not specified in this master template -->

<xsd:annotation>
   <xsd:documentation>* HEADER DATA TYPES *</xsd:documentation>
</xsd:annotation>

<xsd:simpleType name="ProfileClassID_DataType">
   <xsd:restriction base="xsd:string">
      <xsd:enumeration value="AIP" />
      <xsd:enumeration value="Process" />
      <xsd:enumeration value="InformationExchange" />
      <xsd:enumeration value="Resource" />
      <xsd:enumeration value="Device" />
      <xsd:enumeration value="CommunicationNetwork" />
      <xsd:enumeration value="Equipment" />
      <xsd:enumeration value="Human" />
      <xsd:enumeration value="Material" />
   </xsd:restriction>
</xsd:simpleType>

<xsd:complexType name="ISO15745Reference_DataType">
   <xsd:sequence>
      <xsd:element name="ISO15745Part" type="xsd:positiveInteger" />
      <xsd:element name="ISO15745Edition" type="xsd:positiveInteger" />
      <xsd:element name="ProfileTechnology" type="xsd:string" />
   </xsd:sequence>
</xsd:complexType>

<xsd:simpleType name="IASInterface_DataType">
   <xsd:union>
      <xsd:simpleType>
         <xsd:restriction base="xsd:string">
            <xsd:enumeration value="CSI" />
```

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```
            <xsd:enumeration value="HCI" />
            <xsd:enumeration value="ISI" />
            <xsd:enumeration value="API" />
            <xsd:enumeration value="CMI" />
            <xsd:enumeration value="ESI" />
            <xsd:enumeration value="FSI" />
            <xsd:enumeration value="MTI" />
            <xsd:enumeration value="SEI" />
            <xsd:enumeration value="USI" />
         </xsd:restriction>
      </xsd:simpleType>
      <xsd:simpleType>
         <xsd:restriction base="xsd:string">
            <xsd:length value="4" />
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:union>
</xsd:simpleType>

<xsd:annotation>
   <xsd:documentation>* ISO 15745 DEFINED DATA TYPES *</xsd:documentation>
</xsd:annotation>

<xsd:complexType name="ProfileHandle_DataType">
   <xsd:sequence>
      <xsd:element name="ProfileIdentification" type="xsd:string" />
      <xsd:element name="ProfileRevision" type="xsd:string" />
      <xsd:element name="ProfileLocation" type="xsd:anyURI" minOccurs="0" maxOccurs="1" />
   </xsd:sequence>
</xsd:complexType>

</xsd:schema>
```

A.2.1.3.2 CIPDataTypes.xsd

NOTE This XML schema defines the XML schema items (e.g. data types, element types, attribute groups) used in the other XML schemas.

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
   <!-- Target namespaces are not specified in this master template -->
   <xsd:annotation>
      <xsd:documentation>* CIP DATA TYPES *</xsd:documentation>
   </xsd:annotation>
   <xsd:simpleType name="dt_USINT">
      <xsd:restriction base="xsd:unsignedByte"/>
   </xsd:simpleType>
   <xsd:simpleType name="dt_UINT">
      <xsd:restriction base="xsd:unsignedShort"/>
   </xsd:simpleType>
   <xsd:simpleType name="dt_UDINT">
      <xsd:restriction base="xsd:unsignedInt"/>
   </xsd:simpleType>
   <xsd:simpleType name="dt_ULINT">
      <xsd:restriction base="xsd:unsignedLong"/>
   </xsd:simpleType>
   <xsd:simpleType name="dt_SINT">
      <xsd:restriction base="xsd:byte"/>
   </xsd:simpleType>
   <xsd:simpleType name="dt_INT">
      <xsd:restriction base="xsd:short"/>
   </xsd:simpleType>
   <xsd:simpleType name="dt_DINT">
      <xsd:restriction base="xsd:int"/>
   </xsd:simpleType>
   <xsd:simpleType name="dt_LINT">
      <xsd:restriction base="xsd:long"/>
   </xsd:simpleType>
   <xsd:simpleType name="dt_BYTE">
      <xsd:restriction base="xsd:hexBinary">
         <xsd:maxLength value="1"/>
      </xsd:restriction>
   </xsd:simpleType>
```

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```
<xsd:simpleType name="dt_WORD">
   <xsd:restriction base="xsd:hexBinary">
      <xsd:maxLength value="2"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:simpleType name="dt_DWORD">
   <xsd:restriction base="xsd:hexBinary">
      <xsd:maxLength value="4"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:simpleType name="dt_LWORD">
   <xsd:restriction base="xsd:hexBinary">
      <xsd:maxLength value="8"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:simpleType name="dt_REAL">
   <xsd:restriction base="xsd:float"/>
</xsd:simpleType>
<xsd:simpleType name="dt_LREAL">
   <xsd:restriction base="xsd:double"/>
</xsd:simpleType>
<xsd:simpleType name="dt_EDS_Char_Array">
   <xsd:restriction base="xsd:string"/>
</xsd:simpleType>
<xsd:simpleType name="dt_EPATH">
   <xsd:list itemType="et_EPATH_item"/>
</xsd:simpleType>
<xsd:simpleType name="dt_STRINGI">
   <xsd:restriction base="xsd:string"/>
</xsd:simpleType>
<xsd:simpleType name="dt_EDS_Date">
   <xsd:restriction base="xsd:date"/>
</xsd:simpleType>
<xsd:simpleType name="dt_EDS_Time_Of_Day">
   <xsd:restriction base="xsd:time"/>
</xsd:simpleType>
<xsd:simpleType name="dt_EDS_Revision">
   <xsd:restriction base="xsd:string">
      <xsd:pattern value="[0-9]\.[1-9]|[1-9]\.[0-9]|[1-9]\.[1-9]"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:simpleType name="dt_EDS_URL">
   <xsd:restriction base="xsd:anyURI">
      <xsd:pattern value="http://.*"/>
      <xsd:pattern value="ftp://.*"/>
      <xsd:pattern value=".*"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:simpleType name="at_AccessType_OptionalGet">
   <xsd:restriction base="xsd:NMTOKEN">
      <xsd:enumeration value="None"/>
      <xsd:enumeration value="Get"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:simpleType name="at_AccessType_OptionalSet">
   <xsd:restriction base="xsd:NMTOKEN">
      <xsd:enumeration value="None"/>
      <xsd:enumeration value="Get"/>
      <xsd:enumeration value="Set"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:simpleType name="at_AccessType_Mandatory">
   <xsd:restriction base="xsd:NMTOKEN">
      <xsd:enumeration value="Get"/>
      <xsd:enumeration value="Set"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:simpleType name="et_VendorSpecificKeyword">
   <xsd:restriction base="xsd:string">
      <xsd:pattern value="[1-9][0-9]{0,4}_([A-Z]|[a-z]|[0-9])([A-Z]|[a-z]|[0-9]|[_])*"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:simpleType name="et_EPATH_item">
   <xsd:union>
      <xsd:simpleType>
         <xsd:restriction base="xsd:string">
```

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```
                <xsd:pattern value="([0-9]|[a-f]|[A-F]){2}"/>
            </xsd:restriction>
         </xsd:simpleType>
         <xsd:simpleType>
            <xsd:restriction base="xsd:NMTOKEN">
               <xsd:enumeration value="SLOT"/>
               <xsd:enumeration value="SLOT_MINUS_ONE"/>
               <xsd:enumeration value="SYMBOL_ANSI"/>
            </xsd:restriction>
         </xsd:simpleType>
         <xsd:simpleType>
            <xsd:restriction base="xsd:string">
               <xsd:pattern value="Param[1-9][0-9]{0,4}"/>
               <xsd:pattern value="\[Param[1-9][0-9]{0,4}\]"/>
               <xsd:pattern value="ProxyParam[1-9][0-9]{0,4}"/>
               <xsd:pattern value="\[ProxyParam[1-9][0-9]{0,4}\]"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:union>
   </xsd:simpleType>
   <xsd:simpleType name="et_ParamReference">
      <xsd:restriction base="xsd:NMTOKEN">
         <xsd:pattern value="Param[1-9][0-9]{0,4}([:][0-9]{1,2})*"/>
         <xsd:pattern value="ProxyParam[1-9][0-9]{0,4}([:][0-9]{1,2})*"/>
      </xsd:restriction>
   </xsd:simpleType>
   <xsd:simpleType name="et_AssemReference">
      <xsd:restriction base="xsd:NMTOKEN">
         <xsd:pattern value="Assem[1-9][0-9]{0,4}"/>
         <xsd:pattern value="ProxyAssem[1-9][0-9]{0,4}"/>
      </xsd:restriction>
   </xsd:simpleType>
   <xsd:attributeGroup name="ag_FileDescription">
      <xsd:attribute name="DescText" type="dt_EDS_Char_Array" use="required"/>
      <xsd:attribute name="CreateDate" type="dt_EDS_Date" use="required"/>
      <xsd:attribute name="CreateTime" type="dt_EDS_Time_Of_Day" use="required"/>
      <xsd:attribute name="ModDate" type="dt_EDS_Date" use="optional"/>
      <xsd:attribute name="ModTime" type="dt_EDS_Time_Of_Day" use="optional"/>
      <xsd:attribute name="Revision" type="dt_EDS_Revision" use="required"/>
      <xsd:attribute name="HomeURL" type="dt_EDS_URL" use="optional"/>
      <xsd:attribute name="SpecificationConformance" type="dt_EDS_Char_Array" use="required"/>
   </xsd:attributeGroup>
</xsd:schema>
```

A.2.1.3.3 CIP_Device_Profile.xsd

NOTE This XML schema includes the files “MasterTemplateTypes.xsd” (see A.2.1.3.1) and “CIPDataTypes.xsd” (see A.2.1.3.2).

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified">
   <!-- Target namespaces are not specified in this master template -->
   <xsd:redefine schemaLocation="MasterTemplateTypes.xsd">
      <xsd:complexType name="ISO15745Reference_DataType">
         <xsd:complexContent>
            <xsd:restriction base="ISO15745Reference_DataType">
               <xsd:sequence>
                  <xsd:element name="ISO15745Part" type="xsd:positiveInteger"/>
                  <xsd:element name="ISO15745Edition" type="xsd:positiveInteger"/>
                  <xsd:element name="ProfileTechnology" type="xsd:string" fixed="CIP"/>
               </xsd:sequence>
            </xsd:restriction>
         </xsd:complexContent>
      </xsd:complexType>
   </xsd:redefine>
   <xsd:include schemaLocation="CIPDataTypes.xsd"/>
   <xsd:element name="ISO15745Profile">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref="ProfileHeader"/>
            <xsd:element ref="ProfileBody"/>
         </xsd:sequence>
      </xsd:complexType>
```

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```
   </xsd:element>
   <xsd:annotation>
      <xsd:documentation>* HEADER SECTION *</xsd:documentation>
   </xsd:annotation>
   <xsd:element name="ProfileHeader">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="ProfileIdentification" type="xsd:string"/>
            <xsd:element name="ProfileRevision" type="xsd:string"/>
            <xsd:element name="ProfileName" type="xsd:string"/>
            <xsd:element name="ProfileSource" type="xsd:string"/>
            <xsd:element name="ProfileClassID" type="ProfileClassID_DataType" fixed="Device"/>
            <xsd:element name="ProfileDate" type="xsd:date" minOccurs="0"/>
            <xsd:element name="AdditionalInformation" type="xsd:anyURI" minOccurs="0"/>
            <xsd:element name="ISO15745Reference" type="ISO15745Reference_DataType"/>
            <xsd:element name="IASInterfaceType" type="IASInterface_DataType" minOccurs="0"
maxOccurs="unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:annotation>
      <xsd:documentation>* BODY SECTION *</xsd:documentation>
   </xsd:annotation>
   <xsd:element name="ProfileBody">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref="DeviceIdentity"/>
            <xsd:element ref="DeviceManager" minOccurs="0"/>
            <xsd:element ref="DeviceFunction" maxOccurs="unbounded"/>
            <xsd:element ref="ApplicationProcess" minOccurs="0"/>
            <xsd:element name="ExternalProfileHandle" type="ProfileHandle_DataType" minOccurs="0"/>
         </xsd:sequence>
         <xsd:attributeGroup ref="ag_FileDescription"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="DeviceIdentity">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="DeviceIdentity_InstanceAttributes">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:element name="VendCode">
                        <xsd:complexType>
                           <xsd:simpleContent>
                              <xsd:extension base="dt_UINT">
                                 <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                              </xsd:extension>
                           </xsd:simpleContent>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="VendName">
                        <xsd:complexType>
                           <xsd:simpleContent>
                              <xsd:extension base="dt_EDS_Char_Array"/>
                           </xsd:simpleContent>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="SpecificationConformance" type="dt_EDS_Char_Array"
minOccurs="0"/>
                     <xsd:element name="ProdType">
                        <xsd:complexType>
                           <xsd:simpleContent>
                              <xsd:extension base="dt_UINT">
                                 <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                              </xsd:extension>
                           </xsd:simpleContent>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="ProdTypeStr">
                        <xsd:complexType>
                           <xsd:simpleContent>
                              <xsd:extension base="dt_EDS_Char_Array"/>
                           </xsd:simpleContent>
                        </xsd:complexType>
```

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```
                    </xsd:element>
                    <xsd:element name="ProdCode">
                       <xsd:complexType>
                          <xsd:simpleContent>
                             <xsd:extension base="dt_UINT">
                                <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                             </xsd:extension>
                          </xsd:simpleContent>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="ProdRevision">
                       <xsd:complexType>
                          <xsd:sequence>
                             <xsd:element name="MajRev" type="dt_USINT"/>
                             <xsd:element name="MinRev" type="dt_USINT"/>
                          </xsd:sequence>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Status" minOccurs="0">
                       <xsd:complexType>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="SerialNumber" minOccurs="0">
                       <xsd:complexType>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="ProdName">
                       <xsd:complexType>
                          <xsd:simpleContent>
                             <xsd:extension base="xsd:string">
                                <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                             </xsd:extension>
                          </xsd:simpleContent>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="State" minOccurs="0">
                       <xsd:complexType>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="ConfigurationConsistencyValue" minOccurs="0">
                       <xsd:complexType>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="HeartbeatInterval" minOccurs="0">
                       <xsd:complexType>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalSet"
use="required"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Catalog" type="xsd:string" minOccurs="0"/>
                    <xsd:element name="Icon" type="xsd:string" minOccurs="0"/>
                    <xsd:element name="ExcludeFromAdapterRackConnection" type="xsd:string"
minOccurs="0"/>
                    <xsd:element name="DeviceClassification" minOccurs="0">
                       <xsd:complexType>
                          <xsd:sequence>
                             <xsd:element name="Class" maxOccurs="unbounded">
                                <xsd:complexType>
                                   <xsd:sequence>
                                      <xsd:element name="MainClass">
                                         <xsd:simpleType>
                                            <xsd:union>
                                               <xsd:simpleType>
                                                  <xsd:restriction base="xsd:NMTOKEN">
```

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```
                                                <xsd:enumeration value="ControlNet"/>
                                                <xsd:enumeration value="DeviceNet"/>
                                                <xsd:enumeration value="EtherNetIP"/>
                                             </xsd:restriction>
                                          </xsd:simpleType>
                                          <xsd:simpleType>
                                             <xsd:restriction base="et_VendorSpecificKeyword"/>
                                          </xsd:simpleType>
                                       </xsd:union>
                                    </xsd:simpleType>
                                 </xsd:element>
                                 <xsd:element name="SubClass" type="xsd:NMTOKEN" minOccurs="0"
maxOccurs="unbounded"/>
                              </xsd:sequence>
                              <xsd:attribute name="id" use="required">
                                 <xsd:simpleType>
                                    <xsd:restriction base="xsd:ID">
                                       <xsd:pattern value="Class[1-9][0-9]{0,4}"/>
                                    </xsd:restriction>
                                 </xsd:simpleType>
                              </xsd:attribute>
                           </xsd:complexType>
                        </xsd:element>
                     </xsd:sequence>
                  </xsd:complexType>
               </xsd:element>
               <xsd:any namespace="##any"/>
            </xsd:sequence>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="DeviceIdentity_InstanceOperations" minOccurs="0">
         <xsd:complexType>
            <xsd:sequence>
               <xsd:element name="Get_Attribute_All">
                  <xsd:complexType>
                     <xsd:attribute ref="SupportedService" fixed="true"/>
                  </xsd:complexType>
               </xsd:element>
               <xsd:element name="Reset">
                  <xsd:complexType>
                     <xsd:attribute ref="SupportedService" fixed="true"/>
                  </xsd:complexType>
               </xsd:element>
               <xsd:element name="Get_Attribute_Single">
                  <xsd:complexType>
                     <xsd:attribute ref="SupportedService"/>
                  </xsd:complexType>
               </xsd:element>
               <xsd:any namespace="##any"/>
            </xsd:sequence>
         </xsd:complexType>
      </xsd:element>
      <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
   </xsd:sequence>
</xsd:complexType>
</xsd:element>
<xsd:element name="DeviceManager">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element name="DeviceIdentity_ClassAttributes" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="ObjectRevision">
                     <xsd:complexType>
                        <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="MaxInstance">
                     <xsd:complexType>
                        <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="MaxIDClassAttributes">
                     <xsd:complexType>
```

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```
                        <xsd:simpleContent>
                           <xsd:extension base="xsd:string">
                              <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                           </xsd:extension>
                        </xsd:simpleContent>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="MaxIDInstanceAttributes">
                     <xsd:complexType>
                        <xsd:simpleContent>
                           <xsd:extension base="xsd:string">
                              <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                           </xsd:extension>
                        </xsd:simpleContent>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="DeviceIdentity_ClassOperations" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="Get_Attribute_All">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="Reset">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="Get_Attribute_Single">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="Find_Next_Object_Instance">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="Modular" minOccurs="0">
            <xsd:complexType>
               <xsd:choice>
                  <xsd:element name="Chassis">
                     <xsd:complexType>
                        <xsd:sequence>
                           <xsd:element name="DefineSlotsInRack" type="dt_UINT"/>
                           <xsd:element name="SlotDisplayRule" type="et_ParamReference"
minOccurs="0"/>
                           <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                        </xsd:sequence>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="Module">
                     <xsd:complexType>
                        <xsd:sequence>
                           <xsd:element name="Width" type="dt_UINT"/>
                           <xsd:element name="Rack" maxOccurs="unbounded">
                              <xsd:complexType>
                                 <xsd:sequence>
                                    <xsd:element name="VendCode" type="dt_UINT"/>
                                    <xsd:element name="ProdType" type="dt_UINT"/>
                                    <xsd:element name="ProdCode" type="dt_UINT"/>
                                    <xsd:element name="MajRev" type="dt_USINT"/>
                                    <xsd:element name="MinRev" type="dt_USINT"/>
                                    <xsd:element name="LegalSlot" type="dt_UINT"
maxOccurs="unbounded"/>
```

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```
                                    <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                                 </xsd:sequence>
                                 <xsd:attribute name="id" use="required">
                                    <xsd:simpleType>
                                       <xsd:restriction base="xsd:ID">
                                          <xsd:pattern value="Rack[1-9][0-9]{0,4}"/>
                                       </xsd:restriction>
                                    </xsd:simpleType>
                                 </xsd:attribute>
                              </xsd:complexType>
                           </xsd:element>
                           <xsd:element name="ExternalID" type="dt_EPATH" minOccurs="0"/>
                           <xsd:element name="GenericID" type="dt_EPATH" minOccurs="0"/>
                           <xsd:element name="ExternIDExactMatch" minOccurs="0">
                              <xsd:simpleType>
                                 <xsd:restriction base="xsd:NMTOKEN">
                                    <xsd:enumeration value="Yes"/>
                                    <xsd:enumeration value="No"/>
                                 </xsd:restriction>
                              </xsd:simpleType>
                           </xsd:element>
                           <xsd:element name="Query" minOccurs="0">
                              <xsd:complexType>
                                 <xsd:sequence>
                                    <xsd:element name="Path" type="dt_EPATH"/>
                                    <xsd:element name="Service" type="dt_USINT"/>
                                    <xsd:element name="Size">
                                       <xsd:simpleType>
                                          <xsd:restriction base="dt_USINT">
                                             <xsd:minInclusive value="1"/>
                                             <xsd:maxInclusive value="16"/>
                                          </xsd:restriction>
                                       </xsd:simpleType>
                                    </xsd:element>
                                    <xsd:element name="ExternalID" type="dt_EPATH"/>
                                 </xsd:sequence>
                              </xsd:complexType>
                           </xsd:element>
                           <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                        </xsd:sequence>
                     </xsd:complexType>
                  </xsd:element>
               </xsd:choice>
            </xsd:complexType>
         </xsd:element>
         <xsd:any namespace="##any"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name="DeviceFunction">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name="ApplicationProcess">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element name="Parameter" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="Parameter_Class" minOccurs="0">
                     <xsd:complexType>
                        <xsd:sequence>
                           <xsd:element name="Parameter_ClassAttributes">
                              <xsd:complexType>
                                 <xsd:sequence>
                                    <xsd:element name="ObjectRevision" minOccurs="0">
                                       <xsd:complexType>
                                          <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                       </xsd:complexType>
                                    </xsd:element>
                                    <xsd:element name="MaxInstance">
                                       <xsd:complexType>
```

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```
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Get"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="ParameterClassDescriptor">
                                    <xsd:complexType>
                                        <xsd:simpleContent>
                                            <xsd:extension base="xsd:string">
                                                <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Get"/>
                                            </xsd:extension>
                                        </xsd:simpleContent>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="ConfigurationAssemblyInstance">
                                    <xsd:complexType>
                                        <xsd:simpleContent>
                                            <xsd:extension base="xsd:string">
                                                <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Get"/>
                                            </xsd:extension>
                                        </xsd:simpleContent>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="NativeLanguage" minOccurs="0">
                                    <xsd:complexType>
                                        <xsd:simpleContent>
                                            <xsd:extension base="xsd:string">
                                                <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalSet" use="required"/>
                                            </xsd:extension>
                                        </xsd:simpleContent>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                            </xsd:sequence>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Parameter_ClassOperations" minOccurs="0">
                        <xsd:complexType>
                            <xsd:sequence>
                                <xsd:element name="Get_Attribute_All">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Reset">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Get_Attribute_Single">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService" fixed="true"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Set_Attribute_Single">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Restore">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Save">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                            </xsd:sequence>
                        </xsd:complexType>
                    </xsd:element>
                </xsd:sequence>
```

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```
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="Parameter_Instance" minOccurs="0">
                        <xsd:complexType>
                           <xsd:sequence>
                              <xsd:element name="Parameter_InstanceAttributes" minOccurs="0">
                                 <xsd:complexType>
                                    <xsd:sequence>
                                       <xsd:element name="ParameterValue">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Set"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="LinkPathSize">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Set"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="LinkPath">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Set"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="ParamDescriptor">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Get"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="DataType">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Get"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="DataSize">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Get"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="ParameterName">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="UnitsString">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="HelpString">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="MinimumValue">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="MaximumValue">
                                          <xsd:complexType>
                                             <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                          </xsd:complexType>
                                       </xsd:element>
                                       <xsd:element name="DefaultValue">
                                          <xsd:complexType>
```

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```
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="ScalingMultiplier">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="ScalingDivider">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="ScalingBase">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="ScalingOffset">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="MultiplierLink">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="DivisorLink">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="BaseLink">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="OffsetLink">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="DecimalPrecision">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                            </xsd:sequence>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Parameter_InstanceOperations" minOccurs="0">
                        <xsd:complexType>
                            <xsd:sequence>
                                <xsd:element name="Get_Attribute_All">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Get_Attribute_Single">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService" fixed="true"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Set_Attribute_Single">
```

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```
                                    <xsd:complexType>
                                       <xsd:attribute ref="SupportedService" fixed="true"/>
                                    </xsd:complexType>
                                 </xsd:element>
                                 <xsd:element name="Get_Enum_String">
                                    <xsd:complexType>
                                       <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                 </xsd:element>
                                 <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                              </xsd:sequence>
                           </xsd:complexType>
                        </xsd:element>
                     </xsd:sequence>
                  </xsd:complexType>
               </xsd:element>
               <xsd:element name="Param" minOccurs="0" maxOccurs="unbounded">
                  <xsd:complexType>
                     <xsd:complexContent>
                        <xsd:extension base="et_ParamType">
                           <xsd:attribute name="id" use="required">
                              <xsd:simpleType>
                                 <xsd:restriction base="xsd:ID">
                                    <xsd:pattern value="Param[1-9][0-9]{0,4}"/>
                                 </xsd:restriction>
                              </xsd:simpleType>
                           </xsd:attribute>
                        </xsd:extension>
                     </xsd:complexContent>
                  </xsd:complexType>
               </xsd:element>
               <xsd:element name="ProxyParam" minOccurs="0" maxOccurs="unbounded">
                  <xsd:complexType>
                     <xsd:complexContent>
                        <xsd:extension base="et_ProxyParamType">
                           <xsd:attribute name="id" use="required">
                              <xsd:simpleType>
                                 <xsd:restriction base="xsd:ID">
                                    <xsd:pattern value="ProxyParam[1-9][0-9]{0,4}"/>
                                 </xsd:restriction>
                              </xsd:simpleType>
                           </xsd:attribute>
                        </xsd:extension>
                     </xsd:complexContent>
                  </xsd:complexType>
               </xsd:element>
               <xsd:element name="ProxiedParam" minOccurs="0" maxOccurs="unbounded">
                  <xsd:complexType>
                     <xsd:complexContent>
                        <xsd:extension base="et_ParamType">
                           <xsd:attribute name="id" use="required">
                              <xsd:simpleType>
                                 <xsd:restriction base="xsd:ID">
                                    <xsd:pattern value="ProxiedParam[1-9][0-9]{0,4}"/>
                                 </xsd:restriction>
                              </xsd:simpleType>
                           </xsd:attribute>
                        </xsd:extension>
                     </xsd:complexContent>
                  </xsd:complexType>
               </xsd:element>
               <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
            </xsd:sequence>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="Assembly" minOccurs="0">
         <xsd:complexType>
            <xsd:sequence>
               <xsd:element name="Assembly_Class" minOccurs="0">
                  <xsd:complexType>
                     <xsd:sequence>
                        <xsd:element name="Assembly_ClassAttributes" minOccurs="0">
                           <xsd:complexType>
                              <xsd:sequence>
                                 <xsd:element name="ObjectRevision">
                                    <xsd:complexType>
```

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```
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Get"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="MaxInstance">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                            </xsd:sequence>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Assembly_ClassOperations" minOccurs="0">
                        <xsd:complexType>
                            <xsd:sequence>
                                <xsd:element name="Create">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Delete">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Get_Attribute_Single">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService" fixed="true"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                            </xsd:sequence>
                        </xsd:complexType>
                    </xsd:element>
                </xsd:sequence>
            </xsd:complexType>
        </xsd:element>
        <xsd:element name="Assembly_Instance" minOccurs="0">
            <xsd:complexType>
                <xsd:sequence>
                    <xsd:element name="Assembly_InstanceAttributes" minOccurs="0">
                        <xsd:complexType>
                            <xsd:sequence>
                                <xsd:element name="NumberOfMembers">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalGet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="AssemblyMemberList">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_OptionalSet" use="required"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="AssemblyData">
                                    <xsd:complexType>
                                        <xsd:attribute name="Access_Rule"
type="at_AccessType_Mandatory" use="required" fixed="Set"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                            </xsd:sequence>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Assembly_InstanceOperations" minOccurs="0">
                        <xsd:complexType>
                            <xsd:sequence>
                                <xsd:element name="Delete">
                                    <xsd:complexType>
                                        <xsd:attribute ref="SupportedService"/>
                                    </xsd:complexType>
                                </xsd:element>
                                <xsd:element name="Get_Attribute_Single">
```

