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ISO 10303-1

Sixth edition

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

Part 1: Basic stuff

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

Partie 1: Chose basiques

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

Foreword.

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

Part 1:
Basic stuff

1 Scope

Scope.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org

3.1
Test term
Test definition

4 Two different schemas in the separate block (basic_attribute_schema, support_resource_schema)

5 Schemas

6 basic_attribute_schema

6.1 General

The subject of the **basic_attribute_schema** is the assignment of id, name, description and role attributes to aspects of product data. This schema defines the mechanism to define a value for these attributes and associate it with product data.

NOTE 1 The concepts defined in this schema do not provide a generic capability to associate an identification, a name, a description, or a role to product data. They are applied, in order to ensure upward compatibility, in the case where a requirement to add one or more of these kinds of attributes to a particular entity data type has been identified during the revision or amendment process of the standard document in which this entity data type is defined.

NOTE 2 The associated entities are defined in ISO 10303-41, ISO 10303-43 and ISO 10303-44.

EXPRESS specification:

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```
SCHEMA basic_attribute_schema '{iso standard 10303 part(41) version(9) object(1) basic_
attribute_schema(4)}';

REFERENCE FROM support_resource_schema
  (identifier,
   label,
   text);
```

6.2 Fundamental concepts and assumptions

The following concepts are supported by this schema:

— the assignment of an identifier to product data;

— the assignment of a label to product data;

— the assignment of a descriptive text to product data;

— the assignment of a role to an association of management type data with other aspects of product data.

The assignment of an identifier corresponds to the **id_attribute** entity data type. The entities to which an identifier may be assigned are specified in the **id_attribute_select** data type. These entities have a derived attribute **id**. The corresponding identifier value is provided by the **get_id_value** function. A constraint ensures that there is at most one instance of **id_attribute** assigned to an instance of an entity in the **id_attribute_select** type.

The assignment of a name corresponds to the **name_attribute** entity data type. The entities to which a name may be assigned are specified in the **name_attribute_select** data type. These entities have a derived attribute name. The corresponding label value is provided by the **get_name_value** function. A constraint ensures that there is at most one instance of **name_attribute** assigned to an instance of an entity in the **name_attribute_select** type.

The assignment of a descriptive text corresponds to the **description_attribute** entity data type. The entities to which a description may be assigned are specified in the **description_attribute_select** data type. These entities have a derived attribute description. The corresponding text value is provided by the **get_description_value** function. A constraint ensures that there is at most one instance of **description_attribute** assigned to an instance of an entity in the **description_attribute_select** type.

The assignment of a role corresponds to the **role_association** entity data type. The entities to which a role may be assigned are specified in the **role_select** data type. These entities have a derived attribute role. The corresponding **object_role** is provided by the **get_role** function. A constraint ensures that there is at most one instance of **role_association** assigned to an instance of an entity in the **role_select** type.

6.3 basic_attribute_schema type definitions

6.3.1 description_attribute_select

A **description_attribute_select** specifies those objects that may be assigned a descriptive text.

EXPRESS specification:

```
TYPE description_attribute_select = EXTENSIBLE GENERIC_ENTITY SELECT;
END_TYPE;
```

6.3.2 generic_attribute_list_select

A **generic_attribute_list_select** specifies those objects that may be assigned a generic attribute list.

EXPRESS specification:

```
TYPE generic_attribute_list_select = EXTENSIBLE GENERIC_ENTITY SELECT;
```

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```
END_TYPE;
```

6.3.3 generic_attribute_select

A **generic_attribute_select** specifies those objects that may be assigned a generic attribute.

EXPRESS specification:

```
TYPE generic_attribute_select = EXTENSIBLE GENERIC_ENTITY SELECT;
END_TYPE;
```

6.3.4 id_attribute_select

An **id_attribute_select** specifies those objects that may be assigned an identifier.

EXPRESS specification:

```
TYPE id_attribute_select = EXTENSIBLE GENERIC_ENTITY SELECT;
END_TYPE;
```

6.3.5 name_attribute_select

A **name_attribute_select** specifies those objects that may be assigned a name.

EXPRESS specification:

```
TYPE name_attribute_select = EXTENSIBLE GENERIC_ENTITY SELECT;
END_TYPE;
```

6.3.6 role_select

A **role_select** specifies those objects that may be assigned a role.

EXPRESS specification:

```
TYPE role_select = EXTENSIBLE GENERIC_ENTITY SELECT;
END_TYPE;
```

6.4 basic_attribute_schema entity definitions

6.4.1 aggregate_id_attribute

An **aggregate_id_attribute** is used for the case where there is more than one product data element for a specific identifier.

