TECHNICAL SPECIFICATION

ISO/TS 15926-6

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Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities —

Part 6: Methodology for the development and validation of reference data

Systèmes d'automatisation industrielle et intégration — Intégration de données de cycle de vie pour les industries de "process", y compris les usines de production de pétrole et de gaz —

Partie 6: Méthodologie pour le développement et la validation des données de référence

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

ISO 15926 is organized as a series of parts, each published separately. The structure of ISO 15926 is described in ISO 15926-1.

ISO 15926 consists of the following parts, under the general title *Industrial automation systems and integration — Integration of life-cycle data for oil and gas production facilities*:

— *Part 1: Overview and fundamental principles;*

— *Part 2: Data model;*

— *Part 3: Reference data for geometry and topology* [Technical Specification]*;*

— *Part 4: Initial reference data* [Technical Specification]*;*

— *Part 6: Methodology for the development and validation of reference data* [Technical Specification]*;*

— *Part 7: Implementation methods for the integration of distributed systems: Template methodology* [Technical Specification]*;*

— *Part 8: Implementation methods for the integration of distributed systems: Web Ontology Language (OWL) implementation* [Technical Specification].

The following parts are under preparation:

— *Part 9: Implementation methods for the integration of distributed systems: Facade implementation* [Technical Specification]*;*

— *Part 10: Implementation methods for the integration of distributed systems:·Abstract·test·methods* [Technical Specification]*;*

— *Part 11: Methodology for simplified industrial usage of reference data* [Technical Specification].

Introduction

ISO 15926 is an International Standard for the representation of process industries facility life-cycle information. This representation is specified by a generic, conceptual data model that is suitable as the basis for implementation in a shared database or data warehouse. The data model is designed to be used in conjunction with reference data, i.e. standard instances that represent information common to a number of users, production facilities, or both. The support for a specific life-cycle activity depends on the use of appropriate reference data in conjunction with the data model.

This part of ISO 15926 specifies the information that is required to be recorded for reference data items. This part of ISO 15926 contains examples of reference data items.

NOTE 1 These examples are not taken from ISO/TS 15926-4 or from any other standard. In some cases, the examples contain deliberate mistakes in order to show changes to a reference data library.

NOTE 2 A reference data library used with the ISO 15926 series of parts can be standardized or proprietary. A reference data library which is initially proprietary can subsequently be submitted for standardization. Classes contained within a reference data library can be more or less generic. Generic core classes and commodity classes are likely to be standardized, but specific manufactured product classes are unlikely to be standardized. The terms for the different types of class are defined in Clause 3.

Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities —

Part 6: Methodology for the development and validation of reference data

1 Scope

This part of ISO 15926 specifies technical requirements for the structure and content of a reference data library.

The technical requirements are appropriate to a reference data library that is used with the ISO 15926 series of parts.

The following are within the scope of this part of ISO 15926:

— identification of a reference data item;

— information that defines a reference data item;

— administrative information about the source, the history of changes, and current status of a reference data and a reference data library;

— the way identification, defining information, and administrative data are recorded using ISO 15926-2;

— the reference data library that contains the reference data items necessary to record identification, defining information, and administrative data;

— the representation of the reference data library that is defined by this part of ISO 15926 as a spreadsheet;

— requirements for the representation of a reference data library.

The following are outside the scope of this part of ISO 15926:

— the definitions of the scope of reference data libraries within the ISO 15926 series of standards;

— methods and guidelines for implementing ISO 15926-2;

— the representation of a reference data library, that is not defined by this part of ISO 15926;

— procedures for the maintenance of reference data libraries.

2 Normative references

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

ISO 15926-2, *Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities — Part 2: Data model*

ISO/IEC 11179-3:2013, *Information technology — Metadata registries (MDR) — Part 3: Registry metamodel and basic attributes*

ISO 80000-1, *Quantities and units — Part 1: General*

IETF RFC 2141, *URN syntax*[1)]

3 Terms, definitions, abbreviated terms and symbols

3.1 Terms and definitions

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

3.1.1
administered item
registered item for which administrative information is recorded

[SOURCE: ISO/IEC 11179-3:2013, 3.2.2]

3.1.2
administrative information
<metadata registry> information about the administration of an item in a metadata registry

[SOURCE: ISO/IEC 11179-3:2013, 3.2.3]

3.1.3
class
category or division of things based on one or more criteria for inclusion and exclusion

Note 1 to entry: A class need not have any members (things that satisfy its criteria for membership).

Note 2 to entry: Because of the spatio-temporal paradigm used to define individuals in this International Standard, all classes are non-well-founded sets. These are explained in ISO 15926-2.

