
**Industrial automation systems
and integration — Product data
representation and exchange —**

**Part 16:
Description methods: SysML XMI to
EXPRESS transformation**

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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviated terms	2
3.1 Terms and definitions.....	2
3.1.1 Terms and definitions for generic concepts.....	2
3.1.2 Terms and definitions for SysML constructs.....	3
3.2 Abbreviated terms.....	5
4 SysML XMI to EXPRESS	5
4.1 General.....	5
4.2 Presentation conventions.....	5
4.3 Common mapping conventions.....	5
4.3.1 Reference to external files.....	5
4.3.2 xmi:id, xmi:uuid, and UUID.....	6
4.3.3 Assumed sysml:Block in fragments.....	6
4.3.4 Containment and reference relationship.....	6
4.3.5 Used stereotypes to represent STEP concepts.....	6
4.3.6 Select type not treated as SysML supertype.....	7
4.4 Mapping of the primary schema.....	7
4.5 Mapping of Entities.....	7
4.5.1 General mapping of Entity.....	7
4.5.2 Mapping of abstract entity.....	7
4.5.3 Mapping of entity with one supertype.....	8
4.5.4 Mapping of entity with multiple supertypes.....	8
4.6 Mapping of simple type.....	9
4.7 Mapping of aggregation type.....	11
4.8 Mapping of aggregation of aggregation type.....	12
4.9 Mapping of Select type.....	13
4.9.1 General mapping of select type.....	13
4.9.2 Mapping of select type containing value type.....	14
4.10 Mapping of enumeration type.....	15
4.11 Mapping of entity attribute.....	15
4.11.1 Mapping of multiplicity and optionality.....	16
4.11.2 Attribute typed as an Entity.....	18
4.11.3 Attribute typed as Select.....	18
4.11.4 Attribute typed as Enumeration type.....	19
Annex A (normative) Information object registration	20
Annex B (informative) EXPRESS/Information modelling constructs and the equivalent SysML modelling constructs	21
Bibliography	33

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

A list of all parts in the ISO 10303 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO 10303 is an International Standard for the computer-interpretable representation and exchange of product data. The objective is to provide a neutral mechanism capable of describing product data throughout the life cycle of a product and independent from any particular system. The nature of this description makes it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and archiving.

10303-16 is a member of the description methods series. This document specifies a mapping of SysML XMI to the EXPRESS language.

The STEP APs Domain models and the STEP Core Model are information model layer components that are part of the STEP Extended Architecture. These components are developed using SysML. In the past STEP information models were developed using the EXPRESS language. For legacy reasons it is therefore required to provide an EXPRESS schema derived from the SysML domain model. It is mandatory that the transformation from the SysML model to the EXPRESS schema is defined by a reference standard and guarantee a repeatable process applicable to future application protocols developments.

The Object Management Group (OMG) has standardized the XML Metadata Interchange specification (XMI) that integrates the OMG Systems Modeling Language (SysML), the OMG Unified Modeling Language (UML), the OMG Meta-Object Facility (MOF) and the World Wide Web Consortium (W3C) Extensible Markup Language (XML) standards. SysML inherits the XMI interchange capability from UML. XMI is a mechanism for the interchange of metadata between UML-based modeling tools and MOF-based metadata repositories. OMG has also standardized an XMI compliant interchange format for the SysML thus specifying a lexical representation of SysML models based on a standardized metamodel of the SysML. That lexical representation includes, among other things, the ability to interchange data type information, class information (or entities), groupings of classes providing namespaces for the classes (or schemas), associations between classes and inheritance between classes (or subtypes).

ISO has standardized the EXPRESS language (ISO 10303-11:2004). It is used to specify information requirements in ISO 10303.

10303-16 specifies a description method of the STEP Parts family, which defines the transformation of SysML constructs to the EXPRESS elements. Because the XMI standard specifies the XML representation of SysML metamodel constructs, standardizing the binding of SysML constructs into EXPRESS elements supports the representation of SysML models as EXPRESS schemas. SysML metamodel concepts that appear in SysML Block Diagrams are mapped into data specifications defined by EXPRESS schemas. This document does not map all SysML metamodel constructs to EXPRESS elements, because 10303 SysML models do not use all SysML metamodel constructs.

The EXPRESS schemas are derived from the domain model by applying the implementation bindings on the SysML XMI. The EXPRESS binding is realized with XSL transformations, which transforms the SysML model into an EXPRESS Schema. The specified binding is a one-way transformation from SysML information model represented in XMI into an EXPRESS schema. Due to this limitation 10303-16 does not define the transformation of arbitrary SysML models to EXPRESS.

Readers of 10303-16 require detailed knowledge of the EXPRESS language, and SysML.

The structure, conventions and concepts of the EXPRESS language are defined in ISO 10303-11:2004.

The main component of this standard is:

- the specification of the transformation from SysML XMI to EXPRESS for each STEP element modelled in SysML.

