TECHNICAL SPECIFICATION

ISO/TS 10303-1004

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

Part 1004: Application module: Elemental geometric shape

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

Partie 1004: Module d'application: Forme géométrique élémentaire

Reference number
ISO/TS 10303-1004:2001(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 the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years with a view to deciding whether it should be confirmed for a further three years, revised to become an International Standard, or withdrawn. In the case of a confirmed ISO/PAS or ISO/TS, it is reviewed again after six years at which time it has to be either transposed into an International Standard or withdrawn.

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.

ISO/TS 10303-1004 was prepared by Technical Committee ISO/TC 184, *Industrial automation system and integration*, Subcommittee SC 4, *Industrial data*.

ISO 10303 is organized as a series of parts, each published separately. The structure of ISO 10303 is described in ISO 10303-1.

Each part of ISO 10303 is a member of one of the following series: description methods, implementation methods, conformance testing methodology and framework, integrated generic resources, integrated applications resources, application protocols, abstract test suites, application interpreted constructs, and application modules. This part is a member of the application modules series.

A complete list of parts of ISO 10303 is available from the Internet

<http://www.nist.gov/sc4/editing/step/titles/>

Annexes A and B form a normative part of this part of ISO 10303. Annexes C, D and E are for information only.

Introduction

ISO 10303 is an International Standard for the computer-interpretable representation and exchange of product data. The objective is to provide a neutral mechanism capable of describing product data throughout the life cycle of a product, independent from any particular system. The nature of this description makes it suitable not only for neutral file exchange, but also as a basis for implementing and sharing product databases and archiving.

This International Standard is organized as a series of parts, each published separately. The parts of ISO 10303 fall into one of the following series: description methods, integrated resources, application interpreted constructs, application protocols, application modules, 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 application module series.

This part of ISO 10303 specifies an application module for elemental geometric shape. It provides for the definition of the concept shape and how a shape may be formed, but does not include specifications for the geometric model representations of shapes.

A set of application modules can be combined to provide the capability to assign shape elements to layers and visual attributes, such as colours and curve fonts, to geometric and topological elements. For additional information, see Annex F of ISO/TS 10303-1009.

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

Part 1004: Application module: Elemental geometric shape

1 Scope

This part of ISO 10303 specifies the application module for elemental geometric shape. The following are within scope of this part of ISO 10303:

— the definition of the concept geometric shape;

— how a geometric shape may be formed.

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

— the specification of geometric modeling approaches for shape representation, such as wireframe or boundary representation (b-rep).

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/IEC 8824-1:1998, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ISO 10303-1:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 1: Overview and fundamental principles*

ISO 10303-11:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 11: Description methods: The EXPRESS language reference manual*

ISO 10303-41:2000, *Industrial automation systems and integration — Product data representation and exchange — Part 41: Integrated generic resource: Fundamentals of product description and support*

ISO 10303-42:2000, *Industrial automation systems and integration — Product data representation and exchange — Part 42: Integrated generic resource: Geometric and topological representation*

ISO 10303-43:2000, *Industrial automation systems and integration — Product data representation and exchange — Part 43: Integrated generic resources: Representation structures*

ISO 10303-202:1996, *Industrial automation systems and integration — Product data representation and exchange — Part 202: Application protocol: Associative draughting*

ISO/TS 10303-1001:2001, *Industrial automation systems and integration — Product data representation and exchange — Part 1001: Application module: Appearance assignment*

ISO/TS 10303-1006:2001, *Industrial automation systems and integration — Product data representation and exchange — Part 1006: Application module: Foundation representation*

3 Terms, definitions, and abbreviations

3.1 Terms defined in ISO 10303-1

For the purposes of this part of ISO 10303, the following terms defined in ISO 10303-1 apply:

— application;

— application object;

— application protocol;

— application reference model;

— data;

— information;

— integrated resource;

— product;

— product data;

— unit of functionality.