[SOURCE: ISO 15926-1:2004, 3.1.1]

3.1.4
commodity product class
product class that has sufficient characterization to indicate suitability for a defined use, and that is an open agreed standard

Note 1 to entry: Often a commodity product class is defined by several other standards. A piping component typically conforms to a “shape standard” and a “material standard”.

Note 2 to entry: Different manufactured product classes, which are specializations of the same commodity product class, are interchangeable for the use defined by the commodity product class.

EXAMPLE The type of light bulb known as 60 W 230 V E27 is a commodity class.

[SOURCE: ISO 15926-1:2004, 3.1.2, modified]

3.1.5
core class
class that is a commonly used subdivision corresponding to terms used in common language

Note 1 to entry: The conditions for membership are often not formally defined; understanding of the class may be conveyed by example.

EXAMPLE Pipe, floor, pump, and light bulb are all core classes.

1) Available at: http://www.ietf.org/rfc/rfc2141.txt

[SOURCE: ISO 15926-1:2004, 3.1.4]

3.1.6
data
representation of information in a formal manner suitable for communication, interpretation, or processing by human beings or computers

[SOURCE: ISO 10303-1:1994, 3.2.14]

3.1.7
de facto class
class corresponding to common natures that are widely recognized but not formally agreed or defined

Note 1 to entry: De facto classes may be formalized by international, national, or industry agreement.

EXAMPLE 1 A manufacturer may choose to make a product of similar specification to that of another manufacturer in order to compete for the market share by choosing to conform to some characteristics of the other product.

EXAMPLE 2 3.5” floppy disk and HB pencil are de facto classes.

[SOURCE: ISO 15926-1:2004, 3.1.8]

3.1.8
information
facts, concepts, or instructions

[SOURCE: ISO 10303-1:1994, 3.2.20]

3.1.9
ISO 15926 conforming reference data library
ISO 15926 reference data library that conforms to the requirements of ISO/TS 15926-6

Note 1 to entry: An ISO 15926 reference data library can, but need not, conform to the requirements of ISO/TS 15926-6.

Note 2 to entry: An ISO 15926 reference data library can, but need not, be a standard.

3.1.10
ISO 15926 reference data library
reference data library that is recorded as instances of entities in ISO 15926-2

3.1.11
manufactured product class
class whose members are individuals produced by a manufacturing process

Note 1 to entry: The members of a manufactured product class may be discrete or may be batches or continuous flows, such as process fluids.

EXAMPLE 1 “Light bulb 60 W 230 V E27” is an example of a manufactured product class whose members are discrete.

EXAMPLE 2 “BS 4040 Leaded Petrol” is an example of a manufactured product class whose members are continuous.

Note 2 to entry: A manufactured product class may correspond to a specification that has not been realized, such a product specification for which no products have been made.

[SOURCE: ISO 15926-1:2004, 3.1.14]

3.1.12
physical quantity
property
aspect or quality of something that can be determined by measurement

Note 1 to entry: The term “property” is used in ISO 15926-2.

3.1.13
possible individual
thing that exists in space and time

Note 1 to entry: This definition is adapted from ISO 15926-2, within which “possible individual” is an entity, but not a defined term.

3.1.14
proprietary class
class whose specification for membership is owned, controlled, or protected by an organization and is not generally available outside that organization

[SOURCE: ISO 15926-1:2004, 3.1.16]

3.1.15
proprietary product class
class that is a manufactured product class and a proprietary class

Note 1 to entry: Proprietary product classes are specializations that depend on rules of inclusion and exclusion, some of which are controlled in a closed way. This means that some aspects of the specification can be arbitrarily changed. Many proprietary product classes are specializations of commodity product classes, de facto classes, or both, where the additional restrictions reflect design or manufacturing details that the manufacturer uses to differentiate his product from others of the same general type.

EXAMPLE 1 A product specification that is owned by a commercial organization, and is marketed under and protected by a registered trade name, is the basis for a proprietary product class.

EXAMPLE 2 Light bulbs 60 W 230 V E27 manufactured by Phillips are members of a proprietary product class.

[SOURCE: ISO 15926-1:2004, 3.1.17]

3.1.16
reference data
process plant life-cycle data that represents information about classes or individuals which are common to many process plants or of interest to many users

[SOURCE: ISO 15926-1:2004, 3.1.18]

3.1.17
reference data item
thing that is defined within a reference data library

Note 1 to entry: Each reference data item is an administered item.

