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Industrial automation systems and integration — Parts library —

Part 102: View exchange protocol by ISO 10303 conforming specification

Systèmes d'automatisation industrielle et intégration — Bibliothèque de composants —

Partie 102: Protocole d'échange de vue par spécification de conformité ISO 10303

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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 2.

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13584-102 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration,* Subcommittee SC4, *Industrial data.*

ISO 13584 consists of the following parts under the general title *Industrial automation systems and integration — Parts library:*

— *Part 1: Overview and fundamental principles;*

— *Part 20: Logical resource: Logical model of expressions;*

— *Part 24: Logical resource: Logical model of supplier library;*

— *Part 25: Logical resource: Logical model of supplier library with aggregate values and explicit content;*

— *Part 26: Logical resource: Information supplier identification;*

— *Part 31: Implementation resources: Geometric programming interface;*

— *Part 42: Description methodology: Methodology for structuring part families;*

— *Part 101: Geometrical view exchange protocol by parametric program;*

— *Part 102: View exchange protocol by ISO 10303 conforming specification;*

— *Part 501: Reference dictionary for measuring instruments — Registration procedure;*

— *Part 511: Mechanical systems and components for general use — Reference dictionary for fasteners.*

The structure of the ISO 13584 series is described in ISO 13584-1. The numbering of the parts of ISO 13584 reflects its structure:

— Parts 10 to 19 specify the conceptual descriptions,

— Parts 20 to 29 specify the logical resources,

— Parts 30 to 39 specify the implementation resources,

— Parts 40 to 49 specify the description methodology,

— Parts 100 to 199 specify the view exchange protocols,

— Parts 500 to 599 specify reference dictionaries for specific application domains.

Should further parts of ISO 13584 be published, they will follow the same numbering pattern.

Introduction

ISO 13584 is an International Standard for the computer-interpretable representation and exchange of part library data. The objective is to provide a neutral mechanism capable of transferring parts library data, independent of any application that is using a parts library data system. The nature of this description makes it suitable not only for the exchange of files containing parts, but also as a basis for implementing and sharing databases of parts library data.

ISO 13584 is organized as a series of parts, each published separately. The parts of ISO 13584 fall into one of the following series: conceptual descriptions, logical resources, implementation resources, description methodology, view exchange protocol, and standardized content. The series are described in ISO 13584-1. This part of ISO 13584 is a member of the view exchange protocol series.

A view exchange protocol specifies how a particular representation category of the items described in a parts library may be exchanged in a library exchange context. It defines the identification of the representation category, the means to be used to exchange representations that belong to this representation category, the implementation resources that shall be available on any implementation that claims conformance to this view exchange protocol, and the standard data that shall be recognized by any implementation that claims conformance to this view exchange protocol.

This part of ISO 13584 specifies how representations of the items described in a parts library may be exchanged by means of a representation conforming to one application protocol of ISO 10303 (ISO 10303 parts numbered between 200 and 299).

Industrial automation systems and integration — Parts library —

Part 102: View exchange protocol by ISO 10303 conforming specification

1 Scope

This part of ISO 13584 specifies a representation category, called *ISO10303_rep*. This representation category captures the generic concepts used to describe the representation of a product in ISO 10303 application protocols. This representation category may be associated with any of the items defined in a parts library. This part of ISO 13584 also defines how representations that belong to this representation category may be exchanged within a library exchange context by means of ISO 10303 compliant data repositories.

The following are within the scope of this part of ISO 13584:

— the definition of the *ISO10303_rep* representation category, and the mechanisms that are to be used to reference it;

— the properties used to characterize a particular representation within the *ISO10303_rep* representation category;

— the implementation resources to be supported by any implementation that claims conformance to this part of ISO 13584;

— the dictionary entries to be supported by any implementation that claims conformance to this part of ISO 13584;

— the standard data to be recognized by any implementation that claims conformance to this part of ISO 13584.

The following are outside the scope of this part of ISO 13584:

— the structure and exchange format of library delivery files;

— the structure and exchange format of library external files that conform to ISO 10303 application protocols.

NOTE 1 The structure of a library delivery file is defined by a library integrated information model specified in one of the logical resource series parts of ISO 13584.

NOTE 2 The **ISO13584_f_m_iim_schema**, documented in ISO 13584-24:2003, is a library integrated information model that defines the structure of a library delivery file. Such a library delivery file may contain instance values that reference the representation category and/or the library external files defined in this part of ISO 13584.

Annex A, which provides information on document identification, forms an integral part of this part of ISO 13584.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 10303-21:1994, *Industrial automation systems and integration — Product data representation and exchange — Part 21: Implementation methods: Clear text encoding of the exchange structure .*

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

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

ISO 13584-24:2003, *Industrial automation systems and integration — Parts Library — Part 24: Logical resource: Logical model of supplier library*

ISO 13584-42:1998, *Industrial automation systems and integration — Parts Library — Part 42: Description methodology: Methodology for structuring part families*

ISO/IEC 8824-1:2002, *Information technology —Abstract Syntax Notation One (ASN.1) — Part 1: Specification of basic notation*.

3 Terms, definitions, and abbreviations

For the purposes of this document, the following terms and definitions apply. Some of these terms and definitions are repeated for convenience from:

— ISO 10303-1:1994;

— ISO 10303-11:1994;

— ISO 10303-31:1994;

— ISO 13584-1:2001;

— ISO 13584-24:2003;

— ISO 13584-42:1998.

