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

Part 304:

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

*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*



Reference number
ISO/TS 10303-304:2001(E)

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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.

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/>](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:

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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).

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.

3.4 Other definitions

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.

- AIM entity attributes. Test purposes derived from AIM entity attributes are statements of the AIM entity with a given attribute.

Each AIM entity test purpose is grouped with its attribute test purposes, all of which are contained in 4.2.

Other test purposes are derived from implicit domain requirements, rule checking requirements and from the AICs referenced by ISO 10303-204. Each other test purpose is a statement of some requirement that shall be met by any conforming implementation. Other test purposes are grouped in clause 4.4 and later.

AE and AIM test purposes are individually identified by the prefix ‘ae’ or ‘AIM’ and a number which relates to the UoF of origin. The codes used for UoF identification are given below.

Table 1 – Test purpose source identification

Source UoF	AE test purpose number	AIM identifier code
Advanced B-rep UoF and AIC	ae2 - ae99	aim8 - aim105, aim107 - aim172
Elementary B-rep UoF and AIC	ae100 - ae199	aim8 - aim106
Faceted B-rep UoF and AIC	ae200 - ae299	aim1 - aim7
Name Preservation UoF	ae300 - ae399	aim173 - aim198
Product Structure UoF	ae400 - ae499	aim199 - aim295
Visual Presentation for B-rep UoF	ae500 - ae599	aim296 - aim441

NOTE 1 Many of the AE test purposes for the advanced B-rep UoF are also applicable to the elementary B-rep UoF. In such cases a multiple reference is given to the relevant test cases.

4.1 Application element test purposes

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.

Correctly instantiating an information requirement implies that the semantics of the application element are preserved between the input and the output of a test as well as conformance to the reference path specified in the mapping table of the AP. 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 and assertion test purposes.

4.1.1 3D_Projection

ae501 3D_projection as camera_model_3d. (see 6.6.1 to 6.6.7)

ae518 3D_projection presenting zero B-rep model objects. (see 6.6.5)

ae519 3D_projection presenting one B-rep model. (see 6.6.1 to 6.6.7)

ae520 3D_projection presenting many B-rep model objects.

4.1.2 Advanced_B-rep

ae2 advanced_brep_shape_representation. (see 6.3.1)

4.1.3 Assembly

ae401 Assembly as representation. (see 6.5.4)

ae402 Assembly with user_defined_name. (see 6.5.4)

ae403 Assembly with coordinate_system. (see 6.5.4)

ae412 Assembly containing zero Assembly objects (sub-assemblies). (see 6.5.4)

ae413 Assembly containing one assembly in role of sub-assembly. (see 6.5.4)

ae414 Assembly containing more than one assembly in roles of sub-assembly.

ae415 Assembly as part of one product. (see 6.5.4)

ae416 Assembly as part of more than one product. (see 6.5.4)

ae418 Assembly containing one part. (see 6.5.4)

ae419 Assembly containing many parts with associated transformation objects. (see 6.5.4)

ae428 Assembly with sub-assembly located by transformation.

ae419 Assembly containing many parts with associated transformation objects. (see 6.5.4)

4.1.4 B-rep

ae3 B-rep as an Advanced_B-rep. (see 6.3.1)

ae100 B-rep as an Elementary_B-rep. (see 6.2.1)

ae200 B-rep as a Faceted_B-rep. (see 6.1.1)

ae521 B-rep model associated with zero 3D_projection objects. (see 6.6.5)

ae522 B-rep model associated with one 3D_projection. (see 6.6.1 to 6.6.7)

ae523 B-rep model associated with many 3D_projection objects.

ae73 B-rep consisting of one closed_shell as outer shell. (see 6.3.1, 6.2.1, 6.1.1)

ae56 B-rep consisting of more than one closed_shell, one closed_shell as outer shell. (see 6.3.2, 6.2.2, 6.1.2)

ae60 B-rep with edge with sense true and same edge with sense false. (see 6.3.1, 6.2.1)

ae539 B-rep model presented as zero presentation_appearance objects. (see 6.6.5)

ae601 B-rep model presented as one presentation_appearance objects.

ae539b B-rep model presented as many presentation_appearance objects.

ae74 B-rep in advanced_brep_shape_representation. (see 6.3.1)

ae113 B-rep in elementary_brep_shape_representation. (see 6.2.1)

ae206 B-rep in faceted_brep_shape_representation. (see 6.1.1)

4.1.5 Bounded_curve

ae114 Bounded_curve as Polyline. (see 6.3.4, 6.2.4)

ae5 Bounded_curve as a Twisted_curve. (see 6.3.5)

4.1.6 Circle

ae6 Circle. (see 6.3.1, 6.2.1)

ae7 Circle with location. (see 6.3.1, 6.2.1)

ae8 Circle with radius.(see 6.3.1, 6.2.1)

4.1.7 Closed_shell

ae9 Closed_shell. (see 6.3.1, 6.2.1)

ae10 Closed_shell with one face. (see 6.3.2, 6.2.2)

ae11 Closed_shell with set of more than one faces. (see 6.3.1, 6.2.1, 6.1.1)

4.1.8 Conic

ae12 Conic as Circle. (see 6.3.1, 6.2.1)

ae13 Conic as Ellipse. (see 6.3.1, 6.2.1)

ae14 Conic as Hyperbola. (see 6.3.6, 6.2.5)

ae15 Conic as Parabola. (see 6.3.6, 6.2.5)

4.1.9 Conical_surface

ae16 Conical_surface. (see 6.3.6, 6.2.5)

4.1.10 Curve

ae17 Curve as Bounded_curve. (see 6.3.4, 6.2.4)

ae18 Curve as conic. (see 6.3.1, 6.2.1)

ae19 Curve as line. (see 6.3.3, 6.2.3)

ae58 Curve used to define the geometry of one edge. (see 6.3.1, 6.2.1)

ae59 Curve used to define the geometry of more than one edge. (see 6.3.15)

ae527 Curve represented as zero curve_appearance objects. (see 6.6.5)

ae602 Curve represented as one curve_appearance.

