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

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

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

Partie 32: Méthodologie et cadre général pour l'évaluation de la conformité: Prescriptions relatives aux laboratoires d'essai et aux clients

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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.

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 10303-32 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration,* Subcommittee 4, *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 methods: The EXPRESS-I language reference manual;

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

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

— Part 23, Implementation methods: C++ language binding to the standard data access interface;

— Part 24, Implementation methods: C language binding to the standard data access interface;

— Part 26, Implementation methods: Interface definition language binding to the 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 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 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;

— 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 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 products 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 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;

— Part 315, Abstract test suite: Ship arrangement;

— Part 316, Abstract test suite: Ship moulded forms;

— 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 501, Application interpreted construct: Edge-based wireframe;

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— Part 508, Application interpreted construct: Non-manifold surface;

— Part 509, Application interpreted construct: Manifold surface;

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— 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.

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

— Parts 11 and 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 106 specify the integrated application resources,

— Parts 201 to 232 specify the application protocols,

— Parts 301 to 332 specify the abstract test suites, and

— Parts 501 to 518 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. Annexes 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 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 conformance testing series.

This part of ISO 10303 specifies the techniques and means to facilitate the use of those techniques by the testing laboratory and the client for conformance testing. This part of ISO 10303 addresses the roles of both the testing laboratory and the client during the conformance assessment process, the need to reach mutual agreements between them, and the requirements on each of them.

A major objective of standardising the conformance assessment process is to achieve an acceptable and useful degree of comparability of results of conformance testing of similar products. For this to be achieved, standardised tests should be used and the methods of selecting and assigning values to parameters of these tests should be the same. The presentation of their results should also be the same.

This part of ISO 10303 should be read in conjunction with ISO 10303-31.

This part of ISO 10303 prescribes the requirements on both the testing laboratory and the client to achieve the necessary consistency of conformance testing. The target audiences for this part of ISO 10303 are the testing laboratories and their clients.

This part of ISO 10303 may also be of interest to:

— test realisers who are responsible for producing the executable test suites, procedures and executable software from standardised abstract test suites and abstract test methods;

— organisations responsible for the accreditation of testing laboratories[1)];

— organisations responsible for the issue of certificates of conformity that are based upon the conformance test reports issued by testing laboratories;

— readers of conformance test reports.

[1)] Further information on the roles of accreditation and certification organisations is given in annex D of ISO 10303-31.

Within this part of ISO 10303, the conformance assessment process relating to both the testing laboratory and the client is divided into four phases as given in 6.4 of ISO 10303-31. Clauses 5 to 8 of this part of ISO 10303 give requirements for conducting these four phases.

Industrial automation systems and integration — Product data representation and exchange — Part 32: Conformance testing methodology and framework: Requirements on testing laboratories and clients

1 Scope

This part of ISO 10303 specifies the techniques for conformance testing and the means to facilitate the use of those techniques by the testing laboratory and the client. This part of ISO 10303 specifies the roles of both the testing laboratory and the client during the conformance assessment process, the need to reach mutual agreements between them, and the requirements on each of them.

1.1 Coverage

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

— general requirements on the testing laboratory and on the client that are applicable to the conformance assessment process;

— the exchange of technical and administrative information, including a protocol implementation conformance statement (PICS) and a protocol implementation extra information for testing (PIXIT);

— the process of negotiation between the testing laboratory and the client to reach an agreement on:

a) the definition of the implementation under test (IUT);

b) the abstract test method and abstract test suite to be used;

c) the conditions under which conformance testing will be performed;

— requirements for the structure and content of the test report that document the results of the conformance testing.

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

— the resolution of technical issues between the client and the testing laboratory that arise during the conformance assessment process;

— the production of diagnostic information in addition to the conformance log and conformance test report;

— any aspects that are not specific to the conformance testing of implementations of ISO 10303 application protocols;

— the certification and testing laboratory accreditation processes.

NOTE - Information on requirements on the testing laboratory and the client with respect to certification are given in annex D. Roles of accreditation and certification organisations are given in annex D of ISO 10303-31.

1.2 Applicability

This part of ISO 10303 applies to the conformance testing of any implementation of an ISO 10303 application protocol. The application protocols for which abstract test suites are specified are defined in the ISO 10303-200 series. The abstract test suites are specified in the ISO 10303-300 series. Conformance testing of an implementation is based on the use of an abstract test suite together with an abstract test method in accordance with ISO 10303-34.