3.1
AP conformance class
subset of an application protocol for which conformance may be claimed
[ISO 10303-1:1994]

3.2
application
group of one or more processes creating or using product data
[ISO 10303-1:1994]

3.3
application context
conditions that define the intended use of product data within an application
[ISO 10303-1:1994]

3.4
application programming interface
API
set of functions that may be triggered by a program
[ISO 13584-24:2003]

3.5
application protocol
AP
part of ISO 10303 that describes the use of (ISO 10303) integrated resources satisfying the scope and information requirements for a specific application context
[ISO 10303-1:1994]

3.6
basic semantic unit
BSU
entity that provides an absolute and universally unique identification of certain objects of the application domain (e.g. classes, data element types)
[ISO 13584-42]

3.7
conformance class
subset of a standard for which conformance may be claimed
[ISO 13584-24:2003]

3.8
conformance requirement
precise, text definition of a characteristic required to be present in a conforming implementation
[ISO 10303-1:1994]

3.9
conforming implementation
implementation which satisfies the conformance requirements defined by one or several conformance classes of a standard
[ISO 13584-24:2003]

3.10
conformity
conformance
fulfilment by the implementation of all specified requirements
[ISO 10303-31:1994]

3.11
entity (data type) instance
named unit of data that represents a unit of information within the class defined by an entity, and which is a member of the domain established by an entity data type
[ISO 10303-11:1994]

3.12
functional model of a part
information model of one representation category of a part in an integrated library
[ISO 13584-1:2001]

3.13
functional view of a part
information model of one representation category of a part in product data
[ISO 13584-1:2001]

NOTE The structure of a functional view does not depend on the part it represents.

3.14
implementation method
technique used by computers to exchange data that is described using the EXPRESS data specification language
[ISO 13584-24:2003]

3.15
implementation resources
capabilities of a software system that shall be available to claim conformance to a particular conformance class of a view exchange protocol or both view exchange protocol and library integrated information model
[ISO 13584-24:2003]

3.16
information model
formal model of a set of facts, concepts or instructions to meet a specific requirement
[ISO 10303-1:1994]

3.17
integrated library
operational system consisting of a library management system and a user library
[ISO 13584-24:2003]

3.18
library
see: **parts library** (3.25), **supplier library** (3.31), and **user library** (3.32)
[ISO 13584-1:2001]

3.19
library data supplier
organisation that delivers a supplier library in the standard format defined in ISO 13584 and is responsible for its content
[ISO 13584-1:2001]

3.20
library delivery file
population of EXPRESS entity instances conforming to a library integrated information model and represented according to one of the implementation methods specified in ISO 10303
[ISO 13584-24:2003]

NOTE A library delivery file specifies the structure and the content of a supplier library. It can reference library external files.

3.21
library end-user
user of an integrated library.
[ISO 13584-1:2001]

NOTE The library end-user:
- consults the data contained in the library;
- selects a given part;
- requests the transmission of a selected view of this part from the library system

3.22
library exchange context
set of one library delivery file and zero, one or several library external files that represent together a supplier library
[ISO 13584-24:2003]

3.23
library external file
file, referenced from a library delivery file, that contributes to the definition of a supplier library
[ISO 13584-24:2003]

NOTE The structure and the format of a library external file is specified in the library delivery file that references it.

3.24
library integrated information model
LIIM
EXPRESS schema that integrates resource constructs from different EXPRESS schemas in order to represent supplier libraries for the purpose of exchange, and which is associated with conformance requirements
[ISO 13584-24:2003]

NOTE Three library integrated information models are defined in ISO 13584-24 for representing different kinds of supplier libraries.

3.25
parts library
identified set of data, and possibly programs, which can generate information about a set of parts
[ISO 13584-1:2001]

3.26
product
facts, concepts or instructions
[ISO 10303-1:1994]

3.27
reference coordinate system
underlying global rectangular Cartesian coordinate system to which all geometry refers
[ISO 13584-101:2003]

3.28
representation category
abstraction used to distinguish between different user perspectives of a part
[ISO 13584-1:2001]

NOTE In the model defined in this International Standard, this distinction is formally expressed in terms of a view logical name and in terms of the view control variables.

3.29
standard data
requirement on a software system defined by means of EXPRESS entity (data type) instances that are supposed to be recognised by this software system
[ISO 13584-24:2003]

3.30
Standard for the Exchange of Product model data
STEP
ISO 10303

3.31
supplier library
set of data, and possibly of programs, for which the supplier is defined and which describes in the standard format defined in ISO 13584 a set of parts and/or a set of representations of parts
[ISO 13584-24:2003]

3.32
user library
information that results from the integration of one or more supplier libraries by the library management system and possibly from a later adaptation performed by the user
[ISO 13584-1:2001]

3.33
view control variable
variable of enumerated type, which can be associated with a view logical name and is intended to further specify the perspective adopted by the user regarding a part (e.g. for geometry: 2D, wire frame, solid)
[ISO 13584-1:2001]

3.34
view exchange protocol
VEP
part of ISO 13584 that describes the use of resource constructs and of representation transmission interfaces which satisfy the information requirement for the exchange of one representation category of parts
[ISO 13584-24:2003]

3.35
view logical name
identifier of a representation category corresponding to a perspective that can be adopted by a user regarding a part (e.g. geometry, inertia, kinematics)
[ISO 13584-1:2001]

4 Identification of the *ISO10303_rep* representation category

4.1 Concepts

When a library item is selected, it is often useful to access the shape of this item. Such a shape is a generic concept that may be captured at various levels of completeness and detail. These levels may be defined independently of the library items by the requirements that are intended to be met by each level.

To address this requirement, this part of ISO 13584 defines:

— the *ISO10303_rep* representation category that enables a product representation defined by ISO 10303 to represent a library item;

— five view control variables that allow ISO 10303 **representation** entities to be referenced.

4.2 Standardized dictionary entries

4.2.1 General

The information model of the *ISO10303_rep* representation category shall be defined by standard data that consist of a functional view class entity data type instance. Such a functional view class is captured by an instance of the **functional_view_class** entity data type.

NOTE 1 Functional view of a part is defined in ISO 13584-1:2001. The **functional_view_class** EXPRESS entity data type is defined in ISO 13584-24:2003.

NOTE 2 The modelling language EXPRESS which is used to define the entity data type is defined in ISO 10303-11:1994.

EXAMPLE The information model of the *ISO10303_rep* representation category can be defined in EXPRESS through attributes like *step_ap* that specify the application protocol to be used, and a *content* that is an ISO 10303-43 **representation** as follows:

```
ENTITY basic_geometry;
      step_ap: step_application_protocol_type;
      ...
      content: representation;
END_ENTITY;
```

Using the EXPRESS resource constructs defined in ISO 13584-24:2003, the same information model can also be defined and exchanged as an instance of a **functional_view_class** entity data type, using the STEP file format defined in ISO10303-21:1994:

```
#1 = FUNCTIONAL_VIEW_CLASS(..., 'ISO10303_rep', (#10, ...), (#11));
#10 = PROPERTY_BSU('step_ap',...);   /* a view control variable */
#11 = PROPERTY_BSU('content',...);   /* a view property */
```

The latter description is the one used by this part of ISO 13584, and the corresponding instances are found in the dictionary of a conforming implementation.