4.1.11 Curve_appearance

ae502 Curve_appearance as curve_style. (see 6.6.2)

ae503 Curve_appearance with colour as colour_rgb. (see 6.6.2)

ae504 Curve_appearance with curve_font. (see 6.6.5)

ae505 Curve_appearance with curve_width. (see 6.6.5)

ae603 Curve_appearance with default colour.

ae604 Curve_appearance with unspecified curve_font.

ae605 Curve_appearance with unspecified curve_width.

ae524 Curve_appearance associated with zero curve objects. (see 6.6.5)

ae525 Curve_appearance associated with one curve.

ae526 Curve_appearance associated with many curve objects. (see 6.6.1 to 6.6.7)

ae528 Curve_appearance associated with zero edge objects. (see 6.6.5)

ae529 Curve_appearance associated with one edge.

ae530 Curve_appearance associated with many edge objects. (see 6.6.1 to 6.6.7)

4.1.12 Cylindrical_surface

ae20 Cylindrical_surface. (see 6.3.1, 6.2.1)

ae21 Cylindrical_surface with axis. (see 6.3.1, 6.2.1)

ae22 Cylindrical_surface with radius. (see 6.3.1, 6.2.1)

4.1.13 Degenerate_toroidal_surface

ae606 Degenerate_toroidal_surface. (see 6.3.12)

4.1.14 Direction

ae23 Direction as a unit vector in 3 dimensional space. (see 6.3.1, 6.2.1)

4.1.15 Edge

ae24 Edge with edge_geometry as curve. (see 6.3.1, 6.2.1)

ae25 Edge with two vertices. (see 6.3.1, 6.2.1)

ae531 Edge represented as zero curve_appearance objects. (see 6.6.5)

ae607 Edge represented as one curve_appearance.

ae61 Edge connected to another edge by vertex. (see 6.3.6, 6.2.5)

ae69 Edge used to define one loop in a B-rep. (see 6.3.1, 6.2.1)

ae70 Edge used to define two loops in a B-rep. (see 6.3.6, 6.2.5)

4.1.16 Elementary_B-rep

ae101 Elementary_B-rep as elementary_brep_shape_representation. (see 6.2.1)

4.1.17 Elementary_surface

ae102 Elementary_surface as Plane. (see 6.2.1, 6.3.1)

ae103 Elementary_surface as Conical_surface. (see 6.2.5, 6.3.6)

ae104 Elementary_surface as Cylindrical_surface. (see 6.2.1, 6.3.1)

ae105 Elementary_surface as Spherical_surface. (see 6.2.1, 6.3.1)

ae106 Elementary_surface as Toroidal_surface. (see 6.2.3, 6.3.3)

4.1.18 Ellipse

ae26 Ellipse. (see 6.3.1, 6.2.1)

ae27 Ellipse with location. (see 6.3.1, 6.2.1)

ae28 Ellipse with major_radius as positive length. (see 6.3.1, 6.2.1)

ae29 Ellipse with minor_radius as positive length. (see 6.3.1, 6.2.1)

4.1.19 Face

ae107 Face as face_surface. (see 6.2.1, 6.1.1)

ae30 Face as advanced_face. (see 6.3.1)

ae31 Face with one outer bound. (see 6.3.1, 6.2.1, 6.1.1)

ae32 Face with set of two or more bounds. (see 6.3.1, 6.2.1, 6.1.3)

ae57 Face used to define more than one closed_shell in different B-reps. (see 6.3.6)

ae62 Face connected to another face by shared edge. (see 6.3.1, 6.2.1)

ae63 Face with one bounding loop. (see 6.3.1, 6.2.1, 6.1.1)

ae64 Face with many bounding loop objects. (see 6.3.1, 6.2.1, 6.1.3)

ae65 Face with face_geometry as surface. (see 6.3.1, 6.2.1)

ae205 Face in faceted_brep with face_geometry as plane. (see 6.1.1)

ae548 Face presented as zero surface_appearance objects. (see 6.6.5)

ae608 Face presented as one surface_appearance.

4.1.20 Faceted_B-rep

ae201 Faceted_brep as manifold_solid_brep (see 6.1.1)

ae202 Faceted_brep with one void shell. (see 6.1.2)

ae203 Faceted_brep with two or more void shells. (see 6.1.3)

4.1.21 Geometric_element

ae33 Geometric_element as part of geometric description of B-rep. (see 6.3.1, 6.2.1, 6.1.1)

ae304 Geometric_element with user defined name. (see 6.4.1)

ae305 Geometric_element with zero name objects. (see 6.4.1)

ae609 Geometric_element as Point. (see 6.1.1, 6.2.1, 6.3.1)

ae610 Geometric_element as Curve. (see 6.1.1, 6.2.1, 6.3.1)

ae611 Geometric_element as Surface. (see 6.1.1, 6.2.1, 6.3.1)

4.1.22 Global_unit

ae404 Geometric context with global_units assigned. (see 6.5.1)

4.1.23 Hyperbola

ae75 Hyperbola with location. (see 6.3.6, 6.2.5)

4.1.24 Light_source

ae612 Light_source with colour. (see 6.6.1 to 6.6.5)

ae613 Light_source with position. (see 6.6.1)

ae614 Light_source with direction. (see 6.6.2)

ae615 Light_source without position. (see 6.6.1 to 6.6.5)

ae616 Light_source without direction. (see 6.6.1 to 6.6.5)

4.1.25 Line

ae19 Line. (see 6.3.3, 6.2.3)

4.1.26 Location

ae34 Location as axis2_placement_3d. (see 6.3.1, 6.2.1, 6.1.1)

ae83 Location as axis2_placement_2d. (see 6.3.13)

NOTE 1 An axis2_placement_2d is used only to define the geometry of a pcurve in the parameter space of a surface.

4.1.27 Loop

ae35 Loop as edge_loop. (see 6.3.1, 6.2.1)

ae36 Loop as vertex_loop. (see 6.3.2, 6.2.2)

ae204 Loop as poly_loop. (see 6.1.1)

ae67 edge_loop defined by one edge. (see 6.3.1, 6.2.1)

ae68 edge_loop defined by many edge objects. (see 6.3.6, 6.2.5)

4.1.28 Name

ae301 B-rep model with name. (see 6.4.1)

ae302 B-rep model component with name. (see 6.4.1)

ae303 B-rep model component without name. (see 6.4.1)

4.1.29 Parabola

ae15 Parabola. (see 6.3.6, 6.2.5)

ae37 Parabola with location. (see 6.3.6, 6.2.5)

4.1.30 Part

ae405 Part as B-rep solid model. (see 6.5.1)

ae406 Part with user_defined_name. (see 6.5.1)

ae617 Part in one Assembly.

ae420 Part contained in more than one assemblies. (see 6.5.4)

ae424 Part in zero Product objects.

ae618 Part in one Product.

ae425 Part in many Product objects. (see 6.5.4)

ae426 Part with geometry defined by one B-rep model. (see 6.5.1)

ae427 Part with geometry defined by many B-rep model objects. (see 6.5.1, 6.5.2)

4.1.31 Pcurve

ae76 Curve as Pcurve. (see 6.3.13)

ae77 Pcurve with basis_surface. (see 6.3.13)

ae78 Pcurve with curve_2d. (see 6.3.13)

4.1.32 Plane

ae102 Plane. (see 6.2.1, 6.3.1, 6.1.1)

ae108 Plane with location. (see 6.3.1, 6.2.1, 6.1.1)

4.1.33 Point

ae38 Point as cartesian_point. (see 6.3.1, 6.2.1, 6.1.1)

ae72 Point not used to define geometry of vertex. (see 6.3.1, 6.2.1)

ae535 Point presented as zero Point_appearance objects. (see 6.6.5)

ae619 Point presented as one Point_appearance.