3.1.18
reference data item definition by text
text, and optionally equations and figures, that is intended to be understood by a person, and that is the normative definition of a reference data item

3.1.19
reference data item definition by document reference
normative reference to a document that provides the normative definition of a reference data item

3.1.20
reference data item library record
reference data item and a set of statements about it within a reference data library

3.1.21
reference data item non-person-interpretable identifier
text that is a unique identifier for a reference data item and that is not intended to be interpreted by a person

Note 1 to entry: The use of a reference data item non-person-interpretable identifier is defined in 5.2.

3.1.22
reference data item person-interpretable identifier
text that is a unique identifier for a reference data item, and that is intended to be interpreted by a person

Note 1 to entry: The use of a reference data item person-interpretable identifier is defined in 5.3.

Note 2 to entry: If a reference data item is a class, then its reference data item person-interpretable identifier may be a term.

Note 3 to entry: The reference data item person-interpretable identifier is used for all references to a reference data item in natural language text definitions.

Note 4 to entry: Names in natural language and terms in dictionaries are often unique only within a context. A reference data item may be used in many contexts. Hence a reference data item person-interpretable identifier may be longer than a name in a natural language, and contain words which qualify a natural language name, to ensure that it is unique.

Note 5 to entry: A reference data library may contain additional terms for a reference data item, which are not unique and which are used within particular contexts.

3.1.23
reference data library
managed collection of reference data

[SOURCE: ISO 15926-1:2004, 3.1.19]

3.1.24
standard class
class whose specification for membership is owned or controlled by a standardization body and is publicly available

Note 1 to entry: Standard classes result from the work of national, international, or industry standardization bodies and cover sizes, shapes, materials, performance, and manufacturing processes of equipment and materials. The rules for exclusion and inclusion (or conformance) are agreed by an open, consensus process and are made publicly available. A standard class may only constrain one particular aspect and often be insufficient to determine usage or full manufacturing specifications.

EXAMPLE 1 ASME B16.9 **c**onstrains the dimensions and shapes of steel butt welding pipe fittings.

EXAMPLE 2 IEC 60079–1 specifies constraints on electrical equipment to ensure standard degrees of explosion proofness.

[SOURCE: ISO 15926-1:2004, 3.1.20]

3.1.25
statement
fact
information that is regarded as indivisible

Note 1 to entry: A statement can be recorded as an instance of the entity **relationship** in ISO 15926-2. A set of one or more statements can be recorded in shorthand form as a single item as an instance of a template, as defined in ISO/TS 15926-7.

3.1.26
thing
actual part of the real world, perceived part of the real world, or subject of thought

Note 1 to entry: A thing can be a material or non-material object, idea or action.

Note 2 to entry: This definition is adapted from ISO 15926-2, within which "thing" is an entity, but not a defined term.

3.1.27
version of a reference data library
defined content from within a reference data library

Note 1 to entry: The content of a reference data library can change. A version of a reference data library cannot change.

Note 2 to entry: The formal definition of the class **version of a reference data library** in this part of ISO 15926 is "**multidimensional object** that is a set of things and a set of statements about the set of things, where the things and the statements are within a reference data library".

3.2 Abbreviated terms

ABNF Augmented BNF

API Application Programming Interface

BSU Basic Semantic Unit

OED Oxford English Dictionary

OWL Web Ontology Language

RDF Resource Description Framework

RDL Reference Data Library

URN Uniform Resource Name

URI Uniform Resource Identifier

UTC Coordinated Universal Time

3.3 Symbols for set theory operations

Symbol	Usage	Meaning of usage
∪	A∪B	union of sets A and B
∩	A∩B	intersection of sets A and B
¬	¬A	complement of set A
*	A*	power set of set A

4 Definition and content of a reference data library

4.1 A reference data item

A reference data item shall be an instance of an entity defined in ISO 15926-2.

NOTE 1 A reference data item is often an instance of **class**, but can be an instance of another type of **abstract object**, or of **possible individual**.

NOTE 2 A reference data item can be an instance of a template as defined in ISO/TS 15926-7, because a template is an instance of class of relationship which is defined in ISO/IEC 15026-2.

4.2 A reference data library

The organization that maintains the reference data library shall specify:

— the reference data items that are within the reference data library;

— the statements about the reference data items that are within the reference data library;

— the status of each reference data item and statement within the reference data library;

— the status of each set of reference data items and each set of statements within the reference data library.

The reference data items and statements within a reference data library may be added to. The status of each reference data item or statement may be changed.

NOTE 1 This part of ISO 15926 specifies the minimum information that shall be held about a reference data item.

NOTE 2 To help the use and maintenance of a reference data library, a maintenance organization can:

— define subsets of the reference data items, where the subsets can consist of items relevant to an particular engineering discipline, or with a particular status;

— define subsets of the statements about reference data items, where the subsets can consist of statements about a particular reference data item, about a particular subset of reference data items, or with a particular status.

