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

Part 201: Application protocol: Explicit draughting

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

Partie 201: Protocole d'application: Dessin technique explicite

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 10303–201 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC4, *Industrial data and global manufacturing programming 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 specification;
- 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 description 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 protocols series.

This part of ISO 10303 specifies an application protocol (AP) for the exchange of technical CAD drawings consisting of two-dimensional geometry and two-dimensional annotation. This part satisfies the need for the exchange of such drawings within and between organizations, especially those operating in the mechanical engineering and architectural, engineering, and construction industrial sectors.

The exchange of such drawings enables the communication of product data during all stages of the lifecycle of a product for any product type. This product data, in the form of a CAD drawing, may be interpreted by people according to accepted international, national, or organization draughting standards. The use of CAD drawings for the purposes of the communication of product data is common practice in many industries. This product data may also be interpreted by appropriate CAx systems for use in applications other than draughting.

The nominal shape of a product is represented by geometry defined in two dimensions. Such representations may be the result of the application of a projection transformation on a three-dimensional shape representation; such three-dimensional shape representations, and the projection transformations that may be applied to produce a two-dimensional representation, lie outside the scope of this part of ISO 10303.

This application protocol makes use of two fundamental concepts which relate to the creation, revision, storage, and use of drawings produced using CAD systems.

A CAD drawing is a digital representation of a drawing and may include the following, in addition to lines and text presented on the face of the drawing:

- representations of the shape(s) of the product(s) depicted by the drawing;
- information used in administering drawings for purposes of configuration control, audit trails, etc.

The use of the shape representation present in the CAD drawing depends on the interpretation of a draughtsman or engineer viewing the drawing. For this reason the concept of a draughting shape model is included. A draughting shape model is a representation of the shape of a product

whose interpretation is determined through visual inspection of the drawings that depict the product.

EXAMPLE 1 – An architectural drawing may contain both isometric and perspective views of a building. The use of the two-dimensional representations depicted in these views depends on the knowledge, in the mind of a designer, that the lengths of lines may be measured or calculated in the isometric view but not in the perspective view.

This draughting shape model is also a nominal shape model; no information regarding tolerances is included in the draughting shape model.

Figure 1 contains the data planning model that provides a high-level description of the general structure of this application protocol, as well as the relationships between the basic data components.

The data planning model illustrates that a product may be described by a draughting shape model. The draughting shape model is a two-dimensional model generated by a CAD system. This CAD model is composed of geometry which represents the shape of the product and may also include annotation. The product is documented by a drawing.

The drawing is composed of drawing sheets that contain annotation and drawing views. The drawing views are two-dimensional views of the draughting shape model that may include additional annotation. Therefore, the drawing is a presentation of the draughting shape model.

Annotation, in the form of text and symbology, provides additional product data that is needed to fully define the product or interpret the drawing. The scope of this application protocol constrains the dimensionality of all data found within it to be two-dimensional only.

This application protocol defines the context, scope, and information requirements for exchange of geometrically explicit two-dimensional technical CAD drawings with explicit annotation 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