4.1.34 Point_appearance

ae506 Point_appearance as point_style. (see 6.6.2)

ae508 Point_appearance with colour. (see 6.6.2)

ae620 Point_appearance with default colour.

ae509 Point_appearance with marker. (see 6.6.2)

ae621 Point_appearance with default marker.

ae510 Point_appearance with marker_size. (see 6.6.2)

ae511 Point_appearance using default marker_size. (see 6.6.1)

ae532 Point_appearance associated with zero point objects. (see 6.6.5)

ae533 Point_appearance associated with one point.

ae534 Point_appearance associated with many point objects. (see 6.6.1 to 6.6.7)

4.1.35 Polyline

ae5 Polyline. (see 6.3.4, 6.2.6)

4.1.36 Poly_loop

ae204 Poly_loop. (see 6.1.1)

4.1.37 Presentation_appearance

ae536 Presentation_appearance associated with zero B-rep objects. (see 6.6.5)

ae537 Presentation_appearance associated with one B-rep. (see 6.6.1 to 6.6.7)

ae538 Presentation_appearance associated with many B-rep objects.

ae540 Presentation_appearance associated with zero shell objects. (see 6.6.5)

ae541 Presentation_appearance associated with one shell.

ae542 Presentation_appearance associated with many shell objects. (see 6.6.1 to 6.6.7)

4.1.38 Product

ae407 Product as part. (see 6.5.1)

ae408 Product as assembly. (see 6.5.4)

ae409 Product with coordinate_system. (see 6.5.1)

ae410 Product with user_defined_name. (see 6.5.1)

ae411 Product with version_and_id. (see 6.5.1)

ae417 Product containing zero Assembly objects. (see 6.5.1)

ae622 Product containing many Assembly objects.

ae421 Product with one Part. (see 6.5.1)

ae422 Product with zero Part objects.

ae423 Product with many Part objects. (see 6.5.4)

4.1.39 Sculptured_surface

ae39 Sculptured_surface as B_spline_surface. (see 6.3.10)

4.1.40 Screen_image

ae507 Screen_image as presentation_area.

ae516 Screen_image containing one 3D_projection.

ae517 Screen_image containing two or more 3D_projections.

4.1.41 Shape_representation

ae40 Shape_representation. (see 6.3.1, 6.2.1, 6.1.1)

4.1.42 Shell

ae9 Shell as closed_shell. (see 6.3.1, 6.2.1)

ae543 Shell presented as zero presentation_appearance objects. (see 6.6.5)

ae623 Shell presented as one presentation_appearance.

ae544 Shell presented as many presentation_appearance objects. (see 6.6.1 to 6.6.7)

4.1.43 Spherical_surface

ae41 Spherical_surface with centre point. (see 6.3.1, 6.2.1)

ae42 Spherical_surface with radius as positive length. (see 6.3.1, 6.2.1)

4.1.44 Surface

ae109 Surface as Elementary_surface. (see 6.3.1, 6.2.1)

ae43 Surface as Swept_surface. (see 6.3.8)

ae44 Surface as Sculptured_surface. (see 6.3.10)

ae66 Surface used to define the geometry of more than one face. (see 6.3.15)

ae552 Surface presented as zero surface_appearance objects. (see 6.6.5)

ae624 Surface presented as one surface_appearance.

4.1.45 Surface_appearance

ae512 Surface_appearance as surface_style_usage. (see 6.6.1 to 6.6.7)

ae513 Surface_appearance with colour. (see 6.6.1 to 6.6.7)

ae514 Surface_appearance with grid_indicator. (see 6.6.2)

ae515 Surface_appearance with shading_method. (see 6.6.2)

ae625 Surface_appearance with default colour.

ae626 Surface_appearance with unspecified grid_indicator.

ae627 Surface_appearance with unspecified shading_method.

ae545 Surface_appearance associated with zero face objects. (see 6.6.5)

ae546 Surface_appearance associated with one face.

ae547 Surface_appearance associated with many face objects. (see 6.6.1 to 6.6.7)

ae549 Surface_appearance associated with zero surface objects. (see 6.6.5)

ae550 Surface_appearance associated with one surface.

ae551 Surface_appearance associated with many surface objects. (see 6.6.1 to 6.6.7)

4.1.46 Surface_curve

ae79 Curve as Surface_curve. (see 6.3.13)

ae80 Surface_curve with curve_3d. (see 6.3.13)

ae81 Surface_curve with associated geometry as a set of one pcurve. (see 6.3.13)

ae82 Surface_curve with associated geometry as a set of two pcurves. (see 6.3.13)

4.1.47 Surface_of_extrusion

ae45 Surface_of_extrusion. (see 6.3.8)

ae46 Surface_of_extrusion with extruded curve. (see 6.3.8)

ae47 Surface_of_extrusion with extrusion direction. (see 6.3.8)

4.1.48 Surface_of_revolution

ae48 Surface_of_revolution. (see 6.3.8)

ae49 Surface_of_revolution with revolved curve. (see 6.3.8)

ae50 Surface_of_revolution with axis. (see 6.3.8)

4.1.49 Swept_surface

ae45 Swept_surface as Surface_of_extrusion. (see 6.3.8)

ae48 Swept_surface as Surface_of_revolution. (see 6.3.8)

4.1.50 Topological_element

ae628 as Vertex. (see 6.2.1, 6.3.1)

ae629 as Edge. (see 6.2.1, 6.3.1)

ae630 as Loop. (see 6.2.1, 6.3.1)

ae631 as Face. (see 6.2.1, 6.3.1)

ae632 as Shell. (see 6.2.1, 6.3.1)

ae306 Topological_element with user defined name. (see 6.4.1)

ae307 Topological_element with zero name objects. (see 6.4.1)

ae553 Topological_representation_item associated with zero presentation attribute objects. (see 6.6.5)

ae554 Topological_representation_item associated with one presentation attribute.

ae555 Topological_representation_item associated with many presentation attribute objects. (see 6.6.1 to 6.6.7)

