



# INTERNATIONAL STANDARD ISO 10303-203:1994 TECHNICAL CORRIGENDUM 2

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

### Part 203:

### Application protocol: Configuration controlled design

#### TECHNICAL CORRIGENDUM 2

*Systèmes d'automatisation industrielle et intégration — Représentation et échange de données de produits —  
Partie 203: Protocole d'application: Conception contrôlée de configuration*

*RECTIFICATIF TECHNIQUE 2*

Technical Corrigendum 2 to International Standard ISO 10303-203:1994 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 4, *Industrial data*.

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### **Introduction**

*This document corrects ISO 10303-203:1994, Industrial automation systems and integration — Product data representation and exchange — Part 203: Application protocol: Configuration controlled 3D designs of mechanical parts and assemblies. The corrected document supersedes ISO 10303-203:1994.*

*The primary purpose of the modifications to the text of ISO 10303-203:1994 is to change the structure and number of conformance classes. This change to the conformance classes documented in clause 6 also affects the Protocol Implementation Conformance Statement (PICS) proforma documented in annex C of the International Standard. This change affects only the requirements to conform to the protocol and does not change the data requirements of the overall International Standard. This change is being performed to facilitate the conformance of mechanical Computer Aided Design (CAD) systems. The original conformance classes still apply; additional, less comprehensive classes have been added.*

*In addition, several other corrections to the standard are enumerated.*

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## **Modifications to the text of ISO 10303-203:1994**

### **Foreword, p. viii**

Remove the box and enclosed text. Center on the page the following phrase:

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### **Clause 3.6, p. 8 and table of contents, p. ii**

Remove subclause 3.6.1 and renumber the other subsubclauses accordingly. The term is defined in ISO 10303-42 and is properly referenced in clause 3.3. Remove 3.6.1 and renumber the other subsubclause in the table of contents.

### **Clause 5.1, table 13, p. 83**

There was an erroneous tilde at the end of the 6th line of the reference path for the certification\_required attribute of supplied\_part\_version. Replace the reference path with the following:

```
product_definition_formation_with_specified_source <=
  product_definition_formation <-
    product_definition.formation
      product_definition <-
product_definition_relationship.related_product_definition
  product_definition_relationship =>
    supplied_part_relationship
certified_item = supplied_part_relationship
  certified_item <-
    cc_design_certification.items[i]
  cc_design_certification
```

### **Clause 5.1, table 13, p. 84**

The reference path for the supplier\_part\_number attribute of supplied\_part\_version is incorrect. The reference path through supplied\_part\_relationship is correctly a mapping rule. Replace the reference path with the following:

```
product_definition_formation_with_specified_source <=
  product_definition_formation
  {product_definition_formation <-
    product_definition.formation
      product_definition <-
product_definition_relationship.related_product_definition
  product_definition_relationship =>
    supplied_part_relationship}
product_definition_formation.of_product ->
  product
  product.id
```

### **Clause 5.1, table 13, p. 85**

The first line of the reference path for the assertion supplied\_part\_version to approval is missing. Replace the reference path with the following:

```
product_definition_formation_with_specified_source <=
  product_definition_formation
  {product_definition_formation <-
```

```

product_definition.formation
  product_definition <-
product_definition_relationship.related_product_definition
  product_definition_relationship =>
  supplied_part_relationship}
approved_item = product_definition_formation
  approved_item <-
  cc_design_approval.items[i]
  cc_design_approval

```

**Clause 5.1, table 13, p. 86**

The reference path for the assertion *supplier to supplied\_part\_version* is incomplete. Replace the reference path with the following:

```

organization <-
  person_and_organization.the_organization
  person_and_organization <-
person_and_organization_assignment.assigned_person_and_organization
  person_and_organization_assignment =>
  cc_design_person_and_organization_assignment
cc_design_person_and_organization_assignment.items[i] ->
  person_organization_item
  person_organization_item = product_definition_formation
  product_definition_formation =>
  product_definition_formation_with_specified_source

```

**Clause 5.2, p. 91; annex A, p. 289; annex B, p. 403; and annex H, diagram 11, p. 442**

Remove the line containing *cartesian\_transformation\_operator\_2d* from the USE statement for the *geometry\_schema*. Remove the entity *cartesian\_transformation\_operator\_2d* from annex A. In the entity *cartesian\_transformation\_operator* in annex A, replace the supertype of statement with the following:

```
SUPERTYPE OF (cartesian_transformation_operator_3d)
```

In annex B, remove the row containing the entity *cartesian\_transformation\_operator\_2d* and its corresponding short name from the short name table.

In annex H, remove the entity *cartesian\_transformation\_operator\_2d* and the lines denoting its relationships to other entities from the diagram. (See change page 442.)

**Clause 5.2, p. 91; annex A, p.296; annex B, p. 404; and annex H, diagram 18, p. 449**

As written below, add *degenerate\_toroidal\_surface* to the USE statement for the *geometry\_schema* between *degenerate\_pcurve* and *dimension\_count*.

```
degenerate_toroidal_surface,
```

As written below, add the entity *degenerate\_toroidal\_surface* to annex A following the entity *degenerate\_pcurve* and preceding the entity *design\_context*.

```

ENTITY degenerate_toroidal_surface
  SUBTYPE OF (toroidal_surface);
  select_outer : BOOLEAN;
  WHERE

```

```
wr1: (major_radius < minor_radius);
END_ENTITY; -- degenerate_toroidal_surface
```

In annex B, add a row containing the entity *degenerate\_toroidal\_surface* and its corresponding short name 'DGTRSR' to the short names table, as written below.