The universal identification of this instance by means of a basic semantic unit is defined in 4.2.2. The universal identification of the view control variables defined for this instance, together with their domains of values are defined in 4.2.3. The **functional_view_class** instance of the *ISO10303_rep* representation category shall not contain any **view_properties**. The attribute **its_superclass** of this instance does not exist, i.e. the corresponding functional view class has no superclass.

NOTE 3 **view_properties** is an attribute of **functional_view_class** defined in ISO 13584-24. **its_superclass** is an attribute of **class** defined in ISO 13584-42.

4.2.2 View logical name

The basic semantic unit identifying the functional view class that captures the representation category defined in this part of ISO 13584 contains the attributes shown in Table 1.

Table 1 — View logical name description

class_code	class_version	supplier_code
‘ISO10303_rep’	‘001’	‘0112/1///13584_102_1’

This set of information provides a universal identification of the *ISO10303_rep* representation category, and constitutes its view logical name.

NOTE D.3.3.4 and D.3.4.1 in ISO 13584-42:1998 require that the supplier code specified in ISO 13584-26 be used for any ISO 13584 data exchange.

4.2.3 View control variables

The functional view class is characterised using the view control variables whose universal identification and respective datatypes are described in Table 2 and illustrated in Figure 1.

Table 2 — View control variables of the *ISO10303_rep* functional view class

code	**version**	**value**	**corresponding labels** (in English)
‘step_ap’	'001'	201 . . . 299	'AP 201’ . . . 'AP 299’
‘step_cc’	'001'	00 01 02 03 04 ... 99	‘null’ 'AP Conformance Class One’ 'AP Conformance Class Two’ 'AP Conformance Class Three’ 'AP Conformance Class Four’ . . . 'AP Conformance Class Ninety-nine’
‘detail_level’	‘001’	0 1 2 3	‘null’ ‘simplified’ ‘standard’ ‘extended’
‘side’	‘001’	0 1 2 3 4 5 6	‘null’ ‘front’ ‘rear’ ‘right’ ‘left’ ‘top’ ‘bottom’
‘variant’	‘001’	0 1 2 3 … n	‘null’ ‘external_shape’ ‘section’ *library data supplier dependent*

4.3 Rules for the *ISO10303_rep* representation category

4.3.1 General

This subclause defines the conceptual requirements that are intended to be met by each particular *ISO10303_rep* representation associated with a library item.

4.3.2 Step_ap

The value of step_ap is the integer part number of the ISO 10303 application protocol to which the library external file is conformant.

EXAMPLE If the geometry for a brake pedal is represented in a data repository conformant to ISO 10303-214, then step_ap will be set to 214.

4.3.3 Step_cc

The value of step_cc is the number of the AP conformance class of the ISO 10303 application protocol to which the library external files are conformant. When step_cc is set to 00 ('null') it means that the library external files are conformant to any AP conformance class of the corresponding ISO 10303 Application Protocol.

EXAMPLE If the geometry for a brake pedal is represented in a data repository conformant to ISO 10303-214 and the data repository for this representation conforms to the "Conformance Class for component design with 3D shape representation (CC1)", then step_cc will be set to 01.

4.3.4 Detail level

The detail_level enables the distinction between levels of geometric detail. In the case where the STEP conforming representation is non-geometric, detail_level shall be set to 0 ('null').

EXAMPLE The level of detail for a screw will vary based on the user's needs. A screw manufacturer sometimes requires very detailed representations showing threads and precise dimensions. A mechanical designer building a simple assembly sometimes requires a standard representation of the screw showing the basic outline of the shape. A mechanical designer of a complex assembly with hundreds of screws somtimes requires a very simple representation of the screw showing a minimal geometry. An inventory manager somtimes requires a non-graphical view of the screw, like the configuration-controlled design information in STEP conformance class 1 of ISO 10303-203 [3].

Detail level 0: the representation does not contain geometry.

Detail level 1: the representation shall include, as a minimum, an indication of the reference coordinate system of the library item.

Detail level 2: the representation shall include, as a minimum, all the geometric representation items that are needed to establish a spatial relationship between the library item and the environment in which the item is intended for insertion.

Detail level 3: The representation shall include, as a minimum, all the geometric representation items that provide for overlapping (in 2D) or collision detection (in 3D) and it shall provide a representation that may be used in a detail design of the corresponding item.

4.3.5 Side

The meaning of the side view control variable and its relationship with the **geometric_representation_context** of the library item are defined in Figure 1.

This figure shows how the side is defined according to the definition of the reference coordinate system of the library item. In the case of 3D geometry and in the case of non-geometrical representations, side shall be set to 0 ('null').

In the case of 3D geometry and in the case where the detail level is 0 ('null'), side shall be equal to 0 ('null').