3.2 Terms defined in ISO 10303-202

For the purposes of this part of ISO 10303, the following term defined in ISO 10303-202 applies:

— application interpreted construct.

3.3 Terms defined in ISO/TS 10303-1001

For the purposes of this part of ISO 10303, the following terms defined in ISO/TS 10303-1001 apply:

— application module;

— module interpreted model.

3.4 Abbreviations

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

AM	application module
ARM	application reference model
MIM	module interpreted model
UoF	unit of functionality
URL	uniform resource locator

4 Information requirements

This clause specifies the information requirements for elemental geometric shape. The information requirements are specified as a set of units of functionality and application objects. The information requirements are defined using the terminology of the subject area of this application module.

NOTE 1 A graphical representation of the information requirements is given in annex C.

NOTE 2 The mapping specification is specified in 5.1 which shows how the information requirements are met using the integrated resources of this International Standard. The use of the integrated resources introduces additional requirements which are common to application modules and protocols.

EXPRESS specification:

```
*)
SCHEMA Elemental_geometric_shape_arm;
(*
```

4.1 Units of functionality

This subclause specifies the units of functionality (UoF) for this part of ISO 10303 as well as any support elements needed for the application module definition. This part of ISO 10303 specifies the following unit of functionality:

— Elemental_geometric_shape.

This part of ISO 10303 uses the following unit of functionality:

— Foundation_representation.

The units of functionality and a description of the functions that each UoF supports are given below. The application elements included in the UoFs are defined in 4.3.

4.1.1 Elemental_geometric_shape

The Elemental_geometric_shape UoF specifies the definitional information for the concept of shape and how it is composed. The following application entities are specified in the Elemental geometric shape UoF:

— Cartesian_coordinate_space;

— Detailed_geometric_model_element;

— Geometric_model;

— Template_instance;

— Transformation.

4.1.2 Foundation_representation

This UoF is defined in the foundation representation module. The following application entities from this UoF are referenced in the elemental geometric shape module:

— Representation;

— Representation_item.

4.2 Required AM ARMs

The following EXPRESS reference statements specify the elements imported from the ARMs of other modules.

EXPRESS specification:

```
*)
USE FROM Foundation_representation_arm; -- ISO/TS 10303-1006
(*
```

4.3 ARM entity definitions

This subclause specifies the application entities for the elemental geometric shape module. Each application entity is an atomic element that embodies a unique application concept and contains attributes specifying the data elements of the entity. The application entities and their definitions are given below.

4.3.1 Cartesian_coordinate_space

A Cartesian_coordinate_space is the coordinate space where geometric elements are defined. It is either two-dimensional or three-dimensional. An origin for coordinate values is implicitly defined. The units applicable to the coordinate values of elements defined in the Cartesian_coordinate_space are specified.

EXPRESS specification:

```
*)
ENTITY Cartesian_coordinate_space;
  unit : SET[2:?] OF REAL;
END_ENTITY;
(*
```

Attribute definitions:

unit: The unit specifies the various kinds of unit in which values are measured. In the case where geometric elements are defined in the Cartesian_coordinate_space there shall be at least two units specified, the length unit and the plane angle unit. The same length unit is applied to each coordinate direction. Only one unit of a kind shall be specified.

NOTE If elements with different units are required they have to be separated into different models with their own Cartesian_coordinate_space.

EXAMPLE - A length measure unit measured in inches and an angle measure unit measured in degrees are examples for two attributes 'unit' assigned to the same Cartesian_coordinate_space.

4.3.2 Detailed_geometric_model_element

A Detailed_ geometric_model_element is a single element of a model that is any of the general class of elements that represent idealized shape described by mathematical geometry.

EXAMPLE - Points, curves, and surfaces are examples of elements that represent idealized shapes described by mathematical geometry.

A Detailed_ geometric_model_element is a type of Representation_item.