The testing laboratory is responsible for conducting the conformance testing of an implementation of ISO 10303 at the request of a client. A testing laboratory may be any of the following:

— organisations developing or supplying implementations of ISO 10303;

NOTE 1 - Referred to as implementors.

— organisations verifying implementations of ISO 10303 for their own use;

NOTE 2 - Referred to as users.

— organisations who are independent of suppliers or users of implementations of ISO 10303, and whose business is the testing of such implementations.

NOTE 3 - Referred to as testing laboratories.

This part of ISO 10303 applies equally to those testing laboratories that are affiliated to suppliers or procurers, and those that are independent of suppliers and procurers.

Clients may be:

— implementors or suppliers of systems using ISO 10303, who are applying for their implementations to be tested;

— organisations that procure those implementations;

— any other interested party.

This part of ISO 10303 applies equally to all three types of clients.

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.

ISO/IEC 8824-1:1995, *Information technology - Abstract Syntax Notation One (ASN.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 10303-31:1994, *Industrial automation systems and integration - Product data representation and exchange - Part 31: Conformance testing methodology and framework: General concepts.*

ISO 10303-34: —[2)] *Industrial automation systems and integration - Product data representation and exchange - Part 34: Conformance testing methodology and framework: Abstract test methods*

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 (ATS);

— application protocol (AP);

— conformance class;

— conformance requirement;

[2)] To be published.

— conformance testing;

— PICS proforma;

— protocol implementation conformance statement (PICS).

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 (ATC);

— abstract test method;

— (laboratory) accreditation;

— accreditation body;

— client (of a testing laboratory);

— conformance assessment process;

— conformance log;

— conformance test report;

— conformity;

— control board;

— executable test case (ETC);

— executable test suite;

— fail (verdict);

— implementation under test (IUT);

— inconclusive (verdict);

— in-house testing;

— non-conformity;

— pass (verdict);

— PIXIT proforma;

— postprocessor;

— preprocessor;

— protocol implementation extra information for testing (PIXIT);

— selected abstract test suite;

— selected executable test suite;

— system under test (SUT);

— testing laboratory;

— test campaign;

— test case error;

— test purpose;

— test realiser;

— verdict criteria.

3.3 Other definitions

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

3.3.1 means of testing: The combination of equipment and procedures that perform the selection, assignment of parameter values, derivation and execution of test cases, in conformance with an abstract test suite, and that can produce a conformance log. The means of testing is provided by test realisers who are responsible for producing the executable test suites, procedures and executable software from standardised abstract test suites and abstract test methods.

3.4 Abbreviations

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

AP	application protocol
ATC	abstract test case

ATS	abstract test suite
ETC	executable test case
IUT	implementation under test
PICS	protocol implementation conformance statement
PIXIT	protocol implementation extra information for testing
SUT	system under test

4 Fundamental assumptions

For the purposes of this part of ISO 10303, it is assumed that a testing laboratory is available and is organised to provide a conformance testing service. The testing laboratory is assumed to have acquired from a test realiser a means of testing implementations under test (IUTs) for one or more application protocols according to one or more abstract test methods. This part of ISO 10303 specifies requirements on the testing laboratory with respect to conducting the conformance assessment process for a specific client.

Similarly, it is assumed that a client enters into this process when it is ready to apply for conformance testing of an implementation of ISO 10303. The client is assumed to be familiar with the appropriate standards, with the concepts of conformance testing and abstract test methods, and is ready to cooperate with the testing laboratory. This part of ISO 10303 specifies requirements on the client with respect to both the testability of the proposed system under test (SUT) and its conduct in the conformance assessment process. During the conformance assessment process a mutual education takes place, with the testing laboratory learning about the client's system and the client learning about conformance testing.

It is assumed that testing laboratories will seek mutual recognition arrangements with other testing laboratories offering conformance testing services for ISO 10303. Such recognition arrangements may require the testing laboratory to hold accreditation by the relevant national or international accreditation body.

Conformance testing may be accompanied by official certification. Certification authorities are established by national or international bodies. Certification authorities may impose requirements beyond those contained in ISO 10303.

NOTE 1 - Details of the infrastructure are documented in informative annex D of ISO 10303-31.

