



INTERNATIONAL STANDARD ISO 10303-105:1996
TECHNICAL CORRIGENDUM 2

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

Part 105:

Integrated application resource: Kinematics

TECHNICAL CORRIGENDUM 2

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

Partie 105: Ressource d'application intégrée: Cinématique

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Technical Corrigendum 2 to International Standard ISO 10303-105:1996 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 4, *Industrial data*.

Introduction

This document corrects ISO 10303-105:1996, Product data representation and exchange - Part 105: Integrated application resource: Kinematics. The corrected document supersedes ISO 10303-105:1996 as amended by ISO 10303-105:1996/Cor. 1:2000.

The purpose of the modifications to the text of ISO 10303-105:1996 is to correct errors in the EXPRESS definitions likely to cause compilation problems, to replace the URL in the annex for the computer-interpretable EXPRESS, and to replace the object identifier for the document and the modified schema.

Modifications to the text of ISO 10303-105:1996

Clause 5, p. 6

The EXPRESS specification for the kinematic_structure_schema contained logical errors in the reference from the geometry_schema. Remove the following:

```
REFERENCE FROM geometry_schema
(axis2_placement_3d,
 cartesian_transformation_operator_3d,
 curve,
 direction,
 geometric_representation_context,
 normalise,
 point,
 point_on_curve,
 point_on_surface,
 surface,
 rectangular_trimmed_surface,
 trimmed_curve);
```

Replace with the following:

```
REFERENCE FROM geometry_schema
(axis2_placement_3d,
 cartesian_transformation_operator_3d,
 curve,
 direction,
 geometric_representation_context,
 geometric_representation_item,
 normalise,
 point,
 point_on_curve,
 point_on_surface,
 surface,
 rectangular_trimmed_surface,
 trimmed_curve);
```

Clause 5.4.6, p. 17

The EXPRESS specification for mechanism_base_placement had an additional group qualifier for **WR3**: that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```
*)
ENTITY mechanism_base_placement
  SUBTYPE OF (representation_relationship_with_transformation);
  base_of_mechanism : mechanism;
  SELF\representation_relationship_with_transformation.
    transformation_operator : cartesian_transformation_operator_3d;
DERIVE
  SELF\representation_relationship.rep_2
    : kinematic_link_representation
    := representation_of_link (base_of_mechanism.base);
UNIQUE
  UR1: base_of_mechanism;
WHERE
  WR1: ('KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_GROUND_REPRESENTATION' IN
```

```

        TYPEOF (SELF\representation_relationship.rep_1))
    OR
    ('KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_LINK_REPRESENTATION' IN
        TYPEOF (SELF\representation_relationship.rep_1));
    WR2: suitably_based_mechanism (SELF, base_of_mechanism);
    WR3: SELF\representation_relationship_with_transformation.
        transformation_operator IN
        SELF\representation_relationship.rep_1.items;
END_ENTITY;
(*)

```

Clause 5.4.12, p. 21

The EXPRESS specification for the kinematic_link_representation had an additional group qualifier for the link_frame attribute that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY kinematic_link_representation
  SUBTYPE OF (representation);
  SELF\representation.context_of_items :
    geometric_representation_context;
DERIVE
  link_frame : geometric_representation_context
              := SELF\representation.context_of_items;
INVERSE
  link_representation_relation :
    kinematic_link_representation_relation FOR geometric_aspects;
WHERE
  WR1: SIZEOF (QUERY (item <* SELF\representation.items |
    NOT (('KINEMATIC_STRUCTURE_SCHEMA.RIGID_PLACEMENT' IN
      TYPEOF (item))
    OR
    ('GEOMETRY_SCHEMA.CARTESIAN_TRANSFORMATION_OPERATOR_3D' IN
      TYPEOF (item)))) ) = 0;
END_ENTITY;
(*)

```

Clause 5.4.16, p. 24

The EXPRESS specification for the kinematic_frame_background_representation_association had an additional group qualifier for **WR3**: that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY kinematic_frame_background_representation_association
  SUBTYPE OF (representation_relationship_with_transformation);
  SELF\representation_relationship_with_transformation.
    transformation_operator : kinematic_frame_based_transformation;
WHERE
  WR1: 'KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_LINK_REPRESENTATION' IN
    TYPEOF (SELF\representation_relationship.rep_1);
  WR2:
    'KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_FRAME_BACKGROUND_REPRESENTATION'
    IN TYPEOF (SELF\representation_relationship.rep_2);
  WR3: SELF\representation_relationship_with_transformation.

```

```

transformation_operator\kinematic_frame_based_transformation.
    transformator IN
        SELF\representation_relationship.rep_1.items;
END_ENTITY;
(*)

```

Clause 5.4.37, p. 43

The EXPRESS specification for the *universal_pair* had an additional group qualifier for **WR1**: that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY universal_pair
    SUBTYPE OF (kinematic_pair);
    input_skew_angle : OPTIONAL plane_angle_measure;
DERIVE
    skew_angle : plane_angle_measure := NVL (input_skew_angle, 0.0);
WHERE
    WR1: COS (plane_angle_for_pair_in_radian (SELF, skew_angle))
        > 0.0;
END_ENTITY;
(*)