NOTE 3 Both reference data items and statements about reference data items are “administered items”, where the term is as defined in ISO/IEC 11179-1.

4.3 Version of a reference data library

A version of a reference data library is:

— a set of reference data items from within the reference data library;

— a set of statements from within the reference data library.

4.4 Minimum information about a reference data item

A maintenance organization shall not steward a reference data item as “released”, unless the reference data library contains a statement or statements that specify:

— a unique non-person-interpretable identifier for the reference data item, as defined in 5.2;

— a unique person-interpretable identifier for the reference data item, as defined in 5.3;

— a URI for the reference data item, as defined in 5.4;

— a definition that is either:

  — a text definition, as defined in 6.2;

  — a formal definition using set theory relationship, as defined in 7.2;

— at least one classification as a member of a class that is an entity in ISO 15926-2 for each reference data item, as defined in 7.1;

— if the reference data item is a class, a superclass that is already within the reference data library, as defined in 7.1.

The unique non-person-interpretable and person-interpretable identifiers shall be assigned by the maintenance organization.

NOTE The URI need not be assigned by the maintenance organization. If a URI is assigned to the reference data item by a source which can be normatively referenced, then that URI can be used.

4.5 Minimum information about a version of a reference data library

A maintenance organization shall not steward a version of a reference data library as "released", unless each reference data item and statement within the version has the status released.

NOTE During the life of a reference data library, a reference data item or statement can have its status changed from "released" to "withdrawn". When this happens, the status of a version of a reference data library that contains the reference data item is changed to "withdrawn".

A maintenance organization shall not steward a version of a reference data library as "released", unless the reference data library contains a statement that specifies a URI for the version of the reference data library, as defined in 8.3.

EXAMPLE The version of the reference data library defined by the first edition of this part of ISO 15926 is identified by the URI:

http://standards.iso.org/iso/15926/-6/tech/reference-data-library/v-1

5 Reference data item identification

5.1 Types of reference data item identification

The reference data item identification shall consist of:

— a single non-person-interpretable identifier, as specified in 5.2;

— a single person-interpretable identifier, as specified in 5.3;

— one or more URIs, as specified in 5.4;

— any number of alternative reference data item designations, as specified in 5.5.

NOTE 1 Both the non-person-interpretable and the person-interpretable identifiers are unique within the scope of a reference data library, as required by ISO/IEC 11179-6.

NOTE 2 This part of ISO 15926 does not specify the purposes for which an identifier of a reference data item is used outside the reference data library.

NOTE 3 If an identifier is intended to be read by a person, the person-interpretable identifier should be used because this is usually more memorable.

EXAMPLE Within ISO/TS 15926-4, the class centrifugal pump is identified by the person-interpretable identifier "centrifugal pump" and by the non-person-interpretable identifier "7436". The person-interpretable identifier is more memorable.

NOTE 4 The appropriate person-interpretable identifier for a reference data item may not be known when it is first identified by the maintaining organization for the reference data library. Hence initially a reference data item may be identified only by its non-person-interpretable identifier.

5.2 Reference data item non-person-interpretable identification

A non-person-interpretable identifier shall be unique within the reference data library.

The non-person-interpretable identifier shall be allocated by the organization that maintains the reference data library. Information about the reference data item shall not be encoded in a non-person-interpretable identifier.

In a representation of a reference data library in accordance with ISO 15926-2, a non-person-interpretable identifier is represented by an instance of **reference data item non-person-interpretable identification** (subclass of ISO 15926 entity **class of identification**).

NOTE 1 The non-person-interpretable identifier for a reference data item can be represented in a spreadsheet in the column "non-person-interpretable identifier" as shown in the spreadsheet referenced by Annex D.

The characters used in a non-person-interpretable identifier shall be those valid for a URN Namespace Specific String, as defined in IETF RFC 2141.

NOTE 2 The valid characters within a non-person-interpretable identifier are:

— numbers "0" to "9";

— the 26 lowercase letters "a" to "z";

— the 26 uppercase letters "A" to "Z";

— the special characters "(", ")", "+", ",", "-", ".", "":, "=", "@", "";, "$", "_", "!", "*", "'";

— an octet of the form "%" <hex> <hex> .

NOTE 3 The non-person-interpretable identifier can be an internal database key used by the organization that maintains a reference data library.

5.3 Reference data item person-interpretable identification

In a representation of a reference data library in accordance with ISO 15926-2, a person-interpretable identifier is represented by an instance of **reference data item person-interpretable identification** (subclass of ISO 15926 entity **class of identification**).