4.1.51 Toroidal_surface

ae107 Toroidal_surface. (see 6.2.3, 6.3.3)

ae110 Toroidal_surface with centre point. (see 6.2.3, 6.3.3)

ae111 Toroidal_surface with axis. (see 6.2.3, 6.3.3)

ae112 Toroidal_surface with two radii. (see 6.2.3, 6.3.3)

ae633 as Degenerate_Toroidal_Surface. (see 6.3.12)

4.1.52 Transformation

ae49 Transformation as cartesian_transformation_operator_3d. (see 6.3.14, 6.1.5)

ae50 Transformation with scaling factor. (see 6.3.14, 6.1.5)

4.1.53 Twisted_curve

ae51 Twisted_curve as B_spline_curve. (see 6.3.5)

4.1.54 Unbounded_curve

ae52 Unbounded_curve used as edge_geometry. (see 6.3.6, 6.2.5)

4.1.55 Vertex

ae53 Vertex as vertex_point. (see 6.3.1, 6.2.1)

ae71 Vertex with geometry defined by point. (see 6.3.1, 6.2.1)

4.1.56 Void

ae54 Void as closed_shell. (see 6.3.2, 6.2.2, 6.1.2)

ae55 Void with topological_normal pointing into void. (see 6.3.2, 6.2.2, 6.1.2)

4.2 AIM test purposes

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:

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

Correctly instantiating an AIM element implies that the semantics of the application element represented by the AIM element are preserved between the input and the output of a test as well as conformance to the reference path specified in the mapping table of the AP. 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 purposes derived from an AIM element is a simple statement of the entity name.
- AIM entity attributes. Test purposes derived from AIM entity attributes are statements of the AIM entity with a given attribute.

Each AIM entity test purpose is grouped with its attribute test purposes.

In the following clauses each test purpose is stated as an entity name, which may require instantiation as a particular subtype, with one or more defined attributes. Each test purpose statement implicitly requires that the entity with the attribute(s) given in the statement will be correctly instantiated in the

implementation under test in at least one test case. A cross reference to the first abstract test case which exercises the test purpose is provided.

Test purposes are grouped into the following categories:

- faceted B-rep (1-6);
- geometry common to elementary and advanced B-reps (7–105);
- elementary B-rep (106);
- advanced B-rep (107–172);
- name preservation (173–198);
- product structure (199–268);
- measures and units (269-295);
- visual presentation (296-441).

4.2.1 **faceted_brep**

aim1: faceted_brep (no specific test purposes) (see 6.1.1, 6.1.2)

4.2.2 **faceted_brep_shape_representation**

aim2: faceted_brep_shape_representation (no specific test purposes) (see 6.1.1, 6.1.4)

4.2.3 **geometric_representation_item**

aim3: geometric_representation_item as **poly_loop** (see 6.1.1)

4.2.4 **loop**

aim4: loop as **poly_loop** (see 6.1.3)

4.2.5 **manifold_solid_brep**

aim5: manifold_solid_brep as **faceted_brep** (see 6.1.1, 6.1.3)

aim6: manifold_solid_brep as **faceted_brep AND brep_with_voids** (see 6.1.2)

4.2.6 poly_loop

aim7: poly_loop with **polygon** having at least one element as cartesian_point (see 6.1.3)

4.2.7 axis2_placement_3d

aim8: axis2_placement_3d with **ref_direction** present as direction (see 6.1.1, 6.2.1, 6.3.1)

aim9: axis2_placement_3d with **ref_direction** absent (see 6.1.3, 6.2.4, 6.3.4)

aim10: axis2_placement_3d with **axis** present as direction (see 6.1.1, 6.2.1, 6.3.1)

aim11: axis2_placement_3d with **axis** absent (see 6.1.3, 6.2.4, 6.3.4)

4.2.8 bounded_curve

aim12: bounded_curve as **polyline** (see 6.2.4, 6.3.4)

4.2.9 brep_with_voids

aim13: brep_with_voids with **voids** having at least one element as oriented_closed_shell (see 6.1.2, 6.2.2, 6.3.2)

4.2.10 cartesian_point

aim14: cartesian_point with **coordinates** having at least one element as length_measure (see 6.1.1, 6.2.1, 6.3.1)

4.2.11 cartesian_transformation_operator

aim15: cartesian_transformation_operator with **local_origin** as cartesian_point (see 6.1.5, 6.3.14, 6.5.4)

aim16: cartesian_transformation_operator with **axis2** present as direction (see 6.1.5, 6.3.14)

aim17: cartesian_transformation_operator with **axis2** absent

aim18: cartesian_transformation_operator with **axis1** present as direction (see 6.1.5, 6.3.14)

aim19: cartesian_transformation_operator with **axis1** absent

aim20: cartesian_transformation_operator as **cartesian_transformation_operator_3d** (see 6.1.5, 6.3.14, 6.5.4)

aim21: cartesian_transformation_operator with **scale** present as real (see 6.1.5, 6.3.14, 6.5.4)

aim22: cartesian_transformation_operator with **scale** absent

4.2.12 cartesian_transformation_operator_3d

aim23: cartesian_transformation_operator_3d with **axis3** present as direction (see 6.1.5, 6.3.14)

aim24: cartesian_transformation_operator_3d with **axis3** absent

4.2.13 circle

aim25: circle with **radius** as positive_length_measure (see 6.2.1, 6.3.1)

4.2.14 closed_shell

aim26: closed_shell as **closed_shell** (see 6.1.1, 6.2.1, 6.3.1)

aim27: closed_shell as **oriented_closed_shell** (see 6.1.2, 6.2.2, 6.3.2)

4.2.15 conic

aim28: conic with **position** as axis2_placement_3d (see 6.2.5, 6.3.6)

aim29: conic with **position** as axis2_placement_2d (see 6.3.13)

aim30: conic as **parabola** (see 6.2.5, 6.3.6)

aim31: conic as **hyperbola** (see 6.2.5, 6.3.6)

aim32: conic as **ellipse** (see 6.2.1, 6.3.6)

aim33: conic as **circle** (see 6.2.1, 6.3.1)

4.2.16 conical_surface

aim34: conical_surface with **semi_angle** as plane_angle_measure (see 6.2.5, 6.3.6)

aim35: conical_surface with **radius** as length_measure (see 6.2.5, 6.3.6)

4.2.17 connected_face_set

aim36: connected_face_set with **cfs_faces** having at least one element as face (see 6.1.1, 6.2.2, 6.3.1, 6.3.2)

aim37: connected_face_set as **closed_shell** (see 6.3.1, 6.3.2)