DEGENERATE_TOROIDAL_SURFACE	DGTRSR
-----------------------------	--------

In annex H, add a box labelled 'degenerate\_toroidal\_surface' connected to *toroidal\_surface* by a heavy line with an open circle at *degenerate\_toroidal\_surface* (designating that *degenerate\_toroidal\_surface* is a subtype of entity *toroidal\_surface*). Also add a fine line from *degenerate\_toroidal\_surface* labelled 'select\_outer' that terminates in an open circle (designating an attribute *select\_outer* of type *BOOLEAN*). (See change page 449.)

**Clause 5.2, p. 92; annex A, pp. 294 and 311; annex B, p. 406; and annex H, diagram 11, p. 443**  
Remove the line containing *offset\_curve\_2d* from the USE statement for the *geometry\_schema*.  
Remove the entity *offset\_curve\_2d* from annex A. In the entity *curve* in annex A, replace the supertype of statement with the following:

```
SUPERTYPE OF (ONEOF` (line, conic, pcurve, surface_curve, offset_curve_3d,
curve_replica))
```

In annex B, remove the row containing the entity *offset\_curve\_2d* and its corresponding short name from the short name table.

In annex II, remove the entity *offset\_curve\_2d* and the lines denoting its relationships to other entities from diagram 12. (See change page 443.)

**Clause 5.2.3.1.4, p. 113 and annex A, p. 304**

WR3 of the entity *geometrically\_bounded\_wireframe\_shape\_representation* is incorrect. Replace WR3 with the following:

```
WR3: SIZEOF (QUERY (gcs <* QUERY (it <* SELF\representation.items |
'CONFIG_CONTROL_DESIGN.GEOMETRIC_CURVE_SET' IN TYPEOF (it)) |
NOT (SIZEOF (QUERY (curv <* QUERY (elem <*
gcs\geometric_set.elements |
'CONFIG_CONTROL_DESIGN.CURVE' IN TYPEOF (elem)) |
NOT (valid_geometrically_bounded_wf_curve
(curv, 'CONFIG_CONTROL_DESIGN')))) = 0))) = 0;
```

**Clause 5.2.3.2.33, p. 146**

In the first paragraph, the reference to ISO 10303-41 is incorrect. Replace the paragraph with the following:

The base definition of the **representation** entity is given in ISO 10303-43. The following modifications apply to this part of ISO 10303.

**Clause 5.2.3.2.34, p. 146**

In the first paragraph, the reference to ISO 10303-41 is incorrect. Replace the paragraph with the following:

The base definition of the **representation\_context** entity is given in ISO 10303-43. The following

modifications apply to this part of ISO 10303.

**Clause 5.2.5.12, p. 226 and annex A, p. 373**

*In the segment of the function gbsf\_check\_curve restricting polyline to have at least three points, the inequality statement is incorrect and the call to the USEDIN function is also incorrect. Replace the function with the following:*

```

FUNCTION gbsf_check_curve (cv : curve; schema_name : STRING) : BOOLEAN;

-- check whether the input has the right type

IF NOT (schema_name + '.CURVE' IN TYPEOF (cv)) THEN RETURN(TRUE);
END_IF;

-- let those types pass that do not have any further references
-- respectively rules to be applied

IF SIZEOF ([schema_name + '.CIRCLE', schema_name + '.ELLIPSE'
* TYPEOF(cv)) = 1 THEN RETURN(TRUE);
ELSE

-- the b_spline_curve shall not self intersect

IF (schema_name + '.B_SPLINE_CURVE' IN TYPEOF(cv))
THEN RETURN(NOT (cv\b_spline_curve.self_intersect));
ELSE

-- if the curve is a composite_curve, all of its segments shall be valid

IF schema_name + '.COMPOSITE_CURVE' IN TYPEOF(cv) THEN
RETURN (SIZEOF (QUERY (seg <* cv\composite_curve.segments |
NOT (gbsf_check_curve(seg.parent_curve, schema_name)))) = 0);
ELSE

-- the curve_replica references other curves that need to be checked

IF schema_name + '.CURVE_REPLICA' IN TYPEOF(cv) THEN
RETURN (gbsf_check_curve
(cv\curve_replica.parent_curve, schema_name));
ELSE

-- offset_curve_3d references a curve and shall not self intersect

IF schema_name + '.OFFSET_CURVE_3D' IN TYPEOF(cv) THEN
RETURN ((gbsf_check_curve
(cv\offset_curve_3d.basis_curve, schema_name))
AND
(NOT cv\offset_curve_3d.self_intersect));
ELSE

-- pcurve references a curve - indirectly, and a basis_surface

IF schema_name + '.PCURVE' IN TYPEOF(cv) THEN
RETURN
((gbsf_check_curve