EXPRESS specification:

```
*)
ENTITY Detailed_geometric_model_element
  ABSTRACT SUPERTYPE
  SUBTYPE OF (Representation_item);
END_ENTITY;
(*
```


4.3.3 Geometric_model

A Geometric_model is a representation of shape. A Geometric_model that does not reference any Representation_item objects through one the subtypes directly shall reference at least one Template_-instance (see 4.3.4).

EXPRESS specification:

```
*)
ENTITY Geometric_model
  SUBTYPE OF (Representation);
  is_defined_in : Cartesian_coordinate_space;
  id            : STRING;
  version_id    : OPTIONAL STRING;
  description   : OPTIONAL STRING;
  role          : STRING;
  elements      : SET [1:?] OF Representation_item;
  model_extent  : OPTIONAL REAL;
  accuracy      : OPTIONAL REAL;
END_ENTITY;
(*
```

Attribute definitions:

is_defined_in: The is_defined_in specifies the Cartesian_coordinate_space (see 4.3.1) in which the Geometric_model is defined.

id: The id specifies the identifier of the Geometric_model.

version_id: The version_id specifies the version identifier of the Geometric_model. The version_id need not be specified.

description: The description specifies additional information about the Geometric_model. The description need not be specified for a particular Geometric_model. If present, there shall be exactly one object that defines the description for a Geometric_model.

role: The role specifies the function performed by the Geometric_model. Where applicable the following values shall be used:

— 'design shape': The geometry in the Geometric_model represents the shape of an item as designed;

— 'idealized shape': The geometry in the Geometric_model represents a simplified shape.

EXAMPLE - A shape may be simplified for analysis purposes.

elements: The elements specifies the Representation_item instances which comprise the Geometric_-model.

model_extent: The model_extent specifies the radius of a sphere that contains all elements of the model and whose centre is at the origin of the Cartesian_coordinate_space (see 4.3.1) of the

Geometric_model. The model_extent need not be specified for a particular Geometric_model. A unit shall be associated with the model extent value.

accuracy: The accuracy specifies a distance which forms a zone of closure for elements in the model. The value forms the radius of a sphere around points/ vertices and a cylinder around curves wherein any other element within the zone is deemed to be coincident with the element being checked. A unit shall be associated with the accuracy value.

4.3.4 Template_instance

A Template_instance is an occurrence of an object that has been defined in a different Cartesian_coordinate_space (see 4.3.1) as a Geometric_model (see 4.3.3). A Template_instance is an image copy of this template definition into another Cartesian_coordinate_space where only the location of this copy has to be specified. Additionally uniform scaling, rotation, or mirroring information may be applied to this copy.

NOTE In the case where the units of the Cartesian_coordinate_space of the definition are different from the units to be applied to the Template_instance, unit conversion is required. In case of length unit conversion this has to be considered in addition to the scale attribute.

EXAMPLE - In a technical drawing of a mechanical part with several identical drilling holes the hole geometry (circle) together with its annotation elements (diameter dimension and centrelines) is defined once with the name 'annotated drilling hole' and the purpose 'drilling hole representation'. This particular definition is instantiated several times at different locations by corresponding Template_instance objects.

A Template_instance is a type of Representation_item.

EXPRESS specification:

```
*)
ENTITY Template_instance
  SUBTYPE OF (Representation_item);
  id                  : STRING;
  scale               : OPTIONAL REAL;
  template_definition : Geometric_model;
  transformation      : Transformation;
END_ENTITY;
(*
```

Attribute definitions:

id: The id specifies the identifier of the Template_instance.

scale: The scale specifies the scaling factor for all cartesian coordinate directions. The scaling factor shall be positive. If the scaling factor is omitted it shall be 1.0. The scale need not be specified for a particular Template_instance.

template_definition: The template_definition specifies the template to be instantiated. There shall be exactly one object that defines the template_definition for a Template_instance.

transformation: The transformation specifies the cartesian transformation applied to the instance. All transformations that can be expressed by an orthonormal 2 x 2 (for 2D) or 3 x 3 (for 3D) matrix can be applied.