During the conformance assessment process, the client is responsible for the information provided to accompany the SUT and for the configuration of the SUT. It is assumed that such information regarding the SUT to be tested can be given before the client initiates the conformance assessment process.

5 Preparation for testing

5.1 Introduction

This clause specifies requirements on both the testing laboratory and the client, for conformance testing preparation.

The preparatory phase comprises:

— production of administrative information to enable the identification of the appropriate abstract test suite and abstract test method;

NOTE 1 - Details are provided in 5.2 and in 6.5 of ISO 10303-31, items (a) and (c).

— completion of the PICS proforma by the client;

NOTE 2 - Details are provided in 5.3 and in 6.5 of ISO 10303-31, item (b).

— review of the PICS by the testing laboratory to ensure consistency and completeness together with the initial selection and assignment of parameter values;

NOTE 3 - Details are provided in 5.4 and in 6.5 of ISO 10303-31, items (d) and (f).

— informal testing by the client and completion of the PIXIT;

NOTE 4 - Details are provided in 5.5 and in 6.5 of ISO 10303-31, items (b) and (g).

— review of the PIXIT by the testing laboratory to ensure completeness;

NOTE 5 - Details are provided in 5.6 and in 6.5 of ISO 10303-31, item (e).

— selection of the final abstract test cases and assignment of parameter values by the testing laboratory based on the PICS and PIXIT.

NOTE 6 - Details are provided in 5.7 and in 6.5 of ISO 10303-31, item (h).

5.2 Production of administrative information

5.2.1 Testing laboratory role

The testing laboratory shall provide the client with the following information, as a minimum:

— a statement of requirements for the client to complete the PICS proforma and PIXIT proforma;

— a statement of compliance with this part of ISO 10303, based on the use of the standardised conformance test report proforma;

NOTE 1 - This is detailed in annex B;

— a statement of compliance with the abstract test suite for which a testing service is offered and the abstract test method supported;

NOTE 2 - Abstract test suites for application protocols are documented within the ISO 10303-300 series. Each abstract test suite corresponds to an ISO 10303-200 series application protocol.

— the accreditation status of the testing laboratory.

5.2.2 Client role

The client shall provide the testing laboratory with the following information as a minimum:

— administrative information to identify the client;

— system information to identify the SUT including the name and current version number;

— identification of application protocols and implementation methods of ISO 10303 that have been implemented in the SUT;

— identification of the abstract test method and abstract test suite, including the year of the edition of each part.

5.3 Completion of the PICS

The PICS proforma that is to be used as the basis for the PICS is a normative annex of the appropriate application protocol. Information on the role and scope of the PICS is given in 5.3 of ISO 10303-31.

During this phase, the testing laboratory and the client shall complete the PICS proforma to the satisfaction of both parties. This is done to ensure the characteristics of the SUT have been precisely defined. The PICS determines and affects the choice of abstract test method.

Each of the abstract test methods described in ISO 10303-34 imposes particular requirements on the SUT with respect to its testability. The requirements vary according to the abstract test method.

5.3.1 Testing laboratory role

The testing laboratory shall provide the PICS proforma as defined in the appropriate application protocol for use by the client.

5.3.2 Client role

The client shall complete the PICS proforma for each application protocol that is implemented in the IUT and for which conformance is to be tested. Completion of the PICS proforma produces the PICS. The client shall return the completed PICS to the testing laboratory.

In the case of testing an implementation that contains both a preprocessor and a postprocessor, a separate PICS proforma shall be completed for each.

5.4 PICS review

5.4.1 Testing laboratory role

During the PICS review, the testing laboratory shall analyse the PICS according to the following criteria:

— an answer shall be made to every appropriate question stated in the PICS proforma. An answer may be a reference to a precise section of an external document;

— the PICS shall be self-consistent;

— the PICS shall indicate that the IUT meets the requirements of the application protocol.

5.4.2 Client role

The client shall assist the testing laboratory in resolving any inconsistencies found during the PICS review.

5.4.3 Mutual role

The testing laboratory shall inform the client of the results of the PICS review and together they shall attempt to resolve any inconsistencies before revising the PICS and continuing with the conformance assessment process.

5.5 Informal testing and completion of the PIXIT

5.5.1 Content of the PIXIT

Each PIXIT proforma contains the questions necessary to elicit the required information concerning the SUT, the IUT, and any constraints required on the executable test suite parameters that are not contained in the relevant PICS, and that are needed by the testing laboratory in order to create and run the executable version of that abstract test suite.

