INTERNATIONAL STANDARD

ISO 10303-203

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

Part 203:

Application protocol: Configuration controlled design

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

Partie 203: Protocole d'application: Conception contrôlée de configuration

Reference number
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Foreword

The International Organization for Standardization (ISO) 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.

Draft International Standards adopted by 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.

International Standard ISO 10303-203 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC4, *Industrial data and global manufacturing languages*.

ISO 10303 consists of the following parts under the general title Industrial automation systems and integration - Product data representation and exchange:

— Part 1, Overview and fundamental principles;

— Part 11, Description methods: The EXPRESS language reference manual;

— Part 21, Implementation methods: Clear text encoding of the exchange structure;

— Part 22, Implementation methods: Standard data access interface;

— Part 31, Conformance testing methodology and framework: General concepts;

— Part 32, Conformance testing methodology and framework: Requirements on testing laboratories and clients;

— Part 41, Integrated generic resources: Fundamentals of product description and support;

— Part 42, Integrated generic resources: Geometric and topological representation;

— Part 43, Integrated generic resources: Representation structures;

— Part 44, Integrated generic resources: Product structure configuration;

— Part 45, Integrated generic resources: Materials;

— Part 46, Integrated generic resources: Visual presentation;

— Part 47, Integrated generic resources: Shape variation tolerances;

— Part 49, Integrated generic resources: Process structure and properties;

— Part 101, Integrated application resources: Draughting;

— Part 104, Integrated application resources: Finite element analysis;

— Part 105, Integrated application resources: Kinematics;

— Part 201, Application protocol: Explicit draughting;

— Part 202, Application protocol: Associative draughting;

— Part 203, Application protocol: Configuration controlled design;

— Part 207, Application protocol: Sheet metal die planning and design;

— Part 210, Application protocol: Printed circuit assembly product design data;

— Part 213, Application protocol: Numerical control process plans for machined parts.

The structure of this International Standard is described in ISO 10303-1. The numbering of the parts of this International Standard reflects its structure:

— Part 11 specifies the desription methods;

— Parts 21 and 22 specify the implementation methods;

— Parts 31 and 32 specify the conformance testing methodology and framework;

— Parts 41 to 49 specify the integrated generic resources;

— Parts 101 to 105 specify the integrated application resources;

— Parts 201 to 213 specify the application protocols.

Should further parts be published, they will follow the same numbering pattern.

Annexes A, B, C, D and E form an integral part of this part of ISO 10303. Annexes F, G, H, J and K are for information only.

Diskette

Users should note that this part of ISO 10303 comprises a diskette:
— the short names of entities given in annex B are also included on the diskette;
— the EXPRESS listings (annex A) are provided on the diskette only;
— a method to enable users to report errors in the documentation is given. Full details are provided in the file.

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.

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 protocols, abstract test suites, implementation methods, and conformance testing. The series are described in ISO 10303-1. This part of ISO 10303 is a member of the application protocol series.

This part of ISO 10303 specifies an application protocol (AP) for the use of product data within a defined context which satisfies an industrial need to exchange configuration-controlled 3D product design data of mechanical parts and assemblies. In order to specify the composition of products, organizations use many computer-based application systems. Integral to the definition of a product are the specification of its shape, the specification of its configurations and the applicability of its possibly multiple definitions to a particular configuration. This data may reside on one or more application systems within an organization. The integration of the data that defines the shape of a product with the data concerning its configuration is essential to an organization's ability to define its products without relying on redundant data in disparate application systems. In order for the definition of the design of products to be communicated, an organization must be able to share its product data with partners, vendors, and customers.

This application protocol defines the exchange of product definitions with three-dimensional shape representations and the data which defines and controls the configuration of those product definitions. This application protocol is concerned solely with the design phase of the product life cycle. Only the designs of mechanical parts and assemblies may be exchanged using this specification. The specification of the 3D shape of a mechanical part or assembly in this application protocol may be made by any of five different types of geometric representation.

Although important to the design of the product, the product's shape is not of primary focus in this application protocol. The primary focus of this specification is the data which controls the tracking and management of the product. This data includes the following:

— identification of a product to an organization's customers and the link of the design identification of the components which comprise the product;

— the documentation of formal change and release of designs for the product;

— the history of the development of the product as it goes through the formal initiation, change and release process;

— the structure of the relationship of each of the components of the product to the whole;

— additional information concerning materials, processes, finishes and other design requirements about the product;

— the identification of qualified suppliers for the product or the design of the product.

This application protocol defines the context, scope, and information requirements for the exchange of configuration-controlled 3D designs of mechanical parts and assemblies and specifies the integrated resources necessary to satisfy these requirements.

Application protocols provide the basis for developing implementations of ISO 10303 and abstract test suites for the conformance testing of AP implementations.

Clause 1 defines the scope of the application protocol and summarizes the functionality and data covered by the AP. An application activity model that is the basis for the definition of the scope is provided in annex F. The information requirements of the application are specified in clause 4 using terminology appropriate to the application. A graphical representation of the information requirements, referred to as the application reference model, is given in annex G.