```

```

(cv\pcurve.reference_to_curve\representation.items[1],
schema_name)) AND
(gbsf_check_surface
(cv\pcurve.basis_surface, schema_name));
ELSE

-- polyline shall have at least 3 points and shall only
-- be used to represent an intersection_curve

IF schema_name + '.POLYLINE' IN TYPEOF(cv) THEN
  IF (SIZEOF (cv\polyline.points) >= 3) AND
    (SIZEOF ((bag_to_set (USEDIN (cv, '')) -
    bag_to_set (USEDIN (cv,
    schema_name +
    '.INTERSECTION_CURVE.CURVE_3D')))) = 0)
    THEN RETURN (TRUE);
  END_IF;
ELSE

-- surface_curve references a curve_3d and one or two
-- pcurves or one or two surface_curves or one of each

IF schema_name + '.SURFACE_CURVE' IN TYPEOF(cv) THEN

-- if the curve reference is correct, check also the rest

IF gbsf_check_curve
(cv\surface_curve.curve_3d, schema_name) THEN
  REPEAT i := 1 TO SIZEOF
    (cv\surface_curve.associated_geometry);

-- do for one or two associated_geometrys:

  IF schema_name + '.SURFACE' IN TYPEOF
    (cv\surface_curve.associated_geometry[i]) THEN
    IF NOT gbsf_check_surface
      (cv\surface_curve.associated_geometry[i],
      schema_name) THEN
      RETURN(FALSE);
    END_IF;
  ELSE
    IF schema_name + '.PCURVE' IN TYPEOF
      (cv\surface_curve.associated_geometry[i]) THEN
      IF NOT gbsf_check_curve
        (cv\surface_curve.associated_geometry[i],
        schema_name) THEN
        RETURN(FALSE);
      END_IF;
    END_IF;
  END IF;
END_REPEAT;
RETURN(TRUE);
END_IF;
ELSE

-- if the curve is a trimmed_curve

```



```

IF SIZEOF ([schema_name + '.CONICAL_SURFACE',
schema_name + '.CYLINDRICAL_SURFACE',
schema_name + '.PLANE'] * TYPEOF
(sf\curve_bounded_surface.basis_surface)) = 1 THEN
RETURN(SIZEOF (QUERY (bcurve < *
sf\curve_bounded_surface.boundaries |
NOT (gbsf_check_curve(bcurve, schema_name)))) = 0);
ELSE
-- recursively check the basis_surface and then the curves

IF gbsf_check_surface
(sf\curve_bounded_surface.basis_surface, schema_name) THEN
RETURN(SIZEOF (QUERY (bcurve < *
sf\curve_bounded_surface.boundaries |
NOT (gbsf_check_curve(bcurve, schema_name)))) = 0);
END_IF;
END_IF;
ELSE
-- offset_surface references a surface and shall not self_intersect

IF schema_name + '.OFFSET_SURFACE' IN TYPEOF(sf) THEN
RETURN ((gbsf_check_surface
(sf\offset_surface.basis_surface, schema_name))
AND
(NOT (sf\offset_surface.self_intersect)));
ELSE
-- rectangular_composite surface references a matrix of surfaces

IF schema_name + '.RECTANGULAR_COMPOSITE_SURFACE' IN TYPEOF(sf) THEN
REPEAT i := 1 TO SIZEOF
(sf\rectangular_composite_surface.segments);
REPEAT j := 1 TO SIZEOF
(sf\rectangular_composite_surface.segments[i]);
IF NOT (gbsf_check_surface
(sf\rectangular_composite_surface.segments[i][j].
parent_surface, schema_name))
THEN RETURN (FALSE);
END_IF;
END_REPEAT;
END_REPEAT;
RETURN(TRUE);
ELSE
-- rectangular_trimmed_surface has a basis_surface

IF schema_name + '.RECTANGULAR_TRIMMED_SURFACE' IN TYPEOF(sf) THEN

IF SIZEOF ([schema_name + '.CONICAL_SURFACE',
schema_name + '.CYLINDRICAL_SURFACE',
schema_name + '.PLANE'] * TYPEOF
(sf\rectangular_trimmed_surface.basis_surface)) = 1 THEN
RETURN (TRUE);
ELSE

```



```

6   : RETURN(( 1<= date.day_component) AND (date.day_component <= 30));
9   : RETURN(( 1<= date.day_component) AND (date.day_component <= 30));
11  : RETURN(( 1<= date.day_component) AND (date.day_component <= 30));
2   :
BEGIN
  IF leap_year(date.year_component)
  THEN
    RETURN(( 1<= date.day_component) AND (date.day_component <= 29));
  ELSE
    RETURN(( 1<= date.day_component) AND (date.day_component <= 28));
  END_IF;
END;
OTHERWISE : RETURN(TRUE);
END_CASE;
END_FUNCTION; -- valid_calendar_date

```

**Annex J, p. 471 and table of contents, p. iv**

*The computer-interpretable EXPRESS listing has been updated to reflect the changes made to annex A. Both the EXPRESS listing and the short names are being provided as a URL. A change page is provided for the affected area of the table of contents. Replace annex J with the following:*

## Annex J (informative)

### Computer interpretable listings

This annex provides a listing of the complete EXPRESS schema specified in annex A of this part of ISO 10303 without comments or other explanatory text. It also provides a listing of the EXPRESS entity names and corresponding short names as specified in annex B of this part of ISO 10303. The content of this annex is available in computer-interpretable form and can be found at the following URLs:

EXPRESS: <http://www.mel.nist.gov/step/parts/part203/is/tc2/>  
 Short names: <http://www.mel.nist.gov/div826/subject/apde/snr/>

If there is difficulty accessing these sites contact ISO Central Secretariat or contact the ISO TC 184/SC4 Secretariat directly at: [sc4sec@cme.nist.gov](mailto:sc4sec@cme.nist.gov).

NOTE - The information provided in computer-interpretable form at the above URLs is informative. The information that is contained in the body of this part of ISO 10303 is normative.

