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

Part 304:

**Abstract test suite: Mechanical design
using boundary representation**

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

*Partie 304: Suite d'essais abstraite: Conception mécanique utilisant une
représentation de limite*



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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.

The main task of technical committees is to prepare International Standards. 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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50% of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by 2/3 of the members of the parent committee casting a vote.

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An ISO/PAS or ISO/TS is reviewed every three years with a view to deciding whether it can be transformed into an International Standard.

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/TS 10303–304 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC4, *Industrial data*.

This International Standard is organised as a series of parts, each published separately. The structure of this International Standard is described in ISO 10303-1.

Each part of this International Standard is a member of one of the following series: description methods, implementation methods, conformance testing methodology and framework, integrated generic resources, integrated application resources, application protocols, abstract test suites, application interpreted constructs, and application modules. This part is a member of the abstract test suites series.

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

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

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

The preparation of this part of ISO 10303 has benefitted from the technical contributions of many projects and their sponsoring organizations. The contributions of the following are acknowledged:

— Esprit project 6040 Prodex.

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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 interpreted constructs, 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 abstract test suite series.

The purpose of an abstract test suite is to provide a basis for evaluating whether a particular implementation of an application protocol actually conforms to the requirements of that application protocol. A standard abstract test suite helps ensure that evaluations of conformance are conducted in a consistent manner by different test laboratories.

This part of ISO 10303 specifies the abstract test suite for ISO 10303-204, application protocol Mechanical design using boundary representation. The abstract test cases presented here are the basis for conformance testing of implementations of ISO 10303-204.

This abstract test suite is made up of two major parts:

- the test purposes, the specific items to be covered by conformance testing;
- the set of abstract test cases that meet those test purposes.

The test purposes are statements of the application protocol requirements that are to be addressed by the abstract test cases. Test purposes are derived primarily from the application protocol's application elements and application interpreted model, as well as from other sources such as standards referenced by the application protocol and requirements stated in the application protocol conformance requirements clause.

The abstract test cases address the test purposes by:

- specifying the requirements for input data to be used when testing an implementation of the application protocol;
- specifying the verdict criteria to be used when evaluating whether the implementation successfully converted the input data to a different form.

The abstract test cases set the requirements for the executable test cases that are required to actually conduct a conformance test. Executable test cases contain the scripts, detailed values, and other ex-

explicit information required to conduct a conformance test on a specific implementation of the application protocol.

At the time of publication of this document, conformance testing requirements had been established for implementations of application protocols in combination with ISO 10303–21 and ISO 10303–22. Accordingly, this part of ISO 10303 only specifies test purposes and abstract test cases appropriate to such implementations.

For ISO 10303–21, two kinds of implementations, preprocessors and postprocessors, must be tested. Both these are addressed in this abstract test suite.

For ISO 10303–22, a class of applications will possess the capability to upload and download application protocol-compliant standard data access interface-models and/or schema instances to and from applications that implement the standard data access interface. This abstract test suite addresses such applications.

The abstract test cases presented here are the basis for conformance testing of implementations of ISO 10303-204. The test cases in this part of ISO 10303 are documented in the EXPRESS-I language and can potentially be readily adapted to other implementation methods.

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

Part 304:

Abstract test suite: Mechanical design using boundary representation

1 Scope

This part of ISO 10303 specifies the abstract test suite to be used in the conformance testing of implementations of ISO 10303-204. The following are within the scope of this part of ISO 10303:

- the specification of the test purposes associated with ISO 10303-204;
- the verdict criteria to be applied during conformance testing of an implementation of ISO 10303-204 using ISO 10303-21 or ISO 10303-22;
- the abstract test cases to be used as the basis for the executable test cases for conformance testing.

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

- the creation of executable test cases;
- testing other than conformance testing;
- other implementation methods.

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 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/TR 10303-12:1997, *Industrial automation systems and integration — Product data representation and exchange — Part 12: Description methods: The EXPRESS-I language reference manual*.

