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

Part 44:

**Integrated generic resource: Product
structure configuration**

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*Systèmes d'automatisation industrielle et intégration — Représentation
et échange de données de produits —*

*Partie 44. Ressources génériques intégrées: Configuration de structure
de produits*

ISO 10303-44:2000

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 10303 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 10303-44 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 4, *Industrial data*.

This second edition of ISO 10303-44 constitutes a technical revision of the first edition (ISO 10303-44:1994), which is provisionally retained to support continued use and maintenance of implementations based on the first edition, and to satisfy the normative references of other parts of ISO 10303. This edition incorporates the corrections published in ISO 10303-44:1994/Cor.1:1999.

This International Standard is organized as a series of parts, each published separately. The parts of ISO 10303 fall into one of the following series: description methods, integrated resources, application interpreted constructs, application protocols, abstract test suites, implementation methods, and conformance testing. The series are described in ISO 10303-1.

A complete list of parts of ISO 10303 is available from the Internet:

<<http://www.nist.gov/sc4/editing/step/titles/>>.

This part of ISO 10303 is a member of the integrated resources series. The integrated resources specify a single conceptual product data model.

Annexes A and B form a normative part of this part of ISO 10303. Annexes C, D and E are for information only.

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, 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.

Major subdivisions of this part of ISO 10303 are:

- the **product_structure_schema**;
- the **product_concept_schema**;
- the **configuration_management_schema**.

The **product_structure_schema**:

- defines a product in terms of its composition as a set of constituents or consumed products. These products are defined and related at a specific life cycle stage or discipline view. A product may be assembled from the constituents or produced by consuming other products, or both;
- defines mechanisms for expressing the composition relationship.

The **product_concept_schema** identifies the product concept as a set of specifications for a product derived from analysis of customer needs for the product. It represents the idea of a product based on customer needs and not as it might be designed or built.

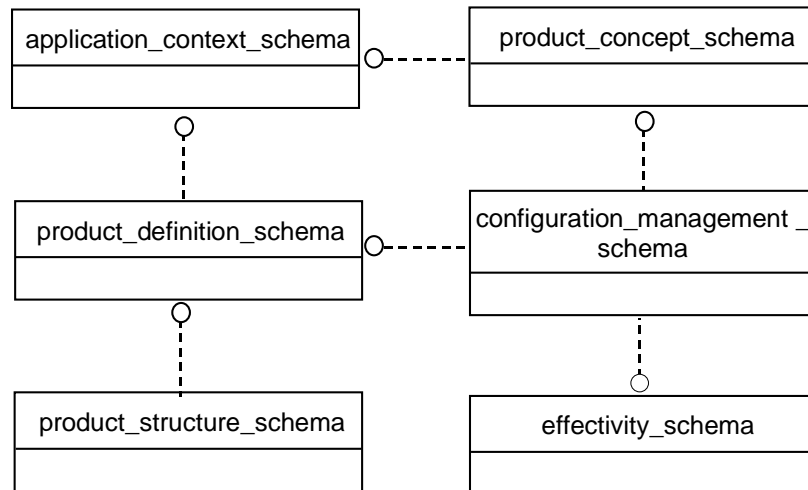
The **configuration_management_schema** identifies those products participating in the configuration of another product that is under the direct control of an organization.

The relationships of the schemas in this part of ISO 10303 to other schemas that define the integrated resources of this International Standard are illustrated in Figure 1 using the EXPRESS-G notation. EXPRESS-G is defined in annex D of ISO 10303-11. The **application_context_schema**, **effectivity_schema**, and **product_definition_schema** are specified in ISO 10303-41. The schemas illustrated in Figure 1 are components of the integrated resources of this International Standard.

Industrial automation is concerned with the management of information including the following:

- product structure;
- product configuration;
- product change.

Product structure is focused on the aspect of product design that defines a product in terms of a nested decomposition of its constituents. The product structure schema of this part of ISO 10303 and the product



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Figure 1 - Relationship of schemas within the integrated resources

definition schema of ISO 10303-41 together define the representation of the information that manages the details of product structure. Examples of the use of the information represented are the generation of bill-of-material reports or the representation of variational bill-of-material structures with conditional part usages.

Product configuration is concerned with the description of the composition of specific products. The planning includes specification of the actual constituents of a product that are to be included in a planned or actual unit. The configuration management schema and the product structure schema represent the information that manages the configuration of a product. The concept of effectivity is used to manage the configuration of a product.

Change management is involved with the changes over time in a product as new versions of a product are developed. This part of ISO 10303 is concerned with changes that affect the organization of constituents into interrelated structures. The configuration management schema represents information on the structural form of the definition of a product as the product changes and is enhanced during the product life cycle. Representation of information on other aspects of change management is defined in the product definition schema and the action schema of ISO 10303-41.

In this International Standard the same English language words may be used to refer to an object in the real world or concept, and as the name of an EXPRESS data type that represents this object or concept. The following typographical convention is used to distinguish between these. If a word or phrase occurs in the same typeface as narrative text, the referent is the object or concept. If the word or phrase occurs in a bold typeface, the referent is the EXPRESS data type.

The name of an EXPRESS data type may be used to refer to the data type itself, or to an instance of the data type. The distinction between these uses is normally clear from the context. If there is a likelihood of ambiguity, either the phrase "entity data type" or "instance(s) of" is included in the text.