**Clause 6, pp. 243-269; annex C, pp. 412-413; annex E, page 415; and table of contents, p. iii-iv**  
*The purpose of the following modifications to the text of ISO 10303-203:1994 is to change the structure and number of conformance classes. In addition, a small number of typographical and editorial errors has been corrected. The corrections to clause 6 and annex C of ISO 10303-203:1994 have been documented in change pages for readability. The following pages replace clause 6 and annexes C and E of ISO 10303-203:1994 in their entirety. A replacement page for the affected portion of the table of contents is also provided.*

*Pages 257 to 269 in ISO 10303-203:1994 become blank pages as clause 6 has been shortened.*

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4.1.11 part_identification.....	14
4.1.12 shape.....	14
4.1.13 source_control.....	14
4.1.14 wireframe_with_topology.....	15
4.2 Application objects.....	15
4.3 Application assertions.....	33
5 Application interpreted model.....	39
5.1 Mapping table.....	39
5.2 AIM EXPRESS short listing.....	89
5.2.1 Fundamental concepts and assumptions.....	96
5.2.2 Configuration controlled design constants.....	99
5.2.3 Configuration controlled design entities.....	102
5.2.4 Configuration controlled design rules.....	150
5.2.5 Configuration controlled design functions.....	209
6 Conformance requirements.....	243
6.1 Conformance class 1a entities.....	244
6.2 Conformance class 1b entities.....	245
6.3 Conformance class 2 entities.....	247
6.4 Conformance class 3 entities.....	250
6.5 Conformance class 4 entities.....	251
6.6 Conformance class 5 entities.....	253
6.7 Conformance class 6 entities.....	254
A AIM EXPRESS expanded listing.....	270
B AIM short names of entities.....	401
C Protocol Implementation Conformance Statement (PICS) proforma.....	412
D Implementation method specific requirements.....	414
E Information object registration.....	415
E.1 Document identification.....	415
E.2 Schema identification.....	415
E.2.1 config_control_design expanded schema.....	415
E.2.2 config_control_design short form schema.....	415
F Application activity model.....	416
F.1 AAM definitions.....	417
F.2 AAM Diagrams.....	420

G Application reference model .....	423
H AIM EXPRESS-G .....	431
J Computer interpretable listings.....	471
K Application protocol usage guide.....	472
K.1 Usage test purposes .....	472
K.2 Example part.....	476
L Bibliography .....	481
Index.....	482

## Figures

Figure F.1 - IDEF0 basic notation.....	416
Figure F.2 - A0 Manage product development in IDEF0 .....	421
Figure F.3 - A3 Develop product design in IDEF0.....	422
Figure G.1 - ARM diagram 1 of 7 in IDEF1X.....	424
Figure G.2 - ARM diagram 2 of 7 in IDEF1X.....	425
Figure G.3 - ARM diagram 3 of 7 in IDEF1X.....	426
Figure G.4 - ARM diagram 4 of 7 in IDEF1X.....	427
Figure G.5 - ARM diagram 5 of 7 in IDEF1X.....	428
Figure G.6 - ARM diagram 6 of 7 in IDEF1X.....	429
Figure G.7 - ARM diagram 7 of 7 in IDEF1X.....	430
Figure H.1 - application context - AIM EXPRESS-G diagram 1 of 39.....	432
Figure H.2 - product definition - AIM EXPRESS-G diagram 2 of 39.....	433
Figure H.3 - product category - AIM EXPRESS-G diagram 3 of 39 .....	434
Figure H.4 - property definition - AIM EXPRESS-G diagram 4 of 39 .....	435
Figure H.5 - property representation - AIM EXPRESS-G diagram 5 of 39 .....	436
Figure H.6 - shape representation relationship - AIM EXPRESS-G diagram 6 of 39.....	437
Figure H.7 - representation - AIM EXPRESS-G diagram 7 of 39.....	438
Figure H.8 - geometric representation items - AIM EXPRESS-G diagram 8 of 39.....	439
Figure H.9 - topological representation items AIM EXPRESS-G diagram 9 of 39.....	440
Figure H.10 - point - AIM EXPRESS-G diagram 10 of 39 .....	441
Figure H.11 - geometric orientation - AIM EXPRESS-G diagram 11 of 39.....	442
Figure H.12 - curve - AIM EXPRESS-G diagram 12 of 39.....	443
Figure H.13 - conic - AIM EXPRESS-G diagram 13 of 39.....	444
Figure H.14 - bounded curves - AIM EXPRESS-G diagram 14 of 39 .....	445
Figure H.15 - surface curve - AIM EXPRESS-G diagram 15 of 39.....	446
Figure H.16 - b-spline curve - AIM EXPRESS-G diagram 16 of 39.....	447
Figure H.17 - surface - AIM EXPRESS-G diagram 17 of 39.....	448

## 6 Conformance requirements

Conformance to this part of ISO 10303 includes satisfying the requirements stated in this part, the requirements of the implementation method(s) supported, and the relevant requirements of the normative references.

An implementation shall support at least one of the following implementation methods: ISO 10303-21. Requirements with respect to implementation methods are specified in annex D.

The Protocol Information Conformance Statement (PICS) proforma lists the options or the combinations of options that may be included in the implementation. The PICS proforma is provided in annex C.

NOTE - ISO 10303-303<sup>1)</sup> defines the abstract test suite to be used in the assessment of conformance. ISO 10103-32 describes the conformance assessment process.

