IEC 62769-8

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Field device integration (FDI®) – Part 8: EDD to OPC-UA Mapping

Intégration des appareils de terrain (FDI®) – Partie 8: Mapping de l'EDD avec l'OPC-UA

IEC 62769-8:2023-04(en-fr)

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FIELD DEVICE INTEGRATION (FDI®) –

Part 8: EDD to OPC-UA Mapping

FOREWORD

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The text of this International Standard is based on the following documents:

Draft	Report on voting
65E/851/CDV	65E/909/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62769 series, published under the general title *Field device integration (FDI®)*, can be found on the IEC website.

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FIELD DEVICE INTEGRATION (FDI®) –

Part 8: EDD to OPC-UA Mapping

1 Scope

This part of IEC 62769 specifies how the internal view of a device model represented by the EDD can be transferred into an external view as an OPC-UA information model by mapping EDD constructs to OPC-UA objects.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE For undated references, the edition of the referenced document (including any amendments), which applies for a specific FDI®[1] Technology Version is defined within the FDI® Technology Management Document and on the support portals of FieldComm Group and PI International.

IEC 61804-3, *Devices and integration in enterprise systems − Function blocks (FB) for process control and electronic device description language (EDDL) − Part 3: EDDL syntax and semantics*

IEC 62541-3, *OPC Unified Architecture – Part 3: Address Space Model*

IEC 62541-4, *OPC Unified Architecture – Part 4: Services*

IEC 62541-5, *OPC Unified Architecture – Part 5: Information Model*

IEC 62541-8, *OPC Unified Architecture – Part 8: Data Access*

IEC 62541-9:2020, *OPC Unified Architecture – Part 9: Alarms and Conditions*

OPC 10000-17, *OPC Unified Architecture – Part 17: Alias Names*

OPC 10000-19, *OPC Unified Architecture – Part 19: Dictionary Reference*

IEC 62541-100, *OPC unified architecture – Part 100: Device Interface*

IEC 62769-1, *Field Device Integration (FDI®) – Part 1: Overview*

IEC 62769-5, *Field Device Integration (FDI®) – Part 5: FDI® Information Model*

IEC 62769-6, *Field Device Integration (FDI®) – Part 6: FDI® Technology Mappings*

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ISO/IEC 11179-6, *Information technology – Metadata registries (MDR) – Part 6: Registration*

OPC 30081, *Process Automation Devices – PADIM*

UN/CEFACT, UNECE Recommendation 20, Codes for Units of Measure Used in International Trade
available at https://www.unece.org/cefact/codesfortrade/codes_index.html [viewed 2023-02-07]

3 Terms, definitions, abbreviated terms, acronyms and conventions

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62769-1, IEC 62769-5, IEC 62769-6, IEC 62541-3, IEC 62541-4, IEC 62541-5, IEC 62541-8, IEC 62541-9, OPC 10000-17, IEC 62541-100, and OPC 30081 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.2 Abbreviated terms and acronyms

For the purposes of this document, the abbreviated terms and acronyms given in IEC 62769-1 as well as the following apply.

PA-DIM Process Automation Device Information Model

3.3 Conventions

3.3.1 Capitalization

Capitalization of the first letter of words is used in the IEC 62769 series to emphasize an FDI® defined term.

3.3.2 Graphical notation

OPC UA defines a graphical notation for an OPC UA AddressSpace. It defines graphical symbols for all NodeClasses and how different types of References between Nodes can be visualized. Figure 1 shows the symbols for the NodeClasses used in this document. NodeClasses representing types always have a shadow.

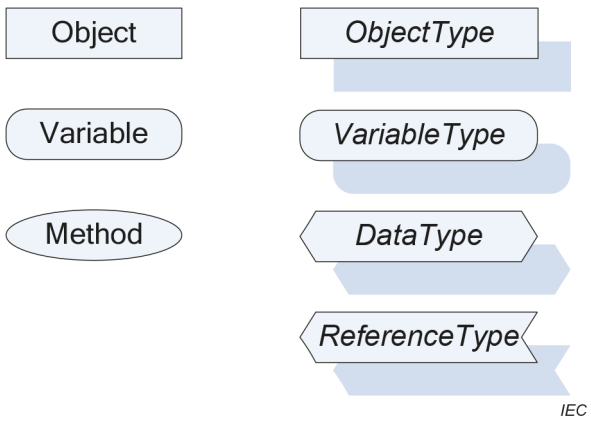

Figure 1 – OPC UA Graphical notation for NodeClasses

Figure 2 shows the symbols for the ReferenceTypes used in this document. The Reference symbol is normally pointing from the source Node to the target Node. The only exception is the HasSubType Reference. The most important References such as HasComponent, HasProperty, HasTypeDefinition and HasSubType have special symbols avoiding the name of the Reference. For other ReferenceTypes or derived ReferenceTypes, the name of the ReferenceType is used together with the symbol.