```

Clause 5.4.68, p. 79

The EXPRESS specification for the *rack_and_pinion_pair_value* had an additional group qualifier for the *actual_rotation* attribute that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
ENTITY rack_and_pinion_pair_value
    SUBTYPE OF (pair_value);
    SELF\pair_value.applies_to_pair : rack_and_pinion_pair;
    actual_displacement : length_measure;
DERIVE
    actual_rotation : plane_angle_measure
        := convert_plane_angle_for_pair_from_radian
            (SELF\pair_value.applies_to_pair,
             (- actual_displacement /
              SELF\pair_value.applies_to_pair\
                rack_and_pinion_pair.pinion_radius));
END_ENTITY;
(*)

```

Clause 5.5.3, p. 82

The EXPRESS specification for the *suitably_based_mechanism* had an additional group qualifier for the *klrep* and the *kgrep* variables that is not allowed. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
FUNCTION suitably_based_mechanism (mbp : mechanism_base_placement;
                                     mech : mechanism) : BOOLEAN;
    LOCAL
        kprop : kinematic_property_definition;

```

```

kgrep  : kinematic_ground_representation;
klrep  : kinematic_link_representation;
klnk   : kinematic_link;
kjnts  : BAG OF kinematic_joint;
nmechs : BAG OF mechanism;
nmbps  : BAG OF mechanism_base_placement;
END_LOCAL;

kprop := mech.containing_property;

IF ('KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_GROUND_REPRESENTATION' IN
    TYPEOF (mbp\representation_relationship.rep_1)) THEN
    kgrep := mbp\representation_relationship.rep_1;

    IF (kgrep.property\property_definition_representation.definition
        :=: kprop) THEN
        RETURN (TRUE);
    ELSE
        RETURN (FALSE);
    END_IF;
ELSE
    klrep := mbp\representation_relationship.rep_1;
    klnk  := klrep.link_representation_relation.topological_aspects;
    kjnts := USEDIN (klnk,
        'KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_JOINT.FIRST_LINK') +
        USEDIN (klnk,
        'KINEMATIC_STRUCTURE_SCHEMA.KINEMATIC_JOINT.SECOND_LINK');
    nmechs := USEDIN (kjnts[1].structure,
        'KINEMATIC_STRUCTURE_SCHEMA.MECHANISM.STRUCTURE_DEFINITION');

    IF (nmechs[1] :=: mech) THEN
        RETURN (FALSE);
    ELSE
        IF (nmechs[1].containing_property :=<: kprop) THEN
            RETURN (FALSE);
        ELSE
            nmbps := USEDIN (nmechs[1], 'KINEMATIC_STRUCTURE_SCHEMA.' +
                'MECHANISM_BASE_PLACEMENT.BASE_OF_MECHANISM');

            IF (SIZEOF (nmbps) = 0) THEN
                RETURN (FALSE);
            ELSE
                RETURN (suitably_based_mechanism (nmbps[1], mech));
            END_IF;
        END_IF;
    END_IF;
END_IF;
END_FUNCTION;
(*

```

Clause 5.5.6, p. 90

The EXPRESS specification for the frame_associated_to_background had an additional group qualifier for the ass_bag and trm_bag variables that is not allowed in the FUNCTION REPEAT and an additional group qualifier in the definition of the rep_bag variable within the FUNCTION. The ass_bag variable constructor did not ensure that the REPRESENTATION_RELATIONSHIP was of type KINEMATIC_FRAME_BACKGROUND_-REPRESENTATION_ASSOCIATION. The rep_bag had the USEDIN replaced with a QUERY to ensure that the background was in the correct schema. Remove the EXPRESS specification and replace with the following:

EXPRESS specification:

```

*)
FUNCTION frame_associated_to_background
  (frame      : rigid_placement;
   background : kinematic_frame_background) : BOOLEAN;
LOCAL
  rep_bag : BAG OF kinematic_frame_background_representation;
  trf_bag : BAG OF kinematic_frame_based_transformation;
  trm_bag : BAG OF kinematic_frame_based_transformation;
  ass_bag : BAG OF
    kinematic_frame_background_representation_association;
  rep      : kinematic_frame_background_representation;
  ass      : kinematic_frame_background_representation_association;
END_LOCAL;

rep_bag := QUERY ( bg <* USEDIN (background,
  'KINEMATIC_STRUCTURE_SCHEMA.' +
  'REPRESENTATION.ITEMS') |
  'KINEMATIC_STRUCTURE_SCHEMA.' +
  'KINEMATIC_FRAME_BACKGROUND_REPRESENTATION'
  IN TYPEOF (bg) );

IF SIZEOF (rep_bag) = 0 THEN
  RETURN (FALSE);
END_IF;

trf_bag := USEDIN (frame,
  'KINEMATIC_STRUCTURE_SCHEMA.' +
  'KINEMATIC_FRAME_BASED_TRANSFORMATION.' +
  'TRANSFORMATOR');

IF SIZEOF (trf_bag) = 0 THEN
  RETURN (FALSE);
END_IF;

REPEAT i := 1 TO HIINDEX (rep_bag);
  rep := rep_bag[i];

ass_bag := QUERY ( kfbra <* USEDIN ( rep,
  'KINEMATIC_STRUCTURE_SCHEMA.' +
  'REPRESENTATION_RELATIONSHIP.REP_2') |
  'KINEMATIC_STRUCTURE_SCHEMA.' +
  'KINEMATIC_FRAME_BACKGROUND_REPRESENTATION_ASSOCIATION'
  IN TYPEOF ( kfbra ) );

IF SIZEOF (ass_bag) > 0 THEN
  REPEAT j:= 1 TO HIINDEX (ass_bag);
    ass := ass_bag[j];

    trm_bag := QUERY (trm <* trf_bag |
      (trm :=:
        ass\representation_relationship_with_transformation.
        transformation_operator));

    IF SIZEOF (trm_bag) > 0 THEN
      RETURN (TRUE);
    END_IF;
  END_REPEAT;
END_REPEAT;

```