This part of ISO 10303 provides for a number of options that may be supported by an implementation. These options have been grouped into conformance classes. Twelve conformance classes are defined. Conformance to this part of ISO 10303 requires, as a minimum, conformance to class 1a. Class 1b is a superset of 1a. Options are defined by classes 2 through 6 and may be selected by an implementation in addition to 1a or 1b. Conformance to a particular conformance class requires that all AIM entities, types, and associated constraints defined as part of that class be supported. Support for a particular conformance class requires support of all the options specified in this class.

The conformance classes are characterized as follows:

- Class 1a: Product identification without shape;
- Class 1b: Configuration-controlled design information without shape;
- Class 2a: Class 1a and shapes represented by geometrically bounded wireframe models, surface models, or both;
- Class 2b: Class 1b and shapes represented by geometrically bounded wireframe models, surface models, or both;
- Class 3a: Class 1a and shapes represented by wireframe models with topology;
- Class 3b: Class 1b and shapes represented by wireframe models with topology;
- Class 4a: Class 1a and shapes represented by manifold surface models with topology;
- Class 4b: Class 1b and shapes represented by manifold surface models with topology;
- Class 5a: Class 1a and shapes represented by faceted b-rep;

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2) To be published.

- Class 5b: Class 1b and shapes represented by faceted b-rep;
- Class 6a: Class 1a and shapes represented by advanced b-rep;
- Class 6b: Class 1b and shapes represented by advanced b-rep.

Class 1a is a prerequisite for classes 2 through 6. If an implementation conforms to any of classes 2 through 6, then it shall also conform to class 1a.

Conformance classes 2 through 6 are defined in terms of required AIM **shape\_representation** subtypes listed in Table 15. Each **shape\_representation** subtype specifies in its local domain rules all of the AIM constructs that define the corresponding conformance class.

shape_representation subtype	class 2	class 3	class 4	class 5	class 6
geometrically_bounded_surface_shape_representation	X				
geometrically_bounded_wireframe_shape_representation	X				
edge_based_wireframe_shape_representation		X			
shell_based_wireframe_shape_representation		X			
manifold_surface_shape_representation			X		
faceted_brep_shape_representation				X	
advanced_brep_shape_representation					X

### 6.1 Conformance class 1a entities

An implementation of conformance class 1a of this part of ISO 10303 shall support the following entities and related constructs:

- application\_context;
- application\_context\_element;
- application\_protocol\_definition;
- approval;
- approval\_assignment;
- approval\_date\_time;
- approval\_person\_organization;
- approval\_role;
- approval\_status;
- calendar\_date;
- cc\_design\_approval;
- cc\_design\_date\_and\_time\_assignment;
- cc\_design\_person\_and\_organization\_assignment;
- cc\_design\_security\_classification;

- coordinated\_universal\_time\_offset;
- date;
- date\_and\_time;
- date\_and\_time\_assignment;
- date\_time\_role;
- design\_context;
- local\_time;
- mechanical\_context;
- organization;
- person;
- person\_and\_organization;
- person\_and\_organization\_assignment;
- person\_and\_organization\_role;
- product;
- product\_category;
- product\_category\_relationship;
- product\_context;
- product\_definition;
- product\_definition\_context;
- product\_definition\_formation;
- product\_definition\_formation\_with\_specified\_source;
- product\_definition\_shape;
- product\_related\_product\_category;
- property\_definition;
- security\_classification;
- security\_classification\_assignment;
- security\_classification\_level.

## 6.2 Conformance class 1b entities

An implementation of conformance class 1b of this part of ISO 10303 shall support class 1a plus the following entities and related constructs:

- action;
- action\_assignment;
- action\_directive;
- action\_method;
- action\_request\_assignment;
- action\_request\_solution;
- action\_request\_status;
- action\_status;
- address;
- alternate\_product\_relationship;
- approval\_relationship;
- area\_measure\_with\_unit;
- area\_unit;
- assembly\_component\_usage;
- assembly\_component\_usage\_substitute;
- cc\_design\_certification;
- cc\_design\_contract;
- cc\_design\_specification\_reference;
- certification;

- certification\_assignment;
- certification\_type;
- change;
- change\_request;
- configuration\_design;
- configuration\_effectivity;
- configuration\_item;
- context\_dependent\_unit;
- contract;
- contract\_assignment;
- contract\_type;
- conversion\_based\_unit;
- dated\_effectivity;
- design\_make\_from\_relationship;
- dimensional\_exponents;
- directed\_action;
- document;
- document\_reference;
- document\_relationship;
- document\_type;
- document\_usage\_constraint;
- document\_with\_class;
- effectivity;
- executed\_action;
- length\_measure\_with\_unit;
- length\_unit;
- lot\_effectivity;
- mass\_measure\_with\_unit;
- mass\_unit;
- measure\_with\_unit;
- named\_unit;
- next\_assembly\_usage\_occurrence;
- ordinal\_date;
- organization\_relationship;
- organizational\_address;
- organizational\_project;
- personal\_address;
- product\_concept;
- product\_concept\_context;
- product\_definition\_effectivity;
- product\_definition\_relationship;
- product\_definition\_usage;
- product\_definition\_with\_associated\_documents;
- promissory\_usage\_occurrence;
- quantified\_assembly\_component\_usage;
- serial\_numbered\_effectivity;
- shape\_aspect;
- shape\_aspect\_relationship;
- si\_unit;
- specified\_higher\_usage\_occurrence;
- start\_request;

- start\_work;
- supplied\_part relationship;
- versioned\_action\_request;
- volume\_measure\_with\_unit;
- volume\_unit;
- week\_of\_year\_and\_day\_date.