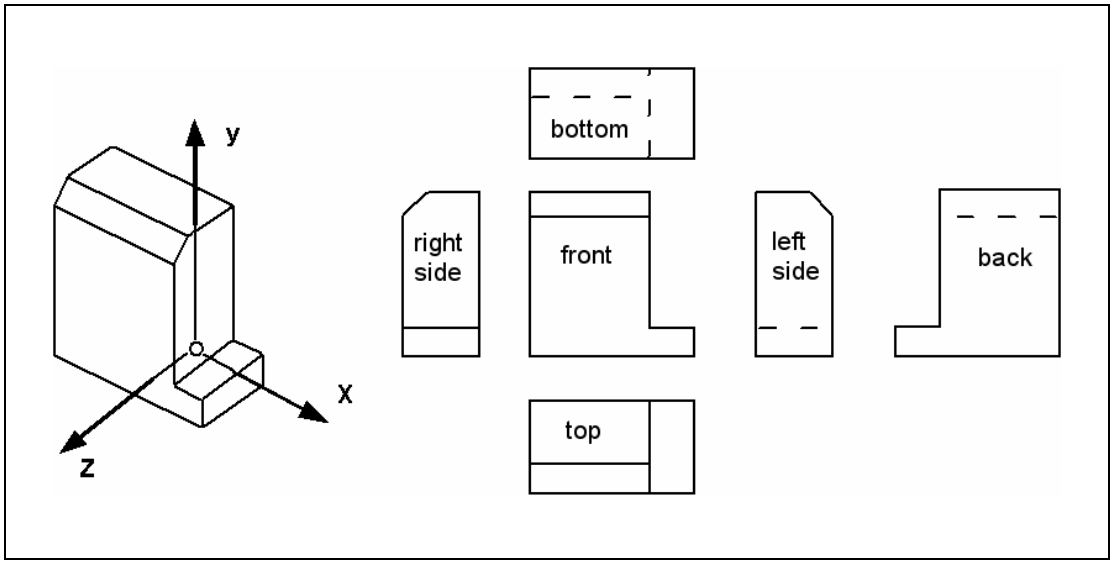

Figure 1 — Meaning of side view control variable

4.3.6 Variant

Variant enables the distinction between representations based upon the intended use of the representation.

EXAMPLE 1 A pair of 2D representations of a complex part, such as the distributor in automobile, might use the same step_ap, step_cc, detail level, and side. The first representation might show the front view of the distributor, while the second might show a sectional front view that reveals some of the detail of the inside of the distributor. In the first case, the view control variables can be set as follows: step_ap = 214 ('AP 214'), step_cc = 001 ('AP Conformance Class One'), detail_level = 3 ('extended'), and variant = 1 ('external_shape'). In the second case, the view control variables can be set as follows: step_ap = 214 ('AP 214'), step_cc = 001 ('AP Conformance Class One'), detail_level = 3 ('extended'), and variant = 2 ('section'). Only the value of variant is different.

EXAMPLE 2 A pair of CSG representations of a complex part, such as a ball valve, might use the same step_ap, step_cc, and detail level. The first representation might show the actual dimensions of the valve, while the second representation might show the clearance envelope required to access the valve's hand wheel. The first representation can use a variant = 1 ('external_shape') or a value defined by the supplier. The second representation uses a value defined by the supplier. Values of variant defined by the supplier shall be greater than 2.

Variant 0: this variant level specifies that the view does not have geometry.

Variant 1: this variant level specifies that the represented shape is the external shape of the library item.

Variant 2: if it exists, this variant level specifies that the shape represented includes a cross-section.

Variant 3..n: these variant levels are library data supplier dependent.

5 Exchange format

5.1 General

This clause defines the requirements for the library external files compliant with this part of ISO 13584. There are currently only two recognized methods for referencing STEP representations

from outside of an ISO 10303 conforming data repository. Both methods allow the identification of a single **representation** entity as defined in ISO 10303-43 **representation_schema**.

NOTE The format of an ISO 10303 application protocol is defined by the appropriate 200 series part in ISO 10303. This clause only adds restrictions necessary to ensure the unambiguous reference to part representations within ISO 10303 data repositories.

5.2 External referent assignment

In this method, application protocols which define entities sub-typed from the **external_referent_assignment** entity in the **management_resources_schema** in ISO 10303-41 may use the attribute **assigned_name** to refer to the **representation** entity of interest. This method has the advantage of allowing multiple **representation** entities in a single ISO 10303 conforming data repository to be referenced by a library exchange context. This method is referred to as method 1 throughout this view exchange protocol.

Figure 2 shows the ISO 13584 definition for some of the internal components of a library management system (LMS) and their relationship to the files in a library exchange context using the external referent assignment mechanism. This is only a logical view that allows specification of the required LMS functions. Individual library management systems may be implemented in a different configuration.

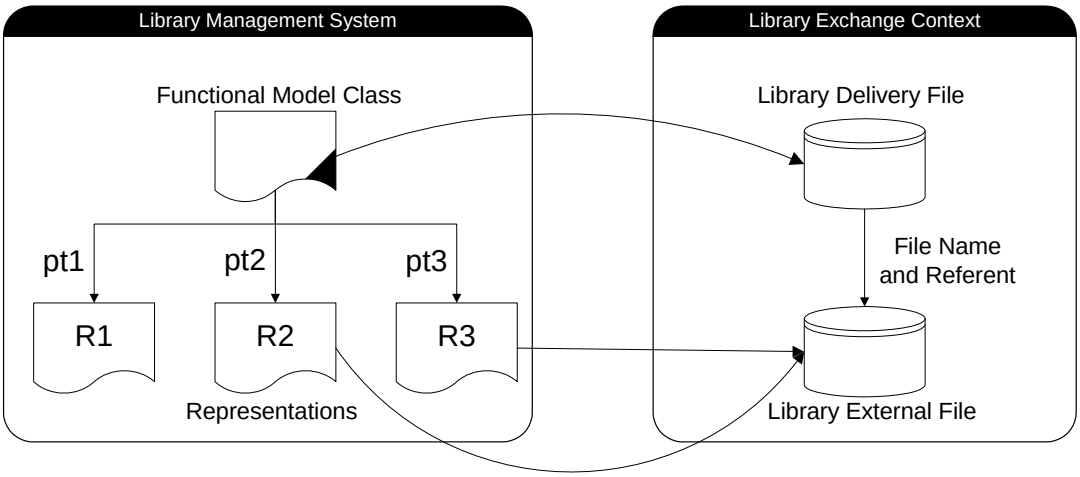

Figure 2 — Method 1: external referent assignment

5.3 One representation per file

In this method, ISO 10303 conforming data repositories are required to have only one **representation** entity. This makes references to the ISO 10303 conforming data repository synonymous with references to the representation. This method is referred to as method 2 throughout this view exchange protocol.

Figure 3 shows the ISO 13584 definition for some of the internal components of a library management system (LMS) and their relationship to the files in a library exchange context using one file for each representation. This is only a logical view that allows specification of the required LMS functions. Individual library management systems may be implemented in a different configuration.

