

**Implementation of
ISO 10303-31 : 1994**

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

**Part 31. Conformance testing methodology
and framework: General concepts**

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Committees responsible for this British Standard

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This British Standard reproduces verbatim ISO 10303-31 : 1994 and implements it as the UK national standard.

This British Standard is published under the direction of the Advanced Manufacturing Technology Assembly whose Technical Committee AMT/4 has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international committee any enquiries on interpretation, or proposals for change, and keep UK interests informed;
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INTERNATIONAL STANDARD

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10303-31

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

Part 31:

Conformance testing methodology and
framework: General concepts

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

*Partie 31: Méthodologie et cadre général pour les essais de conformité:
Concepts généraux*



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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 10303-31 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.

Annex A forms an integral part of this part of ISO 10303. Annexes B, 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.

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 conformance testing series.

This part of ISO 10303 introduces the series of parts of ISO 10303 devoted to conformance testing, provides a framework and describes the general concepts for conformance testing of implementations of ISO 10303. This part of ISO 10303 is based in part upon material in ISO 9646-1 which provides the same function for conformance testing in Open Systems Interconnection. The concepts have been modified for use in this particular domain. This part therefore plays a similar role for this series of parts as does ISO 9646-1 for ISO 9646. Subsequent parts concerning conformance testing of implementations of ISO 10303 are also based upon subsequent parts of ISO 9646. ISO 10303-31 applies not only to exchange structures but, with the current knowledge available, to other implementation methods also. Subsequent parts required for the establishment of conformance testing services address:

- requirements on testing laboratories and clients (ISO 10303-32);
- abstract test suites (ISO 10303-33);
- abstract test methods (ISO 10303-34).

This part also incorporates aspects from the development of the ISO 9000 and EN 45000 series of standards and from a number of ISO/IEC guides:

- a) ISO/IEC Guide 2: General terms and their definitions concerning standardization and related activities;
- b) ISO/IEC Guide 25: General requirements for the competence of calibration and testing laboratories;
- c) ISO/IEC Guide 38: General requirements for the acceptance of testing laboratories;
- d) ISO/IEC Guide 40: General requirements for the acceptance of certification bodies;
- e) ISO/IEC Guide 42: Guidelines for a step-by-step approach to an international certification system;
- f) ISO/IEC Guide 43: Development and operation of laboratory proficiency testing;

g) ISO/IEC Guide 45: Guidelines for the presentation of test results.

The objective of product data exchange cannot be completely achieved unless systems can be tested to determine whether they conform to the relevant product data exchange standards. There is an industrial need to establish conformance testing services for implementations of ISO 10303. This part of ISO 10303 provides a foundation for the subsequent parts in this series which are required to establish conformance testing services and hence, meet that industrial need.

Conformance testing is a type of testing defined as the testing of a candidate product for the existence of specific characteristics required by a standard in order to determine the extent to which that product is a conforming implementation. It involves testing the capabilities of an implementation against both the conformance requirements in the relevant standard(s) and what the client states the implementation's capabilities are.

An abstract test suite is standardised for each application protocol of ISO 10303, for use by suppliers or implementors in self-testing, by users of product data exchange products, or by other third party testing organisations. This should lead to comparability and wide acceptance of test reports produced by different testing laboratories, and thereby minimise the need for repeated conformance testing of the same system.

The standardisation of abstract test suites requires international definition and acceptance of a common test methodology, together with appropriate test methods and procedures. It is the purpose of this series of parts to define the methodology, to provide a framework for specifying abstract test suites, and to define the procedures to be followed during conformance testing.

Details of test methods are addressed in this series of parts; however, any organisation contemplating the use of test methods defined in this series of parts should carefully consider the constraints on their applicability.

Conformance testing does not include some types of testing which may be appropriate for implementations of ISO 10303. These include robustness testing, interoperability testing, acceptance testing and performance testing. These test methods do not form part of conformance testing because there are no appropriate conformance requirements in the standard against which to test. After the results from conformance testing are available, additional testing may be performed.

Conformance testing does not provide judgements on how a system is implemented, how reliable it is, how it provides any requested service, nor the environment of the implementation. It does not, except in an indirect way, prove anything about the logical design of the standard itself.

Conformance is not sufficient to guarantee interoperability; however, it increases the probability that different implementations are able to interoperate. In order to be able to interoperate, it is necessary that two implementations that conform to a given application protocol support compatible options within that application protocol.

The complexity of most standards makes exhaustive testing impractical on both technical and economic grounds. For this same reason of complexity, proof of correctness (verification testing) is also impractical. Falsification testing does not guarantee conformance to a standard since it detects errors rather than the absence of errors. Conformance testing gives confidence that an implementation has the required capabilities.

Industrial automation systems and integration — Product data representation and exchange — Part 31 : Conformance testing methodology and framework: General concepts

1 Scope

This part of ISO 10303, which introduces the series of parts devoted to conformance testing, specifies a general methodology and framework for testing the conformance of an implementation of ISO 10303. During conformance testing, such an implementation is termed an IUT (implementation under test).

NOTE – Figure 1 is a pictorial representation of the relation between the various standards and some of the concepts of conformance testing. The roles of other parts of ISO 10303 are documented in ISO 10303-1.

1.1 Applicability of this series of parts

This series of parts is applicable to the phases of the conformance testing process, these phases being characterised by the following major activities:

- a) the definition of abstract test suites for ISO 10303 application protocols;
- b) the definition of abstract test methods for ISO 10303 implementation methods;
- c) the conformance assessment process carried out by a testing laboratory for a client, culminating in the production of a conformance test report.