### 6.3 Conformance class 2 entities

An implementation of conformance class 2 of this part of ISO 10303 shall support class 1a or 1b (designated as 2a, 2b) and the following entities and related constructs:

- axis1\_placement;
- axis2\_placement\_2d;
- axis2\_placement\_3d;
- b\_spline\_curve;
- b\_spline\_curve\_with\_knots;
- b\_spline\_surface;
- b\_spline\_surface\_with\_knots;
- bezier\_curve;
- bezier\_surface;
- boundary\_curve;
- bounded\_curve;
- bounded\_surface;
- cartesian\_point;
- cartesian\_transformation\_operator;
- cartesian\_transformation\_operator\_3d;
- circle;
- composite\_curve;
- composite\_curve\_on\_surface;
- composite\_curve\_segment;
- conic;
- conical\_surface;
- context\_dependent\_shape\_representation;
- curve;
- curve\_bounded\_surface;
- curve\_replica;
- cylindrical\_surface;
- definitional\_representation;
- degenerate\_pcurve;
- degenerate\_toroidal\_surface;
- direction;
- elementary\_surface;
- ellipse;
- evaluated\_degenerate\_pcurve;
- functionally\_defined\_transformation;
- geometric\_curve\_set;
- geometric\_representation\_context;
- geometric\_representation\_item;
- geometric\_set;
- geometrically\_bounded\_surface\_shape\_representation;
- geometrically\_bounded\_wireframe\_shape\_representation;

- global\_uncertainty\_assigned\_context;
- global\_unit\_assigned\_context;
- hyperbola;
- intersection\_curve;
- item\_defined\_transformation;
- line;
- mapped\_item;
- offset\_curve\_3d;
- offset\_surface;
- outer\_boundary\_curve;
- parabola;
- parametric\_representation\_context;
- pcurve;
- placement;
- plane;
- plane\_angle\_measure\_with\_unit;
- plane\_angle\_unit;
- point;
- point\_on\_curve;
- point\_on\_surface;
- point\_replica;
- polyline;
- property\_definition\_representation;
- quasi\_uniform\_curve;
- quasi\_uniform\_surface;
- rational\_b\_spline\_curve;
- rational\_b\_spline\_surface;
- rectangular\_composite\_surface;
- rectangular\_trimmed\_surface;
- reparametrised\_composite\_curve\_segment;
- representation;
- representation\_context;
- representation\_item;
- representation\_map;
- representation\_relationship;
- representation\_relationship\_with\_transformation;
- seam\_curve;
- shape\_aspect;
- shape\_aspect\_relationship;
- shape\_definition\_representation;
- shape\_representation;
- shape\_representation\_relationship;
- solid\_angle\_measure\_with\_unit;
- solid\_angle\_unit;
- spherical\_surface;
- surface;
- surface\_curve;
- surface\_of\_linear\_extrusion;
- surface\_of\_revolution;
- surface\_patch;
- surface\_replica;

- swept\_surface;
- toroidal\_surface;
- trimmed\_curve;
- uncertainty\_measure\_with\_unit;
- uniform\_curve;
- uniform\_surface;
- vector.

## 6.4 Conformance class 3 entities

An implementation of conformance class 3 of this part of ISO 10303 shall support class 1a or 1b (designated as 3a, 3b) and the following entities and related constructs:

- axis2\_placement\_3d;
- b\_spline\_curve;
- b\_spline\_curve\_with\_knots;
- bezier\_curve;
- bounded\_curve;
- cartesian\_point;
- cartesian\_transformation\_operator;
- cartesian\_transformation\_operator\_3d;
- circle;
- conic;
- connected\_edge\_set;
- context\_dependent\_shape\_representation;
- curve;
- curve\_replica;
- direction;
- edge;
- edge\_based\_wireframe\_model;
- edge\_based\_wireframe\_shape\_representation;
- edge\_curve;
- edge\_loop;
- ellipse;
- functionally\_defined\_transformation;
- geometric\_representation\_context;
- geometric\_representation\_item;
- global\_uncertainty\_assigned\_context;
- global\_unit\_assigned\_context;
- hyperbola;
- item\_defined\_transformation;
- line;
- loop;
- mapped\_item;
- offset\_curve\_3d;
- oriented\_edge;
- parabola;
- path;
- placement;
- plane\_angle\_measure\_with\_unit;
- plane\_angle\_unit;
- point;

- point\_replica;
- polyline;
- property\_definition\_representation;
- quasi\_uniform\_curve;
- rational\_b\_spline\_curve;
- representation;
- representation\_context;
- representation\_item;
- representation\_map;
- representation\_relationship;
- representation\_relationship\_with\_transformation;
- shape\_aspect;
- shape\_aspect\_relationship;
- shape\_definition\_representation;
- shape\_representation;
- shape\_representation\_relationship;
- shell\_based\_wireframe\_model;
- shell\_based\_wireframe\_shape\_representation;
- solid\_angle\_measure\_with\_unit;
- solid\_angle\_unit;
- topological\_representation\_item;
- uncertainty\_measure\_with\_unit;
- uniform\_curve;
- vector;
- vertex;
- vertex\_loop;
- vertex\_point;
- vertex\_shell;
- wire\_shell.