This edition of this part of ISO 10303 incorporates modifications that are upwardly compatible with the previous edition. Modifications to EXPRESS specifications are upwardly compatible if:

- the modifications do not result in changes to instances that are encoded according to ISO 10303-21; such instances conform to both the unmodified and modified EXPRESS specifications;
- the modifications do not result in changes to software that conforms to ISO 10303-22 with respect to access to the data content of data structures;
- the modifications do not invalidate mappings to the previous edition of this part that are specified in the mapping table of an ISO 10303 application protocol.

Technical modifications to ISO 10303-44:1994 are categorized as follows: changes to the EXPRESS declarations, new EXPRESS declarations, and changes to definitions.

The following EXPRESS declarations have been modified:

- **alternate_product_relationship**;
- **assembly_component_usage_substitute**;
- **configuration_design**;
- **configuration_effectivity**;
- **configuration_item**;
- **make_from_usage_option**;
- **product_concept**;
- **product_definition_usage**;
- **quantified_assembly_component_usage**;
- **specified_higher_usage_occurrence**.

The following EXPRESS declarations have been added:

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- **assembly_component_usage_substitute_with_ranking;**
- **concept_feature_operator;**
- **concept_feature_relationship;**
- **concept_feature_relationship_with_condition;**
- **conditional_concept_feature;**
- **configurable_item;**
- **configuration_design_item;**
- **configuration_item_relationship;**
- **product_concept_feature;**
- **product_concept_feature_association;**
- **product_concept_relationship;**
- **product_definition_occurrence_relationship.**

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The definitions of the following EXPRESS data types have been modified:

- **alternate_product_relationship;**
- **assembly_component_usage;**
- **assembly_component_usage_substitute;**
- **configuration_design;**
- **configuration_effectivity;**
- **configuration_item;**
- **make_from_usage_option;**
- **make_from_usage_option_group;**
- **next_assembly_usage_occurrence;**
- **product_concept;**
- **product_definition_usage;**

- **promissory_usage_occurrence;**
- **specified_higher_usage_occurrence.**

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Industrial automation systems and integration — Product data representation and exchange — Part 44: Integrated generic resource: Product structure configuration

1 Scope

This part of ISO 10303 specifies the resource constructs to manage the structure and configuration of a product during its life cycle.

The following are within the scope of this part of ISO 10303:

- the relationships among the components and assemblies of products;
- the relationships among products and their components as made by modification of other products;

EXAMPLE 1 The machining of a product from another product is an example of a modification.

- the description of a product as defined by customer needs;
- the dependencies among specifications of a product in order to represent possible product variations to present to a customer;
- the management of the structure for configuration of assemblies and components as planned for manufacture;
- the decomposition of a product to support different product life cycle activities;

EXAMPLE 2 An organization maintains one bill-of-material structure for a product that enumerates the quantity of each component used in each assembly, and a second bill-of-material that decomposes a product with multiple assemblies into the individual components. See annex E for more examples of different product structure reports that are supported.

- multiple versions of a single product that are equivalent with respect to form, fit, and function.

The following are outside the scope of this part of ISO 10303:

- the relationships among different product definitions for the same product;

NOTE 1 The relationships among different product definitions for the same product are supported by the **product_definition_schema** of ISO 10303-41.

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EXAMPLE 3 The relationship of a product definition for a component in a preliminary design to a corresponding product definition for the same component in a detailed design is an example of this type of relationship.

- administrative activities of the product life cycle including approvals, security classifications, contractual arrangements, and supplier organizations;
- the change process for a product, including the reason for change and what aspect of a product has changed;
- the decisions made, and their reasons, during the product life cycle;
- the physical connections among components of a product;
- the properties that a product constituent may have;

NOTE 2 A mechanism is defined in the **product_property_definition_schema** in ISO 10303-41 to support the association of properties with components. The actual associations are included in various application protocols that are parts of this International Standard. For example, the details of what a material property is and how it is defined are out of scope, as well as the fact that a component has a material property.

- multiple versions of a single product that are not form, fit, and function equivalent.

NOTE 3 The concept of versions of a product is defined in the **product_definition_schema** in ISO 10303-41.

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2 Normative references

[ISO 10303-44:2000](https://standards.iteh.ai/catalog/standards/sist/9783b89a-0250-403c-9b5b-02749f6cfe16/iso-10303-44-2000)

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The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 10303. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 10303 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 8824-1:1995, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation*.

ISO 10303-1:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 1: Overview and fundamental principles*.

ISO 10303-11:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 11: Description methods: The EXPRESS language reference manual*.

ISO 10303-41:—¹⁾, *Industrial automation systems and integration — Product data representation and exchange — Part 41: Integrated generic resource: Fundamentals of product description and support*.

¹⁾ To be published.

3 Terms, definitions, and abbreviations

3.1 Terms defined in ISO 10303-1

For the purposes of this part of ISO 10303, the following terms and definitions given in ISO 10303-1 apply.

- assembly;
- component;
- product.

3.2 Terms defined in ISO 10303-41

For the purposes of this part of ISO 10303, the following terms and definitions given in ISO 10303-41 apply.

- agreement of common understanding;
- annotated EXPRESS schema;
- type of product.



3.3 Other terms and definitions

For the purposes of this part of ISO 10303, the following terms and definitions apply:

3.3.1

ancestor node

any node that can be reached from a given node, by successive traversals of links in the reverse direction. For a given node, its ancestor nodes include all parent nodes, all parent nodes of these parent nodes, etc.

3.3.2

bill-of-material (BOM) data structure

a graph of data elements that depict a bill-of-material structure.

NOTE See annex E for examples of bill-of-material data structures.

3.3.3

bill-of-material (BOM) structure

a description of the structure of a product in terms of its nested constituents.

NOTE See annex E for examples of bill-of-material structures.