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```
                        <xsd:complexType>
                           <xsd:attribute ref="SupportedService" fixed="true"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="Set_Attribute_Single">
                        <xsd:complexType>
                           <xsd:attribute ref="SupportedService"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="Get_Member">
                        <xsd:complexType>
                           <xsd:attribute ref="SupportedService"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="Set_Member">
                        <xsd:complexType>
                           <xsd:attribute ref="SupportedService"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="Insert_Member">
                        <xsd:complexType>
                           <xsd:attribute ref="SupportedService"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="Remove_Member">
                        <xsd:complexType>
                           <xsd:attribute ref="SupportedService"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                  </xsd:sequence>
               </xsd:complexType>
            </xsd:element>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="Assem" minOccurs="0" maxOccurs="unbounded">
      <xsd:complexType>
         <xsd:complexContent>
            <xsd:extension base="et_AssemType">
               <xsd:attribute name="id" use="required">
                  <xsd:simpleType>
                     <xsd:restriction base="xsd:ID">
                        <xsd:pattern value="Assem[1-9][0-9]{0,4}"/>
                     </xsd:restriction>
                  </xsd:simpleType>
               </xsd:attribute>
            </xsd:extension>
         </xsd:complexContent>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="ProxyAssem" minOccurs="0" maxOccurs="unbounded">
      <xsd:complexType>
         <xsd:complexContent>
            <xsd:extension base="et_AssemType">
               <xsd:attribute name="id" use="required">
                  <xsd:simpleType>
                     <xsd:restriction base="xsd:ID">
                        <xsd:pattern value="ProxyAssem[1-9][0-9]{0,4}"/>
                     </xsd:restriction>
                  </xsd:simpleType>
               </xsd:attribute>
            </xsd:extension>
         </xsd:complexContent>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="ProxiedAssem" minOccurs="0" maxOccurs="unbounded">
      <xsd:complexType>
         <xsd:complexContent>
            <xsd:extension base="et_AssemType">
               <xsd:attribute name="id" use="required">
                  <xsd:simpleType>
                     <xsd:restriction base="xsd:ID">
                        <xsd:pattern value="ProxiedAssem[1-9][0-9]{0,4}"/>
                     </xsd:restriction>
                  </xsd:simpleType>
```

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```
                        </xsd:attribute>
                     </xsd:extension>
                  </xsd:complexContent>
               </xsd:complexType>
            </xsd:element>
            <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="ParameterGroup" minOccurs="0">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="Group" minOccurs="0" maxOccurs="unbounded">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:element name="NameString" type="dt_EDS_Char_Array"/>
                     <xsd:element name="NumberOfMembers" type="dt_UINT"/>
                     <xsd:choice maxOccurs="unbounded">
                        <xsd:element name="ParameterRef" type="dt_UINT"/>
                        <xsd:element name="VariantRef" type="xsd:NMTOKEN"/>
                        <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                     </xsd:choice>
                  </xsd:sequence>
                  <xsd:attribute name="id" use="required">
                     <xsd:simpleType>
                        <xsd:restriction base="xsd:ID">
                           <xsd:pattern value="Group[1-9][0-9]{0,4}"/>
                        </xsd:restriction>
                     </xsd:simpleType>
                  </xsd:attribute>
               </xsd:complexType>
            </xsd:element>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
</xsd:sequence>
</xsd:complexType>
</xsd:element>
<xsd:attribute name="SupportedService" use="required">
   <xsd:simpleType>
      <xsd:restriction base="xsd:boolean">
         <xsd:pattern value="true|false"/>
      </xsd:restriction>
   </xsd:simpleType>
</xsd:attribute>
<xsd:complexType name="et_ParamType">
   <xsd:sequence>
      <xsd:element name="LinkPathSize" type="dt_USINT" minOccurs="0"/>
      <xsd:element name="LinkPath" type="dt_EPATH" minOccurs="0"/>
      <xsd:element name="ParamDescriptor" type="dt_WORD"/>
      <xsd:element name="DataType">
         <xsd:simpleType>
            <xsd:union memberTypes="dt_USINT dt_EPATH"/>
         </xsd:simpleType>
      </xsd:element>
      <xsd:element name="DataSize" type="dt_USINT"/>
      <xsd:element name="ParameterName" type="dt_EDS_Char_Array"/>
      <xsd:element name="UnitsString" type="dt_EDS_Char_Array"/>
      <xsd:element name="HelpString" type="dt_EDS_Char_Array"/>
      <xsd:element name="MinimumValue" minOccurs="0"/>
      <xsd:element name="MaximumValue" minOccurs="0"/>
      <xsd:element name="DefaultValue" minOccurs="0"/>
      <xsd:element name="ScalingMultiplier" type="dt_UINT" minOccurs="0"/>
      <xsd:element name="ScalingDivider" type="dt_UINT" minOccurs="0"/>
      <xsd:element name="ScalingBase" type="dt_UINT" minOccurs="0"/>
      <xsd:element name="ScalingOffset" type="dt_INT" minOccurs="0"/>
      <xsd:element name="MultiplierLink" type="dt_UINT" minOccurs="0"/>
      <xsd:element name="DivisorLink" type="dt_UINT" minOccurs="0"/>
      <xsd:element name="BaseLink" type="dt_UINT" minOccurs="0"/>
      <xsd:element name="OffsetLink" type="dt_INT" minOccurs="0"/>
      <xsd:element name="DecimalPrecision" type="dt_USINT" minOccurs="0"/>
      <xsd:element name="InternationalParameterName" type="dt_EDS_Char_Array" minOccurs="0"/>
      <xsd:element name="InternationalEngineeringUnits" type="dt_EDS_Char_Array" minOccurs="0"/>
      <xsd:element name="InternationalHelpString" type="dt_EDS_Char_Array" minOccurs="0"/>
      <xsd:element name="Enum" minOccurs="0">
```

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```
            <xsd:complexType>
               <xsd:sequence maxOccurs="unbounded">
                  <xsd:element name="EnumValue" type="dt_LINT"/>
                  <xsd:element name="EnumName" type="dt_EDS_Char_Array"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
         <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
   <xsd:complexType name="et_ProxyParamType">
      <xsd:complexContent>
         <xsd:extension base="et_ParamType">
            <xsd:sequence>
               <xsd:element name="ProxyParamSizeAdder" minOccurs="0">
                  <xsd:complexType>
                     <xsd:sequence>
                        <xsd:element name="MinimumValue"/>
                        <xsd:element name="MaximumValue"/>
                        <xsd:element name="DefaultValue"/>
                     </xsd:sequence>
                  </xsd:complexType>
               </xsd:element>
            </xsd:sequence>
         </xsd:extension>
      </xsd:complexContent>
   </xsd:complexType>
   <xsd:complexType name="et_AssemType">
      <xsd:sequence>
         <xsd:element name="AssemblyName" type="dt_EDS_Char_Array" minOccurs="0"/>
         <xsd:element name="AssemblyPath" type="dt_EPATH" minOccurs="0"/>
         <xsd:element name="AssemblyDataSize" type="dt_UINT" minOccurs="0"/>
         <xsd:element name="AssemblyDescriptor" type="dt_WORD" minOccurs="0"/>
         <xsd:element name="AssemblyMember" minOccurs="0" maxOccurs="unbounded">
            <xsd:complexType>
               <xsd:choice>
                  <xsd:element name="MemberSize" type="dt_UINT"/>
                  <xsd:element name="MemberReference" type="et_MemberReferenceType"/>
                  <xsd:element name="VariantReference">
                     <xsd:complexType/>
                  </xsd:element>
                  <xsd:choice>
                     <xsd:sequence>
                        <xsd:element name="MemberSize" type="dt_UINT"/>
                        <xsd:element name="MemberReference" type="et_MemberReferenceType"/>
                     </xsd:sequence>
                     <xsd:sequence>
                        <xsd:element name="MemberSize" type="dt_UINT"/>
                        <xsd:element name="VariantReference">
                           <xsd:complexType/>
                        </xsd:element>
                     </xsd:sequence>
                  </xsd:choice>
               </xsd:choice>
            </xsd:complexType>
         </xsd:element>
         <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
   <xsd:simpleType name="et_MemberReferenceType">
      <xsd:union memberTypes="et_AssemReference et_ParamReference dt_UDINT dt_EPATH xsd:NMTOKEN"/>
   </xsd:simpleType>
</xsd:schema>
```

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A.2.2 Device profile template description – XML encapsulation of EDS files

A.2.2.1 General

The device profile XML files used to encapsulate EDS files shall comply with the device profile XML schema as specified in A.2.2.2.

The semantics of the sub-elements of the ExternalProfileHandle element, used to reference an existing EDS file, are specified in Table A.2. Depending on the value of the attribute WrapperReference, the EDS file will be referenced using either identification elements from the EDS file itself, or from the product described by this EDS.

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NOTE 1 Choice of relevant identification elements will depend upon the expected usage of the wrapper file.

Table A.2 — ExternalProfileHandle elements

XML schema elements	WrapperReference = FILEINFO	WrapperReference =DEVICEINFO
ProfileIdentification	EDS File description text[a]	VendorID, Device Type, Product Code [b]
ProfileRevision	EDS Revision[a]	Product Revision [b]
ProfileLocation	EDS HomeURL[a]	Icon File Name [b]
[a] See A.4.1.4.2 for more details [b] See A.4.1.4.3 for more details		

If present, the DeviceIdentity, DeviceManager, DeviceFunction and ApplicationProcess elements should be compatible with the formats specified in A.2.1.3.3.

NOTE 2 This may be used during a transition phase between the legacy EDS format and the full XML format.

A.2.2.2 XML schema : EDS_Device_Profile_wrapper.xsd

NOTE This XML schema includes the file “MasterTemplateTypes.xsd” (see A.2.1.3.1).

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
   <!-- Target namespaces are not specified in this master template -->
   <xsd:redefine schemaLocation="MasterTemplateTypes.xsd">
      <xsd:complexType name="ISO15745Reference_DataType">
         <xsd:complexContent>
            <xsd:restriction base="ISO15745Reference_DataType">
               <xsd:sequence>
                  <xsd:element name="ISO15745Part" type="xsd:positiveInteger"/>
                  <xsd:element name="ISO15745Edition" type="xsd:positiveInteger"/>
                  <xsd:element name="ProfileTechnology" type="xsd:string" fixed="EDS"/>
               </xsd:sequence>
            </xsd:restriction>
         </xsd:complexContent>
      </xsd:complexType>
   </xsd:redefine>
   <xsd:element name="ISO15745Profile">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref="ProfileHeader"/>
            <xsd:element ref="ProfileBody"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:annotation>
      <xsd:documentation>* HEADER SECTION *</xsd:documentation>
   </xsd:annotation>
   <xsd:element name="ProfileHeader">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="ProfileIdentification" type="xsd:string"/>
            <xsd:element name="ProfileRevision" type="xsd:string"/>
            <xsd:element name="ProfileName" type="xsd:string"/>
            <xsd:element name="ProfileSource" type="xsd:string"/>
            <xsd:element name="ProfileClassID" type="ProfileClassID_DataType" fixed="Device"/>
            <xsd:element name="ProfileDate" type="xsd:date" minOccurs="0"/>
            <xsd:element name="AdditionalInformation" type="xsd:anyURI" minOccurs="0"/>
            <xsd:element name="ISO15745Reference" type="ISO15745Reference_DataType"/>
            <xsd:element name="IASInterfaceType" type="IASInterface_DataType" minOccurs="0"
maxOccurs="unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:annotation>
      <xsd:documentation>* BODY SECTION *</xsd:documentation>
   </xsd:annotation>
   <xsd:element name="ProfileBody">
```

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```
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="DeviceIdentity" minOccurs="0">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:any namespace="##any"/>
                  </xsd:sequence>
               </xsd:complexType>
            </xsd:element>
            <xsd:element name="DeviceManager" minOccurs="0">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:any namespace="##any"/>
                  </xsd:sequence>
               </xsd:complexType>
            </xsd:element>
            <xsd:element name="DeviceFunction" maxOccurs="unbounded">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:any namespace="##any"/>
                  </xsd:sequence>
               </xsd:complexType>
            </xsd:element>
            <xsd:element name="ApplicationProcess" minOccurs="0">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:any namespace="##any"/>
                  </xsd:sequence>
               </xsd:complexType>
            </xsd:element>
            <xsd:element name="ExternalProfileHandle">
               <xsd:complexType>
                  <xsd:complexContent>
                     <xsd:extension base="ProfileHandle_DataType">
                        <xsd:attribute name="WrapperReference" use="optional" default="FILEINFO">
                           <xsd:simpleType>
                              <xsd:restriction base="xsd:NMTOKEN">
                                 <xsd:enumeration value="FILEINFO"/>
                                 <xsd:enumeration value="DEVICEINFO"/>
                              </xsd:restriction>
                           </xsd:simpleType>
                        </xsd:attribute>
                     </xsd:extension>
                  </xsd:complexContent>
               </xsd:complexType>
            </xsd:element>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
</xsd:schema>
```

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A.3 Communication network profile template description

A.3.1 Communication network profile template description – XML based

A.3.1.1 General

The communication network profile XML files shall comply with the communication network profile XML schema as specified in A.3.1.3.

Contents of this XML schema are derived from the communication network profile class diagrams shown in 6.1.2, and extended with additional elements to allow full description of communication network requirements or capabilities.

A.3.1.2 Semantics of XML schema elements

A.3.1.2.1 ProfileBody

This main element is associated with a set of attributes which provide additional information about the profile file.

The semantics of these attributes is specified in A.4.1.4.2.

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A.3.1.2.2 ApplicationLayers

A.3.1.2.2.1 ConnectionObject

This element specifies the supported instance attributes and operations of the Connection Object (see IEC 62026-3:2000), together with a description of the individual connection instances and I/O characteristics.

The ConnectionDescriptions element identifies the instances of the Connection Object which are implemented in the device. The semantics of its Connection sub-element are specified in Table A.3.

Table A.3 — Connection elements

XML schema elements	Semantics
InstanceType	Specifies the type of connection (Explicit Message, Polled I/O, Bit Strobed I/O, Dynamic I/O)
ProductionTrigger	Specifies the type of trigger (Cyclic, Change Of State, Application Triggered)
TransportType	Specifies the type of transport (Server, Client)
TransportClass	Specifies the transport class (0, 2 or 3)
ProducedConnectionSize	Specifies the size of produced data in bytes
ConsumedConnectionSize	Specifies the size of consumed data in bytes

The semantics of the IO_Characteristics element are specified in A.4.2.4.2.

A.3.1.2.2.2 MessageRouter

This element specifies the supported instance attributes and operations of the Message Router Object (see IEC 62026-3:2000).

A.3.1.2.3 TransportLayers

A.3.1.2.3.1 DNPhysicalLayer

This element identifies the physical layer characteristics (e.g. connectors, baudrates, electrical characteristics).

The semantics its sub-elements are specified in Table A.4.

Table A.4 — DNPhysicalLayer elements

XML schema elements	XML schema attribute	Semantics
Connectors	ConnectorType	Specifies type of connectors (Open HardWired, Open Pluggable, Sealed Mini, SealedMicro)
LEDs		Specifies supported LED indicators
	Module	If attribute is present, corresponding LED is present
	Network	
	Combo_ModNet	
	IO	
Baud_Rate_Setting		Specifies supported baud rates
	SwitchType	Specifies supported methods for setting of baud rate selection
	SoftwareSettable	Specifies whether baud rate may be set by software
ElectricalCharacteristics		Sub-element specifies maximum network power consumption in Amps, at 11 Volts DC (worst case)
	IsolatedPhysicalLayer	Specifies whether physical layer is isolated or not

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A.3.1.2.3.2 DNLinkLayer

This element defines some properties associated with data link layer configuration.

The semantics its sub-elements are specified in Table A.5.

Table A.5 — DNLinkLayer elements

XML schema elements	XML schema attribute	Semantics
Mac-IDSetting		Specifies the default MAC-ID
	SwitchType	Specifies supported methods for setting of MAC-ID
	SoftwareSettable	Specifies whether MAC-ID may be set via software
PredefinedMasterSlaveConnectionSet		Specifies the supported predefined connection set (none, Group2 Client and/or Group2 Server, GroupOnly2 Client, GroupOnly2 Server)
DynamicConnectionSupport		Specifies support of dynamic connections (none, Group1, Group2, Group3)
FragmentedExplicitMessaging		Sub-elements specify parameters for fragmented messaging
	Supported	Specifies whether fragmented messaging is supported

A.3.1.2.3.3 DeviceNetObject

This element specifies the supported instance attributes and operations of the DeviceNet Object (see IEC 62026-3:2000).

A.3.1.2.3.4 Ports

This element identifies the device ports which are able to route messages from one link to another link.

The semantics of the Port sub-element of the Ports element are specified in A.4.1.4.10 and A.4.2.2.2.

A.3.1.2.4 NetworkManagement

A.3.1.2.4.1 NM-DeviceNetObject

This element specifies the supported class attributes and operations of the DeviceNet Object (see IEC 62026-3:2000).

A.3.1.2.4.2 NM-ConnectionObject

This element specifies the supported class attributes and operations of the Connection Object (see IEC 62026-3:2000).

A.3.1.2.4.3 NM-MessageRouter

This element specifies the supported class attributes and operations of the Message Router Object (see IEC 62026-3:2000).

A.3.1.3 XML schema : DNet_CommNet_Profile.xsd

NOTE This XML schema includes the files “MasterTemplateTypes.xsd” (see A.2.1.3.1) and “CIPDataTypes.xsd” (see A.2.1.3.2).

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified">
   <!-- Target namespaces are not specified in this master template -->
   <xsd:redefine schemaLocation="MasterTemplateTypes.xsd">
```

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```
      <xsd:complexType name="ISO15745Reference_DataType">
         <xsd:complexContent>
            <xsd:restriction base="ISO15745Reference_DataType">
               <xsd:sequence>
                  <xsd:element name="ISO15745Part" type="xsd:positiveInteger" fixed="2"/>
                  <xsd:element name="ISO15745Edition" type="xsd:positiveInteger" fixed="1"/>
                  <xsd:element name="ProfileTechnology" type="xsd:string" fixed="DeviceNet"/>
               </xsd:sequence>
            </xsd:restriction>
         </xsd:complexContent>
      </xsd:complexType>
   </xsd:redefine>
   <xsd:include schemaLocation="CIPDataTypes.xsd"/>
   <xsd:element name="ISO15745Profile">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref="ProfileHeader"/>
            <xsd:element ref="ProfileBody"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:annotation>
      <xsd:documentation>* HEADER SECTION *</xsd:documentation>
   </xsd:annotation>
   <xsd:element name="ProfileHeader">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="ProfileIdentification" type="xsd:string"/>
            <xsd:element name="ProfileRevision" type="xsd:string"/>
            <xsd:element name="ProfileName" type="xsd:string"/>
            <xsd:element name="ProfileSource" type="xsd:string"/>
            <xsd:element name="ProfileClassID" type="ProfileClassID_DataType"
fixed="CommunicationNetwork"/>
            <xsd:element name="ProfileDate" type="xsd:date" minOccurs="0"/>
            <xsd:element name="AdditionalInformation" type="xsd:anyURI" minOccurs="0"/>
            <xsd:element name="ISO15745Reference" type="ISO15745Reference_DataType"/>
            <xsd:element name="IASInterfaceType" type="IASInterface_DataType" fixed="CSI"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:annotation>
      <xsd:documentation>* BODY SECTION *</xsd:documentation>
   </xsd:annotation>
   <xsd:element name="ProfileBody">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref="ApplicationLayers"/>
            <xsd:element ref="TransportLayers"/>
            <xsd:element ref="NetworkManagement" minOccurs="0"/>
         </xsd:sequence>
         <xsd:attributeGroup ref="ag_FileDescription"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="ApplicationLayers">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref="ConnectionObject"/>
            <xsd:element ref="MessageRouter"/>
            <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="TransportLayers">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref="DNPhysicalLayer"/>
            <xsd:element ref="DNLinkLayer"/>
            <xsd:element ref="DeviceNetObject"/>
            <xsd:element ref="Ports" minOccurs="0"/>
            <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="NetworkManagement">
      <xsd:complexType>
         <xsd:sequence>
```

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```
            <xsd:element ref="NM-DeviceNetObject"/>
            <xsd:element ref="NM-ConnectionObject" minOccurs="0"/>
            <xsd:element ref="NM-MessageRouter" minOccurs="0"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="ConnectionObject">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="ConnectionObject_InstanceAttributes" minOccurs="0">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:element name="State">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="InstanceType">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="TransportClassTrigger">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="ProducedConnectionID">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="ConsumedConnectionID">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="InitialCommCharacteristics">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="ProducedConnectionSize">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="ConsumedConnectionSize">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="ExpectedPacketRate">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="WatchdogTimeoutAction">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="ProducedConnectionPathLength">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
```

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```
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="ProducedConnectionPath">
                        <xsd:complexType>
                            <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="ConsumedConnectionPathLength">
                        <xsd:complexType>
                            <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Get"/>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="ConsumedConnectionPath">
                        <xsd:complexType>
                            <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory"
use="required" fixed="Set"/>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="ProductionInhibitTime">
                        <xsd:complexType>
                            <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalSet"
use="required"/>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                </xsd:sequence>
            </xsd:complexType>
        </xsd:element>
        <xsd:element name="ConnectionObject_InstanceOperations" minOccurs="0">
            <xsd:complexType>
                <xsd:sequence>
                    <xsd:element name="Reset">
                        <xsd:complexType>
                            <xsd:attribute ref="SupportedService"/>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Delete">
                        <xsd:complexType>
                            <xsd:attribute ref="SupportedService"/>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Apply_Attributes">
                        <xsd:complexType>
                            <xsd:attribute ref="SupportedService"/>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Get_Attribute_Single">
                        <xsd:complexType>
                            <xsd:attribute ref="SupportedService" fixed="true"/>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Set_Attribute_Single">
                        <xsd:complexType>
                            <xsd:attribute ref="SupportedService"/>
                        </xsd:complexType>
                    </xsd:element>
                    <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                </xsd:sequence>
            </xsd:complexType>
        </xsd:element>
        <xsd:element ref="ConnectionDescriptions" minOccurs="0"/>
        <xsd:element name="IO_Characteristics" minOccurs="0">
            <xsd:complexType>
                <xsd:sequence>
                    <xsd:element name="IO_Info" type="et_IOInfoType"/>
                    <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                </xsd:sequence>
            </xsd:complexType>
        </xsd:element>
        <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
<xsd:element name="ConnectionDescriptions">
```

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```
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="Connection" minOccurs="0" maxOccurs="unbounded">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:element name="InstanceType">
                        <xsd:simpleType>
                           <xsd:restriction base="xsd:NMTOKEN">
                              <xsd:enumeration value="ExplicitMessage"/>
                              <xsd:enumeration value="PolledIO"/>
                              <xsd:enumeration value="BitStrobedIO"/>
                              <xsd:enumeration value="DynamicIO"/>
                           </xsd:restriction>
                        </xsd:simpleType>
                     </xsd:element>
                     <xsd:element name="ProductionTrigger">
                        <xsd:simpleType>
                           <xsd:restriction base="xsd:NMTOKEN">
                              <xsd:enumeration value="Cyclic"/>
                              <xsd:enumeration value="ChangeOfState"/>
                              <xsd:enumeration value="ApplicationTriggered"/>
                           </xsd:restriction>
                        </xsd:simpleType>
                     </xsd:element>
                     <xsd:element name="TransportType">
                        <xsd:simpleType>
                           <xsd:restriction base="xsd:NMTOKEN">
                              <xsd:enumeration value="Server"/>
                              <xsd:enumeration value="Client"/>
                           </xsd:restriction>
                        </xsd:simpleType>
                     </xsd:element>
                     <xsd:element name="TransportClass">
                        <xsd:simpleType>
                           <xsd:restriction base="dt_SINT">
                              <xsd:enumeration value="0"/>
                              <xsd:enumeration value="2"/>
                              <xsd:enumeration value="3"/>
                           </xsd:restriction>
                        </xsd:simpleType>
                     </xsd:element>
                     <xsd:element name="ProducedConnectionSize" type="dt_UINT"/>
                     <xsd:element name="ConsumedConnectionSize" type="dt_UINT"/>
                     <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                  </xsd:sequence>
               </xsd:complexType>
            </xsd:element>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="MessageRouter">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="MessageRouter_InstanceAttributes" minOccurs="0">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:element name="Object_List">
                        <xsd:complexType>
                           <xsd:simpleContent>
                              <xsd:extension base="xsd:string">
                                 <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                              </xsd:extension>
                           </xsd:simpleContent>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="MaximumConnectionSupported">
                        <xsd:complexType>
                           <xsd:simpleContent>
                              <xsd:extension base="dt_UINT">
                                 <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                              </xsd:extension>
                           </xsd:simpleContent>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="NumberActiveConnections">
                        <xsd:complexType>
```

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```
                        <xsd:simpleContent>
                           <xsd:extension base="dt_UINT">
                              <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                           </xsd:extension>
                        </xsd:simpleContent>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="ActiveConnectionList">
                     <xsd:complexType>
                        <xsd:simpleContent>
                           <xsd:extension base="dt_UINT">
                              <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                           </xsd:extension>
                        </xsd:simpleContent>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="MessageRouter_InstanceOperations" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="Get_Attribute_All">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="Get_Attribute_Single">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name="DNPhysicalLayer">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element name="Connectors" minOccurs="0">
            <xsd:complexType>
               <xsd:attribute name="ConnectorType">
                  <xsd:simpleType>
                     <xsd:restriction base="xsd:NMTOKEN">
                        <xsd:enumeration value="OpenHardWired"/>
                        <xsd:enumeration value="OpenPluggable"/>
                        <xsd:enumeration value="SealedMini"/>
                        <xsd:enumeration value="SealedMicro"/>
                     </xsd:restriction>
                  </xsd:simpleType>
               </xsd:attribute>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="LEDs" minOccurs="0">
            <xsd:complexType>
               <xsd:attribute name="Module" type="xsd:NMTOKEN"/>
               <xsd:attribute name="Network" type="xsd:NMTOKEN"/>
               <xsd:attribute name="Combo_ModNet" type="xsd:NMTOKEN"/>
               <xsd:attribute name="IO" type="xsd:NMTOKEN"/>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="Baud_Rate_Setting" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="BR_125Kbits" minOccurs="0">
                     <xsd:complexType>
                        <xsd:attribute ref="Supported"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="BR_250Kbits" minOccurs="0">
                     <xsd:complexType>
                        <xsd:attribute ref="Supported"/>
```

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```
                  </xsd:complexType>
               </xsd:element>
               <xsd:element name="BR_500Kbits" minOccurs="0">
                  <xsd:complexType>
                     <xsd:attribute ref="Supported"/>
                  </xsd:complexType>
               </xsd:element>
            </xsd:sequence>
            <xsd:attribute name="SwitchType" use="required">
               <xsd:simpleType>
                  <xsd:restriction base="xsd:NMTOKEN">
                     <xsd:enumeration value="DipSwitch"/>
                     <xsd:enumeration value="Other"/>
                     <xsd:enumeration value="SoftwareOnly"/>
                  </xsd:restriction>
               </xsd:simpleType>
            </xsd:attribute>
            <xsd:attribute name="SoftwareSettable" use="required">
               <xsd:simpleType>
                  <xsd:restriction base="xsd:boolean">
                     <xsd:pattern value="true"/>
                     <xsd:pattern value="false"/>
                  </xsd:restriction>
               </xsd:simpleType>
            </xsd:attribute>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="ElectricalCharacteristics" minOccurs="0">
         <xsd:complexType>
            <xsd:sequence>
               <xsd:element name="MaxNetworkPowerConsumption" type="dt_REAL"/>
            </xsd:sequence>
            <xsd:attribute name="IsolatedPhysicalLayer">
               <xsd:simpleType>
                  <xsd:restriction base="xsd:boolean">
                     <xsd:pattern value="true"/>
                     <xsd:pattern value="false"/>
                  </xsd:restriction>
               </xsd:simpleType>
            </xsd:attribute>
         </xsd:complexType>
      </xsd:element>
      <xsd:element name="Other" type="xsd:string" minOccurs="0"/>
      <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
   </xsd:sequence>
</xsd:complexType>
</xsd:element>
<xsd:element name="DNLinkLayer">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element name="MAC-IDSetting" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="DefaultMAC-ID" type="et_MAC-IDRange" minOccurs="0"/>
               </xsd:sequence>
               <xsd:attribute name="SwitchType" use="required">
                  <xsd:simpleType>
                     <xsd:restriction base="xsd:NMTOKEN">
                        <xsd:enumeration value="DipSwitch"/>
                        <xsd:enumeration value="Other"/>
                        <xsd:enumeration value="SoftwareOnly"/>
                     </xsd:restriction>
                  </xsd:simpleType>
               </xsd:attribute>
               <xsd:attribute name="SoftwareSettable" use="required">
                  <xsd:simpleType>
                     <xsd:restriction base="xsd:boolean">
                        <xsd:pattern value="true"/>
                        <xsd:pattern value="false"/>
                     </xsd:restriction>
                  </xsd:simpleType>
               </xsd:attribute>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="PredefinedMasterSlaveConnectionSet" minOccurs="0">
            <xsd:simpleType>
```