NOTE 1 This entity provides the capability to add an aggregate id attribute to product data using a method that is upwardly compatible with ISO 10303-41:1994 and ISO 10303-43:1994.

EXPRESS specification:

```
ENTITY aggregate_id_attribute;
  attribute_value : identifier;
  identified_item : SET [1:?] OF id_attribute_select;
END_ENTITY;
```

Attribute definitions:

attribute_value the identifier that distinguishes the **identified_item**.

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NOTE 2 The context in which **attribute_value** is used as a discriminating characteristic can be identified in an annotated Express schema that uses or specializes this entity, or be default, in an agreement of common understanding between partners sharing this information.

identified_item the collection of items that are identified.

6.4.2 description_attribute

A **description_attribute** is the assignment of a descriptive text string to product data.

NOTE This entity provides the capability to add a description attribute to product data using a method that is upwardly compatible with ISO 10303-41:1994, ISO 10303-43:1994, and ISO 10303-44:1994.

EXPRESS specification:

```
ENTITY description_attribute;
  attribute_value : text;
  described_item : description_attribute_select;
END_ENTITY;
```

Attribute definitions:

attribute_value the text that characterizes the **described_item**.

described_item the item that is described.

6.4.3 generic_attribute

A **generic_attribute** is the declaration of a named attribute as a text string to enable it to be associated with product data. This capability shall not be used to replace more specific assignment capabilities if both are available to a specified target.

NOTE This entity provides the capability to define a generic attribute associated with product data using a method that is upwardly compatible with ISO 10303-41:1994, ISO 10303-43:1994, and ISO 10303-44:1994.

EXAMPLE A person entity data type instance is included in both generic_attribute_select and name_attribute_select. The name attribute of person is provided for the name value.

EXPRESS specification:

```
ENTITY generic_attribute;
  attribute_name : label;
  attribute_value : text;
END_ENTITY;
```

Attribute definitions:

attribute_name the label used to name the **generic_attribute**.

attribute_value the text that characterizes the **generic_attribute**.

6.4.4 generic_attribute_assignment

A **generic_attribute_assignment** is the assignment of a generic attribute to element of product data.

NOTE This entity provides the capability to add a generic attribute to product data using a method that is upwardly compatible with ISO 10303-41:1994 and ISO 10303-43:1994.

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EXPRESS specification:

```
ENTITY generic_attribute_assignment;
  attribute : generic_attribute;
  item_with_attribute : generic_attribute_select;
END_ENTITY;
```

Attribute definitions:

attribute the generic_attribute to be associated with the product data.

item_with_attribute the item to which the attribute is assigned.

6.4.5 generic_attribute_list_assignment

A **generic_attribute_list_assignment** is the assignment of a named list of generic attributes to element of product data.

NOTE This entity data type provides a capability to add a named list of generic attributes to certain product data entity data types using a method that is upwardly compatible with ISO 10303-41:1994, ISO 10303-43:1994, and ISO 10303-44:1994.

EXPRESS specification:

```
ENTITY generic_attribute_list_assignment;
  attribute_name : label;
  attributes : LIST [1:?] OF generic_attribute;
  item_with_attribute : generic_attribute_list_select;
END_ENTITY;
```

Attribute definitions:

attribute_name the label used to name the list of generic attributes.

attributes the list of generic_attributes that are assigned to the element of product data.

item_with_attribute the item to which the attributes are assigned.

6.4.6 id_attribute

An **id_attribute** is the assignment of an identifier to product data.

NOTE 1 This entity provides the capability to add an id attribute to product data using a method that is upwardly compatible with ISO 10303-41:1994 and ISO 10303-43:1994.

EXPRESS specification:

```
ENTITY id_attribute;
  attribute_value : identifier;
  identified_item : id_attribute_select;
END_ENTITY;
```

Attribute definitions:

attribute_value the identifier that distinguishes the **identified_item**.

NOTE 2 The context in which **attribute_value** is used as a discriminating characteristic can be identified in an annotated Express schema that uses or specializes this entity, or be default, in an agreement of common understanding between partners sharing this information.

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identified_item the item that is identified.

6.4.7 name_attribute

A **name_attribute** is the assignment of a label by which the product data is known.

NOTE This entity provides the capability to add a name attribute to product data using a method that is upwardly compatible with ISO 10303-41:1994 and ISO 10303-44:1994.