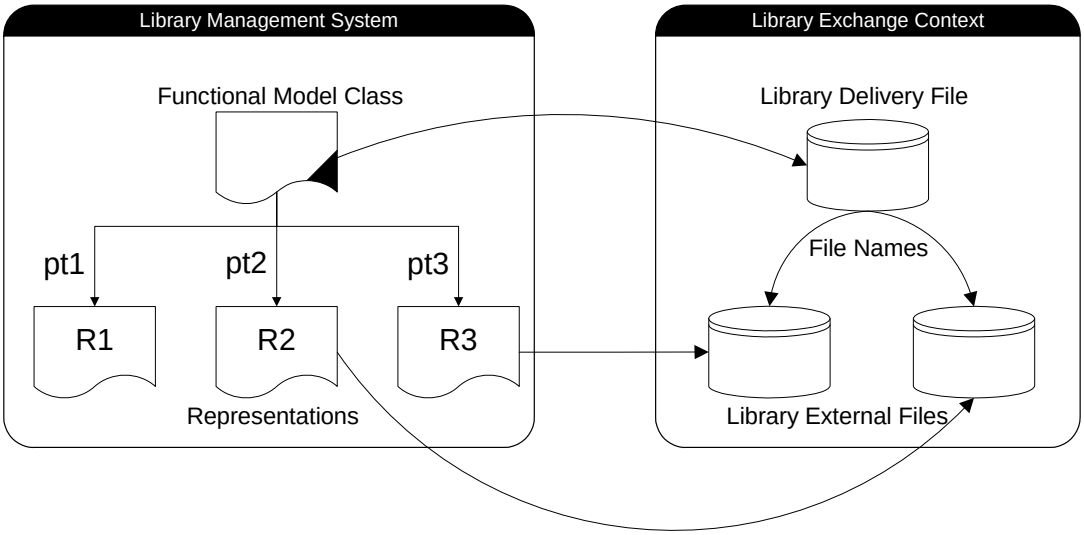

Figure 3 — Method 2: file name

6 Conformance requirements

6.1 General

This part of ISO 13584 implicitly defines a matrix of view exchange protocol conformance classes that may be selected by an implementation. Conformance classes for this view exchange protocol are based upon ISO 10303 application protocols (APs) and the AP conformance classes defined for these APs. It is undesirable to explicitly define conformance classes for this view exchange protocol, because the list of ISO 10303 APs is not static.

A conformance class of this view exchange protocol shall be defined for each AP conformance class of each ISO 10303 application protocol and for each of the two methods of identifying **representation** entities. The method for identifying **representation** entities is enumerated as method 1, corresponding to the method defined in 5.2 and method 2, corresponding to 5.3. The conformance classes of this part of ISO 13584 are defined by specifying three pieces of information: the ISO 10303 application protocol number, the method used to point to representations, and the lexical order of the application protocol AP conformance class used.

EXAMPLE If the library external files referenced by a library integrated information model which references this view exchange protocol contain data compliant with ISO 10303-203 [3] (Configuration Controlled Design) AP conformance class 3 (shapes represented by wireframe models with topology), then conformance is needed with all requirements of conformance class ISO_10303_203-2-3 in order to claim conformance to this view exchange protocol. The view exchange protocol conformance class name follows the pattern ISO_10303_<AP>-<method>-<AP Conformance Class>. Since ISO 10303-203 does not support the **external_referent_assignment** entity, only method 2 is available, and the ISO 10303 data repository is required to contain one and only one **edge_based_wireframe_representation** entity or one and only one **shell_based_wireframe_representation** entity.

An implementation claiming conformance to this part of ISO 13584 shall contain the dictionary entries defined in Clause 4, shall have the capability to process library external files compliant with Clause 5, shall include the implementation resources defined in 6.2, and shall recognize any library delivery context that obeys the constraints defined in 6.4.

6.2 Implementation resources

Implementations which support this part of ISO 13584 shall support at least one ISO 10303 compliant translator having an application programming interface (API) that supports at least one of the methods for identifying **representation** entities defined in Clause 5.

As shown in Figures 2 and 3, each functional model class managed by a library management system may be associated with one or more representations for a part. This part of ISO 13584 defines how representations R1, R2 and R3 in Figures 2 and 3 may be captured in library external files conformant with ISO 10303. In order to maintain the associations between the functional model class and its representations (pt1 to pt3 in Figures 2 and 3), the PLIB translator shall be able to interact with a STEP translator through some API.

In the case of preprocessing an ISO 10303 compliant part representation using method 1 described in 5.2, the API shall allow the ISO 13584 preprocessor to submit a representation of a part for inclusion of this representation in a STEP data repository. Furthermore, the API shall return both the name of the generated STEP repository, and the value of the **assigned_name** attribute of the **external_-referent_assignment** entity that references a particular **representation** within the ISO 10303 conforming data repository.

In the case of preprocessing an ISO 10303 compliant part representation using method 2 described in 5.3, the API shall allow the ISO 13584 preprocessor to submit a representation of a part for inclusion of this representation in a STEP data repository. Furthermore, the API shall return the name of the generated ISO 10303 conforming data repository.

In the case of postprocessing an ISO 10303 compliant part representation using method 1 described in 5.2, the API shall allow the ISO 13584 postprocessor to submit an ISO 10303 conforming data repository name, and the value of an **assigned_name** attribute of the **external_referent_assignment** entity which references a particular **representation** within the STEP repository. Furthermore, the API shall return a reference to the local representation generated by the STEP postprocessor.

In the case of postprocessing an ISO 10303 compliant part representation using method 2 described in Clause 5.3, the API shall allow the ISO 13584 postprocessor to submit the name of an ISO 10303 conforming data repository. The API shall return a reference to the local representation generated by the STEP postprocessor.

NOTE The resolution of the ISO 10303 conforming data repository into a part representation on the receiving system can be postponed until the user of the local LMS requests the representation of the part. In other words, it is possible to store data in ISO 10303 conforming data repositories, rather than requiring translation as part of the compilation of a library exchange context on a receiving system.

6.3 Implementation methods

The implementation method for the library delivery file that references library external files compliant with this part of ISO 13584 shall be defined by the library integrated information model referenced by the library delivery file.