NOTE 1 Computer interpretable references to reference data items are usually made by URI. Person interpretable references are usually made by person-interpretable identifier. The person-interpretable identifier for a reference data item is not necessarily unique across multiple reference data libraries. Hence it is recommended that person interpretable references specify the library as well as the person-interpretable identifier.

NOTE 2 The person-interpretable identifier for a reference data item can be represented in a spreadsheet in the column "person-interpretable identifier" as shown in the spreadsheet referenced by Annex D.

The requirements for a reference data item person-interpretable identifier are as follows:

— Within a reference data library, each person-interpretable identifier shall identify exactly one reference data item.

— Within a reference data library, no two person-interpretable identifiers shall differ solely by case.

NOTE 3 This requirement ensures that two person-interpretable identifiers remain different even if both are converted into all upper case or all lower case.

NOTE 4 The case that is specified for a person-interpretable identifier is the preferred case and shall be used to construct a URI which is case sensitive.

— Within a reference data library, one person-interpretable identifier shall not be the natural language plural of another.

— The characters used in a person-interpretable identifier shall be those valid for a URN Namespace Specific String, as defined in IETF RFC 2141, with the addition of blank, and with the exception of underscore.

NOTE 5 The valid characters within a person-interpretable identifier are:

— numbers "0" to "9";

— the 26 lowercase letters "a" to "z";

— the 26 uppercase letters “A” to “Z”;

— the special characters “(”, “)”, “+”, “,”, “-“, “.”, “”:, “=”, “@”, “”;, “$”, “ ”, “!”, “*”, “‘”;

— an octet of the form “%” <hex> <hex> .

NOTE 6 Where a person-interpretable identifier is used to construct a URI, blank is replaced by underscore, as specified in 5.4.

— If a reference data item is commonly identified by a natural language word or phrase, then that word or phrase shall be used as the person-interpretable identifier.

NOTE 7 An English word or phrase is usually preferred, but a non-English word or phrase may be chosen as the person-interpretable identifier where it is considered to be more expressive than the English, or where the non-English word or phrase is used more widely.

5.4 Reference data item identification by URI

A published reference data library item shall be identified by one or more URIs, where a URI is as defined in IETF RFC 2141. If a reference data item is defined in a normatively reference source and is assigned a URI by that source, then an additional URI is optional.

NOTE 1 The source URI is usually preferred because it is already in use.

A URI that identifies a reference data item shall not be used to identify anything else.

NOTE 2 The used of URIs is discussed in “*Cool URIs don’t change*”[13].

If a URI is not assigned in a normatively referenced source, then at least one URI shall be assigned by the maintenance organization for the reference data library. An assigned URI shall be derived from the non-person-interpretable identifier or from the person-interpretable identifier.

NOTE 3 When a proprietary RDL is submitted for standardization, the standardization body will assign its own URIs.

A URI assigned by the maintenance organization shall consist of:

— a prefix allocated to the organization that maintains the reference data library;

— a suffix that is either the non-person-interpretable identifier or the person-interpretable identifier, with any blank replaced by underscore.

NOTE 4 The prefix is the leading characters of the URI that are common to each URI assigned to reference data items in a reference data library. For a URN, the leading characters include, but are not restricted to the URN prefix that is registered to an organization. For an HTTP URI, the leading characters include, but are not restricted to, an HTTP domain.

If a URI contains a fragment identifier, then the suffix shall be the fragment identifier.

The URIs that are assigned to a reference data item shall be stated explicitly.

If a URI is derived from a person-interpretable identifier, then the case shall be that specified for the person-interpretable identifier.

NOTE 5 URIs are case sensitive.

NOTE 6 Some implementation methods can require a particular form of URI. For example, ISO/TS 15926-7 requires the use of an HTTP URI.

In a representation of a reference data library in accordance with ISO 15926-2, an identification by URI is represented by an instance of **reference data item identification by URI** (subclass of ISO 15926 entity **class of identification**), which has subclasses as follows:

— **reference data item identification by URN**;

— **reference data item identification by HTTP URI without fragment ID**;

— **reference data item identification by HTTP URI with fragment ID**.

NOTE 7 The URIs for a reference data item can be represented in a spreadsheet in the columns “URI 1”, “URI 2” or “URI 3” as shown in the spreadsheet referenced by Annex D.

NOTE 8 A possible URI scheme for a standard ISO 15926 reference data library is contained in Annex H.

5.5 Alternative reference data item designations for use in natural language text

In a representation of a reference data library in accordance with ISO 15926-2, an alternative reference data item designation is represented by an instance of **reference data item alternative person-interpretable identifier** (subclass of ISO 15926 entity **class of identification**).

An alternative designation shall not be used to make a computer interpretable reference to a reference data item.

NOTE 1 A reference data item can have any number of alternative reference data item designations for use in natural language text.

