

---

---

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

Part 502:

**Application interpreted construct:  
Shell-based wireframe**

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

*Partie 502: Construction interprétée d'application: Cadre en fil  
métallique basé sur une coquille*

<https://standards.iteh.ai/catalog/standards/sist/a06fe7b8-ac27-4110-b740-77aa6139f058/iso-dis-10303-239>



**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

[ISO/DIS 10303-239](https://standards.iteh.ai/catalog/standards/sist/a06fe7b8-ae27-4110-b740-77aa6139f058/iso-dis-10303-239)

<https://standards.iteh.ai/catalog/standards/sist/a06fe7b8-ae27-4110-b740-77aa6139f058/iso-dis-10303-239>

© ISO 2000

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 734 10 79  
E-mail [copyright@iso.ch](mailto:copyright@iso.ch)  
Web [www.iso.ch](http://www.iso.ch)

Printed in Switzerland

<b>Contents</b>	Page
1 Scope .....	1
2 Normative references .....	1
3 Terms, definitions, and abbreviations .....	2
4 EXPRESS short listing .....	3
4.1 Introduction .....	4
4.2 Fundamental concepts and assumptions .....	4
4.3 aic_shell_based_wireframe entity definition: shell_based_wireframe_shape_representation ...	4
4.4 aic_shell_based_wireframe function definitions .....	8
4.4.1 valid_wireframe_edge_curve .....	8
4.4.2 valid_wireframe_vertex_point .....	9
Annex A (normative) Short names of entities .....	10
Annex B (normative) Information object registration .....	11
B.1 Document identification .....	11
B.2 Schema identification .....	11
Annex C (informative) EXPRESS-G diagrams .....	12
Annex D (informative) Computer interpretable listings .....	19
Index .....	20
 <b>Figures</b>	
Figure C.1 - aic_shell_based_wireframe - EXPRESS-G diagram 1 of 6 .....	13
Figure C.2 - aic_shell_based_wireframe - EXPRESS-G diagram 2 of 6 .....	14
Figure C.3 - aic_shell_based_wireframe - EXPRESS-G diagram 3 of 6 .....	15
Figure C.4 - aic_shell_based_wireframe - EXPRESS-G diagram 4 of 6 .....	16
Figure C.5 - aic_shell_based_wireframe - EXPRESS-G diagram 5 of 6 .....	17
Figure C.6 - aic_shell_based_wireframe - EXPRESS-G diagram 6 of 6 .....	18
 <b>Tables</b>	
Table A.1 - Short names of entities .....	10

## 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.

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.

International Standard ISO 10303-501 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC4, *Industrial data*.

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 12, Description method: The EXPRESS-I language reference manual;
- Part 21, Implementation methods: Clear text encoding of the exchange structure;
- Part 22, Implementation method: Standard data access interface specification;
- Part 23, Implementation method: C++ language binding to the standard data access interface;
- Part 24, Implementation method: C language binding to the standard data access interface;
- Part 26, Implementation method: Interface definition language binding to the standard data access;
- Part 31, Conformance testing methodology and framework: General concepts;
- Part 32, Conformance testing methodology and framework: Requirements on testing laboratories and clients;
- Part 34, Conformance testing methodology and framework: Abstract test methods;
- Part 35, Conformance testing methodology and framework: Abstract test methods for SDAI implementations;
- 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 resource: Materials;
- Part 46, Integrated generic resources: Visual presentation;
- Part 47, Integrated generic resource: Shape variation tolerances;
- Part 49, Integrated generic resource: Process structure and properties;
- Part 101, Integrated application resource: Draughting;
- Part 104, Integrated application resource: Finite element analysis;
- Part 105, Integrated application resource: Kinematics;
- Part 106, Integrated application resource: Building construction core model;
- Part 107, Engineering Analysis Core Application reference model (EA C-ARM);
- Part 108, Integrated application resource: Parameterization and constraints for explicit geometric product models
- Part 201, Application protocol: Explicit draughting;
- Part 202, Application protocol: Associative draughting;
- Part 203, Application protocol: Configuration controlled design;
- Part 204, Application protocol: Mechanical design using boundary representation;
- Part 205, Application protocol: Mechanical design using surface representation;
- Part 207, Application protocol: Sheet metal die planning and design;
- Part 208, Application protocol: Life cycle management - Change process;
- Part 209, Application protocol: Composite and metallic structural analysis and related design;
- Part 210, Application protocol: Electronic assembly, interconnect, and packaging design;
- Part 212, Application protocol: Electrotechnical design and installation
- Part 213, Application protocol: Numerical control process plans for machined parts;
- Part 214, Application protocol: Core data for automotive mechanical design processes;
- Part 215, Application protocol: Ship arrangement;
- Part 216, Application protocol: Ship moulded forms;