ISO 10303-21:1994, *Industrial automation systems and integration - Product data representation and exchange - Part 21 : Implementation methods: Clear text encoding of the exchange structure.*

ISO 10303-22:1998, *Industrial automation systems and integration - Product data representation and exchange - Part 22 : Implementation methods: Standard data access interface.*

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

ISO 10303-32:1998, *Industrial automation systems and integration - Product data representation and exchange - Part 32: Conformance testing methodology and framework: Requirements on testing laboratories and clients.*

ISO 10303-34:2001, *Industrial automation systems and integration - Product data representation and exchange - Part 34: Conformance testing methodology and framework: Abstract test methods for application protocol implementations.*

ISO 10303-204¹⁾, *Industrial automation systems and integration - Product data representation and exchange - Part 204 : Application protocol: Mechanical design using boundary representation.*

ISO 10303-511:2001, *Industrial automation systems and integration - Product data representation and exchange - Part 511 : Application interpreted construct: Topologically bounded surface*

ISO 10303-512:1999, *Industrial automation systems and integration - Product data representation and exchange - Part 512 : Application interpreted construct: Faceted boundary representation*

ISO 10303-513:2000, *Industrial automation systems and integration - Product data representation and exchange - Part 513 : Application interpreted construct: Elementary boundary representation*

ISO 10303-514:1999, *Industrial automation systems and integration - Product data representation and exchange - Part 514 : Application interpreted construct: Advanced boundary representation*

ISO 10303-517:2000, *Industrial automation systems and integration - Product data representation and exchange - Part 517 : Application interpreted construct: Mechanical design geometric presentation*

ISO 10303-518¹⁾, *Industrial automation systems and integration - Product data representation and exchange - Part 518 : Application interpreted construct: Mechanical design shaded presentation*

ISO/IEC 8824-1:1998, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

¹⁾To be published.

3 Definitions

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 (AAM);
- application context;
- application interpreted model (AIM);
- application object;
- application protocol (AP);
- application reference model (ARM);
- conformance class;
- conformance requirement;
- context;
- data;
- data exchange;
- implementation method;
- interpretation;
- model;
- product data;
- unit of functionality (UoF).

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3.2 Terms defined in ISO 10303-31

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

- abstract test case;
- conformance testing;
- executable test case;
- executable test suite;
- test purpose;
- (test) verdict;
- verdict criterion.

3.3 Terms defined in ISO 10303-204

This part of ISO 10303 makes use of the following terms defined in ISO 10303-204.

- advanced B-rep;
- elementary B-rep;
- faceted B-rep.

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3.4 Other definitions

[ISO/TS 10303-304:2001](https://standards.iteh.ai/catalog/standards/sist/0164bc6e-c7fc-47ca-90ab-10303-304-2001)

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10303-304-2001

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

3.4.1

minimal entity set

the set of entities which shall be present in every instantiated model under this application protocol.

3.5 Abbreviations

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

AIC: Application Interpreted Construct;

B-rep: Boundary representation solid;

IP: Informal Proposition;

IUT: Implementation Under Test;

UoF: Unit of Functionality.

4 Test purposes

This clause specifies the test purposes for this part of ISO 10303. Test purposes are derived from the information requirements contained in clause 4 of ISO 10303-204, the AIM EXPRESS schema in annex A of ISO 10303-204, and AIC parts referenced by ISO 10303-204. The test purposes are organized in this clause by type.

AE test purposes are individually identified by the prefix “ae” in the test purpose number. Each test purpose derived from the information requirements shall be interpreted as:

Correctly instantiate in the implementation under test the semantic associated with the unique application concept corresponding to (*insert test purpose here*) in at least one test case within the test suite.

AE test purposes apply to the input specifications of both preprocessor and postprocessor test cases. AE test purposes are derived from the AP information requirements as follows:

- application objects (4.2 of ISO 10303-204). A test purpose derived from an application object is a simple statement of the object’s name. Each application object test purpose is documented in a separate subclause.
- application objects with categorisations (subtypes) (4.2 of ISO 10303-204). Test purposes derived from application objects with categorisations are statements of the application object name as a specific subtype.
- application object attributes (4.2 of ISO 10303-204). Test purposes derived from application object attributes are statements of the application object name with a specific attribute name.
- application assertions (4.3 of ISO 10303-204). Test purposes derived from application assertions are statements describing the relationship between two application objects. Application assertion test purposes address the directions of relationships as well as the number (cardinality) of relationships.

Each application object test purpose is listed as a separate subclause, with its related application object attribute test purposes. The application assertion test purposes form another subclause.

AIM test purposes are identified by the prefix “aim” in the test purpose number. Each test purpose derived from the AIM EXPRESS shall be interpreted as follows:

Correctly instantiate in the implementation under test the AIM element associated with the unique AIM entity corresponding to (*insert test purpose here*) in at least one test case within the test suite.

AIM test purposes apply to the input specifications of postprocessor test cases only. AIM test purposes are derived directly from the expanded EXPRESS listing contained in annex A of ISO 10303-204 as follows:

- AIM entities. A test purpose derived from an AIM element is a simple statement of the entity name.