4.2.18 curve

aim38: curve as **bounded_curve** (see 6.2.4, 6.3.4, 6.3.5)

aim39: curve as **conic** (see 6.2.1, 6.3.1)

aim40: curve as **line** (see 6.2.3, 6.3.3)

4.2.19 cylindrical_surface

aim41: cylindrical_surface with **radius** as positive_length_measure (see 6.2.1, 6.3.1)

4.2.20 degenerate_toroidal_surface

aim42: degenerate_toroidal_surface with **select_outer** = true (see 6.3.12)

aim43: degenerate_toroidal_surface with **select_outer** = false (see 6.3.12)

4.2.21 direction

aim44: direction (no specific test purposes) (see 6.2.1, 6.3.1)

4.2.22 edge

aim45: edge with **edge_end** as vertex (see 6.2.1, 6.3.1)

aim46: edge with **edge_start** as vertex (see 6.2.1, 6.3.1)

aim47: edge as **oriented_edge** (see 6.2.1, 6.2.3, 6.3.1, 6.3.3)

aim48: edge as **edge_curve** (see 6.2.1, 6.3.1)

4.2.23 edge_curve

aim49: edge_curve with **same_sense** = true (see 6.2.1, 6.3.1)

aim50: edge_curve with **same_sense** = false (see 6.2.5, 6.3.6)

aim51: edge_curve with **edge_geometry** as curve (see 6.2.1, 6.2.3, 6.2.4, 6.3.3, 6.3.4, 6.3.1, 6.3.5, 6.3.13)

4.2.24 **edge_loop**

aim52: edge_loop (no specific test purposes) (see 6.3.1)

4.2.25 **elementary_surface**

aim53: elementary_surface with **position** as axis2_placement_3d (see 6.1.1, 6.1.3, 6.2.1, 6.2.4, 6.3.1, 6.3.4)

aim54: elementary_surface as **toroidal_surface** (see 6.2.3, 6.3.3, 6.3.12)

aim55: elementary_surface as **spherical_surface** (see 6.2.1, 6.3.1)

aim56: elementary_surface as **conical_surface** (see 6.2.5, 6.3.6)

aim57: elementary_surface as **cylindrical_surface** (see 6.2.1, 6.3.1)

aim58: elementary_surface as **plane** (see 6.1.1, 6.1.3, 6.2.1, 6.3.1)

4.2.26 **ellipse**

aim59: ellipse with **semi_axis_2** as positive_length_measure (see 6.2.1, 6.3.1)

aim60: ellipse with **semi_axis_1** as positive_length_measure (see 6.2.1, 6.3.1)

4.2.27 **face**

aim61: face with **bounds** having at least one element as face_bound (see 6.1.1, 6.1.3, 6.2.1, 6.2.5, 6.3.1, 6.3.6, 6.3.11)

aim62: face as **face_surface** (see 6.1.1, 6.1.3, 6.2.1, 6.2.5, 6.3.1, 6.3.6, 6.3.11)

4.2.28 **face_bound**

aim63: face_bound with **orientation** = true (see 6.1.1, 6.1.3, 6.2.1, 6.3.1)

aim64: face_bound with **orientation** = false (see 6.1.3, 6.2.1, 6.3.1)

aim65: face_bound with **bound** as loop (see 6.1.1, 6.1.3, 6.2.1, 6.2.5, 6.3.1)

aim66: face_bound as **face_outer_bound** (see 6.1.1, 6.1.3, 6.2.1, 6.2.5, 6.3.1)

4.2.29 **face_outer_bound**

aim67: face_outer_bound (no specific test purposes) (see 6.2.1, 6.3.1)

4.2.30 face_surface

aim68: face_surface with **same_sense** = true (see 6.1.1, 6.2.1)

aim69: face_surface with **same_sense** = false (see 6.1.3, 6.2.5)

aim70: face_surface with **face_geometry** as surface (see 6.1.1, 6.2.1)

4.2.31 geometric_representation_context

aim71: geometric_representation_context with **coordinate_space_dimension** as dimension_count (see 6.1.1, 6.2.1, 6.3.1, 6.5.1)

4.2.32 hyperbola

aim72: hyperbola with **semi_imag_axis** as positive_length_measure (see 6.2.5, 6.3.6)

aim73: hyperbola with **semi_axis** as positive_length_measure (see 6.2.5, 6.3.6)

4.2.33 line

aim74: line with **dir** as vector (see 6.2.5, 6.3.6)

aim75: line with **pnt** as cartesian_point (see 6.2.5, 6.3.6)

4.2.34 loop

aim76: loop as **edge_loop** (see 6.2.1, 6.3.1)

aim77: loop as **vertex_loop** (see 6.2.2, 6.2.5, 6.3.2)

4.2.35 manifold_solid_brep

aim78: manifold_solid_brep with **outer** as closed_shell (see 6.1.1, 6.1.2, 6.2.1, 6.3.1, 6.3.2)

aim79: manifold_solid_brep as **brep_with_voids** (see 6.2.2, 6.3.2)

4.2.36 oriented_closed_shell

aim80: oriented_closed_shell with **orientation** = true

aim81: oriented_closed_shell with **orientation** = false (see 6.1.2, 6.2.2, 6.3.2)

aim82: oriented_closed_shell with **closed_shell_element** as closed_shell (see 6.1.2, 6.2.2, 6.3.2)

4.2.37 **oriented_edge**

aim83: oriented_edge with **orientation** = true (see 6.2.1, 6.3.1)

aim84: oriented_edge with **orientation** = false (see 6.2.3, 6.3.3)

aim85: oriented_edge with **edge_element** as edge (see 6.2.1, 6.3.1)

4.2.38 **parabola**

aim86: parabola with **focal_dist** as length_measure (see 6.2.5, 6.3.6)

4.2.39 **parametric_representation_context**

aim87: parametric_representation_context (no specific test purposes) (see 6.3.13)

4.2.40 **path**

aim88: path with **edge_list** having at least one element as oriented_edge (see 6.2.1, 6.3.1)

aim89: path as **edge_loop** (see 6.2.1, 6.3.1)

4.2.41 **placement**

aim90: placement with **location** as cartesian_point (see 6.1.1, 6.2.1)

aim91: placement as **axis2_placement_3d** (see 6.1.1, 6.1.3, 6.2.1, 6.3.1)

4.2.42 **plane**

aim92: plane (no specific test purposes) (see 6.1.1, 6.2.1, 6.3.1)

4.2.43 **point**

aim93: point as **cartesian_point** (see 6.2.2, 6.3.2)

4.2.44 **polyline**

aim94: polyline with **points** having at least one element as cartesian_point (see 6.2.4, 6.3.4)