- Part 217, Application protocol: Ship piping;
- Part 218, Application protocol: Ship structures;
- Part 220, Application protocol: Process planning, manufacture, and assembly of layered electronic products
- Part 221, Application protocol: Functional data and their schematic representation for process plant;
- Part 222, Application protocol: Exchange of product data for composite structures;
- Part 223, Application protocol: Exchange of design and manufacturing product information for casting parts;
- Part 224, Application protocol: Mechanical product definition for process plans using machining features;
- Part 225, Application protocol: Building elements using explicit shape representation;
- Part 226, Application protocol: Ship mechanical systems;
- Part 227, Application protocol: Plant spatial configuration;
- Part 229, Application protocol: Exchange of design and manufacturing product information for forged parts;
- Part 230, Application protocol: Building structural frame: Steelwork;
- Part 231, Application protocol: Process engineering data: Process design and process specification of major equipment;
- Part 232, Application protocol: Technical data packaging core information and exchange;
- Part 233, Application Protocol: Systems engineering data representation
- Part 234, Application protocol: Ship Operational logs, records, and messages
- Part 235, Application Protocol: Materials information for the design and verification of products
- Part 301, Abstract test suite: Explicit draughting;
- Part 302, Abstract test suite: Associative draughting;
- Part 303, Abstract test suite: Configuration controlled design;
- Part 304, Abstract test suite: Mechanical design using boundary representation;
- Part 305, Abstract test suite: Mechanical design using surface representation;
- Part 307, Abstract test suite: Sheet metal die planning and design;
- Part 308, Abstract test suite: Life cycle management - Change process;

- Part 309, Abstract test suite: Composite and metallic structural analysis and related design;
- Part 310, Abstract test suite: Electronic assembly, interconnect, and packaging design;
- Part 312, Abstract test suite: Electrotechnical design and installation;
- Part 313, Abstract test suite: Numerical control process plans for machined parts;
- Part 314, Abstract test suite: Core data for automotive mechanical design processes;
- Part 315, Abstract test suite: Ship arrangement;
- Part 316, Abstract test suite: Ship moulded for
- Part 317, Abstract test suite: Ship piping;
- Part 318, Abstract test suite: Ship structures;
- Part 321, Abstract test suite: Functional data and their schematic representation for process plant;
- Part 322, Abstract test suite: Exchange of product data for composite structures;
- Part 323, Abstract test suite: Exchange of design and manufacturing product information for casting parts;
- Part 324, Abstract test suite: Mechanical product definition for process plans using machining features;
- Part 325, Abstract test suite: Building elements using explicit shape representation;
- Part 326, Abstract test suite: Ship mechanical systems;
- Part 327, Abstract test suite: Plant spatial configuration;
- Part 329, Abstract test suite: Exchange of design and manufacturing product information for forged parts;
- Part 330, Abstract test suite: Building structural frame: Steelwork;
- Part 331, Abstract test suite: Process engineering data: Process design and process specification of major equipment;
- Part 332, Abstract test suite: Technical data packaging core information and exchange;
- Part 334, Abstract test suite: Ship Operational logs, records, and messages
- Part 335, Abstract test suite: Materials information for the design and verification of products
- Part 501, Application interpreted construct: Edge-based wireframe;
- Part 502, Application interpreted construct: Shell-based wireframe;
- Part 503, Application interpreted construct: Geometrically bounded 2D wireframe;