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```
                  <xsd:restriction base="xsd:NMTOKEN">
                     <xsd:enumeration value="NotSupported"/>
                     <xsd:enumeration value="Group2Client"/>
                     <xsd:enumeration value="Group2Server"/>
                     <xsd:enumeration value="Group2ClientServer"/>
                     <xsd:enumeration value="GroupOnly2Client"/>
                     <xsd:enumeration value="GroupOnly2Server"/>
                  </xsd:restriction>
               </xsd:simpleType>
            </xsd:element>
            <xsd:element name="DynamicConnectionSupport" minOccurs="0">
               <xsd:simpleType>
                  <xsd:restriction base="xsd:NMTOKEN">
                     <xsd:enumeration value="NotSupported"/>
                     <xsd:enumeration value="Group1"/>
                     <xsd:enumeration value="Group2"/>
                     <xsd:enumeration value="Group3"/>
                  </xsd:restriction>
               </xsd:simpleType>
            </xsd:element>
            <xsd:element name="FragmentedExplicitMessaging" minOccurs="0">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:element name="TransmissionTimeout" type="dt_UINT" minOccurs="0"/>
                     <xsd:element name="TypicalTargetAddress" minOccurs="0">
                        <xsd:complexType>
                           <xsd:sequence>
                              <xsd:element name="Class" type="dt_USINT" minOccurs="0"/>
                              <xsd:element name="Instance" type="dt_USINT" minOccurs="0"/>
                              <xsd:element name="Attribute" type="dt_USINT" minOccurs="0"/>
                           </xsd:sequence>
                        </xsd:complexType>
                     </xsd:element>
                  </xsd:sequence>
                  <xsd:attribute ref="Supported"/>
               </xsd:complexType>
            </xsd:element>
            <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name="DeviceNetObject">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="DeviceNetObject_InstanceAttributes" minOccurs="0">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:element name="MAC_ID">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalSet"
use="required"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="Baud_Rate">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalSet"
use="required"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="BOI">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalSet"
use="required"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="Bus_Off_Counter">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalSet"
use="required"/>
                        </xsd:complexType>
                     </xsd:element>
                     <xsd:element name="Allocation_Information">
                        <xsd:complexType>
                           <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                        </xsd:complexType>
```

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```
                    </xsd:element>
                    <xsd:element name="MAC_ID_Switch_Changed">
                       <xsd:complexType>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Baud_Rate_Switch_Changed">
                       <xsd:complexType>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="MAC_ID_Switch_Value">
                       <xsd:complexType>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Baud_Rate_Switch_Value">
                       <xsd:complexType>
                          <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"
use="required"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                 </xsd:sequence>
              </xsd:complexType>
           </xsd:element>
           <xsd:element name="DeviceNetObject_InstanceOperations" minOccurs="0">
              <xsd:complexType>
                 <xsd:sequence>
                    <xsd:element name="Get_Attribute_Single">
                       <xsd:complexType>
                          <xsd:attribute ref="SupportedService"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Set_Attribute_Single">
                       <xsd:complexType>
                          <xsd:attribute ref="SupportedService"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Allocate_MS_Connection_Set">
                       <xsd:complexType>
                          <xsd:attribute ref="SupportedService"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:element name="Release_Group2_Identifier_Set">
                       <xsd:complexType>
                          <xsd:attribute ref="SupportedService"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                 </xsd:sequence>
              </xsd:complexType>
           </xsd:element>
        </xsd:sequence>
     </xsd:complexType>
  </xsd:element>
  <xsd:element name="Ports">
     <xsd:complexType>
        <xsd:sequence>
           <xsd:element name="Port" minOccurs="0" maxOccurs="unbounded">
              <xsd:complexType>
                 <xsd:sequence>
                    <xsd:element name="PortTypeName">
                       <xsd:simpleType>
                          <xsd:union>
                             <xsd:simpleType>
                                <xsd:restriction base="xsd:NMTOKEN">
                                   <xsd:enumeration value="ControlNet"/>
                                   <xsd:enumeration value="ControlNet_Redundant"/>
                                   <xsd:enumeration value="TCP"/>
                                   <xsd:enumeration value="DeviceNet"/>
                                </xsd:restriction>
                             </xsd:simpleType>
```

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```
                        <xsd:simpleType>
                           <xsd:restriction base="et_VendorSpecificKeyword"/>
                        </xsd:simpleType>
                     </xsd:union>
                  </xsd:simpleType>
               </xsd:element>
               <xsd:element name="PortName" type="dt_EDS_Char_Array" minOccurs="0"/>
               <xsd:element name="PortObject" type="dt_EPATH" minOccurs="0"/>
               <xsd:element name="PortNumber" type="dt_UINT"/>
               <xsd:element name="PortSpecific">
                  <xsd:complexType>
                     <xsd:sequence>
                        <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                     </xsd:sequence>
                  </xsd:complexType>
               </xsd:element>
               <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
            </xsd:sequence>
            <xsd:attribute name="id" use="required">
               <xsd:simpleType>
                  <xsd:restriction base="xsd:ID">
                     <xsd:pattern value="Port[1-9][0-9]{0,4}"/>
                  </xsd:restriction>
               </xsd:simpleType>
            </xsd:attribute>
         </xsd:complexType>
      </xsd:element>
   </xsd:sequence>
</xsd:complexType>
</xsd:element>
<xsd:element name="NM-DeviceNetObject">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element name="DeviceNetObject_ClassAttributes" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="ObjectRevision">
                     <xsd:complexType>
                        <xsd:attribute name="Access_Rule" type="at_AccessType_Mandatory" fixed="Get"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="DeviceNetObject_ClassOperations" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="Get_Attribute_Single">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name="NM-ConnectionObject">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element name="ConnectionObject_ClassAttributes" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="ObjectRevision">
                     <xsd:complexType>
                        <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="ConnectionObject_ClassOperations" minOccurs="0">
```

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```
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="Reset">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="Create">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="Delete">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="Get_Attribute_Single">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="Find_Next_Object_Instance">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name="NM-MessageRouter">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element name="MessageRouter_ClassAttributes" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="ObjectRevision">
                     <xsd:complexType>
                        <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="OptionalAttributeList">
                     <xsd:complexType>
                        <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="OptionalServiceList">
                     <xsd:complexType>
                        <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="MaxIDClassAttributes">
                     <xsd:complexType>
                        <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:element name="MaxIDInstanceAttributes">
                     <xsd:complexType>
                        <xsd:attribute name="Access_Rule" type="at_AccessType_OptionalGet"/>
                     </xsd:complexType>
                  </xsd:element>
                  <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="MessageRouter_ClassOperations" minOccurs="0">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="Get_Attribute_All">
                     <xsd:complexType>
                        <xsd:attribute ref="SupportedService"/>
                     </xsd:complexType>
```

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```
                    </xsd:element>
                    <xsd:element name="Get_Attribute_Single">
                       <xsd:complexType>
                          <xsd:attribute ref="SupportedService"/>
                       </xsd:complexType>
                    </xsd:element>
                    <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
                 </xsd:sequence>
              </xsd:complexType>
           </xsd:element>
        </xsd:sequence>
     </xsd:complexType>
  </xsd:element>
  <xsd:attribute name="SupportedService" use="required">
     <xsd:simpleType>
        <xsd:restriction base="xsd:boolean">
           <xsd:pattern value="true|false"/>
        </xsd:restriction>
     </xsd:simpleType>
  </xsd:attribute>
  <xsd:attribute name="Supported" use="required">
     <xsd:simpleType>
        <xsd:restriction base="xsd:boolean">
           <xsd:pattern value="true|false"/>
        </xsd:restriction>
     </xsd:simpleType>
  </xsd:attribute>
  <xsd:simpleType name="et_MAC-IDRange">
     <xsd:restriction base="xsd:nonNegativeInteger">
        <xsd:maxInclusive value="63"/>
     </xsd:restriction>
  </xsd:simpleType>
  <xsd:complexType name="et_SpecificIOInfoType">
     <xsd:sequence>
        <xsd:element name="CompatibleIOTypeMask" type="dt_WORD"/>
        <xsd:element name="DefaultProducingConnection" type="dt_UINT"/>
        <xsd:element name="DefaultConsumingConnection" type="dt_UINT"/>
        <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
     </xsd:sequence>
  </xsd:complexType>
  <xsd:complexType name="et_GenericIOInfoType">
     <xsd:sequence>
        <xsd:element name="Size" type="dt_UINT"/>
        <xsd:element name="NumberSignificantBits" type="dt_UINT"/>
        <xsd:element name="CompatibleIOTypeMask" type="dt_WORD"/>
        <xsd:element name="Name_String" type="dt_EDS_Char_Array"/>
        <xsd:element name="ConnectionPathSize" type="dt_UINT"/>
        <xsd:element name="Path" type="dt_EPATH"/>
        <xsd:element name="Help_String" type="dt_EDS_Char_Array"/>
        <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
     </xsd:sequence>
  </xsd:complexType>
  <xsd:complexType name="et_IOInfoType">
     <xsd:sequence>
        <xsd:element name="Default">
           <xsd:complexType>
              <xsd:sequence>
                 <xsd:element name="DefaultIOTypeMask" type="dt_WORD"/>
              </xsd:sequence>
           </xsd:complexType>
        </xsd:element>
        <xsd:element name="PollInfo" type="et_SpecificIOInfoType" minOccurs="0"/>
        <xsd:element name="StrobeInfo" type="et_SpecificIOInfoType" minOccurs="0"/>
        <xsd:element name="MulticastPollInfo" type="et_SpecificIOInfoType" minOccurs="0"/>
        <xsd:element name="COSInfo" type="et_SpecificIOInfoType" minOccurs="0"/>
        <xsd:element name="CyclicInfo" type="et_SpecificIOInfoType" minOccurs="0"/>
        <xsd:element name="Input" minOccurs="0" maxOccurs="unbounded">
           <xsd:complexType>
              <xsd:complexContent>
                 <xsd:extension base="et_GenericIOInfoType">
                    <xsd:attribute name="id" use="required">
                       <xsd:simpleType>
                          <xsd:restriction base="xsd:ID">
                             <xsd:pattern value="Input[1-9][0-9]{0,4}"/>
                          </xsd:restriction>
                       </xsd:simpleType>
```

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```
                    </xsd:attribute>
                 </xsd:extension>
              </xsd:complexContent>
           </xsd:complexType>
        </xsd:element>
        <xsd:element name="Output" minOccurs="0" maxOccurs="unbounded">
           <xsd:complexType>
              <xsd:complexContent>
                 <xsd:extension base="et_GenericIOInfoType">
                    <xsd:attribute name="id" use="required">
                       <xsd:simpleType>
                          <xsd:restriction base="xsd:ID">
                             <xsd:pattern value="Output[1-9][0-9]{0,4}"/>
                          </xsd:restriction>
                       </xsd:simpleType>
                    </xsd:attribute>
                 </xsd:extension>
              </xsd:complexContent>
           </xsd:complexType>
        </xsd:element>
        <xsd:any namespace="##any" minOccurs="0" maxOccurs="unbounded"/>
     </xsd:sequence>
  </xsd:complexType>
</xsd:schema>
```

A.3.2 Communication network profile template description – XML encapsulation of EDS files

A.3.2.1 General

The communication network profile XML files used to encapsulate EDS files shall comply with the communication network profile XML schema as specified in A.3.2.2.

The semantics of the sub-elements of the ExternalProfileHandle element, used to reference an existing EDS file, are specified in Table A.2. Depending on the value of the attribute WrapperReference, the EDS file will be referenced using either identification elements from the EDS file itself, or from the product described by this EDS.

NOTE Choice of relevant identification elements will depend upon the expected usage of the wrapper file.

A.3.2.2 XML schema : EDS_CommNet_Profile_wrapper.xsd

NOTE This XML schema includes the file "MasterTemplateTypes.xsd" (see A.2.1.3.1).

```
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
   <!-- Target namespaces are not specified in this master template -->
   <xsd:redefine schemaLocation="MasterTemplateTypes.xsd">
      <xsd:complexType name="ISO15745Reference_DataType">
         <xsd:complexContent>
            <xsd:restriction base="ISO15745Reference_DataType">
               <xsd:sequence>
                  <xsd:element name="ISO15745Part" type="xsd:positiveInteger"/>
                  <xsd:element name="ISO15745Edition" type="xsd:positiveInteger"/>
                  <xsd:element name="ProfileTechnology" type="xsd:string" fixed="EDS"/>
               </xsd:sequence>
            </xsd:restriction>
         </xsd:complexContent>
      </xsd:complexType>
   </xsd:redefine>
   <xsd:element name="ISO15745Profile">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref="ProfileHeader"/>
            <xsd:element ref="ProfileBody"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:annotation>
      <xsd:documentation>* HEADER SECTION *</xsd:documentation>
   </xsd:annotation>
   <xsd:element name="ProfileHeader">
      <xsd:complexType>
```

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```
         <xsd:sequence>
            <xsd:element name="ProfileIdentification" type="xsd:string"/>
            <xsd:element name="ProfileRevision" type="xsd:string"/>
            <xsd:element name="ProfileName" type="xsd:string"/>
            <xsd:element name="ProfileSource" type="xsd:string"/>
            <xsd:element name="ProfileClassID" type="ProfileClassID_DataType"
fixed="CommunicationNetwork"/>
            <xsd:element name="ProfileDate" type="xsd:date" minOccurs="0"/>
            <xsd:element name="AdditionalInformation" type="xsd:anyURI" minOccurs="0"/>
            <xsd:element name="ISO15745Reference" type="ISO15745Reference_DataType"/>
            <xsd:element name="IASInterfaceType" type="IASInterface_DataType" fixed="CSI"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:annotation>
      <xsd:documentation>* BODY SECTION *</xsd:documentation>
   </xsd:annotation>
   <xsd:element name="ProfileBody">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element name="ExternalProfileHandle">
               <xsd:complexType>
                  <xsd:complexContent>
                     <xsd:extension base="ProfileHandle_DataType">
                        <xsd:attribute name="WrapperReference" use="optional" default="FILEINFO">
                           <xsd:simpleType>
                              <xsd:restriction base="xsd:NMTOKEN">
                                 <xsd:enumeration value="FILEINFO"/>
                                 <xsd:enumeration value="DEVICEINFO"/>
                              </xsd:restriction>
                           </xsd:simpleType>
                        </xsd:attribute>
                     </xsd:extension>
                  </xsd:complexContent>
               </xsd:complexType>
            </xsd:element>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
</xsd:schema>
```

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A.4 Electronic Data Sheet (EDS)

A.4.1 Common CIP EDS requirements

A.4.1.1 General

This subclause specifies the file encoding requirements of the Electronic Data Sheet (EDS) which are common to all CIP-based networks. The EDS encoding requirements define the standard file encoding format to use for CIP products without regard to the configuration tool host platform or file system.

The term “file” as used in this chapter refers to any recognized file format associated with a configuration tool’s file system without regard to the file storage media.

An EDS file is defined as an ASCII file, which includes an ASCII representation of objects in the device that can be accessed from the network (e.g. Parameter and Assembly), and some additional information required to support object addressing.

A.4.1.2 EDS content

A.4.1.2.1 EDS structure

A single file shall contain the entire EDS. An EDS shall consist of sections. Table A.6 summarizes the structure of the sections which are common to several CIP-based networks, the corresponding legal section delimiters, and the order of these sections in an EDS.

Table A.6 — CIP EDS file structure

Section Name	Legal Delimiter	Placement	Required/Optional
File Description	[File]	1	Required
Device Description	[Device]	2	Required
Device Classification	[Device Classification]	[a]	Optional
Parameter Class	[ParamClass]	[a]	Optional
Parameters	[Params]	[a]	Optional
Parameter Groups	[Groups]	[a]	Optional
Assembly	[Assembly]	[a]	Optional
Connection Characteristics	[Connection Manager]	[a]	Optional
Port	[Port]	[a]	Optional
Modular	[Modular]	[a]	Optional
Vendor Specific	[VendorID_vendorspecifickeyword]	Last	Optional
[a] Placement of these optional groups only needs to follow the required groups			

The Electronic Data Sheet (EDS) contents shall be organised as follows:

— all EDS files shall contain the File Description section, which shall be the first section in the EDS file and shall use the legal delimiter [File];

— all EDS files shall contain the Device Description section, which shall immediately follow the File Description section and shall use the legal delimiter [Device];

— the optional sections described in this specification may be present in any order provided that no forward references exist within the EDS file;

— the optional Vendor Specific section(s) shall uses the legal delimiter(s) [VendorID_vendorspecifickeyword] as specified in A.4.1.2.2.11 and shall be placed after all the sections defined in this specification.

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A.4.1.2.2 EDS formatting rules

A.4.1.2.2.1 General

An EDS file shall consist of sections, entries, fields, comments and white space. This subclause defines the rules that shall be observed when defining an EDS.

A.4.1.2.2.2 EDS White Space

White space may be used in the EDS file, but shall be ignored by all EDS interpreters when it appears outside of fields and double quoted character arrays.

The EDS interpreter shall treat the following characters as white space characters. These characters, read by the interpreter but not encoded as human-readable characters, designate the presence of blank space in a file.

— Space character

— New line

— Carriage Return

— Linefeed

— Tabs, vertical and horizontal

— Form Feed

— End of File marker

— Comments

A.4.1.2.2.3 Keyword characters

All keywords within an EDS file shall be composed of ASCII characters from the following list:

— upper case letters A through Z;

— lower case letters a through z;

— numerals 0 through 9;

— the special character underscore "_";

— the space character.

The space shall only be used in a section keyword. The space shall only appear internal to a section name, and multiple sequential spaces are invalid.

A.4.1.2.2.4 Sections

The EDS file shall be partitioned into required and optional sections.

A.4.1.2.2.5 Section delimiters

Each section in the EDS shall be properly delimited by a section keyword in square brackets (the Legal Delimiter). The valid section legal delimiters shall be those specified in Table A.6.

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A.4.1.2.2.6 Section keywords

Each section keyword is defined to be the text between the beginning of section keyword delimiter "[" and the terminating delimiter "]". The characters valid for use in section keywords are defined in A.4.1.2.2.3. There are two types of section keywords, public and vendor specific.

A.4.1.2.2.7 Section order

Each required section shall be placed in the required order as specified in A.4.1.2. Optional sections may be omitted entirely or included with empty data place holders. Except for the Vendor Specific section(s), optional sections may be placed in any order. The Vendor Specific section(s) shall be placed last in the EDS file.

A.4.1.2.2.8 Entry

Each section in the EDS shall contain one or more entries beginning with an entry keyword followed by an equal sign. The entry keyword meaning shall be global in scope, allowing keywords defined in one section to be used in another. Each entry shall terminate with a semicolon. An entry may extend over multiple lines, as long as commas properly delimit the fields.

A.4.1.2.2.9 Entry keywords

An entry keyword shall consist of a unique sequence of keyword characters, as defined in A.4.1.2.2.3. There are two types of entry keywords, public and vendor specific.

A.4.1.2.2.10 Public keyword

A Public Keyword shall always be defined within the CIP specification by the responsible vendors associations. A public keyword shall never begin with any numeric digit.

A.4.1.2.2.11 Vendor-specific keywords

Keywords may be vendor-specific. These keywords shall begin with the Vendor ID of the company making the addition followed by an underscore (VendorID_VendorSpecificKeyword). The VendorID shall be displayed in decimal and shall not contain leading zeroes. Each vendor is responsible for maintaining and documenting their vendor-specific keywords.

A.4.1.2.2.12 Entry fields

Each entry shall contain one or more fields. Comma delimiters shall separate all fields. The meaning of the field(s) shall depend on the context of the section. Entry fields are either required or optional, as defined by this specification. A white space or nothing between commas shall be used for optional fields not provided. A semicolon may be used to designate the absence of trailing optional fields. The term “Field Number” shall indicate field position within the entry. Fields shall be numbered from left-to-right (or up-to-down) starting with the number 1.

A.4.1.2.2.13 Field keywords

A field keyword shall consist of a unique sequence of keyword characters, as defined in A.4.1.2.2.3. There are two types of field keywords, public and vendor specific.

A.4.1.2.2.14 Complex data fields

Certain entry fields shall be specified with data that cannot be specified by a single value between the comma delimiters. The ability to further delimit an entry field is defined via the use of one or more sets of matching brace characters "{" and "}". The content between brace characters shall be considered a single item or entry. Content may be grouped in multiple braces.

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A.4.1.2.2.15 Comments

Comments shall be delimited with the dollar sign character ($) and the new line character. The EDS interpreter shall treat all characters between the comment delimiters as white space. The $ comment delimiter appearing inside of a field or double quoted character array shall not be treated as a comment delimiter.

EXAMPLE

Some example comments are:

```
$ This is a valid comment line    <NL>
1, 2, 3;                          $ This is a valid comment <NL>
$ Comments cannot span <NL>
more than one line <NL>           <= This is an error - no $
```

A.4.1.2.2.16 EDS formatting structure example

Figure A.1 examples highlight the structure of the Electronic Data Sheet.

```
[section name]
$ Comment - extends to end of line
Entry1=Field1, Field2, Field3;          $ Entire entry on one line
Entry2=Field1, Field2, Field3, Field4;  $ Entire entry on one line

Entry3=                                $ Multiple line entry
       Field1,                         $ Field1
       Field2,                         $ Field2
       Field3;                         $ Field3

Entry4=                                $ Combination
       Field1, Field2,                 $ Fields 1 and 2 on one line
       Field3,                         $ Field3
       Field4;                         $ Field4

Entry5=   1,                           $ Field 1 specifies the value 1
       {1,2,3};                        $ Field 2 specifies an array or
                                       $ structure with three values

Entry6=   { 44, {22,33,11} };          $ Entry 6 specifies a single field.
                                       $ The field contains two sets of data.
                                       $ The first set is the single value 44
                                       $ The second set contains three values

65535_Entry=                           $ Vendor Specific entry for
          Field1, Field2;              $ Vendor_ID 65535 with two fields
```

Figure A.1 — EDS formatting structure example (informative)

A.4.1.2.3 File naming requirements

No file naming conventions are specified for disk-based EDS files, except for files in a DOS/Windows environment : these files shall have the suffix “.EDS” appended to the file name.

A.4.1.3 EDS data encoding requirements

A.4.1.3.1 General

This section specifies the data encoding requirements for the EDS file.

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The information contained in the EDS file may represent attributes of object instances in the device to be configured. All data in the EDS file shall be ASCII text whereas the object class and instance attributes need not be ASCII (available Aata types are defined in the CIP specification). Therefore, translation between data contained in an EDS file and the object attributes may be needed : this translation is specified in the following subclauses.

The elementary data types specified in the CIP specification are also used for other elements of the EDS, however, the meaning is transformed as described in the following subclauses (see A.4.1.3.3 to A.4.1.3.10).

Some data types are used solely in EDS files (see A.4.1.3.11 to A.4.1.3.14).

A.4.1.3.2 ASCII character file convention

All data in the EDS shall be encoded using 8-bit ASCII characters, where all references to “ASCII characters” mean an 8-bit ASCII character format (as defined by Tables 1 and 2, Row 00 of ISO/IEC 10646-1:2000). Characters that cannot be displayed on an ANSI terminal shall not be used in identifier names or in data representations. The valid ASCII character values shall include newline, tab, and those from 32 to 126 decimal.

A.4.1.3.3 Character string convention – EDS_Char_Array

A.4.1.3.3.1 General

All string data in the EDS file shall be character strings of fixed length, without null terminators, and shall be enclosed by double quotes (EDS_Char_Array data type).

There are two forms of string data conversions. Characters contained between double quotes shall be converted into 8-bit ASCII characters. Characters contained between double quotes that are preceded by a capital L shall be converted into UNICODE (16-bit) characters.

EXAMPLE 1 “This results in a string composed by 8-bit characters”

EXAMPLE 2 L“A string of UNICODE characters, including the Greek character Pi \u03C0”

NOTE The text \u03C0 specifies a single 16-bit character whose value is 03C0. In the UNICODE character set, this is Table 9, Row 3, Basic Greek – the character for lower case "Pi". Descriptions of character escape sequences is described in A.4.1.3.3.5.

A.4.1.3.3.2 Handling insufficient characters in a string field

An EDS interpreter shall use right-justification of characters in a field and fill any unspecified characters with leading blanks (ASCII 0x20) for the remaining length of the string.

EXAMPLE If a parameter has a maximum string length of 8 and receives the string ”123AB”, the string is interpreted as ”~~~123AB”, where the tilde characters (~) represent spaces.

A.4.1.3.3.3 Handling excess characters in a string field

If a given string field contains too many characters, the EDS interpreter shall truncate characters from left to right.

EXAMPLE If a parameter has a maximum string length of 8 and receives the string ”I23ABCDEFG”, the string is truncated and interpreted as ”I23ABCDE”.

A.4.1.3.3.4 String concatenation

Multiple strings with no intervening commas shall be concatenated.

EXAMPLE 1
The line : ”ABC” ”123” ”XYZ”
is interpreted as : ”ABC123XYZ”

The strings may also be on separate lines.

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EXAMPLE 2
The following lines :
”ABC” $this is a comment
”123”
”XYZ”
are also interpreted as : ”ABC123XYZ”

For a UNICODE string (long string), only the first double quotes mark shall be preceded by a capital L.

EXAMPLE 3 L”ABC” ”123” ”XYZ” is the same as L”ABC123XYZ”.

A.4.1.3.3.5 String escape sequences

The EDS interpreter shall recognize all escape sequences listed in Table A.7. Interpretation is application specific.

Table A.7 — String escape sequences

Escape sequence	Translation
\\	\
\n	newline
\t	tab
\v	vertical tab
\b	backspace
\r	carriage return
\f	form feed
\a	the BELL character (0x07)
\”	”
\’	’
\xnn	single byte containing the value of “nn” as expressed in hexadecimal
\unnnn	pair of bytes containing the value of “nnnn” as expressed in hexadecimal. This form of string escape is only valid where the resultant string data is 16-bits in length, e.g. the L" form of string specification.

If a sequence not listed above is encountered, the interpreting device shall reject the entire string and indicate an error. EDS files shall only contain escape sequences defined in Table A.7.

A.4.1.3.4 ASCII string convention (STRING, SHORT_STRING, STRING2)

All string data types (STRING, SHORT_STRING, STRING2) used in the object attributes shall be converted into EDS_Char_Array in the EDS file.

A.4.1.3.5 STRINGI

The CIP International String (STRINGI) data type is encoded in an EDS file as a complex data representation. The entire content of a STRINGI entry shall be enclosed in a pair of braces. The number of language members, specified as a USINT, shall be followed by the language members definitions, each being enclosed in a pair of braces, and separated by a comma. Each language member of a STRINGI entry shall be specified as four fields. The first field (the language selection) shall be expressed as exactly a three character fixed length string enclosed in double quotation marks – language code as defined in ISO 639-2/T. The string data type shall be expressed using the data type code as defined in the CIP specification for STRING, STRING2, STRINGN or SHORT_STRING. The character set selection shall be expressed as a UINT – as defined in IANA MIB Printer Codes (RFC 1759). The string content portion of the language member shall be expressed as a string or long string.

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EXAMPLE

The following represents a STRINGI entry with three languages:

```
Field1 =        { 3,
                {"eng",0xD0,4,"This is an ASCII English language string"},
                {"spa",0xD5,1000,L"Españoles palabras"},          $ “Spanish words”
                                                                 $ using UNICODE
                {"deu",0xD0,4,"Spanische Wörter auf Deutsch"}    $“Spanish words in German”
                };
```

A.4.1.3.6 CIP path (EPATH)

The CIP EPATH data type, used in particular to define CIP path strings, shall be encoded in EDS files using the base format defined in ISO 15745-2 for EDS_Char_Array. In addition, the string contents for a CIP path or other EPATH data shall consist of groups of two adjacent hexadecimal characters separated by spaces. Both upper and lower case may be used.

EXAMPLE 1 “20 04 24 01”

EXAMPLE 2 “20 05 24 02 30 04”

A.4.1.3.7 ASCII unsigned integer convention - (USINT, UINT, UDINT, ULINT)

The unsigned integer data types represent positive integer values. Unsigned integer data shall be entered either in decimal or in hexadecimal notation with no whitespace or commas between characters. If hexadecimal notation is used to represent the unsigned integer characters, the two character sequence 0x, with no white space, shall precede the unsigned integer characters.

The range of legal USINT data is:

Decimal Notation:	0	to	255
Hexadecimal Notation:	0x0	to	0xFF

The range of legal UINT data is:

Decimal Notation:	0	to	65535
Hexadecimal Notation:	0x0	to	0xFFFF

The range of legal UDINT data is:

Decimal Notation:	0	to	4294967295
Hexadecimal Notation:	0x0	to	0xFFFFFFFF

The range of legal ULINT data is:

Decimal Notation:	0	to	18446744073709551615
Hexadecimal Notation:	0x0	to	0xFFFFFFFFFFFFFFFF

Leading zeros shall not be used for the decimal notation, but may be used for the hexadecimal notation. For hexadecimal notation, both upper and lower case may be used, and the total number of characters shall be limited to 10 (0x plus 8 more), or 18 (0x plus 16 more) for the ULINT type.

EXAMPLE The decimal UINT value 254 may be represented as 254 (decimal), or as 0xFE (hexadecimal), or as 0x000000FE (hexadecimal) but 0254 (decimal) and 0x0000000FE (hexadecimal) are illegal.

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A.4.1.3.8 ASCII signed integer convention - (SINT, INT, DINT, LINT)

The SINT, INT, DINT and LINT data types represent signed integer data values. Signed integer data shall be entered either in decimal or in hexadecimal notation with no whitespace or commas between characters. If hexadecimal notation is used to represent the signed integer characters, the two character sequence 0x, with no white space, shall precede the integer value characters.

The range of legal SINT data is:

Decimal Notation: -128 to 127

Hexadecimal Notation: 0x80 to 0x7F

The range of legal INT data is:

Decimal Notation: -32768 to 32767

Hexadecimal Notation: 0x8000 to 0x7FFF

The range of legal DINT data is:

Decimal Notation: -2147483648 to 2147483647

Hexadecimal Notation: 0x80000000 to 0x7FFFFFFF

The range of legal LINT data is:

Decimal Notation: -9223372036854775808 to 9223372036854775807

Hexadecimal Notation: 0x8000000000000000 to 0x7FFFFFFFFFFFFFFF

Leading zeros shall not be used for the decimal notation, but may be used for the hexadecimal notation. For hexadecimal notation, both upper and lower case may be used, and the total number of characters shall be limited to 10 (0x plus 8 more), or 18 (0x plus 16 more) for the LINT type.

EXAMPLE The decimal INT value 254 may be represented as 254 (decimal), or as 0xFE (hexadecimal), or as 0x000000FE (hexadecimal) but 0254 (decimal) and 0x0000000FE (hexadecimal) are illegal.

A.4.1.3.9 ASCII word convention - (BYTE, WORD, DWORD, LWORD)

The BYTE, WORD, DWORD and LWORD data types represent bit-addressable values. These values are considered discrete bit position values and are not intended to represent either signed or unsigned integer values. However, these values, for convenience, shall be entered either in decimal, hexadecimal or binary notation with no whitespace or commas between characters. If hexadecimal (respectively binary) notation is used to represent value characters, the two character sequence 0x (respectively 0b), with no white space, shall precede the value characters.

The range of legal BYTE data is:

Decimal Notation: 0 to 255

Hexadecimal Notation: 0x0 to 0xFF

Binary Notation: 0b00000000 to 0b11111111

The range of legal WORD data is:

Decimal Notation: 0 to 65535

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Hexadecimal Notation: 0x0 to 0xFFFF

Binary Notation: 0b0000000000000000 to 0b1111111111111111

The range of legal DWORD data is:

Decimal Notation: 0 to 4294967295

Hexadecimal Notation: 0x0 to 0xFFFFFFFF

Binary Notation: 0b00000000000000000000000000000000 to

0b11111111111111111111111111111111

The range of legal LWORD data is:

Decimal Notation: 0 to 18446744073709551615

Hexadecimal Notation: 0x0 to 0xFFFFFFFFFFFFFFFF

Binary Notation: 0b0000000000000000000000000000000-

0000000000000000000000000000000 to

0b1111111111111111111111111111111-

1111111111111111111111111111111

Leading zeros shall not be used for the decimal notation, but may be used for the hexadecimal and binary notations. For hexadecimal notation, both upper and lower case may be used, and the total number of characters shall be limited to 10 (0x plus 8 more), or 18 (0x plus 16 more) for the LWORD type.

EXAMPLE The decimal WORD value 254 may be represented as 254 (decimal), or as 0xFE (hexadecimal), or as 0x000000FE (hexadecimal) but 0254 (decimal) and 0x0000000FE (hexadecimal) are illegal.

A.4.1.3.10 ASCII floating point convention (REAL, LREAL)

The REAL and LREAL data types represent binary floating point values. The internal representation of these data formats are described by the IEEE Standard 754. This standard describes both numeric values and bit sequences which are interpreted as “Not a Number” (NaN) symbolic values and positive and negative infinity. The floating point values may be entered as either integer values, values based upon decimal floating point representation, or values entered in “scientific” notation using a base value and an offset in exponential form. Integer values are the same as those shown for the INT, DINT or LINT data types. These values cannot be use to represent fractional values. Decimal floating point values are those which have both a whole integer and fractional component. The whole value and fractional components are separated by a decimal point “.” or period character. The exponential (scientific) notation form of the value is the same as the fractional value representation with the addition of an exponential component. This exponent is always a signed integer power to ten applied to the base value.

NOTE The maximum precision of a floating point value is determined by the capabilities of the internal binary format, i.e. the number of binary digits available to encode the mantissa. Therefore, using a large number of decimal digits within the decimal notation (or the mantissa part of the scientific notation) of a floating point value is more for presentation convenience than precision. EDS defines arbitrary limits for the number of decimal digits.

The range of legal REAL data (single IEEE, 32 bit format) is based upon the formula:

$$value = (-1)^{s} \bullet (2)^{e-127} \bullet (m)$$

Where:

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— “s” is the value of the sign bit;

— “e” is the eight bit exponent. This exponent allows an exponent range between -126 and +127;

— “m” is the normalized 24 bit mantissa (23 internal to the storage plus one hidden bit). This allows a range of mantissa values to range between 0 and 16777215.

The combination of “e” and “m” allows an approximate absolute value range of 0 to 3,4028e^{38}.

EDS uses for REAL data the following floating point values notations :

Integer (Fixed) Notation: -16777215 to 16777215

Decimal (Floating Point) Notation: 0.0 to ±9999999999999999

Where the total number of digits shall not exceed 16, in addition to the decimal point and sign characters. Both the decimal point character and the sign character may be omitted (+ sign is implied if the sign character is omitted).

Scientific Notation: 0.0 to ±nn.nnnnnnnnnE±xxxx

Where the total number of digits in the mantissa shall not exceed 11 (in addition to the decimal point character and sign character), and the number of digits in the exponent shall not exceed 4 (in addition to the “E” character and sign character). The decimal point may be placed anywhere in the mantissa. Both the decimal point character and the sign character may be omitted in the mantissa (+ sign is implied if the sign character is omitted).

The range of legal LREAL data (double IEEE, 64 bit format) is based upon the formula:

$$value = (-1)^{s} \bullet (2)^{e-1023} \bullet (m)$$

Where:

— “s” is the value of the sign bit;

— “e” is the eleven bit exponent. This exponent allows an exponent range between -1022 and +1023;

— “m” is the normalized 53 bit mantissa (52 internal to the storage plus one hidden bit). This allows a range of mantissa values to range between 0 and 9007199254740991.

The combination of “e” and “m” allows an approximate absolute value range of 0 to 1,7976e^{308}.

EDS uses for LREAL data the following floating point values notations:

Integer (Fixed) Notation: -9007199254740991 to 9007199254740991

Decimal (Floating Point) Notation: 0.0 to ±9999999999999999

Where the total number of digits shall not exceed 16, in addition to the decimal point and sign characters. Both the decimal point character and the sign character may be omitted (+ sign is implied if the sign character is omitted).

Scientific Notation: 0.0 to ±nnnn.nnnnnnnnnnnnE±xxxx

Where the total number of digits in the mantissa shall not exceed 16 (in addition to the decimal point character and sign character), and the number of digits in the exponent shall not exceed 4 (in addition to the “E” character and sign character). The decimal point may be placed anywhere in the mantissa. Both the decimal point character and the sign character may be omitted in the mantissa (+ sign is implied if the sign character is omitted).

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In addition to the above value entries, the floating point representation allows for two styles of “Not a Number” or NaN symbolic entries, and two forms of infinity. There are two types of NaN; a Signaling NaN and a Quiet NaN. Also, the format allows for the representation of the values positive and negative infinity. For these cases, the following special words are reserved and shall be used to represent the entry of the associated floating point symbol:

— Quiet Not a Number: QUIET-NAN

— Signaling Not a Number: SIGNAL-NAN

— Positive Infinity: INFINITY (or +INFINITY)

— Negative Infinity: -INFINITY

A.4.1.3.11 EDS_Date

The EDS_Date data type shall be of the format mm-dd-yyyy, where mm is the month, dd is the day of the month and yyyy is the year. Valid values for the month, day and year portions of the mm-dd-yyyy shall be:

— mm 01 through 12;

— dd 01 through 31 (depending upon the month and year);

— yyyy 1996 through 9999.

Two character years representations may be used in which case the EDS_Date data type shall be of the format; mm-dd-yy, where mm is the month, dd is the day of the month and yy is the year. In this case, the two digits for the year have an implied leading 19, such that yy=96 shall represent the year 1996. Valid values for the month, day and year portions of the mm-dd-yy parameters shall be:

— mm 01 through 12;

— dd 01 through 31 (depending upon the month and year);

— yy 96 through 99 (a leading 19 is implied).

NOTE Two character year representations are not recommended.

A.4.1.3.12 EDS_Time_Of_Day

The EDS_Time_Of_Day data type shall be of the format hh:mm:ss, where hh is hours, mm is minutes and ss is seconds. Valid values for the hours, minutes and seconds shall be:

— hh 00 through 23;

— mm 00 through 59;

— ss 00 through 59.

A.4.1.3.13 EDS_Revision

The EDS_Revision data type shall be of format Major_Revision.Minor_Revision with valid values of:

— Major_Revision 0 to 9;

— Minor_Revision 0 to 9.

An EDS_Revision of 0.0 shall be invalid.

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EXAMPLE An EDS_Revision of 1.4 corresponds to a major revision of 1 and a minor revision of 4.

A.4.1.3.14 EDS_URL Uniform Resource Locator

All references to EDS_URL within the EDS requirements are for the formalized information necessary to locate and access resources via an Internet capable mechanism. An EDS_URL shall be encoded in EDS files using the base format defined in ISO 15745-2 for EDS_Char_Array. In addition, the string contents for an EDS_URL shall follow the format defined by the Internet's Network Working Group RFC 1738 "Uniform Resource Locator (URL)". For specifications made within an EDS file, the EDS_URL shall be limited to any of the forms:

— http;

— ftp;

— file.

A.4.1.4 Basic EDS file requirements

A.4.1.4.1 Overview

This subclause describes the basic sections of an EDS which are common to several CIP-based networks, and specifies the corresponding usage requirements. Table A.8 gives the subclause location of these section definitions.

Table A.8 — Basic sections definition

EDS sections	Defined in
File description section	A.4.1.4.2
Device description section	A.4.1.4.3
Device classification section	A.4.1.4.4
Parameter class section	A.4.1.4.5
Parameters section	A.4.1.4.6
Parameter groups section	A.4.1.4.7
Assembly section	A.4.1.4.8
Connection manager section	A.4.1.4.9
Port section	A.4.1.4.10
Modular section	A.4.1.5.2

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A.4.1.4.2 File Description section

The file description section shall contain administrative information about the EDS file. A configuration tool shall read this information, format it, and display it to the user. The user can also access this section with a text file viewer and display the unformatted information. This section shall not require modification unless the user manually modifies the file. The file description section shall contain the entries shown in Table A.9.

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Table A.9 — File description format

Entry Name	Entry Keyword	Field Number	Data Type	Required/Optional
File Description Text	DescText	1	EDS_Char_Array	Required
File Creation Date	CreateDate	1	EDS_Date	Required
File Creation Time	CreateTime	1	EDS_Time_Of_Day	Required
Last Modification Date	ModDate	1	EDS_Date	Conditional
Last Modification Time	ModTime	1	EDS_Time_Of_Day	Conditional
EDS Revision	Revision	1	EDS_Revision	Required
Home URL	HomeURL	1	EDS_URL	Optional

The entries in the file description section shall provide the information as shown in Table A.10.

Table A.10 — File description entries

Entries	Description
File Description Text	A single line of text displayed by the configuration tool. The EDS developer shall assign a meaningful line of text for this entry. Double quotes shall enclose all character arrays.
File Creation Date	The creation date of the EDS, assigned by the EDS developer. Provided only for convenience, this date can be used to get version information about the file. A configuration tool shall not use this information to perform any type of version control, but it may display the contents.
File Creation Time	The creation time of the EDS, assigned by the EDS developer. Provided only for convenience, this time can be used to get version information about the file. A configuration tool shall not use this information to perform any type of version control, but it may display the contents.
Last Modification Date	The date of the last modification to the EDS. A configuration tool that allows modification of the EDS file shall update this field as needed. Provided only for convenience, the configuration tool shall display the contents of this entry if it exists. If a configuration tool changes the EDS, the configuration tool shall update this field. However, if the EDS is modified manually or with a text editor, this field shall also be updated. This entry is required if either : – the EDS file is modified by a software tool – the Last Modification Time entry is present
Last Modification Time	The time of the last modification to the EDS. A configuration tool that allows modification of the EDS file shall update this entry as needed. Provided for convenience, the configuration tool shall display the contents of this entry if it exists. If a configuration tool changes the EDS, the configuration tool shall update this field. However, if the EDS is modified manually or with a text editor, this field shall also be updated.
EDS Revision	The revision of the EDS. The EDS revision need not have any relationship to the product's revision, it is simply the revision of the EDS file itself.
Home URL	Uniform Resource Locator of the master EDS file, the Icon file and other files related to this EDS. The HomeURL shall specify a complete qualified URL for referencing a master version of the EDS file. In addition, the referenced area (without the file name specification) is used to specify an area where other related file(s) relating to the device described by this EDS are contained.

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Figure A.2 is an example that shows a typical [File] section.

```
[File]
   DescText = "Smart Widget EDS File";
   CreateDate = 04-03-94;              $ created
   CreateTime = 17:51:44;
   ModDate = 04-06-94;                 $ last changed
   ModTime = 22:07:30;
   Revision = 2.1;                     $ Revision of EDS
   HomeURL = "http://www.odva.org/EDS/example.eds";
```

Figure A.2 — [File] section example (informative)

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A.4.1.4.3 Device Description section

The Device Description section shall contain manufacturer's information about the device, including some of the same values as in a device Identity Object. The device description section shall contain the entries specified in Table A.11

Table A.11 — Device description format

Entry Name	Entry Keyword	Field Number	Data Type	Required/Optional
Vendor Id[a,b]	VendCode	1	UINT	Required
Vendor Name	VendName	1	EDS_Char_Array	Required
Device Type[a,b]	ProdType	1	UINT	Required
Device Type String	ProdTypeStr	1	EDS_Char_Array	Required
Product Code[a,b]	ProdCode	1	UINT	Required
Major Revision[a,b]	MajRev	1	USINT	Required
Minor Revision[a]	MinRev	1	USINT	Required
Product Name[c]	ProdName	1	EDS_Char_Array	Required
Catalog Number	Catalog	1	EDS_Char_Array	Optional
Exclude from Adapter Rack Connection	ExcludeFromAdapterRackConnection	1	EDS_Char_Array	Optional
Icon File Name	Icon	1	EDS_Char_Array	Optional

[a] This entry represents an attribute of the Identity Object
[b] This entry is used to match an EDS with a specific product/revision
[c] This entry represents an attribute of the Identity Object, although the data type may be slightly different.

The entry name for the device description field describes the unique data entry line number.

A configuration tool shall use the required entries in the device description section to match the EDS to the device being configured. The entries in the device description section shall provide the information as shown in Table A.12.

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Table A.12 — Device description entries

Entries	Description
Vendor ID	Numeric vendor identifier as defined by the Identity Object, Attribute 1.
Vendor Name	Textual vendor name. When displayed, truncation may occur to meet the display capabilities.
Device Type	Numeric device identifier as defined by the Identity Object, Attribute 2.
DeviceType String	Textual description of device type exactly as defined in the corresponding CIP device profile. The individual vendors may choose the strings for vendor specific device types.
Product Code	Vendor assigned numeric product code identifier as defined by the Identity Object, Attribute 3. Each product code shall have its own EDS.
Major Revision	Vendor-assigned major revision number as defined by the Identity Object, Attribute 4. The major revision of a product may be typically incremented when there is a change to the form, fit, or function of the device. Changes to major revisions shall be used by a configuration tool to match a device to an EDS.
Minor Revision	Vendor-assigned minor revision number as defined by the Identity Object, Attribute 4. The minor revision number shall be used to identify changes in a product that do not effect user configuration choices (e.g. firmware bug fixes, an additional LED, internal hardware changes). Changes in minor revisions shall not be used by a configuration tool to match a device with an EDS.
Product Name	Textual product name as defined by the Identity Object, Attribute 7. When displayed, truncation may occur to meet the display capabilities.
Catalog Number	Textual catalog or model number. One or more catalog numbers may be associated with a particular product code. NOTE In the case of multiple catalog numbers, it is still useful to provide as much of the catalog number as is practical. For example, 1438-BAC7xx where 'xx' represents variants in the catalog number supported by this product code/EDS.
ExcludeFromAdapterRackConnection	This field is used to describe if a rack based device is required to be excluded from an adapter rack connection. If the field value is the string "Yes" this module shall be excluded from adapter rack connections by resetting the associated slot mask bits (input, output and configuration). If the field value is the string "No" or this optional field is omitted the associated slot mask bits may be set.
Icon File Name	File name of an icon file. Identifies a file that contain a graphical representation of the device. The file shall have the *.ICO MSWindows format, and shall minimally contain a 16x16 icon. The file may also contain 32x32, 48x48, and 64x64 icons. The location of the icon file is the combination of the location specified by the HomeURL keyword (without the HomeURL file name component) and the file name specified by this keyword. This keyword shall only be present when a HomeURL keyword exists.

Figure A.3 is an example that shows a typical Device Section.

```
[Device]
   VendCode = 65535;
   VendName = "Widget-Works, Inc.";
   ProdType = 0;
   ProdTypeStr = "Generic";
   ProdCode = 42;
   MajRev = 1;            $ Device Major Revision
   MinRev = 1;            $ Device Minor Revision
   ProdName = "Smart-Widget";
   Catalog = "1499-DVG";
   Icon = "example.ico";
```

Figure A.3 — [Device] section example (informative)

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A.4.1.4.4 Device Classification section

The Device Classification section shall classify the device described by the EDS into one or more categories of devices. The entry keyword for all classifications shall consist of the character array, "Class", combined with a decimal number. The numbers shall start at 1 for the first class, and shall be incremented for each additional class.

The number of fields for each classification entry shall be variable to allow a tree classification structure similar to a file systems directory structure. Sub-classification of the public classifications shall be reserved. Vendor-specific classifications may be sub-classified at the discretion of the vendor. The first field shall represent the highest level in the tree structure and shall be one of the following field keywords:

— ControlNet;

— DeviceNet;

— EtherNetIP;

— a vendor-specific field keyword.

The vendor-specific field keyword shall begin with the Vendor ID of the company making the addition followed by an underscore (VendorID_VendorSpecificField). The VendorID shall be displayed in decimal and shall not contain leading zeroes. Each vendor is responsible for maintaining and documenting their vendor-specific field keyword.

A.4.1.4.5 Parameter Class section

The parameter class section shall identify general attributes of the configuration parameters described by the EDS, which correspond to a subset of the Parameter Object class attributes as defined in the CIP Object Library.

The parameter class section shall contain the entries specified in Table A.13.

Table A.13 — Parameter class format

Entry Name	Entry Keyword	Field Number	Data Type	Required/Optional
Max Instances	MaxInst	1	UINT	Required
Parameter Class Descriptor	Descriptor	1	WORD	Required
Configuration Assembly Instance	CfgAssembly	1	UINT	Required

The entries in the parameter class section shall provide the information as shown in Table A.14.

Table A.14 — Parameter class entries

Entries	Description
Max Instances	Identifies the total number of configuration parameters contained in the device associated with the EDS
Parameter Class Descriptor	Contains bit flags that describe the behavior of the device's parameter objects
Configuration Assembly Instance	Specifies the instance number of the Assembly Object that contains the device configuration data.

The Parameter Class Descriptor entry shall contain bits to describe parameter characteristics as defined in Table A.15. Bits not defined in Table A.15 shall not be used and shall be set to zero (0).

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Table A.15 — Parameter class descriptor bit values

Bit	Name	Bit value and meaning
0	Supports individual parameter access	0 = NO parameter can be individually accessed. Only the Configuration assembly is used. 1 = Parameters can be individually accessed.
1	Supports full attributes	0 = Only the current value of a parameter is available within the device. 1 = All configuration data for a parameter is available within the device itself.
2	Non-volatile storage save command	0 = Parameters saved automatically. 1 = Parameters not saved automatically. Need to execute non-volatile storage save command when desired parameters to be saved in non-volatile storage.
3	Params are stored in non-volatile storage	0 = Parameters are not stored in non-volatile storage. 1 = All full parameters are stored in non-volatile storage.

Figure A.4 is an example that shows a typical Parameter Class Section.

```
[ParamClass]
   MaxInst = 3;
   Descriptor = 0x0E;
   CfgAssembly = 3;
```

Figure A.4 — [ParamClass] section example (informative)

A.4.1.4.6 Parameters section

The parameter section shall identify the configuration parameters in a device. The entry keyword shall be one of the following character arrays, “Param”, “ProxyParam”, “ProxiedParam”, combined with a parameter instance number (decimal) for the device, e.g. “Param1”. The actual parameter object instance may, but need not be, implemented in the device. Conversely, it is not required that ALL parameter object instances have a corresponding “ParamN” entry in an EDS. However, when a parameter object instance exists within a node, and if this parameter is also described within an EDS, then the value of “N” in “ParamN” shall be equal to the parameter object instance.

Each entry shall contain the formatted fields shown in Table A.16. The “ProxyParam”and “ProxiedParam” keywords are defined further in A.4.1.5.3.1, as part of the modular EDS requirements.

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Table A.16 — Parameter format

Field Name	Field Number	Data Type	Required/Optional
Reserved	1	USINT	Required
Link Path Size	2	USINT	Optional
Link Path	3	EPATH	Optional
Descriptor	4	WORD	Required
Data Type	5	USINT/EPATH	Required
Data Size	6	USINT	Required
Parameter Name	7	EDS_Char_Array	Required
Units String	8	EDS_Char_Array	Required
Help String	9	EDS_Char_Array	Required
Minimum Value	10	data type	Conditional[a]
Maximum Value	11	data type	Conditional[a]
Default Value	12	data type	Required
Scaling Multiplier	13	UINT	Optional
Scaling Divider	14	UINT	Optional
Scaling Base	15	UINT	Optional
Scaling Offset	16	INT	Optional
Multiplier Link	17	UINT	Optional
Divisor Link	18	UINT	Optional
Base Link	19	UINT	Optional
Offset Link	20	UINT	Optional
Decimal Precision	21	USINT	Optional
International Parameter Name	22	STRINGI	Optional
International Engineering Units	23	STRINGI	Optional
International Help String	24	STRINGI	Optional
[a]These are further specified in Table A.20			

The entries in the parameter section shall provide the information as shown in Table A.17 and Table A.21.

Parameter fields listed in Table A.17 are common to all parameters.

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Table A.17 — Common parameter fields

Fields	Description
Reserved	This first field shall contain a zero.
Link Path Size	The number of bytes used to represent path. If the link size does not agree with the number bytes in the "Link Path" field, then the "Link Size" shall be ignored. If this parameter is not addressable from the link, this field shall be empty. If this field is empty and the "Link Path" field is not, the "Link Size" shall be equal to the number of bytes in the "Link Path" field.
Link Path	CIP path to the object attribute from where the parameter value is retrieved. The path shall be entered as a character array, using the path notation described in IEC 62026-3:2000 and with the format as specified in A.4.1.3.6. If the parameter described by this ParamN entry is not directly addressable from the network, this field shall be empty. If this field contains a null string, "", the parameter described by this ParamN entry shall be addressable as the data attribute (instance attribute 1) of the Nth instance of the Parameter object (i.e. using path "20 0F 24 N 30 01")
Descriptor	The parameter descriptor. Contains bit flags that describe the behaviour of the individual parameters (see Table A.18)
Data Type	The data type identifier, as defined in IEC 62026-3:2000 (Data Type Specification and Encoding). This identifier shall be encoded either as a USINT, or an EPATH. NOTE Old versions of EDS files may use USINT data type identifiers as specified in Table A.19, but these are now obsolete. They are provided here for compatibility reasons.
Data Size	The numeric data size value. For string and EPATH data types, this field specifies the number of bytes per character or entry. Therefore, for the STRING and EPATH data types, this value shall be specified as 1. For the STRING2 data type, this shall be specified as a 2. For the STRINGN data type, this shall be specified as the value of "N".
Parameter Name	The textual parameter name. If necessary, truncation of the retrieved text shall occur to meet the maximum character array length allowed.
Units String	The textual display units character array. If necessary, truncation of the retrieved text shall occur to meet the maximum character array length allowed.
Help String	The textual help character array. If necessary, truncation of the retrieved text occurs to meet the maximum character array length allowed.
Minimum Value	See Table A.20 for meaning and requirement based on parameter data type.
Maximum Value	See Table A.20 for meaning and requirement based on parameter data type.
Default Value	The default numeric value assigned to the parameter data value.
International Parameter Name	The parameter name expressed in STRINGI notation.
International Engineering Name	The engineering units expressed in STRINGI notation.
International Help String	The help string expressed in STRINGI notation.

The bits of the Descriptor field shall be as defined in Table A.18.

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Table A.18 — Bit definitions of descriptor field

Bit	Definition	Bit value and meaning
0	Supports settable path	0 = Link path cannot be set. 1 = Link path can be set.
1	Supports enumerated strings	0 = Enumerated strings are not supported.µ 1 = Enumerated strings are supported and may be read
2	Supports scaling	0 = Scaling not supported. 1 = Scaling is supported. The scaling attributes are implemented and the value presented to the user in engineering units.
3	Supports scaling Links	0 = Scaling links not supported. 1 = The values for the scaling attributes may be retrieved from other parameters
4	Read only parameter	0 = Parameter value can be written (set) and read (get). 1 = The parameter value can only be read (get), and not set.
5	Monitor parameter	0 = Parameter value is not updated in real time by the device. 1 = The parameter value is updated in real time by the device.
6	Supports extended precision scaling	0= Extended precision scaling not supported. 1 = Extended precision scaling should be implemented and the value presented to the user in engineering units.
7	Support non-consecutive enumerated strings	0 = Non-consecutive enumerated strings not supported 1 = Non-consecutive enumerated strings are supported
8	Allow both enumeration and individual values	0 = Both enumeration and individual values are not supported 1 = Both enumeration and individual values are supported
9-15	Reserved	These bits are reserved and shall be set to 0.

Old versions of EDS files may use data type identifiers as specified in Table A.19.

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Table A.19 — Data types identifiers (obsolete)

Data type identifier	Definition	Data type description
1	WORD	16-bit word
2	UINT	16-bit unsigned integer
3	INT	16-bit signed integer
4	BOOL	Boolean
5	SINT	Short integer
6	DINT	Double integer
7	LINT	Long integer
8	USINT	Unsigned short integer
9	UDINT	Unsigned double integer
10	ULINT	Unsigned long integer
11	REAL	Single floating point format (IEEE 754)
12	LREAL	Double floating point format (IEEE 754)
13	ITIME	Duration (short)
14	TIME	Duration
15	FTIME	Duration (high resolution)
16	LTIME	Duration (long)
17	DATE	Date
18	TIME_OF_DAY	Time of day
19	DATE_AND_TIME	Date and time
20	STRING	8-bit per character string
21	STRING2	16-bit per character string
22	STRINGN	N-byte per character string
23	SHORT_STRING	Short N-byte character string
24	BYTE	8-bit string
25	DWORD	32-bit string
26	LWORD	64-bit string

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Table A.20 specifies the meaning and specific requirements for the minimum and maximum value entries, based on the parameter data type.

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Table A.20 — Semantics for minimum and maximum value entries

Data Type	Description and Semantics	Minimum Value Semantics	Maximum Value Semantics	Required/ Optional/ Not Allowed
BYTE	Bit String – 8 bit length	The minimum and maximum values for these data types are not defined and shall not be specified in an EDS file.		Not allowed
WORD	Bit String – 16 bit length			
DWORD	Bit String – 32 bit length			
LWORD	Bit String – 64 bit length			
STRING[a]	String (2 byte length indicator, 1 byte per character)	Minimum string length	Maximum string length	Required
STRING2[a]	String (2 byte length indicator, 2 bytes per character)	Minimum string length	Maximum string length	Required
STRINGN[a]	String (2 byte length indicator, N bytes per character)	Minimum string length	Maximum string length	Required
SHORT_STRING[a]	Character string (1 byte length indicator, 1 byte characters)	Minimum string length	Maximum string length	Required
EPATH[a]	Enumerated Path	Minimum string length	Maximum string length	Optional
All Other Data Types		The minimum numeric value that may be assigned to the data value.	The maximum numeric value that may be assigned to the data value.	Optional[b]

[a]The STRING, STRING2, STRINGN, SHORT_STRING and EPATH data types do not have a minimum or maximum value specification. The minimum and maximum value fields are used to present the minimum and maximum string or path lengths. In these cases, the Data Size parameter is used to represent the number of bytes required per character or encoding entry.

[b]If the Minimum Value and/or Maximum Value is not specified then the minimum and/or maximum value for the parameter data value are as defined in IEC 62026-3:2000, based on the parameter data type.

Parameter fields listed in Table A.21 are optional and are only meaningful when used with the following data types: SINT, INT, DINT, LINT, USINT, UINT, UDINT, ULINT, REAL and LREAL. Specification of these fields with any other data type is prohibited.

Table A.21 — Parameter fields reserved for numeric data types

Fields	Description
Scaling Multiplier	The numeric multiplier value applied to the current parameter data value.
Scaling Divider	The numeric divisor value applied to the current parameter data value.
Scaling Base	The numeric base value applied to the current parameter data value.
Scaling Offset	The numeric offset value applied to the current parameter data value.
Multiplier Link	The parameter number pointing to a Parameter Object instance or other object attribute that contains the numeric multiplier value to apply to the current parameter data value.
Divisor Link	The parameter number pointing to a Parameter Object instance or other object attribute that contains the numeric divisor value to apply to the current parameter data value.
Base Link	The parameter number pointing to a Parameter Object instance or other object attribute that contains the numeric base value to apply to the current parameter data value.
Offset Link	The parameter number pointing to a Parameter Object instance or other object attribute that contains the numeric offset value to apply to the current parameter data value.
Decimal Precision	The numeric precision value applied to the current parameter data value.

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Scaling shall not be performed by the device containing the parameter, but by the display tool. If scaling is supported, the display tool shall use the equation shown in Figure A.5 to determine the parameter engineering value (i.e. the value to display) from the parameter actual value. If scaling is not supported then the parameter value shall be displayed as is.

$$EngValue = \frac{(ActualValue + Offset) * Mult * Base}{Div * 10^{Decimal\ Precision}}$$

[a] If extended scaling is not supported, this formula shall be used with DecimalPrecision=0

Figure A.5 — Parameter scaling formula

A second keyword may also exist in the [Params] section. This keyword shall be used to provide an enumeration list of parameter choices to present to the user. The entry keyword for all enumerated parameters shall consist of the character array, “Enum”, combined with the decimal number from the corresponding Param entry. Each Enum entry shall consist of pairs of integers and strings.

Figure A.6 is an example that shows a typical Parameter section.