EXAMPLE - Rotation or mirroring operations are examples to which these transformations can be applied.

4.3.5 Transformation

A Transformation is a geometric placement and orientation composed of translation and rotation. Scaling is not included.

EXPRESS specification:

```
*)
ENTITY Transformation;
END_ENTITY;

END_SCHEMA;
(*
```

5 Module interpreted model

5.1 Mapping specification

This clause contains the mapping table that shows how each UoF and application element of this part of ISO 10303 (see clause 4) maps to one or several MIM resource constructs. The mapping table is organized in five columns. The contents of these five columns are:

Column 1) Application element: Name of an application element as it appears in the application entity definition. Application entity names are written in uppercase. Attribute names are listed after the application entity to which they belong and are written in lower case.

Column 2) MIM element: Name of an MIM element as it appears in the MIM, the term 'IDENTICAL MAPPING', or the term 'PATH'. MIM entities are written in lower case. Attribute names of MIM entities are referred to as <entity name>.<attribute name>. The mapping of an application element may result in several related MIM elements. Each of these MIM elements will require a line of its own in the table. The term 'IDENTICAL MAPPING' indicates that both application entities of an application assertion map to the same MIM element. The term 'PATH' indicates that the application assertion maps to the entire reference path.

Column 3) Source: For those MIM elements that are interpreted from the integrated resources, this is the number of the corresponding part of ISO 10303. For those MIM elements that are created for the purpose of this part of ISO 10303, this is the number of this part.

Column 4) Rules: One or more numbers may be given which refer to rules that apply to the current MIM element or reference path. For rules that are derived from relationships between application entities, the same rule is referred to by the mapping entries of all the involved MIM elements. The expanded names of the rules are listed after the table.

Column 5) Reference path: To describe fully the mapping of an application entity, it may be necessary to specify a reference path through several related MIM elements. The reference path column documents the role of a MIM element relative to the MIM element in the row succeeding it. Two or more such related MIM elements define the interpretation of the integrated resources that satisfies the requirement specified by the application entity. For each MIM element that has been created for use within this part of ISO 10303, a reference path up to its supertype from an integrated resource is specified.

For the expression of reference paths and the relationships between MIM elements, the following notational conventions apply:

a) [] : multiple MIM elements or sections of the reference path are required to satisfy an information requirement;

b) () : multiple MIM elements or sections of the reference path are identified as alternatives within the mapping to satisfy an information requirement;

c) { } : enclosed section constrains the reference path to satisfy an information requirement;

d) -> : attribute references the entity or select type given in the following row;

e) <- : entity or select type is referenced by the attribute in the following row;

f) [i] : attribute is an aggregation of which a single member is given in the following row;

h) [n] : attribute is an aggregation of which member n is given in the following row;

i) => : entity is a supertype of the entity given in the following row;

j) <= : entity is a subtype of the entity given in the following row;

k) = : the string, select or enumeration type is constrained to a choice or value;

l) \ : the line continuation for strings that wrap.

Table 1 - Mapping table for Elemental_geometric_shape UoF

Application_element	MIM element	Source	Rules	Reference path
CARTESIAN_-COORDINATE_-SPACE	geometric_-representation_context	42		
unit	global_unit_assigned_-context.units	41		geometric_representation_context <= representation_context => global_unit_assigned_context global_unit_assigned_context.units
DETAILED_-GEOMETRIC_-MODEL_ELEMENT	geometric_-representation_item	42		
GEOMETRIC_-MODEL	shape_representation	41		
is_defined_in	PATH			shape_representation => representation representation.context_of_items -> representation_context => geometric_representation_context
id	representation.id	1006		shape_representation <= representation representation.id

Table 1 - Mapping table for Elemental_geometric_shape UoF (continued)