## 6.5 Conformance class 4 entities

An implementation of conformance class 4 of this part of ISO 10303 shall support class 1a or 1b (designated as 4a, 4b) and the following entities and related constructs:

- advanced\_face;
- axis1\_placement;
- axis2\_placement\_2d;
- axis2\_placement\_3d;
- b\_spline\_curve;
- b\_spline\_curve\_with\_knots;
- b\_spline\_surface;
- b\_spline\_surface\_with\_knots;
- bezier\_curve;
- bezier\_surface;
- bounded\_curve;
- bounded\_surface;
- cartesian\_point;
- cartesian\_transformation\_operator;
- cartesian\_transformation\_operator\_3d;
- circle;

- closed\_shell;
- composite\_curve;
- composite\_curve\_on\_surface;
- composite\_curve\_segment;
- conic;
- conical\_surface;
- connected\_face\_set;
- context\_dependent\_shape\_representation;
- curve;
- curve\_replica;
- cylindrical\_surface;
- definitional\_representation;
- degenerate\_pcurve;
- degenerate\_toroidal\_surface;
- direction;
- edge;
- edge\_curve;
- edge\_loop;
- elementary\_surface;
- ellipse;
- evaluated\_degenerate\_pcurve;
- face;
- face\_bound;
- face\_outer\_bound;
- face\_surface;
- functionally\_defined\_transformation;
- geometric\_representation\_context;
- geometric\_representation\_item;
- global\_uncertainty\_assigned\_context;
- global\_unit\_assigned\_context;
- hyperbola;
- intersection\_curve;
- item\_defined\_transformation;
- line;
- loop;
- manifold\_surface\_shape\_representation;
- mapped\_item;
- offset\_curve\_3d;
- offset\_surface;
- open\_shell;
- oriented\_closed\_shell;
- oriented\_edge;
- oriented\_face;
- oriented\_open\_shell;
- oriented\_path;
- parabola;
- parametric\_representation\_context;
- path;
- pcurve;
- placement;
- plane;
- plane\_angle\_measure\_with\_unit;

- plane\_angle\_unit;
- point;
- point\_on\_curve;
- point\_on\_surface;
- polyline;
- property\_definition\_representation;
- quasi\_uniform\_curve;
- quasi\_uniform\_surface;
- rational\_b\_spline\_curve;
- rational\_b\_spline\_surface;
- representation;
- representation\_context;
- representation\_item;
- representation\_map;
- representation\_relationship;
- representation\_relationship\_with\_transformation;
- seam\_curve;
- shape\_aspect;
- shape\_aspect\_relationship;
- shape\_definition\_representation;
- shape\_representation;
- shape\_representation\_relationship;
- shell\_based\_surface\_model;
- solid\_angle\_measure\_with\_unit;
- solid\_angle\_unit;
- spherical\_surface;
- surface;
- surface\_curve;
- surface\_of\_linear\_extrusion;
- surface\_of\_revolution;
- surface\_replica;
- swept\_surface;
- topological\_representation\_item;
- toroidal\_surface;
- uncertainty\_measure\_with\_unit;
- uniform\_curve;
- uniform\_surface;
- vector;
- vertex;
- vertex\_loop;
- vertex\_point.

## 6.6 Conformance class 5 entities

An implementation of conformance class 5 of this part of ISO 10303 shall support class 1a or 1b (designated as 5a, 5b) and the following entities and related constructs:

- axis2\_placement\_3d;
- brep\_with\_voids;
- cartesian\_point;
- cartesian\_transformation\_operator;

- cartesian\_transformation\_operator\_3d;
- closed\_shell;
- connected\_face\_set;
- context\_dependent\_shape\_representation;
- direction;
- edge;
- elementary\_surface;
- face;
- face\_bound;
- face\_outer\_bound;
- face\_surface;
- faceted\_brep;
- faceted\_brep\_shape\_representation;
- functionally\_defined\_transformation;
- geometric\_representation\_context;
- geometric\_representation\_item;
- global\_uncertainty\_assigned\_context;
- global\_unit\_assigned\_context;
- item\_defined\_transformation;
- loop;
- manifold\_solid\_brep;
- mapped\_item;
- open\_shell;
- oriented\_closed\_shell;
- oriented\_edge;
- oriented\_face;
- oriented\_open\_shell;
- oriented\_path;
- path;
- placement;
- plane;
- plane\_angle\_measure\_with\_unit;
- plane\_angle\_unit;
- point;
- poly\_loop;
- property\_definition\_representation;
- representation;
- representation\_context;
- representation\_item;
- representation\_map;
- representation\_relationship;
- representation\_relationship\_with\_transformation;
- shape\_aspect;
- shape\_aspect\_relationship;
- shape\_definition\_representation;
- shape\_representation;
- shape\_representation\_relationship;
- solid\_angle\_measure\_with\_unit;
- solid\_angle\_unit;
- solid\_model;
- surface;
- topological\_representation\_item;

- uncertainty\_measure\_with\_unit;
- vector;
- vertex.