NOTE - When the information requested is extensive, the PIXIT may refer to other documents that contain the necessary information.

The role and scope of the PIXIT are given in 6.3 of ISO 10303-31. Requirements and further guidance on the structure and content of the PIXIT are given in annex C.

5.5.2 Testing laboratory role

The testing laboratory shall deliver a PIXIT proforma for each abstract test suite for which testing is offered together with all the instructions necessary to complete the PIXIT.

An executable test suite containing appropriate values for parameters shall be sent to the client before the completion of the initial PIXIT proforma. Appropriate values may be obtained from the abstract test suite documentation.

The executable test suite provided at this stage contains initial values for parameters. Any problems in using these values should be reported to the testing laboratory through the completion of the PIXIT proforma. Final selection of abstract test cases and assignment of parameter values for use in the test campaign shall be performed by the testing laboratory.

The testing laboratory shall also provide a description of the procedures that are related to running the tests that are relevant to the client, including those to be performed by the SUT operator.

The testing laboratory shall identify in the PIXIT proforma any requirements for test execution, beyond those in the abstract test suite, which are placed on the SUT or IUT.

If the conformance testing is to be undertaken at the testing laboratory, the testing laboratory may provide information on any physical requirements for the client's equipment.

The testing laboratory shall also provide the client with a proforma statement of compliance with the appropriate combination of conformance classes of the relevant application protocol.

5.5.3 Client role

The client shall provide the testing laboratory with the following information for the test campaign:

— specification of what part of the SUT is proposed to be the IUT;

— a statement that the SUT is suitable for testing based on a specific abstract test method and an abstract test suite;

— the PIXIT information (see below).

The client shall complete the relevant PIXIT proforma provided by the testing laboratory for the abstract test suite to be used for testing.

Any parameter values that are unsuitable for the IUT shall be noted in the PIXIT. On completion of the informal testing, the client shall return the PIXIT to the testing laboratory for analysis.

The client shall ensure that the SUT provides the necessary means of control and observation as specified by the chosen abstract test method.

5.6 PIXIT review

5.6.1 Testing laboratory role

During the PIXIT review, the testing laboratory shall analyse the PIXIT according to the following criteria:

— the PIXIT shall contain sufficient information to perform the test campaign;

— the PIXIT shall be self-consistent;

— the PIXIT shall be consistent with the PICS.

5.6.2 Client role

The client shall assist the testing laboratory in resolving any inconsistencies found during the PIXIT review.

5.6.3 Mutual role

The testing laboratory shall inform the client of the results of the PIXIT review and together with the client shall resolve any inconsistencies and revise the PIXIT before continuing with the conformance assessment process.

5.7 Final abstract test case selection and assignment of parameter values

5.7.1 Testing laboratory role

The testing laboratory shall select those abstract test cases appropriate for the IUT, based on the information in the PICS and PIXIT, in accordance with the documentation of the means of testing and with the requirements of the abstract test suite. The testing laboratory shall select:

— all abstract test cases for capabilities mandated by the conformance requirements identified by the PICS;

— all abstract test cases for optional or conditional capabilities that are present in the IUT according to the PICS, and testable according to the PIXIT.

The testing laboratory shall ensure that the abstract test cases defined as mandatory, optional or conditional in the abstract test suite, and relevant to this IUT according to the capabilities stated in the PICS, are selected for the test campaign.

Details of the selected abstract test cases shall be forwarded to the client for agreement as the scope of the test campaign.

After the set of abstract test cases has been selected, the information provided in the PIXIT shall be used to determine the appropriate values for each parameter in those abstract test cases, in accordance with the means of testing and with the requirements of the abstract test suite.

NOTE 1 - See ISO 10303-31 clause 8.3 for a description of the contents of abstract test cases.

The abstract test case needs to be instanced with data and translated into an executable format required by the SUT.

EXAMPLE 1 - ISO 10303-21 Clear text encoding of the exchange structure.

An executable test case is derived from an abstract test case and is in a form that allows it to be run on the IUT. This derivation includes the assignment of parameter values, of which there are potentially many for each abstract test case, and written instructions.

The testing laboratory is responsible for obtaining and retaining the documentation of the process by which the executable test cases were derived from the abstract test cases. Such documentation shall be provided by the test realiser.