NOTE 1 Identification of the library delivery file and the medium to be used for storing the library delivery file and the library external files referenced by this library delivery file are defined by separate agreement between the sender and the receiver and are outside the scope of this part of ISO 13584.

Following the mechanism defined in this part of ISO 13584, the implementation method for a library external file constituting the **external_content** of an **external_item** that references some ISO 10303 AP as its **external_file_protocol** is specified by the corresponding ISO 10303 AP. When several implementation methods are allowed by the ISO 10303 AP, the implementation method for the library external file shall be established by private agreement between the sender and the reciever.

NOTE 2 **external_context**, **external_item**, and **external_file_protocol** are defined in ISO 13584-24:2003.

6.4 Constraints on a library delivery file for referencing this view exchange protocol

6.4.1 General

This subclause defines **view_exchange_protocol_identification** instance values that are allowed for use in a library delivery file to reference the view exchange protocol defined in this part of ISO 13584.

NOTE 1 **view_exchange_protocol_identification** is defined in ISO 13584-24:2003.

The set of allowed values is defined textually in 6.4.2, which specifies for each view exchange protocol conformance class the allowed values of **view_exchange_protocol_identification.name**, **view_exchange_protocol_identification.application**, **view_exchange_protocol_identification.level**, and the **view_exchange_protocol_identification.external_file_protocols[1].level**. The specification of these values is done by means of an EXPRESS schema called **ISO13584_102_cc_schema**, which contains a global rule. This rule shall be fulfilled by any library delivery file that references the view exchange protocol defined in this part of ISO 13584 in any of its conformance classes. The goal of the rule is to specify the allowed values for the attributes of the **view_exchange_protocol_identification** entity and the **external_file_protocol** entity used to reference the view exchange protocol defined in this part of ISO 13584.

When the view exchange protocol defined in this part of ISO 13584 is referenced by a library delivery file, these rules shall be added to the EXPRESS schema specifying the requirements of the library integrated information model (LIIM) referenced by this library delivery file using the following process.

Assume that a library delivery file references a library integrated information model "L", the requirements of which are stated in the unique schema without external references called "L_library_implicit_schema" and the view exchange protocol defined in this part of ISO 13584.

NOTE 2 An EXPRESS schema that specifies a set of requirements without any external references is often called a long form schema.

EXAMPLE 1 **ISO13584_f_m_iim_library_implicit_schema** is an EXPRESS schema that specifies the requirement of LIIM 24-2 by means of a single schema without any external references.

NOTE 3 **ISO13584_f_m_iim_library_implicit_schema** is defined in Annex G of ISO 13584-24:2003.

This library delivery file shall fulfil the requirements of the schema defined as follows:

— Check that all the entities referenced in the **ISO13584_102_cc_schema** already exist in the **L_library_implicit_schema**, otherwise reference to the library integrated information model "L" and to the view exchange protocol defined in this part of ISO 13584 is not allowed.

NOTE 4 The information model of a library delivery file and the entities it contains are specified by a library integrated information model. A view exchange protocol can only add constraints.

EXAMPLE 2 The view exchange protocol defined in this part of ISO 13584 references the **abstract_functional_model_class** entity. Therefore, this view exchange protocol cannot be used with the **ISO13584_g_m_iim_library_implicit_schema** that specifies the requirement of LIIM 24-1, which does not reference any EXPRESS resource constructs for modelling functional models.

NOTE 5 **ISO13584_g_m_iim_library_implicit_schema** is defined in Annex C of ISO 13584-24:2003.

— Replace in the **ISO13584_102_cc_schema** schema the string 'ISO13584_EXTENDED_DICTIONARY_SCHEMA' by the string 'L_library_implicit_schema' in capital letters.

EXAMPLE 3 If the library integrated information model "L" is the LIIM 24-2 defined in ISO 13584-24, replace the string 'ISO13584_EXTENDED_DICTIONARY_SCHEMA by the string 'ISO13584_F_M_IIM_LIBRARY_IMPLICIT_SCHEMA'.

— Add to the **L_library_implicit_schema** all the functions and rules defined in the **ISO13584_102_cc_schema**.

NOTE 6 The result of the above process is that the rule **ISO13584_102_allowed_refrence_to_conformance_class_rule** rule has been added in the **L_library_implicit_schema** together with all the functions required to ensure this rule.

NOTE 7 The names of the functions and rules defined in this part of ISO 13584 are prefixed by the string "ISO13584_102" to avoid name conflicts when more than one view exchange protocol is referenced by the same library delivery file.

NOTE 8 A library delivery file referencing a library integrated information model "L", the requirements of which are stated in the unique schema without external references called "L_library_implicit_schema", and the view exchange protocol defined in this part of ISO 13584 can also be exchanged using the **L_library_implicit_schema** defined in the part of ISO 13584 that specifies the library integrated information model "L" without any further change. In this case, the requirements specified in this part of ISO 13584 are not included in the exchange schema. They are checked before and after exchange of the library delivery file.

This listing of the **ISO13584_102_cc_schema** schema is available in computer-interpretable form and can be found at the following URL:

http://www.tc184-sc4.org/EXPRESS/

NOTE 9 If there is difficulty accessing these sites, contact ISO Central Secretariat or contact the ISO TC 184/SC4 Secretariat directly at: sc4sec@tc184-sc4.org.

NOTE 10 The information provided in computer-interpretable form at the above URLs is normative.

NOTE 11 If errors are identified in the EXPRESS code after publication of this part of ISO 13584, the description of these errors, together with the corrections recommended for PLIB implementations by the part editors before publication of a Technical corrigendum can be found at the following URL:

http://www.lisi.ensma.fr/ftp/pub/PLIB_release_notes/Part102/PART102-IS/

6.4.2 Conformance class specification

To reference the view exchange protocol defined in this part of ISO 13584, a library delivery file shall use an instance of a **view_exchange_protocol_identification** entity, the **name** attribute of which shall be 'ISO_13584_102'.