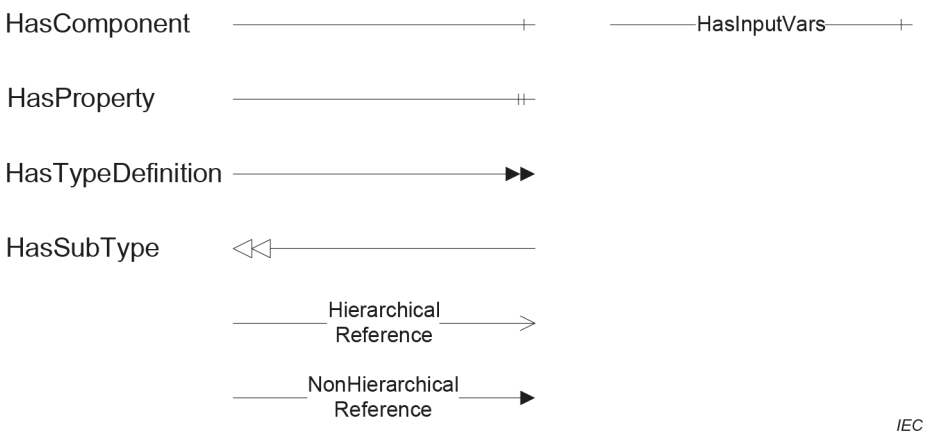

Figure 2 – OPC UA Graphical notation for References

Figure 3 shows a typical example for the use of the graphical notation. Object_A and Object_B are instances of the ObjectType_Y indicated by the HasTypeDefinition References. The ObjectType_Y is derived from ObjectType_X indicated by the HasSubType Reference. The Object_A has the components Variable_1, Variable_2 and Method_1.

To describe the components of an Object on the ObjectType, the same NodeClasses and References are used on the Object and on the ObjectType such as for ObjectType_Y in the example. The Nodes used to describe an ObjectType are instance declaration Nodes.

To provide more detailed information for a Node, a subset or all Attributes and their values can be added to a graphical symbol (see for example Variable_1, the component of Object_A in Figure 3).

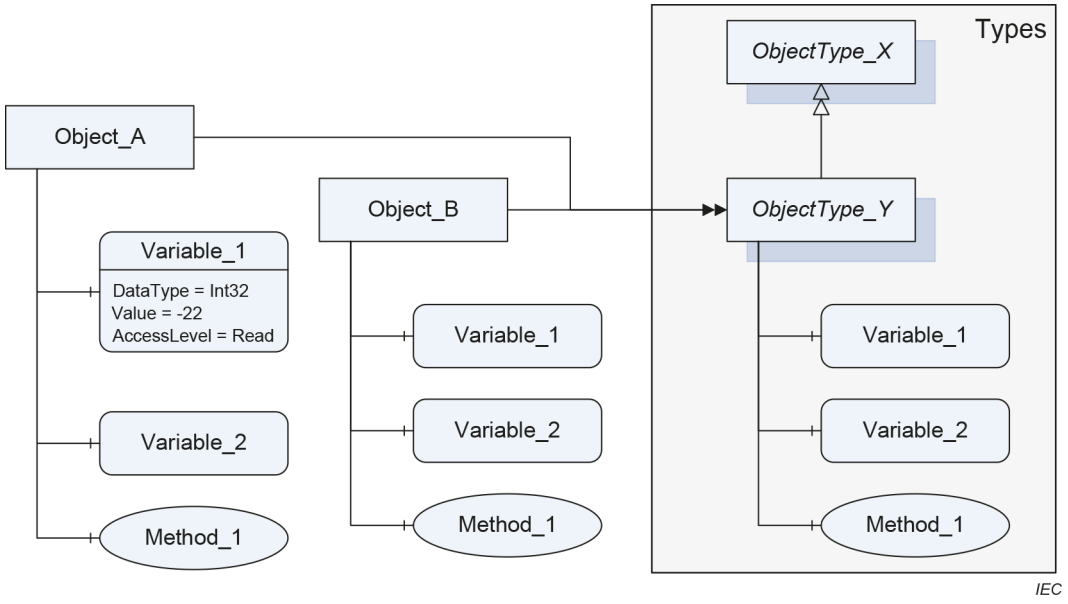

Figure 3 – OPC UA Graphical notation example

To improve readability, this document frequently includes the type name inside the instance box rather than displaying both boxes and a reference between them. This optimization is shown in Figure 4.