Resource constructs are interpreted to meet the information requirements. This interpretation produces the application interpreted model (AIM). This interpretation, given in 5.1, shows the correspondence between the information requirements and the AIM. The short listing of the AIM specifies the interface to the integrated resources and is given in 5.2. Note that the definitions and EXPRESS provided in the integrated resources for constructs used in the AIM may include select list items and subtypes which are not imported into the AIM. The expanded listing given in Annex A contains the complete EXPRESS for the AIM without annotation. A graphical representation of the AIM is given in annex H. Additional requirements for specific implementation methods are given in annex D.

Industrial automation systems and integration - Product data representation and exchange - Part 203: Application protocol: Configuration controlled 3D designs of mechanical parts and assemblies

1 Scope

This part of ISO 10303 specifies the integrated resources necessary for the scope and information requirements for the exchange between application systems of configuration-controlled 3D designs of mechanical parts and assemblies. Configuration in this context only includes data and processes that control the 3D product design data. Exchange is used as a scoping consideration to narrow the scope to only those data which are exchanged as part of the 3D product definition. Organizations exchanging data within the scope of this part of ISO 10303 may have a contractual relationship, the details of which are outside the scope of this part.

NOTE - The application activity model in annex E provides a graphical representation of the processes and information flows which are the basis for the definition of the scope of this part of ISO 10303.

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

a) Products that are mechanical parts and assemblies;

b) Product definition data and configuration control data pertaining to the design phase of a product's development;

c) The change of a design and data related to the documentation of the change process;

d) Five types of shape representations of a part that include wireframe and surface without topology, wireframe geometry with topology, manifold surfaces with topology, faceted boundary representation, and boundary representation;

e) Alternate representations of the data by different disciplines during the design phase of a product's life cycle;

f) Identification of government, industry, company or other specifications for design, process, surface finish, and materials which are specified by a designer as being applicable to the design of the product;

g) The identification of government, industry, company, or other standard parts for the purpose of their inclusion in a product's design;

h) Data that are necessary for the tracking of a design's release;

i) Data that are necessary to track the approval of a design, a design aspect, or a configuration control aspect of a product;

j) Data that identify the supplier of either the product or the design and, where required by an organization, qualification information for the supplier;

k) If a part is being designed under a contract, the identification of, and reference to, that contract under which a design is developed;

l) The identification of the security classification of a single part or a part when it is a component in an assembly;

m) Data that is used in, or results from, the analysis or test of a design which is used as evidence for consideration of a change to a design.

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

a) Data that is used in, or results from, the analysis or test of a design that is not used as evidence for consideration of a change to a design;

b) Data that results in changes to the design during the initial design evolution prior to its release;

c) Product definition data and configuration control data pertaining to any life cycle phase of a product's development other than design;

d) The business data for the management of a design project;

e) Alternate representations of the data by different disciplines outside of the design phase (e.g., manufacturing);

f) The use of constructive solid geometry for the representation of objects;

g) Data that pertains to the visual presentation of any of the shape or configuration control data.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of the IEC and ISO maintain registers of currently valid International Standards.

ISO 31:1992, *Quantities and units.*

ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units.*

ISO/IEC 8824-1:–[1], *Information technology - Open systems interconnection - Abstract syntax notation one (ASN.1) - Part 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 10303-21:1994, *Industrial automation systems and integration - Product data representation and exchange - Part 21: Clear text encoding of the exchange structure.*

ISO 10303-31:1994, *Industrial automation systems and integration - Product data representation and exchange - Part 31: Conformance testing methodology and framework: General concepts.*

ISO 10303-41:1994, *Industrial automation systems and integration - Product data representation and exchange - Part 41: Integrated generic resources: Fundamentals of product description and support.*

ISO 10303-42:1994, *Industrial automation systems and integration - Product data representation and exchange - Part 42: Integrated generic resources: Geometric and topological representation.*

ISO 10303-43:1994, *Industrial automation systems and integration - Product data representation and exchange - Part 43: Integrated generic resources: Representation structures.*

ISO 10303-44:1994, *Industrial automation systems and integration - Product data representation and exchange - Part 44: Integrated generic resources: Product structure configuration.*

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[1] To be published.

3 Definitions and abbreviations

For the purposes of this part of ISO 10303, the following definitions and abbreviations apply.

3.1 Terms defined in ISO 10303-1

This part of ISO 10303 makes use of the following terms defined in ISO 10303-1.

— abstract test suite;

— application;

— application activity model;

— application context;

— application interpreted model;

— application object;

— application protocol;

— application reference model;

— assembly;

— component;

— conformance class;

— conformance requirement;

— data;

— data exchange;

— implementation method;

— information;

— integrated resource;

— interpretation;

— PICS proforma;

— product;

— product data;

— protocol implemtnation conformance statement;

— structure;

— unit of functionality.

3.2 Terms defined in ISO 10303-31

This part of ISO 10303 makes use of the following terms defined in ISO 10303-31.

— conformance testing;

— preprocessor;

— postprocessor;

3.3 Terms defined in ISO 10303-42

This part of ISO 10303 makes use of the following terms defined in ISO 10303-42.

— arcwise connected;

— axi-symmetric;

— bounds;

— boundary;

— boundary representation solid model;

— closed curve;

— closed surface;

— connected;

— connected component;