4.2.45 **solid_model**

aim95: solid_model as **manifold_solid_brep** (see 6.1.1, 6.2.1, 6.3.1)

4.2.46 spherical_surface

aim96: spherical_surface with **radius** as positive_length_measure (see 6.2.1, 6.3.1)

4.2.47 surface

aim97: surface as **elementary_surface** (see 6.1.1, 6.1.3, 6.2.1, 6.3.1)

4.2.48 toroidal_surface

aim98: toroidal_surface with **minor_radius** as positive_length_measure (see 6.2.3, 6.3.3)

aim99: toroidal_surface with **major_radius** as positive_length_measure (see 6.2.3, 6.3.3)

aim100: toroidal_surface as **degenerate_toroidal_surface** (see 6.3.12)

4.2.49 vector

aim101: vector with **magnitude** as length_measure (see 6.2.5, 6.3.6)

aim102: vector with **orientation** as direction (see 6.2.5, 6.3.6)

4.2.50 vertex

aim103: vertex as **vertex_point** (see 6.2.1, 6.3.2, 6.3.1)

4.2.51 vertex_loop

aim104: vertex_loop with **loop_vertex** as vertex (see 6.2.2, 6.3.2)

4.2.52 vertex_point

aim105: vertex_point with **vertex_geometry** as point (see 6.2.2, 6.3.2)

4.2.53 elementary_brep_shape_representation

aim106: elementary_brep_shape_representation (no specific test purposes) (see 6.2.1)

4.2.54 advanced_brep_shape_representation

aim107: advanced_brep_shape_representation (no specific test purposes) (see 6.3.1)

4.2.55 **advanced_face**

aim108: advanced_face (no specific test purposes) (see 6.3.1)

4.2.56 **axis1_placement**

aim109: axis1_placement with **axis** present as direction (see 6.3.8)

aim110: axis1_placement with **axis** absent

4.2.57 **axis2_placement_2d**

aim111: axis2_placement_2d with **ref_direction** present as direction (see 6.3.13)

aim112: axis2_placement_2d with **ref_direction** absent

4.2.58 **b_spline_curve**

aim113: b_spline_curve with **self_intersect** = false (see 6.3.5)

aim114: b_spline_curve with **self_intersect** = unknown (see 6.3.9)

aim115: b_spline_curve with **closed_curve** = true (see 6.3.5)

aim116: b_spline_curve with **closed_curve** = false (see 6.3.10)

aim117: b_spline_curve with **closed_curve** = unknown (see 6.3.9)

aim118: b_spline_curve with **curve_form** = unspecified (see 6.3.5)

aim119: b_spline_curve with **control_points_list** having at least one element as cartesian_point (see 6.3.5)

aim120: b_spline_curve as **rational_b_spline_curve** (see 6.3.10)

aim121: b_spline_curve as **bezier_curve** (see 6.3.5, 6.3.10)

aim122: b_spline_curve as **b_spline_curve_with_knots** (see 6.3.11)

4.2.59 **b_spline_curve_with_knots**

aim123: b_spline_curve_with_knots with **knot_spec** = piecewise_bezier_knots (see 6.3.11)

aim124: b_spline_curve_with_knots with **knot_spec** = quasi_uniform_knots

aim125: `b_spline_curve_with_knots` with **knot_spec** = unspecified

aim126: `b_spline_curve_with_knots` with **knot_spec** = uniform_knots

aim127: `b_spline_curve_with_knots` with **knots** having at least one element as parameter_value (see 6.3.11)

4.2.60 `b_spline_surface`

aim128: `b_spline_surface` with **self_intersect** = false (see 6.3.10)

aim129: `b_spline_surface` with **self_intersect** = unknown (see 6.3.11)

aim130: `b_spline_surface` with **v_closed** = true (see 6.3.11)

aim131: `b_spline_surface` with **v_closed** = false (see 6.3.10)

aim132: `b_spline_surface` with **v_closed** = unknown

aim133: `b_spline_surface` with **u_closed** = true (see 6.3.11)

aim134: `b_spline_surface` with **u_closed** = false (see 6.3.10)

aim135: `b_spline_surface` with **u_closed** = unknown

aim136: `b_spline_surface` with **surface_form** = unspecified (see 6.3.10)

aim137: `b_spline_surface` with **control_points_list** having at least one element as cartesian_point

aim138: `b_spline_surface` as **rational_b_spline_surface** (see 6.3.10)

aim139: `b_spline_surface` as **bezier_surface** (see 6.3.10)

aim140: `b_spline_surface` as **b_spline_surface_with_knots** (see 6.3.11)

4.2.61 `b_spline_surface_with_knots`

aim141: `b_spline_surface_with_knots` with **knot_spec** = piecewise_bezier_knots

aim142: `b_spline_surface_with_knots` with **knot_spec** = quasi_uniform_knots

aim143: `b_spline_surface_with_knots` with **knot_spec** = unspecified (see 6.3.11)

aim144: `b_spline_surface_with_knots` with **knot_spec** = uniform_knots

aim145: `b_spline_surface_with_knots` with **v_knots** having at least one element as parameter_value

aim146: `b_spline_surface_with_knots` with **u_knots** having at least one element as `parameter_value` (see 6.3.11)

4.2.62 **bezier_curve**

aim147: `bezier_curve` (no specific test purposes) (see 6.3.9)

4.2.63 **bezier_surface**

aim148: `bezier_surface` (no specific test purposes) (see 6.3.9)

4.2.64 **bounded_curve**

aim149: `bounded_curve` as `b_spline_curve` (see 6.3.5)

4.2.65 **bounded_surface**

aim150: `bounded_surface` as `b_spline_surface` (see 6.3.10)

4.2.66 **curve**

aim151: `curve` as `surface_curve` (see 6.3.13)

aim152: `curve` as `pcurve` (see 6.3.13)

4.2.67 **definitional_representation**

aim153: `definitional_representation` (no specific test purposes) (see 6.3.13)

4.2.68 **face_surface**

aim154: `face_surface` as `advanced_face` (see 6.3.1, 6.3.6, 6.3.11)

4.2.69 **pcurve**

aim155: `pcurve` with `reference_to_curve` as `definitional_representation` (see 6.3.13)

aim156: `pcurve` with `basis_surface` as `surface` (see 6.3.13)

4.2.70 **placement**

aim157: `placement` as `axis2_placement_2d` (see 6.3.13)

aim158: placement as **axis1_placement** (see 6.3.8)

4.2.71 **rational_b_spline_curve**

aim159: rational_b_spline_curve (no specific test purposes) (see 6.3.10)