The contents of an executable test case are documented in 8.4 of ISO 10303-31.

NOTE 2 - The ATC is translated by the test realiser to a description that is adapted by the testing laboratory to the IUT. As the description becomes IUT dependent, there is a description for each conformance testing instance and it is therefore not possible to standardise the description.

In the case of the exchange structure, there are two types of executable test cases that may be generated from an abstract test case. The two types are the ETCs that may be processed by a preprocessor and the ETCs that may be processed by a postprocessor.

A preprocessor ETC consists of a description that is the instantiated equivalent of the ATC description for a given set of values. This description is made using the vocabulary understood by the IUT. A script of implementation specific instructions may accompany the description to facilitate the introduction of the description into the IUT.

A postprocessor ETC consists of a description in ISO 10303-21 format that has to be postprocessed by the IUT. It is the instantiated equivalent of the ATC description for a given set of values. The verdict criteria section of the postprocessor ETC is the documented set of verifications to be performed on the observed model stored in the database of the IUT, resulting from the postprocessor's execution of the ISO 10303-21 exchange structure.

The testing laboratory shall ensure that all the tests in the selected abstract test suite are present in the resulting executable test suite.

Should differences be discovered between the abstract test suite and the corresponding application protocol, the latter shall have precedence in problem resolution.

5.7.2 Client role

The client shall review and sign an agreement to accept the selected abstract test suite provided by the testing laboratory as the scope of the test campaign.

5.7.3 Mutual role

Before continuing with the conformance assessment process, both parties shall agree on:

— the definition of the IUT;

— the scope of the test campaign.

6 Test campaign

6.1 Introduction

A test campaign is the process of running the executable test suite for a particular IUT and producing information required by the testing laboratory.

NOTE - Unresolved issues of a technical nature that are related to the interpretation of relevant standards should be referred to the appropriate ISO 10303 defining group. The control board is the appropriate authority; guidance is provided in annex D of ISO 10303-31.

Prior to the commencement of the test campaign, all equipment to be used by either the testing laboratory or the client, shall be determined to be in an acceptable condition to fulfil its required role.

6.2 Testing laboratory role

The testing laboratory shall ensure that:

— the means of testing and a designated test operator are available throughout the agreed test campaign period;

— all of the tests in the executable test suite are run, and sufficient information to assign a verdict is obtained.

6.3 Client role

The client shall ensure that:

— the SUT and a designated SUT operator are available throughout the agreed test campaign period;

— the SUT operator performs all data entry to and receives output from the SUT, for which the client is responsible;

— the SUT operator is responsible for configuring the IUT to meet the requirements as specified in the PICS and PIXIT.

6.4 Mutual role

Once a test campaign has started, no changes to the executable test suite, the IUT or its environment shall occur.

7 Analysis of results

7.1 Testing laboratory role

The testing laboratory is responsible for assigning a verdict for each test case. The possible verdicts are enumerated in 6.7 of ISO 10303-31; the procedures for assigning such verdicts are given in ISO 10303-34.

For any executable test case with an error, either in the executable version or inherited from the abstract test case, the testing laboratory shall indicate in the conformance test report that the test case verdict was inconclusive, test case error.

NOTE - The testing laboratory should ensure the abstract test suite is corrected by the control board via its documented amendment and revision procedures.

For each test case that yielded an inconclusive verdict, the testing laboratory shall assess whether or not the result was caused by reproducible behaviour in the IUT.

If the testing laboratory decides that there is a reproducible error in the IUT, the testing laboratory shall assign a fail verdict for this executable test case in the conformance test report. Otherwise, the testing laboratory shall re-run the test case. If after re-running the test case, a pass or fail verdict is produced, this verdict shall become the verdict to be published in the conformance test report.

7.2 Client role

The client shall review and sign acceptance of each fail or inconclusive verdict in accordance with 6.5 of ISO 10303-34.

7.3 Mutual role

The testing laboratory and the client shall ensure that:

— all the required test cases have been run;

— the verdicts assigned are acceptable to both parties;

— documentary evidence is produced to support all verdicts.

8 Conformance test report production

8.1 Testing laboratory role

The testing laboratory shall produce a conformance test report that provides a summary and the details of the results of the conformance testing process performed on the client's SUT. The testing laboratory shall use the conformance test report proforma given in annex B.

The conformance test report shall be made available to the client by the testing laboratory at the end of the conformance assessment process.