```
[Params]
   Param1 = 0, 1,"20 02", 0x0E94, 1, 1,"Preset","V","User Manual p33",
          0, 5, 1, 1, 1, 1, 0, 0, 0, 0, 0, 2;

   Param2 =                  $ parameter instance
   0,                        $ First field shall equal 0
   6, "20 04 24 01 30 03",   $ path size, path
   0x0A94,                   $ descriptor - in hex format
   1,                        $ data type
   1,                        $ data size
   "Trigger",                $ name
   "Hz",                     $ units
   "User Manual p49",        $ help string
   0, 2, 0,                  $ min, max, default data values
   1, 1, 1, 0,               $ mult, div, base, offset scaling
    ,  ,  ,  ,               $ mult, div, base, offset links not used
   2;                        $ decimal places

   Param3 =                  $ not addressable from link
   0, , , 0x0082, 8, 1, "speed control", "", "", 3, 12, 3, ,,,,,,,,;

   Enum3  = 3, "stop", 8, "slow", 12, "fast";
```

Figure A.6 — [Params] section example

A.4.1.4.7 Parameter Groups section

The parameter groups section shall identify all of the parameter groups in a device. Each parameter group shall contain a list of the parameters in the group. The entry keyword for each group shall consist of the combination of the character array, “Group”, and a parameter group number (decimal), for example “Group1”. The decimal numbers shall start at one and increment by one.

The actual Parameter Group object instance may, but need not be, implemented in the device. Conversely, it is not required that ALL Parameter Group object instances have a corresponding “GroupN” entry in an EDS. However, when a Parameter Group object instance exists within a node, and if this Parameter Group is also described within an EDS, then the value of “N” in “GroupN” shall be equal to the Parameter Group object instance.

The fields in each entry shall contain the group name, the number of members in the group, and the instance numbers of the parameters in the group. The parameter group section shall contain the fields shown in Table A.22.

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Table A.22 — Parameter group format

Field Name	Field Number	Data Type	Required/Optional
Group Name String	1	EDS_Char_Array	Required
Number of Members	2	UINT	Required
Parameter	3 through (number of members + 2)	UINT	Required

Figure A.7 is an example that shows a typical Parameter Groups section.

```
[Groups]
   Group1 = "Setup", 2, 1, 2;              $ group 1
   Group2 = "Monitor", 2, 2, 3;            $ group 2
   Group3 = "Maintenance", 2, 1, 3;        $ group 3
```

Figure A.7 — [Groups] section example

A.4.1.4.8 Assembly section

The Assembly section describes the structure of a data block. Often this block is the data attribute of an Assembly object; however, this section of the EDS can be used to describe any complex structure. The description of this data block parallels the mechanism that the Assembly object uses to describe its member list.

The "Revision" entry keyword shall have one 16-bit integer field that shall be the revision (class attribute 1) of the Assembly object within the device. If this optional entry is missing, the revision of the Assembly object shall be 2.

The entry keyword for all assemblies shall consist of one of the following character arrays, “Assem”, “ProxyAssem”, “ProxiedAssem”combined with the Assembly object instance number (decimal) for the device, e.g. “Assem1”. If a particular instance of the Assembly object is addressable from the link, there shall be a one-for-one pairing between the Assem number in the EDS file and the Assembly instance number in the device. The “ProxyAssem”and “ProxiedAssem” keywords are defined further in A.4.1.5.3.2, as part of the modular EDS requirements.

Each entry shall contain the formatted fields shown in Table A.23.

Table A.23 — AssemN keyword format

Field name	Field number	Data type	Required/ Optional
Name	1	EDS_Char_Array	Optional
Path	2	EDS_Char_Array	Optional
Size	3	UINT	Conditional
Descriptor	4	WORD	Optional
Reserved	5, 6	empty	
Member Size	7, 9, 11 …	UINT	Conditional
Member Reference	8, 10, 12 …	AssemN, ProxyAssemN, ParamN, ProxyParamN, UDINT, or EPATH	Conditional

The first field, called "Name", shall be a string giving a name to the data block. This optional field may be used by a user interface.

The second field, called "Path", shall be a string that specifies a logical path. This path shall identify the address of the data block within the device. If the block described by this AssemN entry is not directly addressable from the link, this field shall be empty. If this field is a null string, “”, the data block shall be addressable as the data attribute (instance attribute 3) of the Nth instance of the Assembly object.

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The third field, called "Size", shall be the size of the data block in bytes. If neither this field nor the "Member Size"/"Member Reference" fields are present the size of the data block shall be 0. Both of these fields may be present; however, since they both specify the size of the block, the sizes specified by both means shall agree.

The fourth field, “Descriptor”, shall be a bit-field that describes certain properties of the Assembly. The bits of this field shall be interpreted as specified in Table A.24.

Table A.24 — Bit definition of Assembly descriptor field

Bit	Name	Meaning
0	Allow Value Edit	If this bit is set (1), the contents of the Assembly’s member references fields defined as values may be edited. If reset (0), the contents of these member references fields may not be edited. If this field is empty, the meaning shall default to reset (0). The member references considered to be values are those specifying either a UDINT constant, or a path composed of Data Segments.
1-15		Reserved

Fields 5 and 6 shall be reserved and shall be empty.

The remaining fields shall be paired such that a "Member Size" field is paired with a "Member Reference" field making the total number of fields even. The number of fields pairs in each entry shall be variable. The pairs shall correspond to an Assembly object member list.

The allowed values for the "Member Reference" field shall be one of the following:

— a ParamN or ProxyParamN reference from the [Params] section;

— an AssemN or ProxyAssemN reference from the [Assembly] section;

— a string representing a path (EPATH);

— a UDINT constant;

— an empty field;

— additional values as defined for modular EDS in A.4.1.5.3.2.

If the "Member Reference" field is empty, the number of bits specified by the "Member Size" field shall be used as a pad within the Assembly object. A "Member Reference" field containing a null string shall be treated as if the field was empty. A "Member Reference" field and its corresponding "Member Size" shall not both be empty. If the "Member Reference" field specifies an EPATH, this path shall consist of either Logical Segments (path to an object within the device) or Data Segments.

The "Member Size" field shall have units of bits. If a "Member Size" field is empty, the defined size of the corresponding "Member Reference" field shall be used. The defined size of a Param entry shall be as given in its 6th field (size). The defined size of an Assem entry shall be as given in its 3rd field (size).

The members shall be placed into the data block least significant bit first just as they are in the Assembly object. If a "Member Size" field is smaller than the defined size of the corresponding "Member Reference" field, the least significant bits of the corresponding "Member Reference" field shall be used. If a "Member Size" field is larger than the defined size of the corresponding "Member Reference" field, the entire member shall be followed by zero pads to extend the member to the "Member Size". The data block represented shall be an integer number of bytes. The total of all member sizes shall equal the AssemN Size field (when expressed as bits).

Figure A.8 is an example that shows a typical Assembly section. In this example, Assem5 is 1 byte long and has a default value of 0x21.

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```
[Params]
   Param1 =
          0,                      $ first field shall equal 0
          6, "20 0F 24 01 30 01", $ path size, path
          0x0000,                 $ descriptor
          2,                      $ data type : 16-bit WORD
          2,                      $ data size in bytes
          "Idle state",           $ name
          "",                     $ units
          "User Manual p48",      $ help string
          0, 2, 1,                $ min, max, default data values
          0, 0, 0, 0,             $ mult, dev, base, offset scaling not used
          0, 0, 0, 0,             $ mult, dev, base, offset link not used
          0;                      $ decimal places not used

   Param2 =
          0, 6, "20 0F 24 02 30 01", $ path size, path
          0x0000, 2, 2,
          "Fault state", "", "User Manual p49",
          0, 2, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0;

[Assembly]
   Revision = 2;

   Assem5 = "configuration", "20 04 24 05 30 03",1,,,,
            4, Param1,
            3, Param2,
            1, ;
```

Figure A.8 — [Assembly] section example

NOTE The keyword Variant, combined with a decimal number (e.g. “Variant1”) is reserved for the future definition of new entry types in the Assembly section.

A.4.1.4.9 Connection Manager section

This CIP section is not used in DeviceNet EDS files, hence it is not specified in this document.

A.4.1.4.10 Port section

The Port section shall describe the CIP routable ports available within a device. Every CIP routable port shall have a corresponding entry in this section. The entry keyword for all ports shall consist of the character array “Port”, combined with a decimal number corresponding to an instance of the port object. For example, Port1 is instance 1 of the Port Object.

NOTE A CIP routable port is a port that is able to exchange CIP messages with another CIP port connected to another CIP link.

Each entry shall contain the formatted fields shown in Table A.25.

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Table A.25 — Port entry format

Field Name	Field number	Data type	Required/Optional
Port Type Name	1	Field Keyword	Required
Port Name	2	EDS_Char_Array	Optional
Port Object	3	EDS_Char_Array	Optional
Port Number	4	UINT	Required
Reserved	5, 6	empty	Not Used
Port Specific	7, 8, …	Port Specific	Port Specific

The first field, called “Port Type Name”, shall be one of the following field keywords:

— ControlNet;

— ControlNet_Redundant;

— TCP (to indicate an EtherNet/IP capable TCP port);

— DeviceNet;

— a vendor-specific field keyword beginning with the device’s VendorID and an underscore character (‘65535_’).

The optional “Port Name” field shall be a string giving a name to the port, and may be used by a user interface. The “Port Object” field shall be a path (EPATH) that identifies the network specific link object associated with the port.

The port number 1 shall correspond to the backplane “port”. Devices with a backplane that cannot route CIP messages shall not have a port number 1.

Figure A.9 is an example that shows a typical Port section.

```
[Port]
   Port1 =   DeviceNet,
             "Port A",          $ name of port
             "20 03 24 01",     $ instance one of the DeviceNet object
             2;                 $ port number 2

   Port2 =   65535_Chassis,
             "Chassis",         $ name of port
             "20 9A 24 01",     $ vendor specific backplane object
             1;                 $ port number 1
```

Figure A.9 — [Port] section example

A.4.1.5 Modular EDS file requirements

A.4.1.5.1 General

This subclause describes the concept and contents of a Modular EDS and specifies the usage requirements.

A.4.1.5.2 Modular section

A.4.1.5.2.1 Contents

The [Modular] section shall describe a chassis based system. The two types of modular devices shall be:

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— chassis;

— module.

A.4.1.5.2.2 Chassis device

A [Modular] section that describes a chassis shall contain a required keyword “DefineSlotsInRack”. The single field on this entry shall be a 16-bit unsigned integer (UINT) indicating the number of slots in the chassis. Even though an electronic key is defined for the chassis, it need not be addressable from the link. The SLOT keyword used in path definitions in the [Connection Manager] section shall range from 0 to the number of slots minus 1.

The keyword “SlotDisplayRule” is optional. The single field on this entry shall be a parameter from the [Params] section (ParamN only) which defines the translation between internal and external slot number.

Figure A.10 is an example that shows an EDS for a chassis device, including a Modular section.

```
[File]
   DescText = "Wonder Chassis EDS file";
   CreateDate = 09-01-1997;
   CreateTime = 17:23:00;
   Revision = 1.1;

[Device]
   VendCode = 65535;
   VendName = "Widget Works, Inc.";
   ProdType = 101;
   ProdTypeStr = "Widget Works Generic";
   ProdCode = 1;
   MajRev = 1;
   MinRev = 1;
   ProdName = "Widget Chassis";
   Catalog = "1234-chassis";

[Params]
   Param1 =
      0,                          $ first field shall equal 0
      ,,                          $ path size,path
      0x0004,                     $ descriptor
      8,                          $ data type: 32-bit Unsigned Long Integer
      1,                          $ data size in bytes
      "Slot Naming Convention",   $ name
      "",                         $ units
      "",                         $ help string
      0,4,0,                      $ min,max,default data values
      0,0,0,0,                    $ mult,dev,base,offset scaling
      0,0,0,0,                    $ mult,dev,base,offset link not used
      0;                          $ decimal places not used

   Enum1 =   0,"n/a",1,"0",2,"1",3,"2",4,"3";

[Modular]
   DefineSlotsInRack    = 5;
   SlotDisplayRule      = Param1;
```

Figure A.10 — [Modular] section describing a chassis

A.4.1.5.2.3 Module device (basic entries)

A [Modular] section that describes a module shall contain the "Width" and "Rack" entries.

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The required entry with the keyword "Width" shall have a single field that indicates how many slots of the chassis are consumed by the module. The field shall be a 16-bit unsigned integer (UINT).

The entry keyword for all chassises, into which the module can be placed, shall consist of the character array, "Rack", combined with a decimal number. The numbers shall start at 1 for the first chassis, and shall be incremented for each additional chassis. The fields for the "Rack" entries shall be as shown in Table A.26.

Table A.26 — Rack entry format

Field name	Field number	Data type	Required/Optional
Vendor ID	1	UINT	Required
Product Type	2	UINT	Required
Product Code	3	UINT	Required
Major Revision	4	USINT	Required
Minor Revision	5	USINT	Required
reserved	6, 7, 8	empty	not used
Legal Slot	9, 10, 11 ...	UINT	Required

The "Vendor ID", "Product Type", "Product Code", "Major Revision" and "Minor Revision" field shall identify the electronic key of the chassis into which the module may be placed. The reserved field shall be empty. The "Legal Slot" fields shall identify the slots into which the module may be placed. The EDS for the module shall contain one "Rack" entry for each chassis into which the module may be placed.

Figure A.11 is an example that shows a typical [Modular] section.

```
[Modular]
   Width = 1;

   Rack1 =                          $ this module can plug into
      65535, 101, 1, 1, 1,,,,       $ slots 1, 2, 3 and 4 of
      1, 2, 3, 4;                   $ this five slot chassis
```

Figure A.11 — [Modular] section example

A.4.1.5.2.4 Module device (additional entries)

Overview

Additional entries are defined in the EDS to allow device identification and device keying for modules in chassis-based systems which do not support CIP.

For that purpose, modular devices are typically divided into two categories:

— modules that have a CIP link connection, a corresponding Identity object addressable from the link, and are placed in slot 0 (e.g. communication adapters);

— modules that do not have a CIP link connection or an addressable Identity object, and therefore may not be placed in slot 0 (e.g. I/O modules).

NOTE CIP provides other mechanisms for device identification and device keying for modules supporting a CIP link addressable Identity object.

Entries for a module that does not have a link addressable Identity object

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A [Modular] section that describes a module that does not have a link addressable Identity object may contain the entry keyword "ExternalID". The keyword shall have a single field. This field shall be a byte string that identifies the module. This byte string shall be encoded using the same format as specified for an EPATH.

Figure A.12 is an example that shows a typical [Modular] section describing a module without a link addressable Identity object.

```
[Modular]
   Width = 1;

   Rack1 =                          $ this module can plug into
      65535, 101, 1, 1, 1,,,,       $ slots 1, 2, 3 and 4 of
      1, 2, 3, 4;                   $ this five slot chassis

   Rack2 =
      65535, 101, 2, 1, 1,,,,
      1, 2, 3, 4, 5, 6, 7;

   ExternalID = "12 34";
```

Figure A.12 — [Modular] section example (module without a link addressable Identity object)

Entries for a module that has a link connection and is placed in slot 0

A [Modular] section that describes a module that has a link connection and is placed in slot 0 may contain any of the following entry keywords, or a combination of them.

The keyword "GenericID" shall have a single field. This field shall be a byte string that shall be included in the data segment for a module connection in place of the ExternalID when no module keying is desired. This byte string shall be encoded using the same format as specified for an EPATH.

The keyword "ExternIDExactMatch" shall have a single field, with a value of Yes or No. Yes shall indicate that the ExternalID specifies one specific device, No shall indicate that the ExternalID specifies one of a set of compatible devices. If the "ExternIDExactMatch" keyword is omitted, the default condition shall be that the ExternalID specifies one specific device.

The keyword "Query" shall have 4 fields. The first field shall be a path that identifies a link addressable attribute that contains an array of external identifiers, one for each slot in the chassis except slot 0. The second field shall be the service to use with the query path (i.e. 1 – get attribute all or 14 – get attribute single). The third field shall be an integer that determines the number of bytes used to identify each module and shall be in the range 1 to 16. If a double slot module is in the chassis, the external identifier for the module shall appear twice in the array returned from a query. A query shall only be addressed to a module in slot 0. The fourth field shall be the ExternalID returned when an empty slot exists, encoded using the same format as specified for an EPATH.

Figure A.13 is an example that shows a typical [Modular] section describing a module with a link connection placed in slot 0.

```
[Modular]
   Width = 1;

   Rack1 =                          $ this module can only plug into
      65535, 101, 1, 1, 1,,,,       $ slot 0 of this five slot chassis
      0;

   Rack2 = 65535, 101, 2, 1, 1,,,,      0;
```

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```
Query = "20 04 24 07 30 03",1,2,"FF FF";

GenericID = "00 00";

ExternalIDExactMatch = No;
```

Figure A.13 — [Modular] section example (module with a link connection in slot 0)

A.4.1.5.3 Modular additions to basic EDS sections

A.4.1.5.3.1 Additions to the Parameter section

The "ProxyParam" and "ProxiedParam" keywords shall be used to describe parameters that are proxied by a DeviceNet adapter device to another device that does not support the CIP protocol. An example of this is a DeviceNet adapter module (the device proxying the connection) in a multiple slot I/O rack with an analog I/O module (the device the connection is proxied for).

The "ProxyParam" shall exist in the EDS for the device that performs the proxy.

The "ProxiedParam" keyword shall exist in the EDS for the device that the proxy is performed for.

The information in the [Modular] section shall be used to associate EDS files containing "ProxyParam" keywords to EDS files containing "ProxiedParam" keywords. This association shall exist when both EDS files specify a matching Rack entry.

The decimal number (that is combined with "ProxyParam" and "ProxiedParam") shall be used to match a "ProxyParam" to a "ProxiedParam". The field values of a matched "ProxyParam" and "ProxiedParam" pair shall be combined to constitute the same field value information that exists in a single "Param" entry. This combination shall be done by using the field value from the "ProxyParam" unless that field value is the keyword "Module". When the field value specified in the "ProxyParam" is "Module" the field value specified in the "ProxiedParam" shall be used. It shall be legal to specify field values for "ProxiedParam" entries whose corresponding field value in the "ProxyParam" is not "Module", however, these field value shall not by used, they shall exist only for documentation.

Another keyword may also exist in the [Params] section. This keyword shall be used to provide minimum, maximum and default values to be added to the "ProxyParam" minimum, maximum and default values. This entry keyword shall be "ProxyParamSizeAdder", combined with the decimal number from the corresponding "ProxyParam" entry. Each "ProxyParam" entry shall consist of a Minimum Value, Maximum Value and Default Value fields. The definition of these fields matches the "Param" definitions. The "ProxyParamSizeAdder" keyword provides a means for an adapter on a module connection (e.g. "ProxyConnect") to add adapter data to the module data and return the combined data on the connection.

Another keyword may also exist in the [Param] section that corresponds to the "ProxyParam", "ProxyEnum". "ProxyEnum" has the same definition as "Enum" except it is associated with "ProxyParam" instead of "Param". A second keyword may also exist in the [Param] section that corresponds to the "ProxiedParam", "ProxiedEnum". "ProxiedEnum" has the same definition as "Enum" except it is associated with "ProxiedParam" instead of "Param".

A.4.1.5.3.2 Additions to the Assembly section

Additional entry keywords

The "ProxyAssem" and "ProxiedAssem" keywords shall be used to describe assemblies that are proxied by a CIP adapter device to another device that does not support the CIP protocol. An example of this is a DeviceNet adapter module (the device proxying the connection) in a multiple slot I/O rack with an analog I/O module (the device the connection is proxied for).

The "ProxyAssem" keyword shall exist in the EDS for the device that performs the proxy; the "ProxiedAssem" keyword shall exist in the EDS for the device that the proxy is performed for.

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The information in the [Modular] section shall be used to associate EDS files containing “ProxyAssem” keywords to EDS files containing “ProxiedAssem” keywords. This association shall exist when both EDS files specify a matching Rack entry.

The decimal number (that is combined with “ProxyAssem” and “ProxiedAssem”) shall be used to match a “ProxyAssem” to a “ProxiedAssem”. The field values of a matched “ProxyAssem” and “ProxiedAssem” pair shall be combined to constitute the same field value information that exists in a single “Assem” entry. This combination shall be done by using the field value from the “ProxyAssem” unless that field value is one of the keywords “Module” or “ModuleMemberList”. When the field value specified in the “ProxyAssem” is “Module” the field value specified in the “ProxiedAssem” shall be used. The field value “Module” shall not be used for “Member Size” or “Member Reference” fields. “ModuleMemberList” shall only be used in place of a “Member Size” and “Member Reference” field pair. When the field value specified in the “ProxyAssem” is “ModuleMemberList” all “Member Size” and “Member Reference” fields specified in the “ProxiedAssem” shall be used. It shall be legal to specify field values for “ProxiedAssem” entries whose corresponding field value in the “ProxyAssem” is not “Module”, however, these field values shall not by used, they shall exist only for documentation.

Additional field keywords

An adapter rack connection is a connection to a rack based adapter device that includes data from modules in the rack. Such a connection may also be used to send configuration and keying data for modules in the rack (e.g. at connection establishment).

The following keywords are additional values allowed for the "Member Reference" field within the Assembly section, that indicate the special purpose intended for the use of the data defined by an assembly member:

— ExternalID;

— InputSlotMask0 or InputSlotMask1;

— OutputSlotMask0 or OutputSlotMask1;

— ConfigSlotMask0 or ConfigSlotMask1.

The “ExternalID” keyword specifies that this assembly member shall contain either a module device “ExternalID” value if device keying is desired, or the “GenericID” value defined in the adapter EDS if module keying is not desired.

The “ExternalID” keyword combined with a decimal number (e.g. ExternalID2) shall be used to allow individual device keying for adapter rack connections. The decimal (positive) number N in “ExternalIDN” specifies slot N in the rack. The “ExternalIDN” keyword specifies that this assembly member shall contain either a module device “ExternalID” value for slot N if device keying is desired for this slot, or the “GenericID” value defined in the adapter EDS if module keying is not desired for this slot.

NOTE Keying is not available for slot 0.

The “InputSlotMask0” or “InputSlotMask1” keyword shall indicate the location of the input slot mask in the assembly. An input slot mask is an array of bits which represents inclusion or exclusion of a module’s target to originator data in an adapter rack connection. If “InputSlotMask0” keyword is used, bit 0 in this array represents slot 0, bit 1 represents slot 1, and so on. If “InputSlotMask1” keyword is used, bit 0 in this array represents slot 1, bit 1 represents slot 2, and so on. “InputSlotMask0” and “InputSlotMask1” shall not be used both in the same assembly. The preceding “Member size” field shall be required.

The “OutputSlotMask0” or “OutputSlotMask1” keyword shall indicate the location of the output slot mask in the assembly. An output slot mask is an array of bits which represents inclusion or exclusion of a module’s originator to target data in an adapter rack connection. If “OutputSlotMask0” keyword is used, bit 0 in this array represents slot 0, bit 1 represents slot 1, and so on. If “OutputSlotMask1” keyword is used, bit 0 in this array represents slot 1, bit 1 represents slot 2, and so on. “OutputSlotMask0” and “OutputSlotMask1” shall not be used both in the same assembly. The preceding “Member size” field shall be required.

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The “ConfigSlotMask0” or “ConfigSlotMask1” keyword shall indicate the location of the configuration slot mask in the assembly. A configuration slot mask is an array of bits which represents inclusion or exclusion of a module’s configuration data in the establishement service of an adapter rack connection. If “ConfigSlotMask0” keyword is used, bit 0 in this array represents slot 0, bit 1 represents slot 1, and so on. If “ConfigSlotMask1” keyword is used, bit 0 in this array represents slot 1, bit 1 represents slot 2, and so on. “ConfigSlotMask0” and “ConfigSlotMask1” shall not be used both in the same assembly. The preceding “Member size” field shall be required.

A.4.1.5.3.3 Additions to the Connection Manager section

This CIP section is not used in DeviceNet EDS files, hence it is not specified in this document.

A.4.1.5.3.4 Examples of extended EDS section (informative)

Figure A.14 and Figure A.15 are examples that show the usage of the modular EDS extensions for the Parameter and Assembly sections.