4.2.72 **rational_b_spline_surface**

aim160: rational_b_spline_surface (no specific test purposes) (see 6.3.10)

4.2.73 **surface**

aim161: surface as **bounded_surface** (see 6.3.10)

aim162: surface as **swept_surface** (see 6.3.8)

4.2.74 **surface_curve**

aim163: surface_curve with **master_representation** = pcurve_s2

aim164: surface_curve with **master_representation** = pcurve_s1 (see 6.3.13)

aim165: surface_curve with **master_representation** = curve_3d (see 6.3.13)

aim166: surface_curve with **associated_geometry** having at least one element as pcurve (see 6.3.13)

aim167: surface_curve with **curve_3d** as curve (see 6.3.13)

4.2.75 **surface_of_linear_extrusion**

aim168: surface_of_linear_extrusion with **extrusion_axis** as vector (see 6.3.8)

4.2.76 **surface_of_revolution**

aim169: surface_of_revolution with **axis_position** as axis1_placement (see 6.3.8)

4.2.77 **swept_surface**

aim170: swept_surface with **swept_curve** as curve (see 6.3.8)

aim171: swept_surface as **surface_of_revolution** (see 6.3.8)

aim172: swept_surface as **surface_of_linear_extrusion** (see 6.3.8)

4.2.78 **geometric_representation_item**

- aim173:** geometric_representation_item as **planar_extent**
- aim174:** geometric_representation_item as **camera_model** (see 6.6.1)
- aim175:** geometric_representation_item as **light_source** (see 6.6.1)
- aim176:** geometric_representation_item as **solid_model** (see 6.1.1, 6.2.1, 6.3.1)
- aim177:** geometric_representation_item as **vertex_point** (see 6.2.1, 6.3.1)
- aim178:** geometric_representation_item as **face_surface** (see 6.1.1, 6.2.1, 6.3.1)
- aim179:** geometric_representation_item as **edge_curve** (see 6.2.1, 6.3.1)
- aim180:** geometric_representation_item as **surface** (see 6.2.1, 6.3.1)
- aim181:** geometric_representation_item as **curve** (see 6.2.1, 6.3.1)
- aim182:** geometric_representation_item as **cartesian_transformation_operator** (see 6.3.14, 6.5.4)
- aim183:** geometric_representation_item as **placement** (see 6.2.1, 6.3.1)
- aim184:** geometric_representation_item as **vector** (see 6.2.5, 6.3.6)
- aim185:** geometric_representation_item as **direction** (see 6.1.1)
- aim186:** geometric_representation_item as **point** (see 6.2.1)

4.2.79 **representation_item**

- aim187:** representation_item with **name** as label (see 6.4.1)
- aim188:** representation_item as **topological_representation_item** (see 6.4.1)
- aim189:** representation_item as **geometric_representation_item** (see 6.3.14, 6.4.1, 6.5.4)
- aim190:** representation_item as **styled_item**
- aim191:** representation_item as **mapped_item** (see 6.2.6, 6.3.14)

4.2.80 **topological_representation_item**

- aim192:** topological_representation_item as **path** (see 6.2.1, 6.3.1)

aim193: topological_representation_item as **loop** (see 6.1.1, 6.2.1, 6.3.1)

aim194: topological_representation_item as **connected_face_set** (see 6.1.1, 6.2.1, 6.3.1)

aim195: topological_representation_item as **face** (see 6.1.1, 6.2.1, 6.3.1)

aim196: topological_representation_item as **face_bound** (see 6.1.1, 6.2.1, 6.3.1)

aim197: topological_representation_item as **edge** (see 6.2.1, 6.3.1)

aim198: topological_representation_item as **vertex** (see 6.2.1, 6.3.1)

4.2.81 application_context

aim199: application_context with **application** as text (see 6.5.1)

4.2.82 application_context_element

aim200: application_context_element with **frame_of_reference** as application_context (see 6.5.1)

aim201: application_context_element with **name** as label (see 6.5.1)

aim202: application_context_element as **product_definition_context** (see 6.5.1)

aim203: application_context_element as **product_context** (see 6.5.1)

4.2.83 application_protocol_definition

aim204: application_protocol_definition with **application** as application_context (see 6.5.1)

aim205: application_protocol_definition with **application_protocol_year** as year_number (see 6.5.1)

aim206: application_protocol_definition with **application_interpreted_model_schema_name** as label (see 6.5.1)²⁾

aim207: application_protocol_definition with **status** as label (see 6.5.1)

4.2.84 assembly_component_usage

aim208: assembly_component_usage with **reference_designator** present as identifier (see 6.5.4)

²⁾ = 'part_204_brep_product_schema'

aim209: assembly_component_usage with **reference_designator** absent (see 6.5.4)

4.2.85 design_context

aim210: design_context (no specific test purposes) (see 6.5.1)

4.2.86 functionally_defined_transformation

aim211: functionally_defined_transformation with **description** as text (see 6.1.5, 6.3.14)

aim212: functionally_defined_transformation with **name** as label (see 6.1.5, 6.3.14)

aim213: functionally_defined_transformation as **cartesian_transformation_operator** (see 6.1.5, 6.3.14)

4.2.87 mapped_item

aim214: mapped_item with **mapping_target** as representation_item (see 6.2.6, 6.3.14, 6.5.4)

aim215: mapped_item with **mapping_source** as representation_map (see 6.2.6, 6.3.14)

aim216: mapped_item as **camera_image**

4.2.88 mechanical_context

aim217: mechanical_context (no specific test purposes) (see 6.5.1)

4.2.89 product

aim218: product with **frame_of_reference** having at least one element as product_context (see 6.5.1)

aim219: product with **description** as text (see 6.5.4)

aim220: product with **name** as label (see 6.5.4)

aim221: product with **id** as identifier (see 6.5.4)

4.2.90 product_context

aim222: product_context with **discipline_type** as label (see 6.5.1)

aim223: product_context as **mechanical_context** (see 6.5.1)

4.2.91 product_definition

aim224: product_definition with **frame_of_reference** as product_definition_context (see 6.5.1)

aim225: product_definition with **formation** as product_definition_formation (see 6.5.1)

aim226: product_definition with **description** as text (see 6.5.1)

aim227: product_definition with **id** as identifier (see 6.5.1)

4.2.92 product_definition_context

aim228: product_definition_context with **life_cycle_stage** as label (see 6.5.1)

aim229: product_definition_context as **design_context** (see 6.5.1)

4.2.93 product_definition_formation

aim230: product_definition_formation with **of_product** as product (see 6.5.1)

aim231: product_definition_formation with **description** as text (see 6.5.1)

aim232: product_definition_formation with **id** as identifier (see 6.5.1)