EXPRESS specification:

```
ENTITY name_attribute;
  attribute_value : label;
  named_item : name_attribute_select;
END_ENTITY;
```

Attribute definitions:

attribute_value the label by which the **named_item** is known.

named_item the item to which the name is applied.

6.4.8 object_role

An **object_role** is a specification of a role for the association of management type data with other aspects of product data and a description of that role.

NOTE This entity provides the capability to add a role attribute to an association of management type data with other aspects of product data using a method that is upwardly compatible with ISO 10303-41:1994.

EXPRESS specification:

```
ENTITY object_role;
  name : label;
  description : OPTIONAL text;
END_ENTITY;
```

Attribute definitions:

name the label by which the **object_role** is known.

description the text that characterizes the **object_role**. The value of the attribute need not be specified.

6.4.9 role_association

A **role_association** is the assignment of an object_role to an association of management type data with other aspects of product data.

NOTE This entity data type provides a capability to add a role attribute to certain entity data types that specify associations between product data and administrative or management data. Such entity data types are specified in the management_resources_schema.

EXPRESS specification:

```
ENTITY role_association;
  role : object_role;
  item_with_role : role_select;
END_ENTITY;
```

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Attribute definitions:

role the object_role that specifies the purpose of the association of the **role_association** with product data.

item_with_role the item to which a role is assigned.

6.5 basic_attribute_schema function definitions

6.5.1 get_description_value

The **get_description_value** function accepts an object to which a descriptive text string may be assigned and returns this description if present.

If a description_attribute references the object, the function will return the value of the attribute_value attribute of this description_attribute. Otherwise, the indeterminate value will be returned.

EXPRESS specification:

```
FUNCTION get_description_value(obj : description_attribute_select) : text;
  LOCAL
    description_bag : BAG OF description_attribute := USEDIN(obj, ('BASIC_ATTRIBUTE_
SCHEMA.' + 'DESCRIPTION_ATTRIBUTE.') + 'DESCRIBED_ITEM');
  END_LOCAL;
  IF SIZEOF(description_bag) = 1 THEN
    RETURN (description_bag[1].attribute_value);
  ELSE
    RETURN (?);
  END_IF;
END_FUNCTION;
```

6.5.1.1 Parameters

6.5.1.1.1 obj

(input) the object for which a text is determined. This is an input to the function.

EXPRESS specification:

```
obj : description_attribute_select
```

6.5.1.2 Variables

6.5.1.2.1 description_bag

EXPRESS specification:

```
description_bag : BAG OF description_attribute := USEDIN(obj, ('BASIC_ATTRIBUTE_SCHEMA.'
+ 'DESCRIPTION_ATTRIBUTE.') + 'DESCRIBED_ITEM');
```

6.5.2 get_id_value

The **get_id_value** function accepts an object to which an identifier may be assigned and returns this identifier if present.

If an id_attribute references the object, the function will return the value of the attribute_value attribute of this id_attribute. Otherwise, the indeterminate value will be returned.

EXPRESS specification:

```
FUNCTION get_id_value(obj : id_attribute_select) : identifier;
  LOCAL
```

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```
    id_bag : BAG OF id_attribute := USEDIN(obj, ('BASIC_ATTRIBUTE_SCHEMA.' + 'ID_
ATTRIBUTE.') + 'IDENTIFIED_ITEM');
  END_LOCAL;
  IF SIZEOF(id_bag) = 1 THEN
    RETURN (id_bag[1].attribute_value);
  ELSE
    RETURN (?);
  END_IF;
END_FUNCTION;
```

6.5.2.1 Parameters

6.5.2.1.1 obj

(input) the object for which an identifier is determined. This is an input to the function.

EXPRESS specification:

```
obj : id_attribute_select
```

6.5.2.2 Variables

6.5.2.2.1 id_bag

EXPRESS specification:

```
id_bag : BAG OF id_attribute := USEDIN(obj, ('BASIC_ATTRIBUTE_SCHEMA.' + 'ID_ATTRIBUTE.')
+ 'IDENTIFIED_ITEM');
```

6.5.3 get_aggregate_id_value

The **get_aggregate_id_value** function accepts an object to which an identifier may be assigned and returns this identifier if present.

If an aggregate_id_attribute references the object, the function will return the value of the attribute_value attribute of this aggregate_id_attribute. Otherwise, the indeterminate value will be returned.

EXPRESS specification:

```
FUNCTION get_aggregate_id_value(obj : id_attribute_select) : identifier;
  LOCAL
    aggregate_id_bag : BAG OF aggregate_id_attribute := USEDIN(obj, ('BASIC_ATTRIBUTE_
SCHEMA.' + 'AGGREGATE_ID_ATTRIBUTE.') + 'IDENTIFIED_ITEM');
  END_LOCAL;
  IF SIZEOF(aggregate_id_bag) = 1 THEN
    RETURN (aggregate_id_bag[1].attribute_value);
  ELSE
    RETURN (?);
  END_IF;
END_FUNCTION;
```

6.5.3.1 Parameters

6.5.3.1.1 obj

(input) the object for which an identifier is determined. This is an input to the function.

EXPRESS specification:

```
obj : id_attribute_select
```


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6.5.3.2 Variables

6.5.3.2.1 aggregate_id_bag

EXPRESS specification:

```
aggregate_id_bag : BAG OF aggregate_id_attribute := USEDIN(obj, ('BASIC_ATTRIBUTE_SCHEMA.
' + 'AGGREGATE_ID_ATTRIBUTE.') + 'IDENTIFIED_ITEM');
```

6.5.4 get_name_value

The **get_name_value** function accepts an object to which a label may be assigned and returns this label if present.

If a name_attribute references the object, the function will return the value of the attribute_value attribute of this name_attribute. Otherwise, the indeterminate value will be returned.

EXPRESS specification:

```
FUNCTION get_name_value(obj : name_attribute_select) : label;
  LOCAL
    name_bag : BAG OF name_attribute := USEDIN(obj, ('BASIC_ATTRIBUTE_SCHEMA.' + 'NAME_
ATTRIBUTE.') + 'NAMED_ITEM');
  END_LOCAL;
  IF SIZEOF(name_bag) = 1 THEN
    RETURN (name_bag[1].attribute_value);
  ELSE
    RETURN (?);
  END_IF;
END_FUNCTION;
```

6.5.4.1 Parameters

6.5.4.1.1 obj

the object for which a label is determined. This is an input to the function.

EXPRESS specification:

```
obj : name_attribute_select
```

6.5.4.2 Variables

6.5.4.2.1 name_bag

EXPRESS specification:

```
name_bag : BAG OF name_attribute := USEDIN(obj, ('BASIC_ATTRIBUTE_SCHEMA.' + 'NAME_
ATTRIBUTE.') + 'NAMED_ITEM');
```

6.5.5 get_role

The **get_role** function accepts an object to which a role may be assigned and returns this role if present.

If a role_association references the object, the function will return the object_role of the role attribute of this role_association. Otherwise, the indeterminate value will be returned.

EXPRESS specification:

```
FUNCTION get_role(obj : role_select) : object_role;
  LOCAL
    role_bag : BAG OF role_association := USEDIN(obj, ('BASIC_ATTRIBUTE_SCHEMA.' + 'ROLE_
ASSOCIATION.') + 'ITEM_WITH_ROLE');
  END_LOCAL;
  IF SIZEOF(role_bag) = 1 THEN
```

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```
    RETURN (role_bag[1].role);
  ELSE
    RETURN (?);
  END_IF;
END_FUNCTION;
```

6.5.5.1 Parameters

6.5.5.1.1 obj

(input) the object for which an object_role is determined. This is an input to the function.

EXPRESS specification:

```
obj : role_select
```

6.5.5.2 Variables

6.5.5.2.1 role_bag

EXPRESS specification:

```
role_bag : BAG OF role_association := USEDIN(obj, ('BASIC_ATTRIBUTE_SCHEMA.' + 'ROLE_
ASSOCIATION.') + 'ITEM_WITH_ROLE');
```

7 support_resource_schema

7.1 General

The subject of the **support_resource_schema** is a description of EXPRESS declarations that are shared by more than one of the ISO 10303 integrated resource schemas.

NOTE In contrast to elements of the generic product description resource schemas, which are also potentially referenced by more than one ISO 10303 integrated resource schema, the elements of this schema cannot exist without (that is, are existent-dependent upon) the entities that reference them.

EXPRESS specification:

```
SCHEMA support_resource_schema '{iso standard 10303 part(41) version(7) object(1) support_
resource_schema(23)}';
```

7.2 Fundamental concepts and assumptions

An identifier is a means that enables a processor to distinguish an information from other information of the same kind. A label is textual information assigned to an item of information in order to facilitate its access by a human being.

Product data items may have an identification. The formats used to define identifiers are quite various. This International Standard defines identifiers as strings. It does not specify the internal structure and content of these strings.

Product data items may have a label. The formats used to define labels are quite various. This International Standard defines identifiers as strings. It does not specify the internal structure and content of these strings.

7.3 support_resource_schema type definitions

7.3.1 identifier

An **identifier** is a string suitable for identifying some product data.