The testing laboratory shall have established procedures to deal with any client disagreement over the results of testing.

8.2 Client role

The client shall review the conformance test report. The client shall not alter the results assigned by the testing laboratory. If there is any disagreement with the testing laboratory over the content of the conformance test report, the client shall work with the testing laboratory to resolve such disagreement.

8.3 Mutual role

The testing laboratory and client shall ensure that any restrictions on the use by the client of the conformance test report or to its release by the testing laboratory are known. In the event of a disagreement the testing laboratory and the client shall work together to resolve such disagreement.

9 Compliance

9.1 Testing laboratory role

A testing laboratory that claims to comply with ISO 10303 shall:

— for each IUT for which it carries out conformance testing, comply with the requirements stated under all subclauses in this part entitled Testing laboratory role and Mutual role;

— test implementations of ISO 10303 using abstract test suites and applying abstract test methods documented as 30-series parts of ISO 10303.

9.2 Client role

A client who undergoes conformance testing shall comply with ISO 10303 and shall, for each SUT presented for conformance assessment process, comply with the requirements stated under all subclauses in this part entitled Client role and Mutual role.

Where a claim of conformance concerns an application protocol the following references shall be specified:

— the edition of the application protocol;

— the edition of the abstract test suite;

— the edition of implementation method;

— the conformance class or combination of conformance classes within the application protocol (if applicable).

Annex A
(normative)

Information object registration

To provide for unambiguous identification of an information object in an open system, the object identifier

{iso standard 10303 part 32 version 1}

is assigned to this part of ISO 10303. The meaning of this value is defined in ISO/IEC 8824-1, and is described in ISO 10303-1.

Annex B
(normative)

Conformance test report proforma

Each conformance test report detailing the results of testing an implementation of ISO 10303 shall contain the following information as a minimum:

— name and address of the testing laboratory;

— name and address of client;

— unique identifier of the conformance test report issued by that particular testing laboratory;

— on each sheet of the conformance test report, a unique form of sheet identifier such as serial number of the report and unique page number in the form page n of n;

— date of performance of the conformance testing;

— signature and legible name of testing laboratory approved signatory or signatories taking responsibility for the content of the conformance test report;

— unambiguous identification of the item or items tested, including the name of the manufacturer of the items, any model or type designation and any relevant serial numbers;

— any abnormalities or departures from standard conditions;

— references to the abstract test method and procedure used including editions, deviations, additions to or exclusions from the specification;

— reference to the abstract test suite used including the edition, deviations, additions to or exclusions from the specification;

— references to the relevant application protocol and implementation method used including the editions, deviations, additions to or exclusions from the specifications;

— details of SUT preparation;

— conformance testing results;

— details of abstract test cases withdrawn at the time of the test campaign.

Each conformance test report detailing the results of testing an implementation of ISO 10303 shall meet the following requirements as a minimum:

— the conformance test report shall be factually correct;

— the conformance test report shall be checked for accuracy before issue by the testing laboratory and client;

— information in the conformance test report shall be presented in such a way as to minimise the possibility of misuse or misunderstanding;

— the layout of the conformance test report shall be presented to minimise the possibility of addition or removal of pages or otherwise tampering of the information presented.

The presentation of the results of conformance testing shall be presented in two sections, a summary of results and the detailed results.

The presentation of the summary of results shall include:

— the identification of the abstract and executable test cases that have been selected;

— the associated verdict following the execution of that executable test case.

The presentation of the detailed results shall include:

— the identification of each executable test case;

— the identification of the result of each processed executable test case;

— in the case of fail or inconclusive verdicts, additional information as required to explain why that verdict was assigned.

Annex E provides an example test report.

Annex C
(informative)

Guidance for a PIXIT

The PIXIT is intended primarily to provide information about the testing environment of the IUT to the testing laboratory. It is also useful to incorporate into the PIXIT that information (or references to it) that the client requires in order to prepare the SUT. The testing laboratory incorporates this information into the PIXIT proforma that is supplied to the client for completion.

The PIXIT is used in conjunction with the PICS, and should not unnecessarily duplicate information provided by the PICS. Information is required to identify the client, the SUT and the application protocol against which conformance testing is to take place. Cross references should be provided in the PIXIT to sections of the PICS wherever appropriate.

When the client and the testing laboratory agree that large amounts of information are necessary to enable conformance testing to be performed, the PIXIT should reference the appropriate documentation, giving the version number and date.