```
[Params]
   Param1 =          0,,,0x0010,2,2,” Target Error Codes",
                           "","",0,0xFFFF,0,0,0,0,0,0,0,0,0,0;
   ProxyParam1 =     0,,,0x0000,2,2,"input size",
                     "","",Module,Module,Module,0,0,0,0,,,,0;
   ProxyParamSizeAdder1 = 4,4,4;

[Assembly]
   Assem1 = "connection input format",,,,,,
      32,Param1,
      ,ProxyAssem1,
      ,ProxyAssem2;
   ProxyAssem1 = "real time input format","20 7D 24 SLOT 30 0A",,,,,
      ModuleMemberList;
   ProxyAssem2 = "real time status format","20 7D 24 SLOT 30 0B",,,,,
      ModuleMemberList;
```

Figure A.14 — Example of ProxyParam and ProxyAssem entries

```
[Params]
   ProxiedParam1 = ,,,,,,"input size","","",0,2,2,,,,,,,,;

[Assembly]
   ProxiedAssem1 = "real time input format",,,,,;
   ProxiedAssem2 = "real time status format",,,,,,16,;
```

Figure A.15 — Example of matching ProxiedParam and ProxiedAssem entries

A.4.2 DeviceNet specific EDS requirements

A.4.2.1 DeviceNet EDS content

This subclause specifies the file encoding requirements of the Electronic Data Sheet (EDS) which are specific for DeviceNet-based networks.

Table A.27 summarizes the structure of the sections which may be present in a DeviceNet EDS, the corresponding legal section delimiters, and the order of these sections in an EDS. Some of these sections are common to several CIP-based networks, their specific use for DeviceNet is further specified in A.4.2.2 if needed. Other sections are specific to DeviceNet and are specified in A.4.2.4.

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Table A.27 — DeviceNet EDS file structure

Section Name	Legal Delimiter	Placement	Required/Optional
File Description	[File]	1	Required
Device Description	[Device]	2	Required
Device Classification	[Device Classification]	[a]	Conditional[b]
Parameter Class	[ParamClass]	[a]	Optional
Parameters	[Params]	[a]	Optional
Parameter Groups	[Groups]	[a]	Optional
Assembly	[Assembly]	[a]	Optional
Connection Characteristics	[Connection Manager]	Not applicable	Not applicable
Port	[Port]	[a]	Optional
Modular	[Modular]	[a]	Optional
Parameter Enumerations	[EnumPar]	[a]	Optional
I/O Characteristics	[IO_Info]	[a]	Conditional[c]
Vendor Specific	[VendorID_vendorspecifickeyword]	Last	Optional

[a] Placement of these groups only needs to follow the Device Description and Device Classification sections
[b] This section is required if the Modular section is included, else it may be omitted
[c] This section is required if the corresponding functionality is implemented, else it may be omitted

The DeviceNet EDS contents shall be further organised as follows:

— all DeviceNet EDS files which include the Modular section shall also contain the Device Classification section, which shall use the legal delimiter [Device Classification], and may be placed anywhere after the File Description section;

— the optional and conditional sections described in this specification may be present in any order provided that no forward references exist within the EDS file.

A.4.2.2 Implementation of common CIP requirements

A.4.2.2.1 Device Classification section

For any DeviceNet compliant device, the Device Classification section of its EDS, if present, shall contain at least one ClassN keyword entry with its first field set to DeviceNet. Further sub-classification of the DeviceNet classification shall be reserved.

A.4.2.2.2 Port section

In the Port section of the EDS, the PortN entry corresponding to a DeviceNet compliant port shall be set as follows:

— the “Port Type Name” field shall have a value of “DeviceNet”;

— the optional “Port Object” field shall be set to the path of the DeviceNet object for this port;

— no additional requirements, beyond those specified in the CIP common subclause (see A.4.1.4.10), are placed on the “Port Name” and “Port Number” fields.

A.4.2.3 Additional data encoding requirements

There are no additional data encoding requirements for DeviceNet EDS files.

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A.4.2.4 Additional file requirements

A.4.2.4.1 Parameter Enumeration Strings section

The Parameter Enumeration Strings section provides an enumeration list of parameter choices to present to the user. The entry keyword for all parameter enumeration strings shall consist of a combination of the character array “Param”, combined with a parameter instance number (decimal) for the device, e.g. “Param1”. Each parameter that supports enumerated strings and has not corresponding Enum entry in the Parameters section shall have an entry in this section. The entries shall be in ascending order.

The fields in each entry shall contain the enumeration strings, separated by commas. The position in the list defines the enumerated value assigned to the string. The first string in the enumerated list is assigned the minimum value of the parameter. Each ensuing string is assigned a value incremented by one. There shall be one string for each integer value from the minimum to the maximum value of the parameter.

Each entry in the parameter enumeration string section shall contains the formatted fields shown in Table A.28.

Table A.28 — Parameter Enumeration Strings format

Field name	Field number	Data type	Required/Optional
Enumeration String(s)	1 thru number of enumerations	EDS_Char_Array	Required

Figure A.16 is an example that shows a typical Parameter Enumeration Strings section.

```
[EnumPar]
   Param2 =                        $ enums for param 2
      "1 ms input delay",
      "10 ms input delay",
      "25 ms input delay";

   Param3 =                        $ enums for param 3
      "Light Operate",
      "Dark Operate";
```

Figure A.16 — [EnumPar] section example

A.4.2.4.2 I/O Characteristics section

A.4.2.4.2.1 Contents

The I/O Characteristics section shall contain information about a device’s Predefined Master/Slave Connection Set I/O capabilities (see IEC 62026-3:2000). This section is required if a device implements any I/O connection whose characteristics can be completely represented with one or more entries within this section.

This section shall describe the following I/O characteristics of a device:

— I/O trigger type (Poll, Strobe, Change of State and Cyclic);

— I/O message size (number of bytes);

— predefined I/O connection paths.

The I/O Characteristics section shall contain the entries specified in Table A.29.

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Table A.29 — I/O Characteristics format

Entry Name	Entry Keyword	Required/Optional
Default I/O Information	Default	Required
Poll Information	PollInfo	Conditional
Strobe Information	StrobeInfo	Conditional
Multicast Poll Information	MulticastPollInfo	Conditional
Change of State Information	COSInfo	Conditional
Cyclic Information	CyclicInfo	Conditional
Device's Producing Connection	Input	Conditional
Device's Consuming Connection	Output	Conditional

The entries in the I/O Characteristics section shall provide the information as shown in Table A.30.

Table A.30 — I/O Characteristics entries

Entries	Description
Default I/O Information	Defines the default I/O information of the device.
Poll Information	Defines the I/O types that can be used in conjunction with the Poll connection and the default Poll Producing and Consuming connections. If this entry is not present, the polled connection is not supported in the device.
Strobe Information	Defines the I/O types that can be used in conjunction with the Strobe connection and the default Strobe Producing and Consuming connections. If this entry is not present, the strobe connection is not supported in the device.
Change of State Information	Defines the I/O types that can be used in conjunction with the Change of State connection and the default Change of State Producing and Consuming connections. If this entry is not present, the Change of State connection is not supported in the device.
Cyclic Information	Defines the I/O types that can be used in conjunction with the Cyclic connection and the default Cyclic Producing and Consuming connections. If this entry is not present, the Cyclic connection is not supported in the device.
Multicast Poll Information	Defines the I/O types that can be used in conjunction with the Multicast Poll connection and the default Multicast Poll Producing and Consuming connections. If this entry is not present, the multicast poll connection is not supported in the device.
Device's Producing Connection	Defines the byte and bit size of the connection, which I/O types it can be used with, the connection path, a name string and a help string.
Device's Consuming Connection	Defines the byte and bit size of the connection, which I/O types it can be used with, the connection path, a name string and a help string.

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A.4.2.4.2.2 Default I/O Information entry

The Default I/O Information entry shall define the default I/O information of the device.

The Default I/O Information entry shall contains the formatted fields shown in Table A.31.

Table A.31 — Default I/O Information format

Field name	Field number	Data type	Required/Optional
Default I/O Type Mask	1	WORD	Required

The Default I/O Type Mask field shall be a bit mapped field that defines the I/O types to be enabled as a default for the device. If a bit is set to one, that type of connection shall be enabled as a default. The bit assignments are defined in Table A.32.

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Table A.32 — Default I/O Type Mask bit assignments

Bit	Bit Definition
0	Poll
1	Strobe
2	Change of State
3	Cyclic
4	Multicast Poll
5-15	Reserved

A.4.2.4.2.3 Poll Information entry

The Poll Information entry shall define the I/O types that can be used in conjunction with the Poll connection. It shall also define the default Poll Producing and Consuming connections.

If this entry is not present, then:

— the Poll connection is not supported in the device; or

— the connection can not be completely described by the constructs of this keyword.

The Poll Information entry shall contains the formatted fields shown in Table A.33.

Table A.33 — Poll Information format

Field name	Field number	Data type	Required/Optional
Compatible I/O Type Mask	1	WORD	Required
Default Producing Connection	2	UINT	Required
Default Consuming Connection	3	UINT	Required

The Poll Information entry shall provide the information as shown in Table A.34.

Table A.34 — Poll Information fields

Fields	Description
Compatible I/O Type Mask	A bit mapped field that defines the I/O types that the polled connection can be combined with. The bit assignments shall be the same as the Default I/O Type Mask (see Table A.32). The poll bit shall be set.
Default Producing Connection	Specifies one of the Producing Connection entries as the default for the polled connection. A zero shall indicate that there is no producing data for the poll connection.
Default Consuming Connection	Specifies one of the Consuming Connection entries as the default for the polled connection. A zero shall indicate that there is no consuming data for the poll connection.

A.4.2.4.2.4 Strobe Information entry

The Strobe Information entry shall define the I/O types that can be used in conjunction with the Strobe connection. It shall also define the default Strobe Producing and Consuming connections.

If this entry is not present, then:

— the Strobe connection is not supported in the device; or

— the connection can not be completely described by the constructs of this keyword.

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The Strobe Information entry shall contains the formatted fields shown in Table A.35.

Table A.35 — Strobe Information format

Field name	Field number	Data type	Required/Optional
Compatible I/O Type Mask	1	WORD	Required
Default Producing Connection	2	UINT	Required
Default Consuming Connection	3	UINT	Required

The Strobe Information entry shall provide the information as shown in Table A.36.

Table A.36 — Strobe Information fields

Fields	Description
Compatible I/O Type Mask	A bit mapped field that defines the I/O types that the strobed connection can be combined with. The bit assignments shall be the same as the Default I/O Type Mask (see Table A.32). The strobe bit shall be set.
Default Producing Connection	Specifies one of the Producing Connection entries as the default for the strobed connection. A zero shall indicate that there is no producing data for the strobe connection.
Default Consuming Connection	Specifies one of the Consuming Connection entries as the default for the strobed connection. A zero shall indicate that there is no consuming data for the strobe connection.

A.4.2.4.2.5 Change of State Information entry

The Change of State Information entry shall define the I/O types that can be used in conjunction with the Change of State connection. It shall also define the default Change of State Producing and Consuming connections.

If this entry is not present, then:

— the Change of State connection is not supported in the device; or

— the connection can not be completely described by the constructs of this keyword.

The Change of State Information entry shall contains the formatted fields shown in Table A.37.

Table A.37 — Change of State Information format

Field name	Field number	Data type	Required/Optional
Compatible I/O Type Mask	1	WORD	Required
Default Producing Connection	2	UINT	Required
Default Consuming Connection	3	UINT	Required

The Change of State Information entry shall provide the information as shown in Table A.38.

Table A.38 — Change of State Information fields

Fields	Description
Compatible I/O Type Mask	A bit mapped field that defines the I/O types that the Change of State connection can be combined with. The bit assignments shall be the same as the Default I/O Type Mask (see Table A.32). The Change of State bit shall be set.
Default Producing Connection	Specifies one of the Producing Connection entries as the default for the Change of State connection. A zero shall indicate that there is no producing data for the Change of State connection.
Default Consuming Connection	Specifies one of the Consuming Connection entries as the default for the Change of State connection. A zero shall indicate that there is no consuming data for the Change of State connection.

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A.4.2.4.2.6 Cyclic Information entry

The Cyclic Information entry shall define the I/O types that can be used in conjunction with the Cyclic connection. It shall also define the default Cyclic Producing and Consuming connections.

If this entry is not present, then:

— the Cyclic connection is not supported in the device; or

— the connection can not be completely described by the constructs of this keyword.

The Cyclic Information entry shall contains the formatted fields shown in Table A.39.

Table A.39 — Cyclic Information format

Field name	Field number	Data type	Required/Optional
Compatible I/O Type Mask	1	WORD	Required
Default Producing Connection	2	UINT	Required
Default Consuming Connection	3	UINT	Required

The Cyclic Information entry shall provide the information as shown in Table A.40.

Table A.40 — Cyclic Information fields

Fields	Description
Compatible I/O Type Mask	A bit mapped field that defines the I/O types that the Cyclic connection can be combined with. The bit assignments shall be the same as the Default I/O Type Mask (see Table A.32). The Cyclic bit shall be set.
Default Producing Connection	Specifies one of the Producing Connection entries as the default for the Cyclic connection. A zero shall indicate that there is no producing data for the Cyclic connection.
Default Consuming Connection	Specifies one of the Consuming Connection entries as the default for the Cyclic connection. A zero shall indicate that there is no consuming data for the Cyclic connection.

A.4.2.4.2.7 Multicast Poll Information entry

The Multicast Poll Information entry shall define the I/O types that can be used in conjunction with the Multicast Poll connection. It shall also define the default Multicast Poll Producing and Consuming connections.

If this entry is not present, then:

— the Multicast Poll connection is not supported in the device; or

— the connection can not be completely described by the constructs of this keyword.

The Multicast Poll Information entry shall contains the formatted fields shown in Table A.41.

Table A.41 — Multicast Poll Information format

Field name	Field number	Data type	Required/Optional
Compatible I/O Type Mask	1	WORD	Required
Default Producing Connection	2	UINT	Required
Default Consuming Connection	3	UINT	Required

The Multicast Poll Information entry shall provide the information as shown in Table A.42.

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Table A.42 — Multicast Poll Information fields

Fields	Description
Compatible I/O Type Mask	A bit mapped field that defines the I/O types that the Multicast Poll connection can be combined with. The bit assignments shall be the same as the Default I/O Type Mask (see Table A.32). The Multicast Poll bit shall be set.
Default Producing Connection	Specifies one of the Producing Connection entries as the default for the Multicast Poll connection. A zero shall indicate that there is no producing data for the Multicast Poll connection.
Default Consuming Connection	Specifies one of the Consuming Connection entries as the default for the Multicast Poll connection. A zero shall indicate that there is no consuming data for the Multicast Poll connection.

A.4.2.4.2.8 Device's Producing Connection entries

The Device's Producing Connection entries shall be used to define the logical encoded path to the data of one or more objects that can be produced by an I/O Connection.

A separate entry shall be required for each occurrence:

— that is capable of being set in the produced connection path; and

— can be described within an EDS file.

Each entry shall define the byte and bit size of the connection, which I/O types it can be used with, the connection path, a name string and a help string.

The entry keyword for Producing Connection entries shall consist of a combination of the character array "Input", combined with a decimal number, e.g. "Input1". The decimal numbers shall start at one and increment by one.

Each Producing Connection entry shall contains the formatted fields shown in Table A.43.

Table A.43 — Producing Connection format

Field name	Field number	Data type	Required/Optional
Size	1	UINT	Required
Number of Significant Bits	2	UINT	Required
Compatible I/O Type Mask	3	WORD	Required
Name String	4	EDS_Char_Array	Required
Connection Path Size	5	UINT	Required
Connection Path	6	EPATH	Required
Help String	7	EDS_Char_Array	Required

The Producing Connection entry shall provide the information as shown in Table A.44.

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Table A.44 — Producing Connection fields

Fields	Description
Size	The size in bytes of this data.
Number of Significant Bits	The number of consecutive significant bits of this data (bits that are actually used). A zero shall indicate that all bits of the data are significant.
Compatible I/O Type Mask	A bit mapped field that defines the I/O types that this data can be used with. The bit assignments shall be the same as the Default I/O Type Mask (see Table A.32).
Name String	The textual data name (32 characters maximum). When displayed, truncation may occur to meet the display capabilities of the configuration tool.
Connection Path Size	The number of bytes used to represent the path.
Connection Path	The connection path of the data. The path shall be entered as a character array, using the path notation described in IEC 62026-3:2000 and with the format as specified in A.4.1.3.6.
Help String	The textual help string. When displayed, truncation may occur to meet the display capabilities of the configuration tool.

A.4.2.4.2.9 Device's Consuming Connection entries

The Device's Consuming Connection entries shall be used to define the logical encoded path from the data of one or more objects that can be consumed by an I/O Connection.

A separate entry shall be required for each occurrence:

— that is capable of being set in the consumed connection path; and

— can be described within an EDS file.

Each entry shall define the byte and bit size of the connection, which I/O types it can be used with, the connection path, a name string and a help string.

The entry keyword for Consuming Connection entries shall consist of a combination of the character array "Output", combined with a decimal number, e.g. "Output1". The decimal numbers shall start at one and increment by one.

Each Consuming Connection entry shall contains the formatted fields shown in Table A.45.

Table A.45 — Consuming Connection format

Field name	Field number	Data type	Required/Optional
Size	1	UINT	Required
Number of Significant Bits	2	UINT	Required
Compatible I/O Type Mask	3	WORD	Required
Name String	4	EDS_Char_Array	Required
Connection Path Size	5	UINT	Required
Connection Path	6	EPATH	Required
Help String	7	EDS_Char_Array	Required

The Consuming Connection entry shall provide the information as shown in Table A.46.

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Table A.46 — Consuming Connection fields

Fields	Description
Size	The size in bytes of this data. For strobe connections, a one shall indicate that the strobe bit is used and a zero shall indicate that it is not.
Number of Significant Bits	The number of consecutive significant bits of this data (bits that are actually used). A zero shall indicate that all bits of the data are significant.
Compatible I/O Type Mask	A bit mapped field that defines the I/O types that this data can be used with. The bit assignments shall be the same as the Default I/O Type Mask (see Table A.32.)
Name String	The textual data name (32 characters maximum). When displayed, truncation may occur to meet the display capabilities of the configuration tool.
Connection Path Size	The number of bytes used to represent the path.
Connection Path	The connection path of the data. The path shall be entered as a character array, using the path notation described in IEC 62026-3:2000 and with the format as specified in A.4.1.3.6.
Help String	The textual help string. When displayed, truncation may occur to meet the display capabilities of the configuration tool.

A.4.2.4.2.10 Examples

This subclause contains example sections of EDS files that specify the I/O characteristics of the device.

Figure A.17 is an example that shows a typical I/O Characteristics section for a Poll & Strobe capable device (Poll is default).

```
[IO_Info]
   Default = 0x0001;                        $ Poll
                                            $ Bit mapped (0 = None)
                                            $ Bit 0 = Poll
                                            $ Bit 1 = Strobe
   PollInfo =
      0x0003,                               $ OK to Combine w/Poll or Strobe
      2,                                    $ Default Input = Input2
      3;                                    $ Default Output = Output3

   StrobeInfo =
      0x0003,                               $ OK to Combine w/Poll or Strobe
      1,                                    $ Default Input = Input1
      4;                                    $ Default Output = Output4

$ -- Input Connections --

  Input1 =
      1,                                    $ 1 byte
      1,                                    $ 1 bit is significant
      0x0003,                               $ Strobe or Poll Connection
      "Data",                               $ Name String
      6,                                    $ Path Size
      "20 04 24 20 30 03",                  $ Assy Obj Inst 20 Attr 3
      "This is a help string.";             $ Help String

  Input2 =    2, 0, 0x0003, "Status", 6, "20 04 24 21 30 03",
              "This is a help string.";

   Input3 = 3, 0, 0x0003, "Data + Status", 6, "20 04 24 22 30 03",
              "This is a help string.";

$ -- Output Connections --
```

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```
   Output1 =
      1,                                    $ 1 byte
      0,                                    $ All bits are significant
      0x0001,                               $ Poll Only Connection
      "Data",                               $ Name String
      6,                                    $ Path Size
      "20 04 24 10 30 03",                  $ Assy Obj Inst 10 Attr 3
      "This is a help string.";             $ Help String

   Output2 = 2, 0, 0x0001, "Reference", 6, "20 04 24 11 30 03",
             "This is a help string.";

   Output3 = 3, 0, 0x0001, "Data + Reference",6, "20 04 24 12 30 03",
             "This is a help string.";

   Output4 =
      1,                                    $ Use Strobe Bit
      1,                                    $ 1 significant bit
      0x0002,                               $ Strobe Only Connection
      "Data Bit",                           $ Name String
      4,                                    $ Path Size
      "20 0E 24 01",                        $ Sensor Obj Inst 1
      "This is a help string.";             $ Help String

   Output5 =
      1,                                    $ Use Strobe Bit
      1,                                    $ 1 significant bit
      0x0002,                               $ Strobe Only Connection
      "Sync Bit",                           $ Name String
      4,                                    $ Path Size
      "20 0E 24 02",                        $ Sensor Obj Inst 2
      "This is a help string.";             $ Help String

   Output6 =
      0,                                    $ Strobe Bit Ignored, Don't Map
      0,                                    $ All bits are significant (None)
      0x0002,                               $ Strobe Only Connection
      "Sync Pulse",                         $ Name String
      4,                                    $ Path Size
      "20 0E 24 03",                        $ Sensor Obj Inst 3
      "This is a help string.";             $ Help String
```

Figure A.17 — I/O Characteristics example : Poll & Strobe capable device, Poll is default

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Figure A.18 is an example that shows a typical I/O Characteristics section for a Strobe Only device (only one Input and one Output).

```
[IO_Info]

   Default = 0x0002;                        $ Strobe Only

   StrobeInfo =
      0x0002                                $ Strobe Only
      1;                                    $ Default Input = Input1
      1;                                    $ Default Output = Output1
```

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```
$ -- Input Connections --
   Input1 =
      1,                                  $ 1 byte
      2,                                  $ 2 bits are significant
      0x0002,                             $ Only Strobe Connection
      "Data & Status Bits",               $ Name String
      4,                                  $ Path Size
      "20 0E 24 01",                      $ Sensor Obj Inst 1
      "This is a help string.";           $ Help String

$ -- Output Connections --
   Output1=
      0,                                  $ Strobe bit not used
      0,                                  $ All bits are significant
      0x0002,                             $ Only Strobe Connection
      "Strobe Out Bit Not Used",          $ Name String
      6,                                  $ Path Size
      "20 0E 24 01",                      $ Sensor Obj Inst 1
      "This is a help string.";           $ Help String
```

Figure A.18 — I/O Characteristics example : Strobe Only device, only one Input and one Output

Figure A.19 is an example that shows a typical I/O Characteristics section for a Poll & Change of State capable device (Poll and Change of State is default).

```
[IO_Info]

   Default = 0x0005;                   $ Poll & Change of State
                                       $   Bit 0 = Poll
                                       $   Bit 2 =Change of State

   PollInfo =
      0x0005,                          $ OK to Combine w/Poll or COS
      2,                               $ Default Input = Input2
      2;                               $ Default Output = Output2

   COSInfo =
      0x0005,                          $ OK to Combine w/Poll or COS
      1,                               $ Default Input = Input1
      1;                               $ Default Output = Output1

$ -- Input Connections --

   Input1 =
      1,                               $ 1 byte
      1,                               $ 1 bit is significant
      0x0005,                          $ Poll or COS Connection
      "Data",                          $ Name String
      6,                               $ Path Size
      "20 04 24 20 30 03",             $ Assy Obj Inst 20 Attr 3
      "This is a help string.";        $ Help String

   Input2 =  2, 0, 0x0005, "Status", 6, "20 04 24 21 30 03",
             "This is a help string.";

   Input3 =  3, 0, 0x0005, "Data + Status", 6, "20 04 24 22 30 03",
             "This is a help string.";
```

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```
$ -- Output Connections --

   Output1 =
      1,                                    $ 1 byte
      0,                                    $ All bits are significant
      0x0005,                               $ Poll or COS Connection
      "Data",                               $ Name String
      6,                                    $ Path Size
      "20 04 24 10 30 03",                  $ Assy Obj Inst 10 Attr 3
      "This is a help string.";             $ Help String

   Output2 = 2, 0, 0x0005, "Reference", 6, "20 04 24 11 30 03",
             "This is a help string.";

   Output3 = 3, 0, 0x0005, "Data + Reference",6, "20 04 24 12 30 03",
             "This is a help string.";
```

Figure A.19 — I/O Characteristics example : Poll & Change of State capable device, Poll and Change of State is default

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Annex B
(normative)

CANopen profile templates

B.1 Device profile template description

B.1.1 General

The device profile template XML schema defined in B.1.5 contain the mapping of the device profile class diagrams shown in 6.2.1. Besides the mapping classes and attributes, it contains additional elements, with or without XML attributes, to facilitate unambiguous device profiles and device descriptions in XML. To allow the reuse of certain element definitions and to allow a flexible extension of device profiles and device descriptions by models not anticipated here, the classes have been mapped to more than one XML schema. Table B.1 lists all XML schemas of the CANopen device profile template exchange description.

NOTE Describing a device profile or device description may not need the application of all XML schema defined herein.

Table B.1 - Overview of XML schema

Name	Content	Namespace
COFDCML.xsd	Basic classes	http://www.can-cia.org/xml/canopen
FDCMLdt.xsd	Data type definitions	http://www.fdcml.org
FDCMLISO15745DeviceFunction.xsd	Device function classes	http://www.fdcml.org/ISO15745DeviceFunction
FDCMLTextResource.xsd	XML schema for text resources	http://www.fdcml.org/TextResource
xmldef.xsd	Definitions in the XML namespace	http://www.w3.org/XML/1998/namespace
xlinkdef.xsd	Definitions in the Xlink namespace	http://www.w3.org/1999/xlink

B.1.2 Basics

B.1.2.1 Data type elements

The device profile uses IEC 61158 data types. To allow additional attributes the data type information is modelled using XML element type declarations. IEC 61131-3 and CANopen data type aliases are provided as fixed attributes. These data type elements are defined in a XML schema named “FDCMLdt.xsd” which is defined in B.1.5.2.

B.1.2.2 Collection pattern

The device profile uses the Collection Element Pattern. These elements appear in list form of the collected elements (example: `proccessDataDescriptionList / processDataDescription`).

B.1.2.3 Descriptive text for elements

B.1.2.3.1 General

The device profile offers three distinct possibilities to provide descriptive text for elements. B.1.2.3.2 and B.1.2.3.3 are to be used exclusively. B.1.2.3.4 may be used together with B.1.2.3.2 or B.1.2.3.3.

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B.1.2.3.2 Text embedded in the device profile

Every element which requires a descriptive text shall have a `label` child element with the attribute `xml:lang`. This allows mutiple languages with one device profile. Additionally a short help text may be provided with the `help` element. It has the attribute `xml:lang`, too. This attribute is composed of a two-letter language code and an optional two-letter country code separated by a dash. The format is:

```
ISO 639 code for name of language ["-" ISO 3166-1-Alpha-2 code]
```

EXAMPLE `xml:lang='en-us'` states an English text with US American wording.

B.1.2.3.3 Text provided by external text resource files

The elements `labelRef` and `helpRef` shall provide a pointer to a text resource stored in an external text resource file. The AIF has to replace these references by the test provided by the text resource file. The text resource files used by a device profile shall be defined in a `dictionary` element.

The format of the text resource file is defined in the XML schema "FDCMLTextResource.xsd" which is defined in B.1.5.4.

B.1.2.3.4 Pointer to external documentation

Additionally a pointer to an external documentation my be provided. The `hlpRefFile` element shall point to a distinctive position in a file defined with the `helpFile` element.

EXAMPLE Examples for external documentation are *.hlp, *.html, or *.pdf files.

B.1.2.4 Valid element value

If a device profile element has a value, one of the following value descriptions shall be used:

- `const` constant element value
- `edit` editable string value
- `enumeration` enumerated value
- `range` value range, a value can have more than one range
- `yes, no` TRUE/FALSE value combination
- `reference` reference to another element
- `instanceValue` value, if a instance instead of a profile or type is described

B.1.2.5 Modelling of conditional device behaviour

To model conditional device behaviour, the following elements shall be used:

- `disable` disable the referenced device property depending on the value of this device property
- `enable` enable the referenced device property depending on the value of this device property
- `change` change the referenced device property value depending on the value of this device property

Every possible target of a disabled or `enabled` has an `enabled` attribute in the XML schema.

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B.1.2.6 Internal referencing of elements

A path specified in a `ref` attribute shall be a valid Xpath (see [8]) path.

B.1.2.7 Unique element identification

Elements, which require identification, have the attribute uniqueID. The value of this unique identifier shall consist of:

`token_index[[_subindex]…]`, index of type unsigned16 and subindex of type unsigned8

B.1.2.8 Assemblies

All Assembly elements allow a grouping of their respective object elements. An assembly contains a list of Xpath pointers to the assembly objects.

B.1.2.9 Vendor specific categories

An AIP designer may add category elements to the collection elements.

EXAMPLE An AIP designer adds a `processDataCategory` for input signals and `processDataCategory` for output signals.

B.1.3 DeviceManager object

B.1.3.1 datatypeTemplateList, datatypeTemplate objects

The `datatypeTemplate` allows the definition of AIP designer or device profile specific data types. These data types are invoked with the `datatypeInstance` element. These data types can be described as follows:

— `directlyDerivedType` directly derived data type

— `enumeratedType` enumerated data type or list of constants (C-style enumeration)

— `subrangeType` range data type

— `arrayType` array data type

— `structuredType` structured data type

B.1.3.2 Attribute of the communicationEntity object

Table B.2 describes the attributes of the communicationEntity object as defined in 6.2.1.3.4.