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NOTE An identifier may or may not have a natural-language meaning.

EXAMPLE In the context of a product, a part number or serial number would be an example of an identifier.

EXPRESS specification:

```
TYPE identifier = STRING;
END_TYPE;
```

7.3.2 label

A **label** is an alphanumeric string that represents the human-interpretable name of something and shall have a natural-language meaning.

EXAMPLE 'Smith', 'Widget Inc.', and 'Materials Test Laboratory' are examples of labels.

EXPRESS specification:

```
TYPE label = STRING;
END_TYPE;
```

7.3.3 text

A **text** is an alphanumeric string intended to be read and understood by a human being. It is for information purposes only.

EXPRESS specification:

```
TYPE text = STRING;
END_TYPE;
```

7.4 support_resource_schema function definitions

7.4.1 bag_to_set

The **bag_to_set** function converts BAGs into SETs.

EXAMPLE This function can be used to convert the BAGs returned by the USEDIN function into SETs.

EXPRESS specification:

```
FUNCTION bag_to_set(the_bag : BAG OF GENERIC : intype) : SET OF GENERIC : intype;
  LOCAL
    the_set : SET OF GENERIC : intype := [];
  END_LOCAL;
  IF SIZEOF(the_bag) > 0 THEN
    REPEAT i := 1 TO HIINDEX(the_bag);
      the_set := the_set + the_bag[i];
    END_REPEAT;
  END_IF;
  RETURN (the_set);
END_FUNCTION;
```

7.4.1.1 Parameters

7.4.1.1.1 the_bag

(input) the BAG that is to be converted into a SET.

EXPRESS specification:

```
the_bag : BAG OF GENERIC : intype
```

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7.4.1.2 Variables

7.4.1.2.1 the_set

EXPRESS specification:

```
the_set : SET OF GENERIC : intype := [];
```

7.4.2 type_check_function

The **type_check_function** function compares the names of the data types of the instance that is referred to by the parameter **the_type** with the set of entity names specified by **sub_names**.

Depending on the value of **criterion**, it returns TRUE if:

— case 0: the intersection of the two aggregates is not empty.

NOTE 1 If **sub_names** contains the entity names of all the subtypes of a particular entity data type, this case can be used to ensure that no instance of the supertype exists.

— case 1: the intersection of the two aggregates is empty.

NOTE 2 If **sub_names** contains the entity names of subtypes of a particular entity data type, this function can be used to ensure that no instance of these subtypes exists.

— case 2: the intersection of the two aggregates contains exactly one name.

NOTE 3 If **sub_names** contains the entity names of all the subtypes of a particular entity data type, this function can be used to ensure that no complex entity instance of subtypes of the entity exists and that only instances of subtypes of the entity exist.

NOTE 4 The concept of complex entity instance is defined in ISO 10303-11.

— case 3: the intersection of the two aggregates contains at most one name.

NOTE 5 If **sub_names** contains the entity names of subtypes of a particular entity data type, this function can be used to ensure that no complex entity instance of these subtypes of the entity exists.

EXPRESS specification:

```
FUNCTION type_check_function(the_type : GENERIC;
                             sub_names : SET OF STRING;
                             criterion : INTEGER) : LOGICAL;
  IF NOT EXISTS(the_type) OR (SIZEOF(sub_names) = 0) THEN
    RETURN (UNKNOWN);
  ELSE
    CASE criterion OF
    0 :
      RETURN (SIZEOF(sub_names * TYPEOF(the_type)) > 0);
    1 :
      RETURN (SIZEOF(sub_names * TYPEOF(the_type)) = 0);
    2 :
      RETURN (SIZEOF(sub_names * TYPEOF(the_type)) = 1);
    3 :
      RETURN (SIZEOF(sub_names * TYPEOF(the_type)) <= 1);
    OTHERWISE :
      RETURN (UNKNOWN);
    END_CASE;
  END_IF;
END_FUNCTION;
```

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7.4.2.1 Parameters

7.4.2.1.1 the_type

(input) the instance whose data type is checked.

EXPRESS specification:

```
the_type : GENERIC
```

7.4.2.1.2 sub_names

(input) the set of names of the entity data types that are candidates for the type of **the_type**.

EXPRESS specification:

```
sub_names : SET OF STRING
```

7.4.2.1.3 criterion

(input) the integer number value between 0 and 3.

EXPRESS specification:

```
criterion : INTEGER
```

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Descriptors: integrated generic resource, product definition, product property, measure, application context, product property representation, person, organization, experience, qualifications, location and position in organization.

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