Application_element	MIM element	Source	Rules	Reference path
version_id	applied_- identification_- assignment.assigned_id	1004		shape_representation identification_item = shape_representation identification_item <- applied_identification_assignment.items[1] applied_identification_assignment <= identification_assignment {identification_assignment.role -> identification_role identification_role.name = 'version id'} identification_assignment.assigned_id
description	representation.descripti on	1006		shape_representation <= representation representation.description
role	representation.name	1006		shape_representation <= representation representation.name
elements	representation.items	1006		shape_representation <= representation representation.items

Table 1 - Mapping table for Elemental_geometric_shape UoF (continued)

Application_element	MIM element	Source	Rules	Reference path
model_extent	value_representation_-item	43		shape_representation <= representation <- representation_relationship.rep_1 representation_relationship {representation_relationship.name = 'model extent association'} representation_relationship.rep_2 -> representation {representation.name = 'model extent representation'} representation.items[i] -> representation_item => {representation_item.name = 'model extent value'} value_representation_item
accuracy	uncertainty_measure_-with_unit	43		shape_representation <= representation-> representation_context=> global_uncertainty_assigned_context[i]-> uncertainty_measure_with_unit {uncertainty_measure_with_unit <= measure_with_unit => length_measure_with_unit}

Table 1 - Mapping table for Elemental_geometric_shape UoF (continued)

Application_element	MIM element	Source	Rules	Reference path
TEMPLATE_-INSTANCE	([shape_-representation_-relationship] [representation_-relationship_with_-transformation]) (mapped_item)	41 43 43		
template_definition	(PATH) (PATH)			(shape_representation_relationship<= representation_relationship=> representation_relationship.rep_2-> representation) (mapped_item.mapping_source-> representation_map.mapped_representation-> representation)
id	(representation_-relationship.name) (representation_-item.name)	43 1006		(representation_relationship_with_transformation<= representation_relationship representation_relationship.name) (mapped_item<= representation_item.name)

Table 1 - Mapping table for Elemental_geometric_shape UoF (continued)

Application_element	MIM element	Source	Rules	Reference path
transformation	(PATH)			(shape_representation_relationship<= representation_relationship=> representation_relationship_with_transformation. transformation_operator-> [functionally_defined_transformation] [item_defined_transformation]
	(PATH)			(mapped_item [mapped_item.mapping_target] [mapped_item.mapping_source -> representation_map representation_map.mapping_origin])
scale	(PATH)			(shape_representation_relationship<= representation_relationship=> representation_relationship_with_transformation. transformation_operator-> functionally_defined_transformation-> cartesian_transformation_operator cartesian_transformation_operator.scale)
	(PATH)			(mapped_item mapped_item.mapping_target -> representation_item => geometric_representation_item=> cartesian_transformation_operator cartesian_transformation_operator.scale)

Table 1 - Mapping table for Elemental_geometric_shape UoF (concluded)

Application_element	MIM element	Source	Rules	Reference path
TRANSFORMATION	(functionally_-defined_-transformation) (item_defined_-transformation) (mapped_item)	43 43 43		

5.2 MIM EXPRESS short listing

This clause specifies the EXPRESS schema that uses elements from the integrated resources, application interpreted constructs or application module MIMs and contains the types, entity specializations, rules, and functions that are specific to this part of ISO 10303. This clause also specifies modifications to the textual material for constructs that are imported from the integrated resources. The definitions and EXPRESS provided in the integrated resources or application interpreted constructs for constructs used in the MIM may include select list items and subtypes which are not imported into the MIM. Requirements stated in the integrated resources or application interpreted constructs which refer to such items and subtypes apply exclusively to those items which are imported into the MIM.