- Part 504, Application interpreted construct: Draughting annotation;
- Part 505, Application interpreted construct: Drawing structure and administration;
- Part 506, Application interpreted construct: Draughting elements;
- Part 507, Application interpreted construct: Geometrically bounded surface;
- Part 508, Application interpreted construct: Non-manifold surface;
- Part 509, Application interpreted construct: Manifold surface;
- Part 510, Application interpreted construct: Geometrically bounded wireframe;
- Part 511, Application interpreted construct: Topologically bounded surface;
- Part 512, Application interpreted construct: Faceted boundary representation;
- Part 513, Application interpreted construct: Elementary boundary representation;
- Part 514, Application interpreted construct: Advanced boundary representation;
- Part 515, Application interpreted construct: Constructive solid geometry;
- Part 517, Application interpreted construct: Mechanical design geometric presentation;
- Part 518, Application interpreted construct: Mechanical design shaded presentation;
- Part 519, Application interpreted construct: Geometric tolerances;
- Part 520, Application interpreted construct: Associative draughting.

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

- Parts 11 to 12 specify the description methods,
- Parts 21 to 26 specify the implementation methods,
- Parts 31 to 35 specify the conformance testing methodology and framework,
- Parts 41 to 49 specify the integrated generic resources,
- Parts 101 to 108 specify the integrated application resources,
- Parts 201 to 235 specify the application protocols,
- Parts 301 to 335 specify the abstract test suites, and
- Parts 501 to 520 specify the application interpreted constructs.



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

Annexes A and B form an integral part of this part of ISO 10303. Annex C and D are for information only.

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO/DIS 10303-239](#)

<https://standards.iteh.ai/catalog/standards/sist/a06fe7b8-ac27-4110-b740-77aa6139f058/iso-dis-10303-239>

## Introduction

ISO 10303 is an International Standard for the computer-interpretable representation of product information and for the exchange of product data. The objective is to provide a neutral mechanism capable of describing products throughout their life cycle. This mechanism is suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases, and as a basis for archiving.

This part of ISO 10303 is a member of the application interpreted construct series. An application interpreted construct (AIC) provides a logical grouping of interpreted constructs that supports a specific functionality for the usage of product data across multiple application contexts. An interpreted construct is a common interpretation of the integrated resources that supports shared information requirements among application protocols.

This document specifies the application interpreted construct for the description of the product shape using three-dimensional wireframe models that are bounded by a set of shells.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

[ISO/DIS 10303-239](https://standards.iteh.ai/catalog/standards/sist/a06fe7b8-ac27-4110-b740-77aa6139f058/iso-dis-10303-239)

<https://standards.iteh.ai/catalog/standards/sist/a06fe7b8-ac27-4110-b740-77aa6139f058/iso-dis-10303-239>

---

# Industrial automation systems and integration — Product data representation and exchange — Part 502: Application interpreted construct: Shell-based wireframe

## 1 Scope

This part of ISO 10303 specifies the interpretation of the integrated resources to satisfy requirements for the representation of the product shape using three-dimensional wireframe models which are bounded by a set of shells.

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

- the representation of wireframe models that are described by a graph of edges and vertices where the edges intersect only at their vertices;
- the representation of a wireframe model by one or more shells that shall not overlap or intersect except at their vertices or edges;
- points defined in a three-dimensional coordinate space;
- curves, including b-splines, defined in a three-dimensional coordinate space;
- the representation of a single wireframe model or an assembly of wireframe models.

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

- geometry defined in a two-dimensional coordinate space;
- surface geometry;
- solid geometry;
- references to eliminated constructs.

## 2 Normative references

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 - 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 10303-41:1994, *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 10303-202:1996, *Industrial automation systems and integration — Product data representation and exchange — Part 202: Application protocol: Associative draughting.*

### 3 Terms, definitions, and abbreviations

#### 3.1 Terms defined in ISO 10303-1

For the purpose of this part of ISO 10303, the following terms defined in ISO 10303-1 apply.

- application;
- application context;
- application protocol;
- implementation method;
- integrated resource;
- interpretation;
- model;
- product;
- product data.