NOTE 2 If an alternative designation is used within a context, such as a language, community, or class of activity, then it is recommended that the context be stated.

NOTE 3 The same text can be an alternative designation for more than one reference data item. It is recommended that an alternative designation be unique within a context.

NOTE 4 Alternative reference data item designation cannot be used to make a computer interpretable reference because it can identify more than one item within a reference data library, and because no computer interpretable mechanism is provided to link an alternative designation to a context.

NOTE 5 Two or more designations of the same reference data item, which are words or phrases within the same language, are synonyms. Two alternative designations can be synonyms. Also an alternative designation and a reference data item person-interpretable identifier can be synonyms.

NOTE 6 Alternative reference data item designations can be represented in a spreadsheet in the columns “synonym 1” or “synonym 2” as shown in the spreadsheet referenced by Annex D.

5.6 Proprietary reference data libraries

The requirement for uniqueness of a reference data item person-interpretable identifier within a reference data library, stated in 5.3, shall be imposed by the organization that maintains the reference data library.

NOTE 1 There may be a family of reference data libraries which are used together, but which do not have a single maintaining organization.

NOTE 2 ISO/TS 15926-4 defines a core reference data library for process plant. A manufacturer or supplier company can extend this core, with a reference data library which classes specific to items supplied by the company. Different companies can act independently, and each company can be the maintaining organization for its own reference data library.

NOTE 3 The URI methodology ensures that the URI for a reference data item is unique across multiple reference data libraries.

6 Text about a reference data item

6.1 Types of text about a reference data item

Text about a reference data item shall be as follows.

— Text definition: If a reference data item has a formal definition as defined in 7.2, then a reference data item shall not have a text definition. If a reference data item does not have a formal definition as defined in 7.2, then a reference data item shall have a single text definition as defined in 6.2.

— Note: There can be any number of notes about a reference data item as described in 6.6.

— Example: There can be any number of descriptions of examples of a reference data item that is a class as described in 6.6.

— Translated definition: There can be any number of translated definitions of a reference data item as described in 6.7.

6.2 Reference data item text definition

6.2.1 Content of a reference data item text definition

In a standard, a reference data item text definition shall be normative. A reference data item text definition shall be either:

— a reference data item text definition by explicit text, as defined in 6.4; or

— a reference data item text definition by document reference, as defined in 6.5.

A set of reference documents shall be defined for a reference data library. If a text definition can be found within the set of reference documents, then a reference data item text definition by document reference shall be used, as defined in 6.5. If a text definition cannot be found in the set of reference documents, then a reference data item text definition by explicit text shall be used, as defined in 6.4.

For a standard reference data library, the set of reference documents is the set of document to which a normative reference can be made.

6.2.2 Prioritization of sources

A text definition for a reference data item shall be sought from the following types of source document outside the reference data library, prioritised in the order of the following list:

— set of reference documents for the reference data library;

NOTE 1 This set of documents defines the terms commonly used by the community for which the reference data library is defined.

— Oxford English Dictionary;

— ISO and IEC standards;

— other international or national standards;

EXAMPLE 1 Standards published by CEN or CENELEC.

EXAMPLE 2 Standards published by ANSI or DIN.

— standards defined by industry bodies;

EXAMPLE 3 Standards published by the American Petroleum Institute (API) or NORSOK.

— other published documents used within industry.

NOTE 2 This set of documents includes publications by professional societies and industry groups that do not seek formal standardization, such as Society of Manufacturing Engineers (SME) and Association for Operations Management (APICS).

EXAMPLE 4 A widely used academic text book.

EXAMPLE 5 A widely used glossary published by a commercial organization.

6.2.3 Requirements for a reference data item text definition

The requirements for a reference data item text definition are as follows:

— A reference data item text definition shall not contain information that is not part of the definition.

EXAMPLE 1 Information about the usual material of construction of a class of equipment item shall not be included unless this is part of the definition.

EXAMPLE 2 Information about the usual use of a class of equipment item shall not be included unless this is part of the definition.

NOTE 1 Additional information can be included as notes.

— A reference data item text definition shall not contain a complete definition of another reference data item in the same reference data library, but shall instead make reference using its person-interpretable identifier.

— A reference data item text definition shall make reference to other reference data items in accordance with 6.4.

— A reference data item text definition text shall be stated as a descriptive phrase, clause, or one or more sentences with equations and figures as necessary.

— Except where a reference data item can be formally defined in terms of a recursion, a reference data item text definition shall not refer to the reference data item that it defines.

NOTE 2 A reference data item is a not a term. Hence the reference data item person-interpretable identifier can be used in the definition of a reference data item. If this is done, it shall be made clear that the words are understood according to their natural language meaning.