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Table B.2 - Attribute of `communicationEntity` object

Attribute	Description	Data type	Values
protocol	communication protocol	xsd:string	'CANopen'
communicator	specifies, whether this entity takes an active role in the network communication	xsd:string	'YES' – participates in network communication 'NO' – does not participate in network communication
communicationEntityType	type of communication entity	xsd:string	'SLAVE' 'MASTER' 'CLIENT' 'SERVER' 'PEER' (en entity, which acts as client and server) 'MASTER_SERVER' (an entity, which achts as master and slave) 'DEVICEMODULE' (an entity, which needs a parent to communicate via a network) 'PASSIVE' (an entity, which does not participate in network communication)
communicationProfile	communication profile identifier	xsd:string	see 6.2.2.2

B.1.3.3 Attributes of `channel` objects

Table B.3 describes the attributes of the `channel` object as defined in 6.2.1.3.3.2.

Table B.3 - Attributes of `channel` object

Attribute	Description	Data type	Values
channelType	type of channel	xsd:string	
direction	direction of data flow through this channel	xsd:string	"I": Input "Q": Output "X" do not care

B.1.3.4 Attributes of `MAU` objects

Table B.4 describes the attributes of the `MAU` object as defined in 6.2.1.3.3.3.

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Table B.4 - Attributes of `MAU` object

Attribute	Description	Data type	Value
interfaceType	provides additional information on the type of the MAU	xsd:string	“COREMOTE” “COLOCAL”
direction	defines the logical direction of the data flow through this MAU	xsd:string	“INOUT”: transmit and receiver “IN”: receiver and loopback circuit “OUT”: transmit and loopback circuit “IN_UNI”: receive only “OUT_UNI”: transmit only
directlyConnected	defines, if other devices are connected directly to this MAU	xsd:string	“YES” “NO”
MAUType	vendor specific MAU type identifier	xsd:string	value is vendor specific
newLevel	defines, if a new structural level is opened by this MAU (example: local bus branch of a bus terminal)	xsd:string	“YES” “NO”
protocol	defines the protocol run by the MAU	xsd:string	“CANopen”
sequenceNumber	identification of the MAU, starting by 1, separately numbered for each direction	xsd:nonNegativeInteger	default = 1

B.1.3.5 Attributes of slot objects

Table B.5 describes the attributes of the slot object as defined in 6.2.1.3.3.4.

Table B.5 - Attributes of `slot` object

Attributes	Description	Data type	Values
number	indicates the position at which a child device may be added in the sequence of child devices	xsd:string	The `number` attribute can contain a single number (`'3'`), a list of numbers (`'3,5,7'`), a number range (`'1-3'`) or a combination (`'1-2,4,6,9-10'`)[1)].
1) If the child devices may be attached to any slot, use a number, defining the maximum number of attachable child devices. If for example 64 child devices may be attached to a parent device use `slot number='1-64'`. Every slot position requires a `MAUUsage` element pointing to an attached MAU.			

B.1.3.6 Attributes of `LED` and `LEDState` objects

Table B.6 describes the attributes of the `LED` object defined in 6.2.1.3.3.5. The child object `LEDState` describes distinct states. The attributes of the `LEDState` are described in Table B.7.

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Table B.6 — Attributes of `LED` object

Attribute	Description	Data Type	Values
LEDType	type of LED	xsd:string	"IOStatus" "IODiagnostic" "DeviceStatus" "DeviceDiagnostic" "CommStatus" "CommDiagnostic"

Table B.7 — Attributes of `LEDState` object

Attribute	Description	Data Type	Values
LEDCondition	condition of LED in state	xsd:string	"ON" "OFF"
LEDColor	color of LED in state	xsd:string	"GREEN" "YELLOW" "RED" "ORANGE" "BLUE" "WHITE"
LEDFrequency	frequency of blink rate in state in Hz	xsd:float	
LEDFlashCount	number of flashes in state	xsd:nonNegativeInteger	
ref	XPath to object or state of object causing the LED state	xsd:string	

B.1.4 Supplementary element descriptions

B.1.4.1 `accessPath` object

An accessPath object shall describe a path relative to a `communicationEntity` for an application to gain access to a `localDataDescription` object. The format is:

— for a localDataDescription: undefined

NOTE The format for a `localDataDescription` is out of the scope of ISO 15745-2.

Figure B.1 illustrates the order and numbering of the byte and bit offsets.

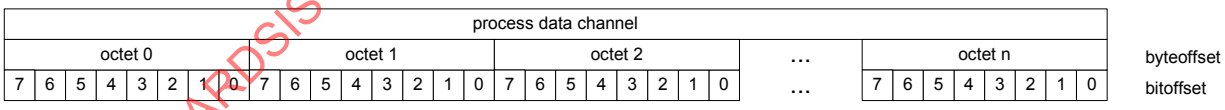

Figure B.1 — Byte and bit offsets in the process data channel

B.1.4.2 `datatype` object

A `datatype` object shall define the data type of the parent element.

B.1.4.3 `file` object

A `file` object contains an XLink [7] reference to an external file.

B.1.4.4 `gain`, `offset`, `maxVal`, `minVal`, `default`, `stepVal`, `on` elements

The following elements shall be used to qualify the `range` element:

— `gain` scaling factor

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— `offset` scaling factor

— `maxVal` maximum value of range

— `minVal` minimum value of range

— `default` default value of range

— `stepVal` step value

— `on` trigger value for a relation

All values refer to x_{actual}.

If present, the scaling factors shall be used as given in the following formula: $x_{scale} = offset + x_{actual} * gain$

B.1.4.5 `picture, hotspotList, hotspot` objects

A `picture` object shall hold a reference to a graphical representation of an element. The attributes of the picture element are specified in Table B.8.

Table B.8 — Attributes of picture element

Name	Description	Data Type
picName	file name of picture	xsd:string
picType	type identifier, file extension	xsd:string
xSize	width in pixel	xsd:positiveInteger
ySize	height in pixel	xsd:positiveInteger
picClassification	user classification of picture contents	xsd:string

The `hotspotList` object is a collection of `hotspot` elements. A `hotspot` defines a position of a `channel`, `LED` or a `MAU` in a graphical representation. The attributes of the hotspot object are specified in Table B.9. The attribute values `xPos` and `yPos` define the relative position (see Figure B.2). The `hotElement` is an XPath to a `channel`, `LED` or `MAU`.

Table B.9 — Attributes of hotspot element

Attribute	Description	Data Type	Value
xPos	hotspot position in percent	xsd:nonNegativeInteger	0 <= value <= 100
yPos	hotspot position in percent	xsd:nonNegativeInteger	0 <= value <= 100
hotElement	XPath to connection point	xsd:string	valid XPath

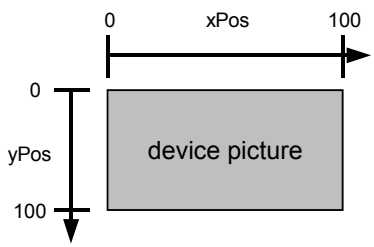

Figure B.2 — Hotspot positions of connection points

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B.1.4.6 `specificProperty` object

The `specificProperty` element is reserved for extensions by an AIP designer.

NOTE Use of specificProperty element is out of the scope of ISO 15745-2.

B.1.4.7 `tool` object

A `tool` object defines a parent element specific tool. Table B.10 describes the attributes of the tool element.

Table B.10 — Attributes of tool element

Attribute	Description	Data Type	Value
toolClassification	classifies the task of the tool	xsd:string	
toolID	operating system specific unique identification of the tool	xsd:string	
NOTE PROGID or GUID are examples for a toolID.			

B.1.4.8 `uses` object

A uses element defines a <<uses>> association as defined in Figure 7 and Figure 9.

B.1.5 Device profile template XML schemas

B.1.5.1 COFDCML.xsd

```
<?xml version = "1.0" encoding = "UTF-8"?>
<xsd:schema xmlns = "http://www.can-cia.org/xml/canopen"
    targetNamespace = "http://www.can-cia.org/xml/canopen"
    xmlns:xlink = "http://www.w3.org/1999/xlink"
    xmlns:xsd = "http://www.w3.org/2001/XMLSchema"
    version = "1.0"
    elementFormDefault = "qualified"
    attributeFormDefault = "unqualified">
   <xsd:import namespace = "http://www.w3.org/1999/xlink" schemaLocation = "xlinkdef.xsd"/>
   <xsd:include schemaLocation = "FDCMLdt.xsd"/>
   <xsd:group name = "g_labels">
      <xsd:choice>
         <xsd:element ref = "label" maxOccurs = "unbounded"/>
         <xsd:element ref = "labelRef"/>
      </xsd:choice>
   </xsd:group>
   <xsd:group name = "g_help">
      <xsd:choice>
         <xsd:element ref = "help" maxOccurs = "unbounded"/>
         <xsd:element ref = "helpRef"/>
      </xsd:choice>
   </xsd:group>
   <xsd:group name = "g_naming">
      <xsd:sequence>
         <xsd:choice>
            <xsd:sequence>
               <xsd:element ref = "label" maxOccurs = "unbounded"/>
               <xsd:element ref = "help" minOccurs = "0" maxOccurs = "unbounded"/>
            </xsd:sequence>
            <xsd:sequence>
               <xsd:element ref = "labelRef"/>
               <xsd:element ref = "helpRef" minOccurs = "0"/>
            </xsd:sequence>
         </xsd:choice>
         <xsd:element ref = "helpFileRef" minOccurs = "0"/>
      </xsd:sequence>
   </xsd:group>
   <xsd:group name = "g_stringValues">
      <xsd:choice>
         <xsd:element ref = "const" maxOccurs = "unbounded"/>
         <xsd:element ref = "edit" maxOccurs = "unbounded"/>
         <xsd:element ref = "labelRef"/>
```

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```
         <xsd:element ref = "instanceValue"/>
      </xsd:choice>
   </xsd:group>
   <xsd:group name = "g_values">
      <xsd:choice>
         <xsd:element ref = "const" maxOccurs = "unbounded"/>
         <xsd:element ref = "edit" maxOccurs = "unbounded"/>
         <xsd:element ref = "enumeration" maxOccurs = "unbounded"/>
         <xsd:element ref = "range" maxOccurs = "unbounded"/>
         <xsd:sequence>
            <xsd:element ref = "yes" minOccurs = "0"/>
            <xsd:element ref = "no" minOccurs = "0"/>
         </xsd:sequence>
         <xsd:element ref = "reference" maxOccurs = "unbounded"/>
         <xsd:element ref = "instanceValue"/>
      </xsd:choice>
   </xsd:group>
   <xsd:attributeGroup name = "ag_FDCML">
      <xsd:attribute name = "formatName" fixed = "FDCML" form = "unqualified" type = "xsd:string"/>
      <xsd:attribute name = "formatVersion" fixed = "2.0" form = "unqualified" type = "xsd:string"/>
      <xsd:attribute name = "fileName" use = "required" form = "unqualified" type = "xsd:string"/>
      <xsd:attribute name = "fileCreator" use = "required" form = "unqualified" type = "xsd:string"/>
      <xsd:attribute name = "fileCreationDate" use = "required" form = "unqualified" type = "xsd:date"/>
      <xsd:attribute name = "fileModificationDate" use = "required" form = "unqualified" type =
"xsd:date"/>
      <xsd:attribute name = "fileVersion" use = "required" form = "unqualified" type = "xsd:string"/>
   </xsd:attributeGroup>
   <xsd:attributeGroup name = "accessCategory">
      <xsd:attribute name = "accessCategory" use = "required">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:NMTOKEN">
               <xsd:enumeration value = "read"/>
               <xsd:enumeration value = "write"/>
               <xsd:enumeration value = "readWrite"/>
               <xsd:enumeration value = "noAccess"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:attributeGroup>
   <xsd:attributeGroup name = "dataType">
      <xsd:attribute name = "dataType" use = "required">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:NMTOKEN">
               <xsd:enumeration value = "bool"/>
               <xsd:enumeration value = "byte"/>
               <xsd:enumeration value = "char"/>
               <xsd:enumeration value = "word"/>
               <xsd:enumeration value = "dWord"/>
               <xsd:enumeration value = "lWord"/>
               <xsd:enumeration value = "sInt"/>
               <xsd:enumeration value = "usInt"/>
               <xsd:enumeration value = "int"/>
               <xsd:enumeration value = "uInt"/>
               <xsd:enumeration value = "dInt"/>
               <xsd:enumeration value = "udInt"/>
               <xsd:enumeration value = "lInt"/>
               <xsd:enumeration value = "ulInt"/>
               <xsd:enumeration value = "real"/>
               <xsd:enumeration value = "lReal"/>
               <xsd:enumeration value = "string"/>
               <xsd:enumeration value = "unicode"/>
               <xsd:enumeration value = "struct"/>
               <xsd:enumeration value = "physical"/>
               <xsd:enumeration value = "array"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:attributeGroup>
   <xsd:attributeGroup name = "persistent">
      <xsd:attribute name = "persistent" use = "required">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:NMTOKEN">
               <xsd:enumeration value = "false"/>
               <xsd:enumeration value = "true"/>
               <xsd:enumeration value = "n.a"/>
            </xsd:restriction>
```

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```
      </xsd:simpleType>
   </xsd:attribute>
</xsd:attributeGroup>
<xsd:attributeGroup name = "type">
   <xsd:attribute name = "type" use = "required">
      <xsd:simpleType>
         <xsd:restriction base = "xsd:NMTOKEN">
            <xsd:enumeration value = "fixedValue"/>
            <xsd:enumeration value = "vendorSpecific"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
</xsd:attributeGroup>
<xsd:attributeGroup name = "use">
   <xsd:attribute name = "use" use = "required">
      <xsd:simpleType>
         <xsd:restriction base = "xsd:NMTOKEN">
            <xsd:enumeration value = "required"/>
            <xsd:enumeration value = "optional"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:attribute>
</xsd:attributeGroup>

<!--xmlns:xml="http://www.w3.org/XML/1998/namespace"-->

<xsd:element name = "ISO15745Profile">
   <xsd:annotation>
      <xsd:documentation>Document Element</xsd:documentation>
   </xsd:annotation>
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "ProfileHeader"/>
         <xsd:choice>
            <xsd:element ref = "ProfileBody"/>
            <xsd:element ref = "ProfilesBody"/>
         </xsd:choice>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>

<xsd:element name = "accessPath" type = "xsd:string"/>
<xsd:element name = "additionalItem">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:element ref = "pictureList" minOccurs = "0"/>
         <xsd:choice minOccurs = "0">
            <xsd:group ref = "g_values"/>
         </xsd:choice>
         <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "additionalItem" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "instances" minOccurs = "0"/>
      </xsd:sequence>
      <xsd:attribute name = "uniqueID" use = "required" type = "xsd:ID"/>
      <xsd:attribute name = "additionalItemType" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "enabled" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "additionalItemCategory">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:element ref = "additionalItem" maxOccurs = "unbounded"/>
      </xsd:sequence>
      <xsd:attribute name = "uniqueID" type = "xsd:ID"/>
      <xsd:attribute name = "enabled" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
```

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```
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "additionalItemList">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:group ref = "g_naming"/>
          <xsd:choice maxOccurs = "unbounded">
             <xsd:element ref = "additionalItemCategory"/>
             <xsd:element ref = "additionalItem"/>
          </xsd:choice>
       </xsd:sequence>
       <xsd:attribute name = "uniqueID" type = "xsd:ID"/>
       <xsd:attribute name = "additionalItemsType" use = "required" type = "xsd:string"/>
       <xsd:attribute name = "enabled" default = "YES">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "alignment">
    <xsd:complexType>
       <xsd:attribute name = "type" use = "required">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:NMTOKEN">
                <xsd:enumeration value = "byte"/>
                <xsd:enumeration value = "word"/>
                <xsd:enumeration value = "dword"/>
                <xsd:enumeration value = "lword"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "ApplicationProcess">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:element ref = "externalSchema"/>
       </xsd:sequence>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "arrayType">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:choice minOccurs = "0">
             <xsd:group ref = "g_help"/>
          </xsd:choice>
          <xsd:group ref = "g_datatypes"/>
          <xsd:element ref = "subrange" maxOccurs = "unbounded"/>
       </xsd:sequence>
       <xsd:attribute name = "initialValues" type = "xsd:string"/>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "buildDate">
    <xsd:complexType>
       <xsd:choice>
          <xsd:group ref = "g_labels"/>
       </xsd:choice>
       <xsd:attribute name = "readOnly" default = "YES">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
```

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```
<xsd:element name = "capabilities">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "externalSchema"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "cfgItemList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:sequence minOccurs = "0">
            <xsd:group ref = "g_naming"/>
         </xsd:sequence>
         <xsd:element ref = "CANopenDedicatedCfgCategory"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "change">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_datatypes"/>
         <xsd:element ref = "datatypeInstance"/>
      </xsd:choice>
      <xsd:attribute name = "ref" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "channel">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:element ref = "pictureList" minOccurs = "0"/>
         <xsd:element ref = "accessPath" minOccurs = "0"/>
         <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "uses" minOccurs = "0"/>
         <xsd:element ref = "provides" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "channel" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "instances" minOccurs = "0" maxOccurs = "unbounded"/>
      </xsd:sequence>
      <xsd:attribute name = "uniqueID" use = "required" type = "xsd:ID"/>
      <xsd:attribute name = "channelType" type = "xsd:string"/>
      <xsd:attribute name = "direction" default = "X">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "I"/>
               <xsd:enumeration value = "Q"/>
               <xsd:enumeration value = "X"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
      <xsd:attribute name = "enabled" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "channelList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "channel" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "communicationEntity">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:sequence minOccurs = "0">
            <xsd:group ref = "g_naming"/>
         </xsd:sequence>
         <xsd:element ref = "cfgItemList" minOccurs = "0"/>
         <xsd:element ref = "CANopenIdentity"/>
         <xsd:element name = "CANopenCommunicationFunctionList" minOccurs = "0">
            <xsd:complexType>
```

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```
                <xsd:sequence>
                   <xsd:element ref = "function" maxOccurs = "unbounded"/>
                </xsd:sequence>
             </xsd:complexType>
          </xsd:element>
          <xsd:element name = "CANopenCommunicationParameterList">
             <xsd:complexType>
                <xsd:sequence>
                   <xsd:element ref = "parameter" maxOccurs = "unbounded"/>
                </xsd:sequence>
             </xsd:complexType>
          </xsd:element>
          <xsd:element ref = "CANopenObjectAccessList"/>
       </xsd:sequence>
       <xsd:attribute name = "uniqueID" type = "xsd:ID"/>
       <xsd:attribute name = "protocol" use = "required" type = "xsd:string"/>
       <xsd:attribute name = "communicator" default = "YES">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
       <xsd:attribute name = "communicationEntityType" default = "SLAVE">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "SLAVE"/>
                <xsd:enumeration value = "MASTER"/>
                <xsd:enumeration value = "CLIENT"/>
                <xsd:enumeration value = "SERVER"/>
                <xsd:enumeration value = "INTERCONNECTION"/>
                <xsd:enumeration value = "PEER"/>
                <xsd:enumeration value = "MASTER_SLAVE"/>
                <xsd:enumeration value = "DEVICEMODULE"/>
                <xsd:enumeration value = "PASSIVE"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
       <xsd:attribute name = "communicationProfile" type = "xsd:string"/>
       <xsd:attribute name = "enabled" default = "YES">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "connection">
    <xsd:complexType>
       <xsd:sequence minOccurs = "0">
          <xsd:element ref = "specificProperty" maxOccurs = "unbounded"/>
       </xsd:sequence>
       <xsd:attribute name = "destination" use = "required" type = "xsd:string"/>
       <xsd:attribute name = "source" use = "required" type = "xsd:string"/>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "connectionList">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:element ref = "connection" minOccurs = "0" maxOccurs = "unbounded"/>
       </xsd:sequence>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "const">
    <xsd:complexType>
       <xsd:choice>
          <xsd:group ref = "g_datatypes"/>
          <xsd:element ref = "datatypeInstance"/>
       </xsd:choice>
       <xsd:attribute ref = "xml:lang"/>
       <xsd:attribute ref = "xlink:type"/>
       <xsd:attribute ref = "xlink:href"/>
       <xsd:attribute name = "format" type = "xsd:string"/>
```

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```
      <xsd:attribute name = "unit" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "datatype">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_datatypes"/>
         <xsd:element ref = "datatypeInstance"/>
      </xsd:choice>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "datatypeInstance" nillable = "true">
   <xsd:complexType>
      <xsd:attribute name = "ref" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "datatypeTemplate">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:choice>
            <xsd:element ref = "directlyDerivedType"/>
            <xsd:element ref = "enumeratedType"/>
            <xsd:element ref = "subrangeType"/>
            <xsd:element ref = "arrayType"/>
            <xsd:element ref = "structuredType"/>
         </xsd:choice>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "datatypeTemplateList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "alignment" minOccurs = "0"/>
         <xsd:element ref = "endianess" minOccurs = "0"/>
         <xsd:element ref = "datatypeTemplate" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "default">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_numericDatatypes"/>
         <xsd:group ref = "g_booleanDatatypes"/>
         <xsd:group ref = "g_userDatatypes"/>
         <xsd:group ref = "g_timeDatatypes"/>
      </xsd:choice>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "deviceFamily">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "defaultfile">
   <xsd:complexType>
      <xsd:attribute ref = "xlink:type"/>
      <xsd:attribute ref = "xlink:href" use = "required"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "deleteEntity">
   <xsd:complexType>
      <xsd:attribute name = "node" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "DeviceFunction">
```

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```
   <xsd:complexType>
      <xsd:choice maxOccurs = "unbounded">
         <xsd:element ref = "externalSchema" minOccurs = "0" maxOccurs = "unbounded"/>
      </xsd:choice>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "DeviceIdentity">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "vendorName"/>
         <xsd:element ref = "vendorID" minOccurs = "0"/>
         <xsd:element ref = "vendorText" minOccurs = "0"/>
         <xsd:element ref = "deviceFamily"/>
         <xsd:element ref = "capabilities" minOccurs = "0"/>
         <xsd:element ref = "productFamily" minOccurs = "0"/>
         <xsd:element ref = "productName"/>
         <xsd:element ref = "productID" minOccurs = "0"/>
         <xsd:element ref = "productText" minOccurs = "0"/>
         <xsd:element ref = "orderNumber" minOccurs = "0"/>
         <xsd:element ref = "version" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "buildDate" minOccurs = "0"/>
         <xsd:element ref = "specificationRevision" minOccurs = "0"/>
         <xsd:element ref = "instanceName" minOccurs = "0"/>
         <xsd:element ref = "serialNumber" minOccurs = "0"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "DeviceManager">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "importList" minOccurs = "0"/>
         <xsd:element ref = "datatypeTemplateList" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "dictionaryList" minOccurs = "0"/>
         <xsd:element ref = "helpFileList" minOccurs = "0"/>
         <xsd:element ref = "toolList" minOccurs = "0"/>
         <xsd:element ref = "pictureList" minOccurs = "0"/>
         <xsd:element ref = "deviceStructure" minOccurs = "0"/>
         <xsd:element ref = "localDataDescriptionList" minOccurs = "0"/>
         <xsd:element ref = "additionalItemList" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "communicationEntity" maxOccurs = "unbounded"/>
         <xsd:element ref = "processingEntity" maxOccurs = "unbounded"/>
         <xsd:element ref = "externalSchema" minOccurs = "0" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "deviceStructure">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "channelList" minOccurs = "0"/>
         <xsd:element ref = "MAUList" minOccurs = "0"/>
         <xsd:element ref = "slotList" minOccurs = "0"/>
         <xsd:element ref = "indicatorList" minOccurs = "0"/>
         <xsd:element ref = "externalSchema" minOccurs = "0" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "dictionary">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "file"/>
      </xsd:sequence>
      <xsd:attribute ref = "xml:lang" use = "required"/>
      <xsd:attribute name = "dictID" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "dictionaryList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "dictionary" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "directlyDerivedType">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:choice minOccurs = "0">
```

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```
            <xsd:group ref = "g_help"/>
         </xsd:choice>
         <xsd:group ref = "g_datatypes"/>
      </xsd:sequence>
      <xsd:attribute name = "initialValue" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "disable">
   <xsd:complexType>
      <xsd:attribute name = "ref" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "edit">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_stringDatatypes"/>
         <xsd:element ref = "datatypeInstance"/>
      </xsd:choice>
      <xsd:attribute ref = "xml:lang"/>
      <xsd:attribute ref = "xlink:type"/>
      <xsd:attribute ref = "xlink:href"/>
      <xsd:attribute name = "format" type = "xsd:string"/>
      <xsd:attribute name = "unit" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "enable">
   <xsd:complexType>
      <xsd:attribute name = "ref" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "endianess">
   <xsd:complexType>
      <xsd:attribute name = "type" use = "required">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:NMTOKEN">
               <xsd:enumeration value = "little"/>
               <xsd:enumeration value = "big"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "enumeratedType">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:choice minOccurs = "0">
            <xsd:group ref = "g_help"/>
         </xsd:choice>
         <xsd:element ref = "enumeratedValue" maxOccurs = "unbounded"/>
      </xsd:sequence>
      <xsd:attribute name = "initialValue" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "enumeratedValue">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:choice minOccurs = "0">
            <xsd:group ref = "g_datatypes"/>
         </xsd:choice>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "enumeration">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_labels"/>
         <xsd:choice>
            <xsd:group ref = "g_numericDatatypes"/>
            <xsd:group ref = "g_booleanDatatypes"/>
            <xsd:group ref = "g_stringDatatypes"/>
            <xsd:group ref = "g_userDatatypes"/>
         </xsd:choice>
         <xsd:element ref = "relations" minOccurs = "0"/>
      </xsd:sequence>
      <xsd:attribute name = "default" default = "NO">
```

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```
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "NO"/>
                  <xsd:enumeration value = "YES"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
         <xsd:attribute name = "multipleSelection">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "YES"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "externalSchema">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:any namespace = "##any" processContents = "strict"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "file">
      <xsd:complexType>
         <xsd:attribute ref = "xlink:type"/>
         <xsd:attribute ref = "xlink:href" use = "required"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "gain">
      <xsd:complexType>
         <xsd:choice>
            <xsd:group ref = "g_numericDatatypes"/>
            <xsd:group ref = "g_userDatatypes"/>
         </xsd:choice>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "help">
      <xsd:complexType>
         <xsd:simpleContent>
            <xsd:extension base = "xsd:string">
               <xsd:attribute ref = "xml:lang" use = "required"/>
            </xsd:extension>
         </xsd:simpleContent>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "helpFile">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "file"/>
         </xsd:sequence>
         <xsd:attribute ref = "xml:lang" use = "required"/>
         <xsd:attribute name = "helpFileID" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "helpFileList">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "helpFile" maxOccurs = "unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "helpFileRef">
      <xsd:complexType>
         <xsd:attribute name = "helpFileID" type = "xsd:string"/>
         <xsd:attribute name = "helpID" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "helpRef">
      <xsd:complexType>
         <xsd:attribute name = "dictID" type = "xsd:string"/>
         <xsd:attribute name = "textID" use = "required" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "hotspot">
      <xsd:complexType>
```

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```
      <xsd:attribute name = "xPos" use = "required">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:nonNegativeInteger">
               <xsd:maxInclusive value = "100"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
      <xsd:attribute name = "yPos" use = "required">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:nonNegativeInteger">
               <xsd:maxInclusive value = "100"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
      <xsd:attribute name = "hotElement" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "hotspotList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "hotspot" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:simpleType name = "IASInterface_DataType">
   <xsd:union memberTypes = "">
      <xsd:simpleType>
         <xsd:restriction base = "xsd:string">
            <xsd:enumeration value = "CSI"/>
            <xsd:enumeration value = "HCI"/>
            <xsd:enumeration value = "ISI"/>
            <xsd:enumeration value = "API"/>
            <xsd:enumeration value = "CMI"/>
            <xsd:enumeration value = "ESI"/>
            <xsd:enumeration value = "FSI"/>
            <xsd:enumeration value = "MTI"/>
            <xsd:enumeration value = "SEI"/>
            <xsd:enumeration value = "USI"/>
         </xsd:restriction>
      </xsd:simpleType>
      <xsd:simpleType>
         <xsd:restriction base = "xsd:string">
            <xsd:length value = "4"/>
         </xsd:restriction>
      </xsd:simpleType>
   </xsd:union>
</xsd:simpleType>
<xsd:simpleType name = "ProfileClassID_DataType">
   <xsd:restriction base = "xsd:string">
      <xsd:enumeration value = "AIP"/>
      <xsd:enumeration value = "Process"/>
      <xsd:enumeration value = "InformationExchange"/>
      <xsd:enumeration value = "Resource"/>
      <xsd:enumeration value = "Device"/>
      <xsd:enumeration value = "CommunicationNetwork"/>
      <xsd:enumeration value = "Equipment"/>
      <xsd:enumeration value = "Human"/>
      <xsd:enumeration value = "Material"/>
   </xsd:restriction>
</xsd:simpleType>
<xsd:element name = "identity">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "vendorName"/>
         <xsd:element ref = "typeName"/>
         <xsd:element ref = "version" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "buildDate"/>
         <xsd:element ref = "specificationRevision" minOccurs = "0"/>
         <xsd:element ref = "instanceName" minOccurs = "0"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "importList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "file" maxOccurs = "unbounded"/>
```