EXPRESS Specification:

```
*)
SCHEMA Elemental_geometric_shape_mim;
  USE FROM Foundation_representation_mim; -- ISO/TS 10303-1006
  USE FROM basic_attribute_schema -- ISO 10303-41
       (description_attribute);
  USE FROM geometry_schema -- ISO 10303-42
       (geometric_representation_item,
        geometric_representation_context,
        cartesian_point,
        placement,
        axis1_placement,
        axis2_placement_2d,
        axis2_placement_3d,
        cartesian_transformation_operator,
        cartesian_transformation_operator_2d,
        cartesian_transformation_operator_3d);
  USE FROM measure_schema -- ISO 10303-41
       (global_unit_assigned_context);
  USE FROM management_resources_schema -- ISO 10303-41
       (identification_assignment);
  USE FROM product_property_representation_schema -- ISO 10303-41
       (shape_representation,
        shape_representation_relationship);
  USE FROM representation_schema -- ISO 10303-43
       (functionally_defined_transformation,
        global_uncertainty_assigned_context,
        item_defined_transformation,
        mapped_item,
        representation_relationship_with_transformation,
        uncertainty_measure_with_unit,
        value_representation_item);
(*
```

NOTE 1 See annex D for a graphical presentation of this schema using the EXPRESS-G notation.

NOTE 2 The schema referenced above can be found in the following part of ISO 10303:

management_resources_schema	ISO 10303-41
measure_schema	ISO 10303-41

basic_attribute_schema	ISO 10303-41
product_property_representation_schema	ISO 10303-41
geometry_schema	ISO 10303-42
representation_schema	ISO 10303-43
foundation_representation_mim	ISO/TS 10303-1006

5.2.1 Application module type definitions

This subclause contains the EXPRESS type definitions in this part of ISO 10303.

5.2.1.1 identification_item

An **identification_item** is an element which may have an identification.

EXPRESS specification:

```
*)
TYPE identification_item  = SELECT
  (representation);
END_TYPE;
(*
```

5.2.2 Module entity definitions

This subclause contains the EXPRESS entity definitions in this part of ISO 10303.

5.2.2.1 applied_identification_assignment

An **applied_identification_assignment** assigns an identification to a **representation**.

EXPRESS specification:

```
*)
ENTITY applied_identification_assignment
  SUBTYPE OF (identification_assignment);
  items : SET[1:?] OF identification_item;
END_ENTITY;
(*
```

Attribute definitions:

items: The set of one or more elements to which an identification may be assigned.

EXPRESS specification:

```
*)
END_SCHEMA;
(*
```


Annex A
(normative)

MIM short names

Table A.1 provides the short names for entities defined in the MIM of this part of ISO 10303. Requirements on the use of the short names are found in the implementation methods included in ISO 10303.

NOTE The EXPRESS entity names are available from Internet:
<http://www.mel.nist.gov/div826/subject/apde/snr/>.

Table A.1 - MIM short names of entities

Entity name	Short name
APPLIED_IDENTIFICATION_ASSIGNMENT	APIDAS

Annex B
(normative)

Information object registration

B.1 Document identification

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

{ iso standard 10303 part(1004) version(1) }

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

B.2 Schema identification

B.2.1 elemental_geometric_shape_arm schema identification

To provide for unambiguous identification of the schema specification given in this application module in an open information system, the object identifiers are assigned as follows:

{ iso standard 10303 part(1004) version(1) object(1) elemental-geometric-shape-arm-schema(1) }

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

B.2.2 elemental_geometric_shape_mim schema identification

To provide for unambiguous identification of the schema specification given in this application module in an open information system, the object identifiers are assigned as follows:

{ iso standard 10303 part(1004) version(1) object(1) elemental-geometric-shape-mim-schema(2) }

is assigned to the elemental_geometric_shape_mim schema short form schema (see 5.2). The meaning of this value is defined in ISO/IEC 8824-1, and is described in ISO 10303-1.

Annex C
(informative)

ARM EXPRESS-G

The following diagrams correspond to the ARM EXPRESS listing given in clause 4. The diagrams use the EXPRESS-G graphical notation for the EXPRESS language. EXPRESS-G is defined in annex D of ISO 10303-11.

NOTE The inter-page referencing is to the diagram number and not the figure number.