The PIXIT may be produced iteratively, arising from discussions between the client and the testing laboratory during the preparations for testing.

Annex D
(informative)

Certification

The following is proposed as a certification scheme for implementations of ISO 10303 that have been conformance tested using ISO 10303 abstract test suites and using abstract test methods which comply with ISO 10303-34. It consists of several steps:

— a particular instance of an implementation is conformance tested by an accredited testing laboratory. The term instance in this context includes the particular version of the implementation and the supporting hardware and software required to effect the conformance testing;

— the testing laboratory then documents the results of that conformance testing in a test report that is given to the client;

— the client may send that test report to a certification body, together with any additional information the certification body may require, and formally requests a certificate of conformity;

NOTE - In some certification schemes, the client may request the testing laboratory to send the test report to the certification body.

— the certification body will review that request based on the evidence provided by the client and either reject the request or award a certificate.

The above covers the conformance testing and certification of a particular instance of an implementation. Market requirements may necessitate the development of a scheme to extend a particular certificate to a range of implementations or a range of platforms based on the single conformance testing exercise. Such extensions are the responsibility of the certification body.

Annex D of ISO 10303-31 provides further details regarding the general requirements and responsibilities of a certification body.

Annex E
(informative)

Example proforma conformance test report

The following example proforma corresponds to the testing of an ISO 10303 preprocessor or postprocessor only but may be adapted for other implementation methods. Separate reports would be required for the ISO 10303 preprocessor and postprocessor so this proforma should be used accordingly. Additional information may be added if required.

Background information

Introduction

This section is included to help readers of the report to understand the process that has been used to arrive at the content of this conformance test report.

Conformance testing

Conformance testing is defined as "the testing of a candidate product for the existence of specific requirements of a standard in order to determine the extent to which that product is a conforming implementation."

The scope of conformance testing does not include:

— robustness testing: testing how well the IUT recovers from various error conditions;

— interoperability testing: testing whether two IUTs will actually interoperate and if not why not;

— user acceptance testing: testing whether the IUT satisfies the customer requirements for the software system using functional, volume, and performance tests;

— performance testing: measuring the performance characteristics of an IUT, such as its throughput and responsiveness under various conditions.

The results of conformance testing provide a useful basis for undertaking additional types of testing.

When the IUT is an ISO 10303 preprocessor, the client is asked to create a model in the SUT such that the generated ISO 10303-21 exchange structure would contain a specific ISO 10303 application protocol entities. The ISO 10303-21 exchange structure is then checked against specific verdict criteria to ensure that the model has been preprocessed correctly.

Verdict criteria for preprocessor testing will include checking that the ISO 10303-21 exchange structure is syntactically conformant and structurally conformant. Additional checks may be undertaken to ascertain

that entities and attributes have maintained the correct values and relationships in the ISO 10303-21 exchange structure. Such additional checks are documented within the abstract test case as verdict criteria.

When the IUT is a ISO 10303 postprocessor, the client is asked to read a specific model into the SUT from an ISO 10303-21 exchange structure. The SUT is then interrogated against specific verdict criteria to ensure that the model has been postprocessed correctly.

Verdict criteria for postprocessor testing will include checking that constructs in the model retained correct values and relationships in the SUT. For example, the interrogation would verify that a text string has the correct contents or that a line maintains its correct positioning within the SUT.

The conformance testing process applies a series of conformance tests to an IUT in a controlled environment.

If, at the time of testing some tests were unavailable for use, such tests and the reasons for their unavailability are detailed in the appropriate section of this report.

Phases of the process

In producing this test report, the client and testing laboratory undertake four phases:

— preparation for testing: Using a PICS and PIXIT proforma, the client provided information about the system, options such the names of ISO 10303 constructs created or used by the SUT, information about limitations in support and details of the way in which those entities are created and interrogated in the system.

— in-house testing: The testing laboratory provided the client with a series of test cases for use by the client to test their own system, with support from the testing laboratory as necessary. When the client is satisfied with the results, the test campaign may proceed.

— test campaign: During this phase the system to be tested is prepared in a carefully controlled environment and a series of tests are executed.

— test report: The results of these tests are analysed by the testing laboratory and the test report is prepared.

The exact content of the test cases is varied between in-house testing and formal test campaign phase by the use of different parameters.