Hence if the OED definition of the word pump was equivalent to the ISO/TS 15926-4 class **pump**, then the class with the reference data item person-interpretable identifier “pump” could be defined as follows:

“**physical object** that is a pump (with the first meaning defined in the OED)”.

In many cases the reference data item person-interpretable identifier for a chemical or a drug is the complete and unambiguous definition of the reference data item. The following text can be both the reference data item person-interpretable identifier and the text definition of a reference data item:

“N-(1-NAPTHYL)-ETHYLENEDIAMINE DIHYDROCHLORIDE”.

— A reference data item text definition that specifies a physical quantity shall be formulated in accordance with ISO 80000-1.

— A reference data item text definition taken from a source which cannot be normatively referenced shall have the standard form defined in 6.4.2.

6.2.4 Use of a reference data item person-interpretable identifier in a text definition

Within a reference data item text definition, reference to a reference data item shall be made by the reference data item person-interpretable identifier, or by any other designation of the reference data item with a URI of the reference data item given in parentheses.

The requirements for use of a reference data item person-interpretable identifier are as follows:

— A reference data item person-interpretable identifier used within text shall be explicitly indicated.

NOTE A person-interpretable identifier can be indicated by one of the following methods:

— it is in capitals;

— it is in bold font;

— it is within "<" and ">";

— it is a hypertext link to a definition of the reference data item;

— it is followed by the text "(reference data item person-interpretable identifier)".

— A reference data item person-interpretable identifier for a class shall be interpreted as a reference to a member of the class.

EXAMPLE 1 The following text refers to a member of the class "impeller":

"where the rotation of the **impeller** is intended to create a radial pressure gradient within the **fluid**".

— A reference to a class shall be made by text as follows:

class "<reference data item person-interpretable identifier>"

EXAMPLE 2 The following sentence describes the relationship between the classes with reference data item person-interpretable identifiers "reciprocating pump" and "impeller":

"The class **reciprocating pump** is disjoint with the class **centrifugal pump**."

— If a reference data item person-interpretable identifier for a class has a natural language plural, then the plural shall be used to refer to more than one member of the class.

EXAMPLE 3 The following text refers to more than one member of the class "bolt":

"**joint** that is made using **bolts**".

— If a reference data item person-interpretable identifier for a class does not have a natural language plural, then the more than one member of the class shall be referred to by text of the form:

members of the class "<reference data item person-interpretable identifier>"

EXAMPLE 4 The following text refers to more than one member of the class "XB-57":

"**joint** that is made using members of the class <XB-57>."

6.3 Standard forms for a reference data item text definition

6.3.1 Qualified superclass compliant with ISO 1087-1

The qualified superclass form defines a class by specifying:

— a base superclass;

— distinguishing characteristics.

The form is as follows:

<base superclass> that <text that describes the distinguishing characteristics>

The selected base superclass shall be defined elsewhere in the reference data library. The most immediate superclass within the reference data library shall be chosen.

The distinguishing characteristics are the necessary and sufficient conditions that determine whether or not a member of the base superclass is a member of the defined class. The text may make reference to equations and figures. The necessary and sufficient conditions are often the possession of a qualitative distinguishing characteristic, such as an operating principle.

NOTE This form complies with ISO 1087-1.

EXAMPLE 1 The definition of the class "centrifugal pump" is as follows:

pump that consists of an **impeller** enclosed within a **casing**, where the rotation of the **impeller** is intended to create a radial pressure gradient within the **fluid**

EXAMPLE 2 The definition of the class "ASME class" is as follows:

class that is defined within an ASME standard

6.3.2 Qualified superclass as a complete sentence

The form is a variant of the form defined in ISO 1087-1 that is a complete sentence, as follows:

A <defined class> is a <base superclass> that <text that describes the distinguishing characteristics>.

EXAMPLE 1 The definition of the class "centrifugal pump" is as follows:

A **centrifugal pump** is a **pump** that consists of an **impeller** enclosed within a **casing**, where the rotation of the **impeller** is intended to create a radial pressure gradient within the **fluid**.

EXAMPLE 2 The definition of the class "ASME class" is as follows:

An **ASME class** is a **class** that is defined within an ASME standard.