## 6.7 Conformance class 6 entities

An implementation of conformance class 6 of this part of ISO 10303 shall support class 1a or 1b (designated as 6a, 6b) and the following entities and related constructs:

- advanced\_brep\_shape\_representation;
- advanced\_face;
- axis1\_placement;
- axis2\_placement\_2d;
- axis2\_placement\_3d;
- b\_spline\_curve;
- b\_spline\_curve\_with\_knots;
- b\_spline\_surface;
- b\_spline\_surface\_with\_knots;
- bezier\_curve;
- bezier\_surface;
- bounded\_curve;
- bounded\_surface;
- brep\_with\_voids;
- cartesian\_point;
- cartesian\_transformation\_operator;
- cartesian\_transformation\_operator\_3d;
- circle;
- closed\_shell;
- composite\_curve;
- composite\_curve\_on\_surface;
- composite\_curve\_segment;
- conic;
- conical\_surface;
- connected\_face\_set;
- context\_dependent\_shape\_representation;
- curve;
- cylindrical\_surface;
- definitional\_representation;
- degenerate\_toroidal\_surface;
- direction;
- edge;
- edge\_curve;
- edge\_loop;
- elementary\_surface;
- ellipse;
- face;
- face\_bound;
- face\_outer\_bound;
- face\_surface;
- functionally\_defined\_transformation;
- geometric\_representation\_context;

- geometric\_representation\_item;
- global\_uncertainty\_assigned\_context;
- global\_unit\_assigned\_context;
- hyperbola;
- item\_defined\_transformation;
- line;
- loop;
- manifold\_solid\_brep;
- mapped\_item;
- open\_shell;
- oriented\_closed\_shell;
- oriented\_edge;
- oriented\_face;
- oriented\_open\_shell;
- oriented\_path;
- parabola;
- parametric\_representation\_context;
- path;
- pcurve;
- placement;
- plane;
- plane\_angle\_measure\_with\_unit;
- plane\_angle\_unit;
- point;
- polyline;
- property\_definition\_representation;
- quasi\_uniform\_curve;
- quasi\_uniform\_surface;
- rational\_b\_spline\_curve;
- rational\_b\_spline\_surface;
- representation;
- representation\_context;
- representation\_item;
- representation\_map;
- representation\_relationship;
- representation\_relationship\_with\_transformation;
- shape\_aspect;
- shape\_aspect\_relationship;
- shape\_definition\_representation;
- shape\_representation;
- shape\_representation\_relationship;
- solid\_angle\_measure\_with\_unit;
- solid\_angle\_unit;
- solid\_model;
- spherical\_surface;
- surface;
- surface\_curve;
- surface\_of\_linear\_extrusion;
- surface\_of\_revolution;
- swept\_surface;
- topological\_representation\_item;
- toroidal\_surface;

- uncertainty\_measure\_with\_unit;
- uniform\_curve;
- uniform\_surface;
- vector;
- vertex;
- vertex\_loop;
- vertex\_point.

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## Annex C (normative)

### Protocol Implementation Conformance Statement (PICS) proforma

#### Overview:

The Protocol Information and Conformance Statement (PICS) proforma supports the conformance assessment of implementations requesting evaluation to this international standard. The PICS proforma contains a series of questions which capture static information about the implementation under test (IUT). This information is used in both statically assessing valid option selection, and in configuring an appropriate conformance test (dynamic assessment) session.

A number of options are identified in this standard for possible use by conforming implementations. Some of these options may be dynamically (run-time) selected for use/non-use, for instance, OPTIONAL attributes of an entity. Others shall be statically (configuration-time) selected for use/non-use, such as a particular style of geometry as defined in a conformance class.

#### Questions:

For simplicity of reference, an identifier for the product or system with which the tested ISO 10303 implementation is packaged in and/or procured by is required.

1. Product/system identifier (or name): \_\_\_\_\_

A conforming implementation shall provide at least conformance class 1a functionality for ISO 10303-203. There are twelve classes defined in this international standard. Each class specifies a subset of ISO 10303-203 AIM constructs. These classes are detailed in clause 6 of this document.

2. Claimed classes of conformance (functionality) - circle choices:

- 1a-(Product identification without shape)
- 1b-(Configuration-controlled design information without shape)
- 2a-(Product identification & Surface & Wireframe & No Topology)
- 2b-(Configuration-controlled design information & Surface & Wireframe & No Topology)
- 3a-(Product identification & Wireframe & Topology)
- 3b-(Configuration-controlled design information & Wireframe & Topology)
- 4a-(Product identification & Manifold Surfaces & Topology)
- 4b-(Configuration-controlled design information & Manifold Surfaces & Topology)
- 5a-(Product identification & Faceted BREP)
- 5b-(Configuration-controlled design information & Faceted BREP)
- 6a-(Product identification & Advanced BREP)
- 6b-(Configuration-controlled design information & Advanced BREP)

Conformance to this international standard may be realized in one or more of several different implementation methods. The implementation methods define what types of exchange behavior are required with respect to this International Standard.

3. Claimed implementation forms - circle choices:

exchange structure (ISO 10303-21)

If the implementation receives data that does not comply with the requirements in this International Standard for the selected conformance class(es), or with the requirements of the ISO 10303-20 series of parts for the selected implementation method, it shall execute a default response. A default response shall be statically set.

4. Default Response: \_\_\_\_\_

A conforming implementation shall maintain the static options selected throughout subsequent dynamic assessment (testing) without requiring modification. In a user environment, a conforming implementation shall permanently maintain the provision of selected static options, or it shall provide users discretionary control over the changing and setting of the static options, or both (depending on the option).

5. Does the IUT provide some user discretion over the changing and setting of static options?

Yes or No

6. If yes, which ones?

(a) Conformance class(es): \_\_\_\_\_

(b) Default response: \_\_\_\_\_

A statement of conformance shall include identification of at least one party deeming conformance for the implementation.

7. Evaluator(s) (tester/certifier/accrediter): \_\_\_\_\_

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