A conformance class of this part of ISO 13584 is identified by a triple of values:

— the value of **view_exchange_protocol_identification.application**, which shall be a string of thirteen characters corresponding to the standard number of the ISO 10303 application protocol being referenced, in the format: 'ISO_10303_2##';

— the value of **view_exchange_protocol_identification.level**, which shall be either ‘1’ if method 1 of 5.2 is used, or ‘2’, if method 2 of 5.3 is used; and

— the value of **view_exchange_protocol_identification.external_file_protocols[1].level**, which shall be a string of two digits that represent the lexical order of the AP conformance class used for the **view_exchange_protocol_identification.application** AP.

6.4.3 Constraints on a library delivery file referencing *ISO10303_rep*

6.4.3.1 General

The **view_exchange_protocol_identification** instance values allowed for use in a library delivery file, in order to reference the view exchange protocol defined in this part of ISO 13584 in any of its conformance classes, shall obey the constraints defined in the following EXPRESS schema.

The EXPRESS specification is:

```
*)
SCHEMA ISO13584_102_cc_schema;

REFERENCE FROM ISO13584_IEC61360_dictionary_schema(
     item_names);

REFERENCE FROM ISO13584_extended_dictionary_schema(
     data_exchange_specification_identification,
     view_exchange_protocol_identification);

REFERENCE FROM ISO13584_external_file_schema(
     external_file_protocol,
     standard_data_protocol);

REFERENCE FROM person_organization_schema(
     organization);
(*
```

The schemas used above can be found in the following documents:

ISO13584_IEC61360_dictionary_schema	Informative Annex D of ISO 13584-42:1998 and normative Annex in IEC 61360-2:2004
ISO13584_extended_dictionary_schema	ISO 13584-24:2003,
ISO13584_external_file_schema	ISO 13584-24:2003,
person_organization_schema	ISO 10303-41.

6.4.3.2 ISO13584_102_protocol_compliant_to_cc function

The **ISO13584_102_protocol_compliant_to_cc** function checks whether an **external_file_protocol** may be referenced by the instance of **view_exchange_protocol_identification** that represents a legitimate conformance class of this part of ISO 13584. An **external_file_protocol** may be referenced by the instance of **view_exchange_protocol_identification** that represents a legitimate conformance class of this part of ISO 13584 if the following conditions are fulfilled:

— the **external_file_protocol** shall be a **standard_data_protocol**,

— the **organisation** attribute of the **external_file_protocol** shall reference an **organization** of which the **id** attribute equals 'ISO' and the **name** attribute equals 'International Organization for Standardization',

— the **country** attribute of the **external_file_protocol** shall not exist,

— the **protocol_name** attribute of the **external_file_protocol** shall be like 'ISO_10303_2##', and

— the **level** attribute of the **external_file_protocol**, if it exists, shall have'00', '01', '02' until '99' as its value.

The **ISO13584_102_protocol_compliant_to_cc** function returns TRUE if the given **external_file_protocol** is allowed for reference, otherwise it returns FALSE.

The EXPRESS specification is:

```
*)
```

```
FUNCTION ISO13584_102_protocol_compliant_to_cc(
     p: external_file_protocol): BOOLEAN;
     IF (('ISO13584_EXTENDED_DICTIONARY_SCHEMA.STANDARD_DATA_PROTOCOL'
          IN TYPEOF(p))
          AND (ISO13584_102_organization_compliant_to_cc(
               p.organisation))
          AND (p.protocol_name LIKE 'ISO_10303_2##')
          AND (p.level LIKE '##')
          AND ((0 <= VALUE(p.level)) AND (VALUE(p.level) <= 99)))
     THEN
          RETURN(TRUE);
     ELSE
          RETURN(FALSE);
     END_IF;
END_FUNCTION; -- ISO13584_102_protocol_compliant_to_cc
(*
```

6.4.3.3 ISO13584_102_organization_compliant_to_cc function

The **ISO13584_102_organization_compliant_to_cc** function checks whether an **organization** may be referenced from an **external_file_protocol** referenced by a **view_exchange_protocol_identification** that represents a legitimate conformance class of this part of ISO 13584. An **organization** may be referenced from an **external_file_protocol** referenced by a **view_exchange_protocol_identification** that represents a legitimate conformance class of this part of ISO 13584 if the following conditions are fulfilled:

— the **id** attribute of the **organization** equals 'ISO', and

— the **name** attribute of the **organization** equals 'International Organization for Standardization'.

The **ISO13584_102_organization_compliant_to_cc** function returns TRUE if the given **organization** fulfils these constraints, otherwise it returns FALSE.

The EXPRESS specification is

```
*)
FUNCTION ISO13584_102_organization_compliant_to_cc(org: organization):
BOOLEAN;
     IF ((org.id = 'ISO') AND
          (org.name = 'International Organization for
Standardization'))
     THEN
          RETURN(TRUE);
     ELSE
          RETURN(FALSE);
     END_IF;
END_FUNCTION; -- ISO13584_102_organization_compliant_to_cc
(*
```

6.4.3.4 ISO13584_102_vep_application_is_the_protocol_name function

The **ISO13584_102_vep_application_is_the_protocol_name** function checks whether the **application** attribute of the **vep_id view_exchange_protocol_identification** is equal to the

protocol_name attribute of the **external_file_protocol** referenced by the first item of the set of **external_file_protocols** defined by the **external_file_protocols** attribute of the **vep_id view_exchange_protocol_identification**.

The **ISO13584_102_vep_application_is_the_protocol_name** function returns TRUE if this condition holds. If the **external_file_protocols** attribute of the **vep_id view_exchange_protocol_identification** is empty, or if the above conditions does not hold, the **ISO13584_102_vep_application_is_the_protocol_name** function returns FALSE.