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```
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "indicatorList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "LEDList" minOccurs = "0"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "instanceName">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "instances">
   <xsd:complexType>
      <xsd:choice>
         <xsd:element ref = "externalSchema" maxOccurs = "unbounded"/>
         <xsd:choice maxOccurs = "unbounded">
            <xsd:element ref = "modifyValue"/>
            <xsd:element ref = "modifyEntity"/>
            <xsd:element ref = "recalcValue"/>
            <xsd:element ref = "recalcEntity"/>
            <xsd:element ref = "deleteEntity"/>
         </xsd:choice>
      </xsd:choice>
      <xsd:attribute name = "maxInstances" type = "xsd:nonNegativeInteger"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "instanceValue" type = "xsd:string"/>
<xsd:element name = "internalConnectionPoint">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "uses" minOccurs = "0"/>
         <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "instances" minOccurs = "0"/>
      </xsd:sequence>
      <xsd:attribute name = "uniqueID" use = "required" type = "xsd:ID"/>
      <xsd:attribute name = "ref" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "enabled" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "internalConnectionPointList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "internalConnectionPoint" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "ISO15745Edition" type = "xsd:positiveInteger"/>
<xsd:element name = "ISO15745Part" type = "xsd:positiveInteger"/>
<xsd:complexType name = "ISO15745Reference_DataType">
   <xsd:sequence>
      <xsd:element name = "ISO15745Part" type = "xsd:positiveInteger"/>
      <xsd:element name = "ISO15745Edition" type = "xsd:positiveInteger"/>
      <xsd:element name = "ProfileTechnology" type = "xsd:string"/>
   </xsd:sequence>
</xsd:complexType>
```

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```
<xsd:element name = "label">
   <xsd:complexType>
      <xsd:simpleContent>
         <xsd:extension base = "xsd:string">
            <xsd:attribute ref = "xml:lang" use = "required"/>
            <xsd:attribute ref = "xlink:type"/>
            <xsd:attribute ref = "xlink:href"/>
         </xsd:extension>
      </xsd:simpleContent>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "labelRef">
   <xsd:complexType>
      <xsd:attribute name = "dictID" type = "xsd:string"/>
      <xsd:attribute name = "textID" use = "required" type = "xsd:string"/>
      <xsd:attribute ref = "xlink:type"/>
      <xsd:attribute ref = "xlink:href"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "LED">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:element ref = "LEDState" maxOccurs = "unbounded"/>
         <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
      </xsd:sequence>
      <xsd:attribute name = "uniqueID" use = "required" type = "xsd:ID"/>
      <xsd:attribute name = "LEDType" use = "required">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "IOStatus"/>
               <xsd:enumeration value = "IODiagnostic"/>
               <xsd:enumeration value = "DeviceStatus"/>
               <xsd:enumeration value = "DeviceDiagnostic"/>
               <xsd:enumeration value = "CommStatus"/>
               <xsd:enumeration value = "CommDiagnostic"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
      <xsd:attribute name = "enabled" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "LEDList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "LED" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "LEDState">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:sequence minOccurs = "0">
            <xsd:group ref = "g_naming"/>
         </xsd:sequence>
         <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
      </xsd:sequence>
      <xsd:attribute name = "LEDCondition" use = "required">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "ON"/>
               <xsd:enumeration value = "OFF"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
      <xsd:attribute name = "LEDColor">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "GREEN"/>
```

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```
                <xsd:enumeration value = "YELLOW"/>
                <xsd:enumeration value = "RED"/>
                <xsd:enumeration value = "ORANGE"/>
                <xsd:enumeration value = "BLUE"/>
                <xsd:enumeration value = "WHITE"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
       <xsd:attribute name = "LEDFrequency" type = "xsd:float"/>
       <xsd:attribute name = "LEDFlashCount" type = "xsd:nonNegativeInteger"/>
       <xsd:attribute name = "ref" type = "xsd:string"/>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "localDataCategory">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:group ref = "g_naming"/>
          <xsd:element ref = "localDataDescription" maxOccurs = "unbounded"/>
       </xsd:sequence>
       <xsd:attribute name = "uniqueID" type = "xsd:ID"/>
       <xsd:attribute name = "enabled" default = "YES">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "localDataDescription">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:group ref = "g_naming"/>
          <xsd:element ref = "pictureList" minOccurs = "0"/>
          <xsd:element ref = "accessPath"/>
          <xsd:element ref = "datatype"/>
          <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
          <xsd:element ref = "uses" minOccurs = "0"/>
          <xsd:element ref = "provides" minOccurs = "0" maxOccurs = "unbounded"/>
          <xsd:element ref = "localDataDescription" minOccurs = "0" maxOccurs = "unbounded"/>
          <xsd:element ref = "instances" minOccurs = "0"/>
       </xsd:sequence>
       <xsd:attribute name = "uniqueID" use = "required" type = "xsd:ID"/>
       <xsd:attribute name = "direction" use = "required">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "I"/>
                <xsd:enumeration value = "Q"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
       <xsd:attribute name = "localDataDescriptionType" use = "required" type = "xsd:string"/>
       <xsd:attribute name = "enabled" default = "YES">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "localDataDescriptionList">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:sequence minOccurs = "0">
             <xsd:group ref = "g_naming"/>
          </xsd:sequence>
          <xsd:choice maxOccurs = "unbounded">
             <xsd:element ref = "localDataCategory"/>
             <xsd:element ref = "localDataDescription"/>
          </xsd:choice>
       </xsd:sequence>
    </xsd:complexType>
 </xsd:element>
```

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```
   <xsd:element name = "logicalConnectionPoint">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:group ref = "g_naming"/>
            <xsd:element ref = "pictureList" minOccurs = "0"/>
            <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
            <xsd:element ref = "uses" minOccurs = "0"/>
            <xsd:element ref = "provides" maxOccurs = "unbounded"/>
            <xsd:element ref = "instances" minOccurs = "0"/>
         </xsd:sequence>
         <xsd:attribute name = "uniqueID" use = "required" type = "xsd:ID"/>
         <xsd:attribute name = "logicalConnectionPointType" use = "required" type = "xsd:string"/>
         <xsd:attribute name = "role" use = "required">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "CLIENT"/>
                  <xsd:enumeration value = "SERVER"/>
                  <xsd:enumeration value = "PEER"/>
                  <xsd:enumeration value = "PUBLISHER"/>
                  <xsd:enumeration value = "SUBSCRIBER"/>
                  <xsd:enumeration value = "PUBLISHERSUBSCRIBER"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
         <xsd:attribute name = "maxRelationships" default = "1" type = "xsd:nonNegativeInteger"/>
         <xsd:attribute name = "newLevel" default = "NO">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "YES"/>
                  <xsd:enumeration value = "NO"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
         <xsd:attribute name = "enabled" default = "YES">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "YES"/>
                  <xsd:enumeration value = "NO"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "logicalConnectionPointAssembly">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:group ref = "g_naming"/>
            <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
            <xsd:element ref = "uses" minOccurs = "0"/>
            <xsd:element ref = "provides" maxOccurs = "unbounded"/>
            <xsd:element ref = "instances" minOccurs = "0"/>
         </xsd:sequence>
         <xsd:attribute name = "uniqueID" use = "required" type = "xsd:ID"/>
         <xsd:attribute name = "logicalConnectionPointAssemblyType" use = "required" type =
"xsd:string"/>
         <xsd:attribute name = "enabled" default = "YES">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "YES"/>
                  <xsd:enumeration value = "NO"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "logicalConnectionPointAssemblyList">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:sequence minOccurs = "0">
               <xsd:group ref = "g_naming"/>
            </xsd:sequence>
            <xsd:element ref = "logicalConnectionPointAssembly" maxOccurs = "unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "logicalConnectionPointList">
```

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```
      <xsd:complexType>
         <xsd:sequence>
            <xsd:sequence minOccurs = "0">
               <xsd:group ref = "g_naming"/>
            </xsd:sequence>
            <xsd:element ref = "logicalConnectionPoint" maxOccurs = "unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "MAU">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:group ref = "g_naming"/>
            <xsd:element ref = "pictureList" minOccurs = "0"/>
            <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
            <xsd:element ref = "instances" minOccurs = "0"/>
         </xsd:sequence>
         <xsd:attribute name = "uniqueID" use = "required" type = "xsd:ID"/>
         <xsd:attribute name = "protocol" use = "required" type = "xsd:string"/>
         <xsd:attribute name = "interfaceType" use = "required" type = "xsd:string"/>
         <xsd:attribute name = "MAUType" type = "xsd:string"/>
         <xsd:attribute name = "newLevel" default = "NO">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "NO"/>
                  <xsd:enumeration value = "YES"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
         <xsd:attribute name = "directlyConnected" use = "required">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "NO"/>
                  <xsd:enumeration value = "YES"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
         <xsd:attribute name = "direction" use = "required">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "IN"/>
                  <xsd:enumeration value = "IN_UNI"/>
                  <xsd:enumeration value = "OUT"/>
                  <xsd:enumeration value = "OUT_UNI"/>
                  <xsd:enumeration value = "INOUT"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
         <xsd:attribute name = "sequenceNumber" default = "1" type = "xsd:nonNegativeInteger"/>
         <xsd:attribute name = "enabled" default = "YES">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "YES"/>
                  <xsd:enumeration value = "NO"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "MAUList">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "MAU" maxOccurs = "unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "MAUUsage">
      <xsd:complexType>
         <xsd:attribute name = "ref" use = "required" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "MAUUsageList">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "MAUUsage" maxOccurs = "unbounded"/>
         </xsd:sequence>
```

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```
   </xsd:complexType>
</xsd:element>
<xsd:element name = "maxVal">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_numericDatatypes"/>
         <xsd:group ref = "g_booleanDatatypes"/>
         <xsd:group ref = "g_userDatatypes"/>
         <xsd:group ref = "g_timeDatatypes"/>
      </xsd:choice>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "minVal">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_numericDatatypes"/>
         <xsd:group ref = "g_booleanDatatypes"/>
         <xsd:group ref = "g_userDatatypes"/>
         <xsd:group ref = "g_timeDatatypes"/>
      </xsd:choice>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "modifyEntity">
   <xsd:complexType>
      <xsd:choice maxOccurs = "unbounded">
         <xsd:any namespace = "http://www.can-cia.org/xml/canopen/" processContents = "strict"/>
      </xsd:choice>
      <xsd:attribute name = "node" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "modifyValue">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_values"/>
      </xsd:choice>
      <xsd:attribute name = "node" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "no">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:element ref = "relations" minOccurs = "0"/>
      </xsd:sequence>
      <xsd:attribute name = "default" default = "NO">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "NO"/>
               <xsd:enumeration value = "YES"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "nonStandardizedExtension">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:any namespace = "##any" processContents = "strict"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "offset">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_numericDatatypes"/>
         <xsd:group ref = "g_userDatatypes"/>
      </xsd:choice>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "on">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "relations"/>
      </xsd:sequence>
      <xsd:attribute name = "value" use = "required" type = "xsd:string"/>
   </xsd:complexType>
```

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```
</xsd:element>
<xsd:element name = "orderNumber">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "picture">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:sequence minOccurs = "0">
            <xsd:group ref = "g_naming"/>
         </xsd:sequence>
         <xsd:element ref = "hotspotList" minOccurs = "0"/>
      </xsd:sequence>
      <xsd:attribute name = "picClassification" type = "xsd:string"/>
      <xsd:attribute name = "picType" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "picName" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "xSize" type = "xsd:positiveInteger"/>
      <xsd:attribute name = "ySize" type = "xsd:positiveInteger"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "pictureList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "picture" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "processingEntity">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:sequence minOccurs = "0">
            <xsd:group ref = "g_naming"/>
         </xsd:sequence>
         <xsd:element ref = "identity" minOccurs = "0"/>
         <xsd:element ref = "helpFileList" minOccurs = "0"/>
         <xsd:element ref = "toolList" minOccurs = "0"/>
         <xsd:element ref = "pictureList" minOccurs = "0"/>
         <xsd:element ref = "cfgItemList" minOccurs = "0"/>
         <xsd:element ref = "additionalItemList" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "logicalConnectionPointList" minOccurs = "0"/>
         <xsd:element ref = "logicalConnectionPointAssemblyList" minOccurs = "0"/>
         <xsd:element ref = "internalConnectionPointList" minOccurs = "0"/>
         <xsd:element ref = "externalSchema" minOccurs = "0" maxOccurs = "unbounded"/>
      </xsd:sequence>
      <xsd:attribute name = "uniqueID" type = "xsd:ID"/>
      <xsd:attribute name = "processingEntityType" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "enabled" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "productFamily">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
```

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```
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "productID">
    <xsd:complexType>
       <xsd:choice>
          <xsd:group ref = "g_labels"/>
       </xsd:choice>
       <xsd:attribute name = "readOnly" default = "YES">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "productName">
    <xsd:complexType>
       <xsd:choice>
          <xsd:group ref = "g_labels"/>
       </xsd:choice>
       <xsd:attribute name = "readOnly" default = "YES">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "productText">
    <xsd:complexType>
       <xsd:choice>
          <xsd:group ref = "g_labels"/>
       </xsd:choice>
       <xsd:attribute name = "readOnly" default = "YES">
          <xsd:simpleType>
             <xsd:restriction base = "xsd:string">
                <xsd:enumeration value = "YES"/>
                <xsd:enumeration value = "NO"/>
             </xsd:restriction>
          </xsd:simpleType>
       </xsd:attribute>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "ProfileBody">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:element ref = "DeviceIdentity"/>
          <xsd:element ref = "DeviceManager"/>
          <xsd:element ref = "DeviceFunction" maxOccurs = "unbounded"/>
          <xsd:element ref = "ApplicationProcess" minOccurs = "0" maxOccurs = "unbounded"/>
          <xsd:element ref = "nonStandardizedExtension" minOccurs = "0" maxOccurs = "unbounded"/>
       </xsd:sequence>
       <xsd:attributeGroup ref = "ag_FDCML"/>
       <xsd:attribute name = "supportedLanguages" type = "xsd:NMTOKENS"/>
       <xsd:attribute name = "uniqueID" type = "xsd:ID"/>
    </xsd:complexType>
 </xsd:element>
 <xsd:element name = "ProfileHeader">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:element name = "ProfileIdentification" type = "xsd:string"/>
          <xsd:element name = "ProfileRevision" type = "xsd:string"/>
          <xsd:element name = "ProfileName" type = "xsd:string"/>
          <xsd:element name = "ProfileSource" type = "xsd:string"/>
          <xsd:element name = "ProfileClassID" type = "ProfileClassID_DataType"/>
          <xsd:element name = "ProfileDate" type = "xsd:date" minOccurs = "0"/>
          <xsd:element name = "AdditionalInformation" type = "xsd:anyURI" minOccurs = "0"/>
          <xsd:element name = "ISO15745Reference" type = "ISO15745Reference_DataType"/>
```

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```
            <xsd:element name = "IASInterfaceType" type = "IASInterface_DataType" minOccurs = "0"
maxOccurs = "unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "ProfilesBody">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "DeviceIdentity" minOccurs = "0"/>
            <xsd:element ref = "ProfileBody" maxOccurs = "unbounded"/>
            <xsd:element ref = "connectionList"/>
         </xsd:sequence>
         <xsd:attributeGroup ref = "ag_FDCML"/>
         <xsd:attribute name = "supportedLanguages" type = "xsd:NMTOKENS"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "provides">
      <xsd:complexType>
         <xsd:attribute name = "ref" use = "required" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "range">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "minVal" minOccurs = "0"/>
            <xsd:element ref = "maxVal" minOccurs = "0"/>
            <xsd:element ref = "stepVal" minOccurs = "0"/>
            <xsd:element ref = "offset" minOccurs = "0"/>
            <xsd:element ref = "gain" minOccurs = "0"/>
            <xsd:element ref = "default" minOccurs = "0"/>
            <xsd:element ref = "on" minOccurs = "0" maxOccurs = "unbounded"/>
         </xsd:sequence>
         <xsd:attribute name = "format" type = "xsd:string"/>
         <xsd:attribute name = "unit" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "recalcEntity">
      <xsd:complexType>
         <xsd:attribute name = "node" use = "required" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "recalcValue">
      <xsd:complexType>
         <xsd:attribute name = "node" use = "required" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "reference">
      <xsd:complexType>
         <xsd:attribute name = "ref" use = "required" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "relations">
      <xsd:complexType>
         <xsd:choice maxOccurs = "unbounded">
            <xsd:element ref = "enable"/>
            <xsd:element ref = "disable"/>
            <xsd:element ref = "change"/>
         </xsd:choice>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "serialNumber">
      <xsd:complexType>
         <xsd:choice>
            <xsd:group ref = "g_labels"/>
         </xsd:choice>
         <xsd:attribute name = "readOnly" default = "YES">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "YES"/>
                  <xsd:enumeration value = "NO"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "slot">
```

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```
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:element ref = "MAUUsageList"/>
         <xsd:element ref = "defaultfile" minOccurs = "0"/>
         <xsd:element ref = "file" maxOccurs = "unbounded"/>
         <xsd:element ref = "specificProperty" minOccurs = "0" maxOccurs = "unbounded"/>
         <xsd:element ref = "instances" minOccurs = "0"/>
      </xsd:sequence>
      <xsd:attribute name = "uniqueID" use = "required" type = "xsd:ID"/>
      <xsd:attribute name = "number" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "enabled" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "slotList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "slot" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "specificationRevision">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "specificProperty">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:sequence minOccurs = "0">
            <xsd:group ref = "g_naming"/>
         </xsd:sequence>
         <xsd:group ref = "g_values"/>
      </xsd:sequence>
      <xsd:attribute name = "propertyType" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "enabled" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "NO"/>
               <xsd:enumeration value = "YES"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "stepVal">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_numericDatatypes"/>
         <xsd:group ref = "g_booleanDatatypes"/>
         <xsd:group ref = "g_userDatatypes"/>
         <xsd:group ref = "g_timeDatatypes"/>
      </xsd:choice>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "structuredType">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:choice minOccurs = "0">
```

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```
            <xsd:group ref = "g_help"/>
         </xsd:choice>
         <xsd:choice maxOccurs = "unbounded">
            <xsd:element ref = "varDeclaration"/>
            <xsd:element ref = "subrangeVarDeclaration"/>
         </xsd:choice>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "subrange">
   <xsd:complexType>
      <xsd:attribute name = "lowerLimit" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "upperLimit" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "subrangeType">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:choice minOccurs = "0">
            <xsd:group ref = "g_help"/>
         </xsd:choice>
         <xsd:group ref = "g_integerDatatypes"/>
         <xsd:element ref = "subrange"/>
      </xsd:sequence>
      <xsd:attribute name = "initialValue" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "subrangeVarDeclaration">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:group ref = "g_integerDatatypes"/>
         <xsd:element ref = "subrange" minOccurs = "0"/>
      </xsd:sequence>
      <xsd:attribute name = "initialValue" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "tool">
   <xsd:complexType>
      <xsd:attribute name = "toolClassification" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "toolID" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "toolList">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:element ref = "tool" maxOccurs = "unbounded"/>
      </xsd:sequence>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "typeName">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "uses">
   <xsd:complexType>
      <xsd:attribute name = "ref" use = "required" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "varDeclaration">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:choice>
            <xsd:group ref = "g_datatypes"/>
```

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```
            <xsd:element ref = "uses"/>
         </xsd:choice>
         <xsd:element ref = "subrange" minOccurs = "0" maxOccurs = "unbounded"/>
      </xsd:sequence>
      <xsd:attribute name = "initialValue" type = "xsd:string"/>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "vendorID">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "vendorName">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "vendorText">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "version">
   <xsd:complexType>
      <xsd:choice>
         <xsd:group ref = "g_labels"/>
      </xsd:choice>
      <xsd:attribute name = "versionType" use = "required" type = "xsd:string"/>
      <xsd:attribute name = "readOnly" default = "YES">
         <xsd:simpleType>
            <xsd:restriction base = "xsd:string">
               <xsd:enumeration value = "YES"/>
               <xsd:enumeration value = "NO"/>
            </xsd:restriction>
         </xsd:simpleType>
      </xsd:attribute>
   </xsd:complexType>
</xsd:element>
<xsd:element name = "yes">
   <xsd:complexType>
      <xsd:sequence>
         <xsd:group ref = "g_naming"/>
         <xsd:element ref = "relations" minOccurs = "0"/>
      </xsd:sequence>
      <xsd:attribute name = "default" default = "NO">
         <xsd:simpleType>
```

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```
               <xsd:restriction base = "xsd:string">
                  <xsd:enumeration value = "YES"/>
                  <xsd:enumeration value = "NO"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "associatedParameter">
      <xsd:complexType>
         <xsd:simpleContent>
            <xsd:extension base = "xsd:string">
               <xsd:attribute name = "associatedParameterValue" use = "required" type = "xsd:string"/>
            </xsd:extension>
         </xsd:simpleContent>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "configParametersList">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "parameterRef" maxOccurs = "unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "constraint">
      <xsd:annotation>
         <xsd:documentation>The elements under Constraints aren't checked by the parser. The languages,
to use to describe the constraints, don't refer to a schema.

         </xsd:documentation>
      </xsd:annotation>
      <xsd:complexType>
         <xsd:sequence>
            <xsd:any namespace = "##any" processContents = "skip" minOccurs = "0" maxOccurs =
"unbounded"/>
         </xsd:sequence>
         <xsd:attribute name = "constraintID" use = "required">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:ID">
                  <xsd:pattern value = "C\d{1,6}"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
         <xsd:attribute name = "constraintType" use = "required">
            <xsd:simpleType>
               <xsd:restriction base = "xsd:NMTOKEN">
                  <xsd:enumeration value = "among_parameters"/>
                  <xsd:enumeration value = "display"/>
                  <xsd:enumeration value = "network"/>
                  <xsd:enumeration value = "device"/>
               </xsd:restriction>
            </xsd:simpleType>
         </xsd:attribute>
         <xsd:attribute name = "constraintLanguage" use = "required" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "constraintsList">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "constraint" maxOccurs = "unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "commandParameter">
      <xsd:complexType>
         <xsd:simpleContent>
            <xsd:extension base = "xsd:string">
               <xsd:attribute name = "commandParameterValue" use = "required" type = "xsd:string"/>
            </xsd:extension>
         </xsd:simpleContent>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "defaultValue">
      <xsd:complexType>
         <xsd:simpleContent>
            <xsd:extension base = "xsd:string">
```

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```
               <xsd:attributeGroup ref = "type"/>
            </xsd:extension>
         </xsd:simpleContent>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "function">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "inputsList" minOccurs = "0"/>
            <xsd:element ref = "outputsList" minOccurs = "0"/>
            <xsd:element ref = "configParametersList" minOccurs = "0"/>
            <xsd:element ref = "constraintsList" minOccurs = "0"/>
            <xsd:element name = "functionStateTransitionDiagram" minOccurs = "0">
               <xsd:complexType>
                  <xsd:sequence>
                     <xsd:element ref = "stateTransitionDiagram"/>
                  </xsd:sequence>
               </xsd:complexType>
            </xsd:element>
         </xsd:sequence>
         <xsd:attribute name = "name" use = "required" type = "xsd:string"/>
         <xsd:attribute name = "description" type = "xsd:string"/>
         <xsd:attribute name = "functionID" use = "required" type = "xsd:ID"/>
         <xsd:attribute name = "version" use = "required" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "functionRef">
      <xsd:annotation>
         <xsd:documentation>By this way the hierarchical view of the device can be describe. There is no
limitation in the level number.</xsd:documentation>
      </xsd:annotation>
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "functionRef" minOccurs = "0" maxOccurs = "unbounded"/>
         </xsd:sequence>
         <xsd:attribute name = "functionName" use = "required" type = "xsd:string"/>
         <xsd:attribute name = "functionIDREF" use = "required" type = "xsd:string"/>
         <xsd:attribute name = "functionURL" type = "xsd:string"/>
         <xsd:attribute name = "functionDescription" type = "xsd:string"/>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "highLimit">
      <xsd:complexType>
         <xsd:simpleContent>
            <xsd:extension base = "xsd:string">
               <xsd:attributeGroup ref = "type"/>
            </xsd:extension>
         </xsd:simpleContent>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "inputsList">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "parameterRef" maxOccurs = "unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "listOfValues">
      <xsd:complexType>
         <xsd:sequence>
            <xsd:element ref = "value" maxOccurs = "unbounded"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "lowLimit">
      <xsd:complexType>
         <xsd:simpleContent>
            <xsd:extension base = "xsd:string">
               <xsd:attributeGroup ref = "type"/>
            </xsd:extension>
         </xsd:simpleContent>
      </xsd:complexType>
   </xsd:element>
   <xsd:element name = "member">
      <xsd:annotation>
         <xsd:documentation>For dataType = array, only first member is needed</xsd:documentation>
```

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```
    </xsd:annotation>
    <xsd:complexType>
       <xsd:sequence>
          <xsd:element ref = "defaultValue" minOccurs = "0"/>
          <xsd:element ref = "lowLimit" minOccurs = "0"/>
          <xsd:element ref = "highLimit" minOccurs = "0"/>
          <xsd:element ref = "unit" minOccurs = "0"/>
          <xsd:element ref = "listOfValues" minOccurs = "0"/>
          <xsd:element ref = "membersList" minOccurs = "0"/>
          <xsd:sequence minOccurs = "0">
             <xsd:group ref = "g_naming"/>
          </xsd:sequence>
          <xsd:element ref = "actualValue" minOccurs = "0"/>
       </xsd:sequence>
       <xsd:attribute name = "name" use = "required" type = "xsd:string"/>
       <xsd:attribute name = "description" type = "xsd:string"/>
       <xsd:attribute name = "memberID" use = "required" type = "xsd:string"/>
       <xsd:attributeGroup ref = "dataType"/>
    </xsd:complexType>
</xsd:element>
<xsd:element name = "membersList">
    <xsd:annotation>
       <xsd:documentation>membersList is mandatory if dataType = struct or array.</xsd:documentation>
    </xsd:annotation>
    <xsd:complexType>
       <xsd:sequence>
          <xsd:element ref = "member" maxOccurs = "unbounded"/>
       </xsd:sequence>
       <xsd:attribute name = "numberOfMembers" use = "required" type = "xsd:integer"/>
    </xsd:complexType>
</xsd:element>
<xsd:element name = "outputsList">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:element ref = "parameterRef" maxOccurs = "unbounded"/>
       </xsd:sequence>
    </xsd:complexType>
</xsd:element>
<xsd:element name = "parameter" type = "parameterType"/>
<xsd:element name = "state" type = "stateType"/>
<xsd:element name = "statesTab">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:element ref = "state" maxOccurs = "unbounded"/>
       </xsd:sequence>
    </xsd:complexType>
</xsd:element>
<xsd:element name = "stateTransitionDiagram" type = "stateTransitionDiagramType"/>
<xsd:element name = "transition" type = "transitionType"/>
<xsd:element name = "transitionsTab">
    <xsd:complexType>
       <xsd:sequence>
          <xsd:element ref = "transition" maxOccurs = "unbounded"/>
       </xsd:sequence>
    </xsd:complexType>
</xsd:element>
<xsd:element name = "unit">
    <xsd:complexType>
       <xsd:attribute name = "multiplier" use = "required" type = "xsd:string"/>
       <xsd:attribute name = "unitURI" type = "xsd:anyURI"/>
    </xsd:complexType>
</xsd:element>
<xsd:element name = "value">
    <xsd:complexType>
       <xsd:simpleContent>
          <xsd:extension base = "xsd:string">
             <xsd:attribute name = "meaning" type = "xsd:string"/>
          </xsd:extension>
       </xsd:simpleContent>
    </xsd:complexType>
</xsd:element>
<xsd:complexType name = "parameterType">
    <xsd:sequence>
       <xsd:element ref = "defaultValue" minOccurs = "0"/>
       <xsd:element ref = "lowLimit" minOccurs = "0"/>
       <xsd:element ref = "highLimit" minOccurs = "0"/>
```

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