1.2 Applicability of this part of ISO 10303

This part of ISO 10303 is applicable to all of the above activities, providing introductory material, normative requirements on each part of this series, and definitions of common terms and concepts.

1.3 Coverage of this series of parts

This series of parts specifies the requirements for and gives guidance on the procedures to be followed in conformance testing for ISO 10303. This series of parts includes only such information as is necessary to meet the following objectives:

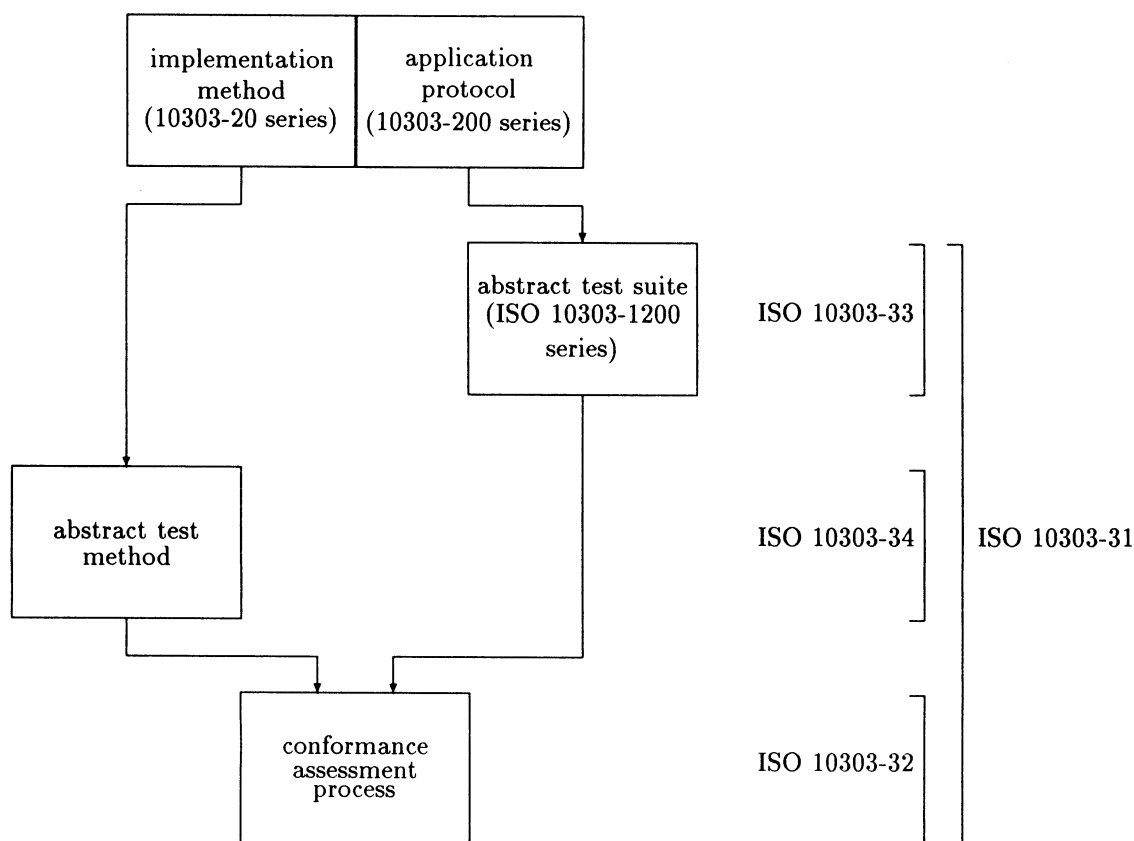


Figure 1 – Relationship between conformance testing standards and other series of parts

- a) to achieve an adequate level of confidence in the tests as a measure of conformance;
- b) to achieve comparability between the results of the corresponding tests applied in different places at different times;
- c) to facilitate communication between the parties responsible for the activities described in (a) and (b).

Requirements for procurement and contracts are outside the scope of this series of parts.

Testing by means of test methods which are specific to particular applications or systems is outside the scope of this series of parts.

The framework established by this part of ISO 10303 includes the concept of executable test suites. These, by their very nature, cannot be standardised; consequently, standardisation of executable test suites is outside the scope of this series of parts.

1.4 Coverage of this part of ISO 10303

This part of ISO 10303 provides introductory material, which is expanded further in the remaining parts of this series of parts of ISO 10303, including:

- a) an exposition of the meaning of conformance in the context of ISO 10303;
- b) a description of basic and capability tests;
- c) an introduction to the conformance assessment process;
- d) an introduction to the abstract test methods and their applicability;
- e) an introduction to the concepts of abstract test suite design.

The procedures required for testing the conformance of an implementation of ISO 10303 are outside the scope of this part of ISO 10303, but are addressed in ISO 10303-34.

The following types of testing are all outside the scope of this part of ISO 10303.

(user) acceptance testing: the process of determining whether an implementation satisfies acceptance criteria and enables the user to determine whether to accept the system. This includes the planning and execution of several kinds of tests (e.g., functional, volume, performance tests) to demonstrate the implemented software satisfies the user requirements.

interoperability testing: related to acceptance testing, but applied to the examination of the information exchange and sharing between two specific IUTs and the ability of each IUT to use such information.

performance testing: measures the performance characteristics of an IUT, such as its throughput, response time, number of transactions, and responsiveness under various conditions.

robustness testing: the process of determining how well an IUT processes data which contains errors.

This part of ISO 10303 provides a framework for certification (an administrative procedure which may follow conformance testing) in annex D. However, there is no ISO requirement for an implementation of ISO 10303 to undergo certification or conformance testing.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 10303. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 10303 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.