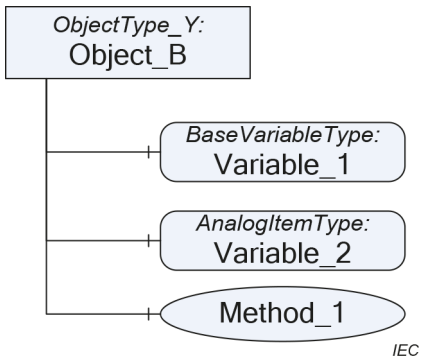

Figure 4 – Optimized Type Reference

4 Overview

There are two types of mapping mechanisms – explicit and implicit mapping. Explicit mapping is provided by the EDD constructs SEMANTIC_MAP in combination with COLLECTIONS, METHODS and VARIABLES including the mapping of enumerations and is done by the EDD-developer. Implicit mapping is provided by the implementation of the OPC-UA server in conjunction with a FDI® Server and covers definitions like default casts (e.g. any number value to float64) or even the mapping of complete lists of unit codes from a fieldbus domain (HART HART®[2], PROFIBUS®[3], …) into an OPC-UA domain (e.g. UNECE, CDD, …).

Looking at OPC-UA objects containing named data items like attributes, properties, variables and other objects, the most similar EDD objects are collections containing named data items like variables, menus and other collections (see Figure 5).

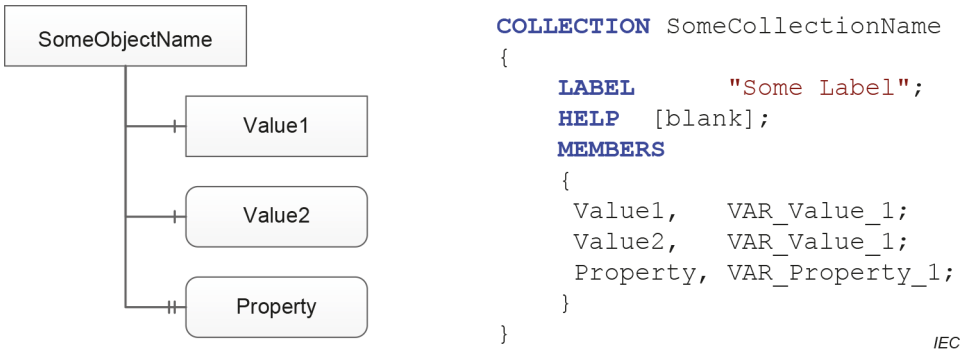

Figure 5 – Similarity of OPC-UA objects and EDD collections

In fact, the EDD construct collection is the key element for the basic principle of how EDD device model data shall be mapped into an OPC-UA information model. The following clauses

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describe and define how this shall be done. Therefore, this document has normative character for EDD developers and developers of OPC-servers accessing an FDI® Server to publish an OPC-UA information model according to a specific OPC-UA namespace and the mapping information provided by the EDD.

Clause 5 covers in detail how the mapping works in principle and for any OPC-UA information model based on any namespace.

Based on Clause 5, Clause 7 describes some details how to map the EDD into PA-DIM. Additional normative definitions how to map fieldbus specific data (e.g. identification) into PA-DIM is provided by the FDI-Profile specifications for HART, FF, PROFINET®[4], PROFIBUS, Modbus®[5] and ISA100 Wireless®[6].

Before starting with doing some EDD mapping, it is strongly recommended to get a basic understanding of OPC-UA concerning how object types, variable types and reference types are defined.

5 Basic principles of explicit mapping

5.1 Semantic maps to tag EDD constructs

For not having to use naming conventions for EDD constructs to link a specific purpose to an EDD construct, semantic maps shall be used to kind of tag an EDD construct by a specifically defined semantic id. For the time being, three syntax definitions exist for three specific purposes. The details of how to use them will be explained in the corresponding context.

The syntax of semantic ids for EDD entry points is illustrated in Figure 6.