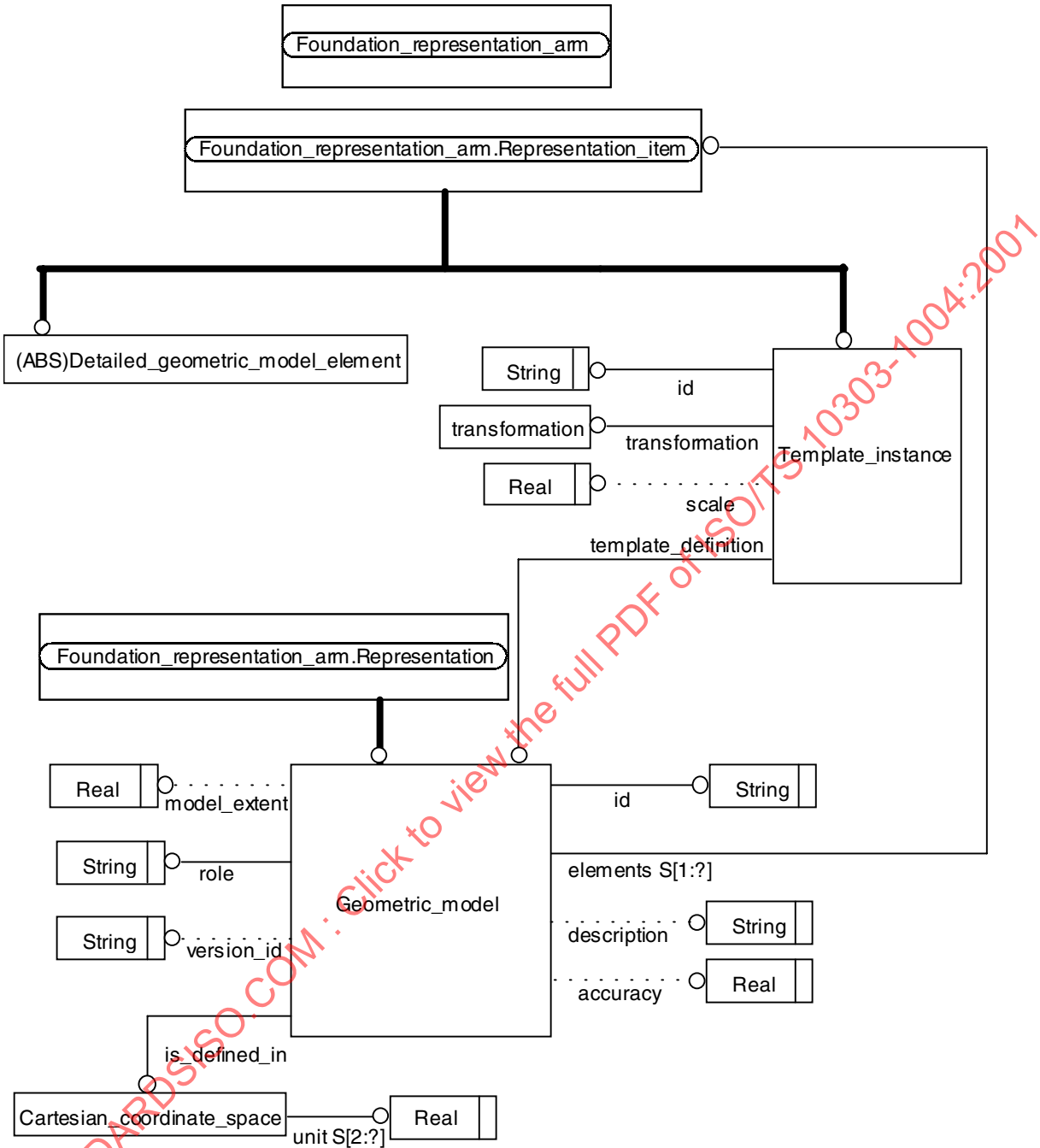

Figure C.1 - ARM EXPRESS-G diagram 1 of 1