The EXPRESS specification is:

```
*)
FUNCTION ISO13584_102_vep_application_is_the_protocol_name(
     vep_id: view_exchange_protocol_identification): BOOLEAN;
     IF (vep_id\data_exchange_specification_identification.
          external_file_protocols = [])
     THEN
          RETURN(TRUE);
     ELSE
          RETURN((vep_id\data_exchange_specification_identification
               .application
               = vep_id\data_exchange_specification_identification
               .external_file_protocols[1].protocol_name));
     END_IF;
END_FUNCTION; -- ISO13584_102_vep_application_is_the_protocol_name
(*
```

6.4.3.5 ISO13584_102_allowed_reference_to_conformance_class_rule rule

The **ISO13584_102_allowed_reference_to_conformance_class_rule** rule defines constraints on a **view_exchange_protocol_identification** to be allowed for use to reference the view exchange protocol defined in this part of ISO 13584. A **view_exchange_protocol_identification** may reference the view exchange protocol defined in this part of ISO 13584 if the following conditions are fulfilled:

— the **name** attribute of the **view_exchange_protocol_identification** shall equal 'ISO_13584_102',

— the **external_file_protocols** attribute of the **view_exchange_protocol_identification** references only one **external_file_protocol**,

— the **protocol_name** attribute of the referenced **external_file_protocol** shall be equal to the **application** attribute of the **view_exchange_protocol_identification**,

— the **level** attribute of the **view_exchange_protocol_identification** shall be equal to either '1' or '2',

— the **status** attribute of the **view_exchange_protocol_identification** shall be equal to either 'WD', 'CD' or 'DIS' or 'FDIS' or 'IS',

— the **external_file_protocol** referenced by the **external_file_protocols** attribute of the **view_exchange_protocol_identification** shall fulfill the constraints specified by the **ISO13584_102_protocol_compliant_to_cc** function defined in clause 6.4.3.2,

— the value used for **level** attribute of the **external_file_protocol** referenced by the **external_file_protocols** attribute of the **view_exchange_protocol_identification** shall be

restricted such that it is within the count of lexically ordered AP conformance classes of the ISO 10303 Application Protocol identified by the **application** attribute of the **view_exchange_protocol_identification**, or shall be 00 ('null').

The last condition is specified as an informal proposition.

The EXPRESS specification is:

```
*)
RULE ISO13584_102_allowed_reference_to_conformance_class_rule FOR (
     view_exchange_protocol_identification);
WHERE
WR1: QUERY(vep_id <* view_exchange_protocol_identification |
     (vep_id\data_exchange_specification_identification.name
     = 'ISO_13584_102')
     AND
     (SIZEOF(vep_id\data_exchange_specification_identification
     .external_file_protocols) <> 1)) = [];

WR2: QUERY(vep_id <* view_exchange_protocol_identification |
     (vep_id\data_exchange_specification_identification.name =
          'ISO_13584_102')
     AND
          ((vep_id\data_exchange_specification_identification.status
          = 'WD')
          OR (vep_id\data_exchange_specification_identification.status
          = 'CD')
          OR (vep_id\data_exchange_specification_identification.status
          = 'DIS')
          OR (vep_id\data_exchange_specification_identification.status
          = 'FDIS')
          OR (vep_id\data_exchange_specification_identification.status
          = 'IS'))
     AND
          ISO13584_102_vep_application_is_the_protocol_name(vep_id)
     AND
          ((vep_id\data_exchange_specification_identification.level
          = '1')
          OR (vep_id\data_exchange_specification_identification.level
          = '2'))
     AND
          (QUERY(efp <* vep_id\
          data_exchange_specification_identification
          .external_file_protocols | NOT(
          ISO13584_102_protocol_compliant_to_cc(efp))) = []))
     = QUERY(vep_id <* view_exchange_protocol_identification |
     (vep_id\data_exchange_specification_identification.name =
     'ISO_13584_102'));
END_RULE; -- ISO13584_102_allowed_reference_to_conformance_class_rule
(*
```


6.4.3.6 Formal propositions

WR1: in **view_exchange_protocol_identification**s that reference the view exchange protocol defined in this part of ISO 13584, only one **external_file_protocol** shall be referenced.

WR2: when a **view_exchange_protocol_identification** entity instance references the view exchange protocol defined in this part of ISO 13584, the **view_exchange_protocol_identification.name** shall have 'ISO_13584_102' as its value, the **view_exchange_protocol_identification.status** shall be equal to either 'WD' or 'CD' or 'DIS' or 'FDIS' or 'IS', the **view_exchange_protocol_identification.level** shall be equal to either '1' or '2', the **view_exchange_protocol_identification.application** shall have the **protocol_name** attribute of the **view_exchange_protocol_identification.external_file_protocols[1] external_file_protocol** as its value, and the **view_exchange_protocol_identification.external_file_protocols** shall fulfill the constraints specifications required by the **ISO13584_102_protocol_compliant_to_cc** function defined in 6.4.3.2.

6.4.3.7 Informal propositions:

IP1: the value used for **level** attribute of the **external_file_protocol** referenced by the **external_file_protocols** attribute of the **view_exchange_protocol_identification** shall be restricted, such that it is within the count of lexically ordered AP conformance classes of the ISO 10303 Application Protocol identified by the **application** attribute of the **view_exchange_protocol_identification**, or shall be 00 ('null')

```
*)
END_SCHEMA; -- ISO13584_102_cc_schema
(*
```

Annex A
(normative)
Information object registration

In order to provide for unambiguous identification of an information object in an open system, the object identifier

{ iso standard 13584 part (102) version (1) }

is assigned to this part of ISO 13584. The meaning of this value is defined in ISO/IEC 8824-1.

Bibliography

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

[2] ISO 10303-31:1994, *Industrial automation system and integration — Product data representation and exchange — Part 31: Conformance testing methodology and framework: General concepts.*

[3] ISO 10303-203, *Industrial automation systems and integration — Product data representation and exchange — Part 203: Application protocol: Configuration controlled 3D designs of mechanical parts and assemblies.*

[4] ISO 10303-214, *Industrial automation systems and integration — Product data representation and exchange — Part 214: Application protocol: Core data for automotive mechanical design processes.*

[5] ISO 13584-1:2001, *Industrial automation systems and integration — Parts Library — Part 1: Overview and fundamental principles.*

[6] ISO 13584-26, *Industrial automation systems and integration — Parts Library — Part 26: Logical resource: Information supplier identification.*

[7] ISO 13584-101:2003, *Industrial automation systems and integration — Parts Library — Part 101: Geometrical view exchange protocol by parametric program.*

[8] IEC 61360-2:2004, *Standard data element types with associated classification scheme for electric components – Part 2: EXPRESS dictionary schema*.

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