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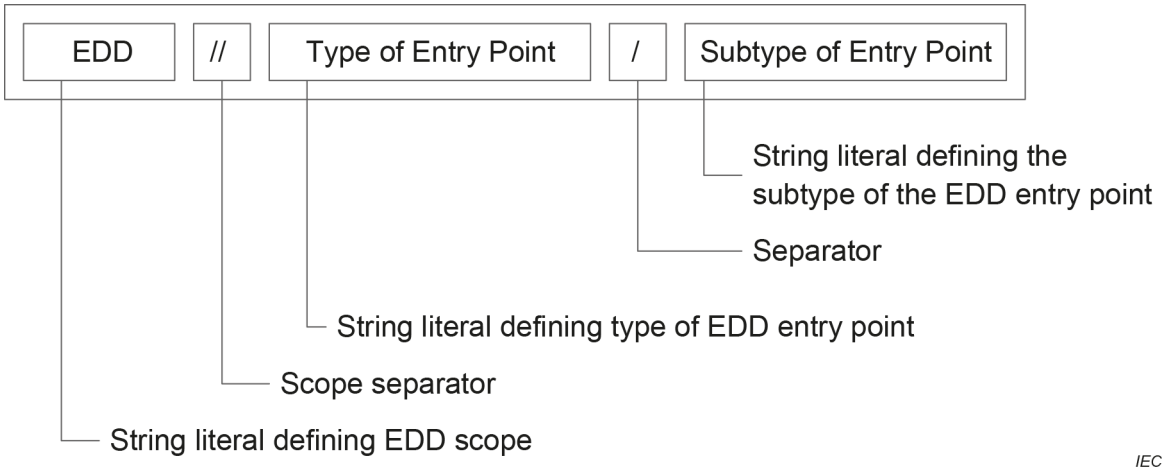

Figure 6 – Syntax of sematic ids for EDD entry points

5.2 Alias collections

5.2.1 General

Alias collections are used to define aliases for lengthy strings having a specific meaning. The alias should be short and shall be unique across the complete EDD. Aliases will be used as member identifiers or as a part of member identifiers or in SEMANTIC_MAPs for OPC-UA type mapping. Alias collections are the main entry points to resolve EDD to OPC-UA mapping and shall not depend on each other (see 5.3 and 5.4).

5.2.2 Syntax of semantic id for alias mappings

The syntax of semantic id for alias mapping is illustrated in Figure 7.

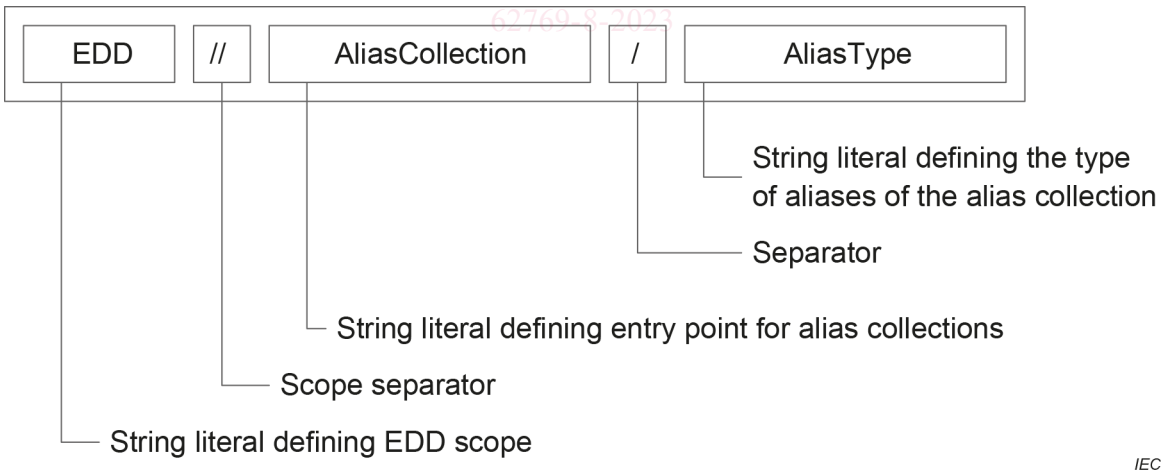

Figure 7 – Syntax of sematic id for alias mapping

5.3 Namespace Alias Collection

To prevent name conflicts, any OPC-UA type is defined in scope of a specific namespace. A namespace collection and appropriate variables shall be defined to provide suitable names for the namespace URIs. The member identifier of the collection item shall be used as an alias wherever a namespace identifier is needed. In the following example "__UA_" represents the namespace http://opcfoundation.org/UA/ which is defined by the default value of the referenced variable "UA_Namespace".

It is mandatory to define at least one namespace collection for an EDD defining EDD to OPC-UA mapping.

Definition:
The name of the namespace collection shall be tagged by a SEMANTIC_MAP with the following semantic ID:

"EDD//AliasCollection/Namespaces"

The name of the namespace COLLECTION, the name of the SEMANTIC_MAP and the names of the referenced string variables can be freely chosen. The default value of the referenced string variable shall contain a valid namespace.

Figure 8 shows an EDD namespace Collection example.