4.2.94 product_definition_relationship

aim233: product_definition_relationship with **related_product_definition** as product_definition (see 6.5.4)

aim234: product_definition_relationship with **relating_product_definition** as product_definition (see 6.5.4)

aim235: product_definition_relationship with **description** as text (see 6.5.4)

aim236: product_definition_relationship with **name** as label (see 6.5.4)

aim237: product_definition_relationship with **id** as identifier (see 6.5.4)

aim238: product_definition_relationship as **product_definition_usage** (see 6.5.4)

4.2.95 product_definition_shape

aim239: product_definition_shape (no specific test purposes) (see 6.5.2)

4.2.96 product_definition_usage

aim240: product_definition_usage as **assembly_component_usage** (see 6.5.4)

4.2.97 property_definition

aim241: property_definition with **definition** as product_definition (see 6.5.1, 6.5.2, 6.5.3)

aim242: property_definition with **definition** as product_definition_relationship (see 6.5.1, 6.5.2, 6.5.3)

aim243: property_definition with **description** as text (see 6.5.1, 6.5.2, 6.5.3)

aim244: property_definition with **name** as label (see 6.5.1, 6.5.2, 6.5.3)

aim245: property_definition as **product_definition_shape** (see 6.5.1, 6.5.2, 6.5.3)

4.2.98 property_definition_representation

aim246: property_definition_representation with **used_representation** as representation (see 6.5.1, 6.5.2, 6.5.3)

aim247: property_definition_representation with **definition** as property_definition (see 6.5.1, 6.5.2, 6.5.3)

aim248: property_definition_representation as **shape_definition_representation** (see 6.5.1, 6.5.2, 6.5.3)

4.2.99 representation

aim249: representation with **context_of_items** as representation_context (see 6.5.1, 6.5.2, 6.5.3)

aim250: representation with **items** having at least one element as representation_item (see 6.5.1, 6.5.2, 6.5.3)

aim251: representation with **name** as label (see 6.5.1, 6.5.2, 6.5.3)

aim252: representation as **shape_representation** (see 6.5.1, 6.5.2, 6.5.3)

aim253: representation as **presentation_representation**

aim254: representation as **mechanical_design_shaded_presentation_representation**

aim255: representation as **mechanical_design_geometric_presentation_representation**

aim256: representation as **definitional_representation** (see 6.3.13)

4.2.100 representation_context

- aim257: representation_context with **context_type** as text (see 6.5.1)
- aim258: representation_context with **context_identifier** as identifier (see 6.5.1)
- aim259: representation_context as **parametric_representation_context** (see 6.3.13)
- aim260: representation_context as **global_unit_assigned_context** (see 6.1.1, 6.2.1, 6.3.1)
- aim261: representation_context as **geometric_representation_context** (see 6.1.1, 6.2.1, 6.3.1)

4.2.101 representation_map

- aim262: representation_map with **mapped_representation** as representation (see 6.1.4, 6.2.6, 6.3.14)
- aim263: representation_map with **mapping_origin** as representation_item (see 6.1.4, 6.2.6, 6.3.14)
- aim264: representation_map as **camera_usage**

4.2.102 shape_definition_representation

- aim265: shape_definition_representation (no specific test purposes) (see 6.5.1, 6.5.2, 6.5.3)

4.2.103 shape_representation

- aim266: shape_representation as **faceted_brep_shape_representation** (see 6.1.1, 6.5.3)
- aim267: shape_representation as **elementary_brep_shape_representation** (see 6.2.1, 6.5.2)
- aim268: shape_representation as **advanced_brep_shape_representation** (see 6.3.1, 6.5.1)

4.2.104 conversion_based_unit

- aim269: conversion_based_unit with **conversion_factor** as measure_with_unit (see 6.2.5)
- aim270: conversion_based_unit with **name** as label (see 6.2.5)

4.2.105 derived_unit

- aim271: derived_unit with **elements** having at least one element as derived_unit_element

4.2.106 derived_unit_element

aim272: derived_unit_element with **unit** as named_unit

4.2.107 dimensional_exponents

aim273: dimensional_exponents (no specific test purposes) (see 6.1.1, 6.2.1, 6.3.1)

4.2.108 global_unit_assigned_context

aim274: global_unit_assigned_context with **units** having at least one element as derived_unit

aim275: global_unit_assigned_context with **units** having at least one element as named_unit (see 6.1.1, 6.2.1, 6.3.1)

4.2.109 length_measure_with_unit

aim276: length_measure_with_unit (no specific test purposes)

4.2.110 length_unit

aim277: length_unit (no specific test purposes) (see 6.1.1, 6.2.1, 6.3.1)

4.2.111 measure_with_unit

aim278: measure_with_unit with **unit_component** as derived_unit

aim279: measure_with_unit with **unit_component** as named_unit (see 6.2.5)

aim280: measure_with_unit with **value_component** as positive_length_measure

aim281: measure_with_unit with **value_component** as parameter_value

aim282: measure_with_unit with **value_component** as plane_angle_measure (see 6.2.5)

aim283: measure_with_unit with **value_component** as length_measure

aim284: measure_with_unit as **plane_angle_measure_with_unit** (see 6.2.5)

aim285: measure_with_unit as **length_measure_with_unit**

4.2.112 named_unit

aim286: named_unit with **dimensions** as dimensional_exponents (see 6.1.1, 6.2.1, 6.3.1)

aim287: named_unit as **plane_angle_unit** (see 6.2.5)

aim288: named_unit as **length_unit** (see 6.1.1)

aim289: named_unit as **conversion_based_unit** (see 6.2.5)

aim290: named_unit as **si_unit** (see 6.1.1)

4.2.113 **plane_angle_measure_with_unit**

aim291: plane_angle_measure_with_unit (no specific test purposes) (see 6.2.5)

4.2.114 **plane_angle_unit**

aim292: plane_angle_unit (no specific test purposes) (see 6.2.5)

4.2.115 **si_unit**

aim293: si_unit with **name** = radian (see 6.1.1)

aim294: si_unit with **name** = metre (see 6.1.1)

aim295: si_unit with **prefix** present as milli (see 6.1.1)

4.2.116 **background_colour**

aim296: background_colour with **presentation** as presentation_view

aim297: background_colour with **presentation** as presentation_area

4.2.117 **camera_image**

aim298: camera_image as **camera_image_3d_with_scale**

4.2.118 **camera_image_3d_with_scale**

aim299: camera_image_3d_with_scale (no specific test purposes)

4.2.119 **camera_model**

aim300: camera_model as **camera_model_d3** (see 6.6.1)