6.3.3 Text definition of intersection

If a class is defined as an intersection of classes, then one of the superclasses shall be regarded as the base superclass, and membership of the others shall be regarded as the necessary and sufficient conditions. In this case, the qualified superclass form is:

<superclass 1> that is also a <superclass 2>

Where there intersection is of more than two classes, the qualified superclass form is:

<superclass 1> that is also a <superclass 2> and a <superclass 3>

EXAMPLE The definition of the class "control valve" is as follows:

valve that is also a **control device**

6.3.4 Text definition of union

For a class that is defined as a union of classes, a common superclass of all of the classes in the union is regarded as the base superclass, and membership of one of the others is regarded as the necessary and sufficient condition. In this case, the qualified superclass form is:

<superclass> that is either a <class in union 1> or a <class in union 2>

6.3.5 Text definition of power set

For a class that is defined as the power set of another, where the person-interpretable identifier of class A is a natural language term with a plural form, then the text definition of class A*, which is the power set of class A, shall be as follows:

<base superclass> that is a subclass of the class "<person-interpretable identifier of class A>"

EXAMPLE The definition of the class "heat exchanger class" is as follows:

class that is a subclass of the class **heat exchanger**

6.3.6 Intention within a text definition

For a class of physical object that is defined by the intended use of the members, the words "intended to" shall be used.

EXAMPLE 1 The definition of the class "pump" is as follows:

physical object that is intended to impart mechanical energy to a **fluid**

NOTE It might be possible to use a pump for something else, but this is not part of the definition.

For a class of activity that is defined by the intended outcome of the members, the words "intended to" shall be used.

EXAMPLE 2 The definition of the class "cooling" is as follows:

activity that is intended to reduce the temperature of a **physical object**

6.3.7 List of conditions

For a class that is defined by specifying a list of necessary and sufficient conditions, the form is as follows:

A thing is a <defined class> if and only if:

— condition 1;

— condition 2;

— etc.

NOTE A list of conditions form does not comply with ISO 1087-1. The form is used for classes where each of the conditions requires a lengthy definition.

6.3.8 Qualified superclass for a class of relationship

A specialized qualified superclass form is used for a class of relationship. In this case the form shall be:

<base superclass relationship> between a <first related class> , the <first role name> , and a <second related class> , the <second role name> , such that <text that defines the necessary and sufficient conditions for the relationship>

EXAMPLE 1 The definition of the class of relationship "maximum allowable working pressure" is as follows:

indirect property between a **pressure holding container**, the **possessor**, and a **pressure**, the **property**, such that the **pressure** is the maximum at which it is allowed to operate the **pressure holding container**

In this example, the instance of **indirect property** is not the result of a measurement but a relationship that is deemed as an operating constraint.

EXAMPLE 2 The definition of the class of relationship "ISO 13584 BSU identification" is as follows:

class of identification between a member of a family of manufactured parts, the **represented**, and an **ISO 13584 BSU**, the **pattern**, such that the **pattern** is a unique identification in accordance with ISO 13584

6.4 Reference data item definition by explicit text

6.4.1 Representation of a text definition by explicit text

A text definition of a reference data item shall be specified by reference to a source within the set of reference documents defined for a reference data library unless:

— a definition cannot be found;

— the definition in a source does not comply with the requirements for a reference data item definition by text stated in 6.2.3;

— the source cannot be normatively referenced.

This item is only valid for a reference data library that is a standard.

If a text definition of a reference data item cannot be specified by reference to a source, then it shall be specified by explicit text.

In a representation of a reference data library in accordance with ISO 15926-2, a text definition is represented by an instance of **reference data item definition by text** (subclass of ISO 15926 entity **class of definition**).

NOTE The definition of a reference data item can be represented in a spreadsheet in the column "text definition" as shown in the spreadsheet referenced by Annex D.

6.4.2 Reference data item text definition by explicit text taken from a source

The text shall be copied from the source document without change, except in the following circumstances:

— if permission for copying from the source cannot be obtained, then a new definition shall be created;

— if the definition in the source does not comply with the requirements for a reference data item definition by text stated in 6.2.3, then the definition in the source shall be adapted;

— if the definition in the source does not comply with the recommendations for a reference data item text definition by document reference stated in Annex F, then the definition the source may be adapted.

Adaptation of a definition shall not change its meaning.

NOTE 1 Common reasons for adaptation are as follows:

— the terminology of the definition in the source document is different to the terminology of the reference data library;

— the definition in the source document does not separate the definitive part from informative notes and examples.

In a representation of a reference data library in accordance with ISO 15926-2, the source of a copied text definition is represented by an instance of the class of relationship **source of text**.

NOTE 2 The source of the definition of a reference data item can be represented in a spreadsheet in the column "source" as shown in the spreadsheet referenced by Annex D.

EXAMPLE 1 The class "widget" is defined within Fred Bloggs and Co. technical specification W_101. This document cannot be normatively referenced, so the text is extracted and represented explicitly.

In a reference data library implemented as an instantiation of entity types defined in ISO 15926-2, the instantiation of this example is as shown in Figure 1.

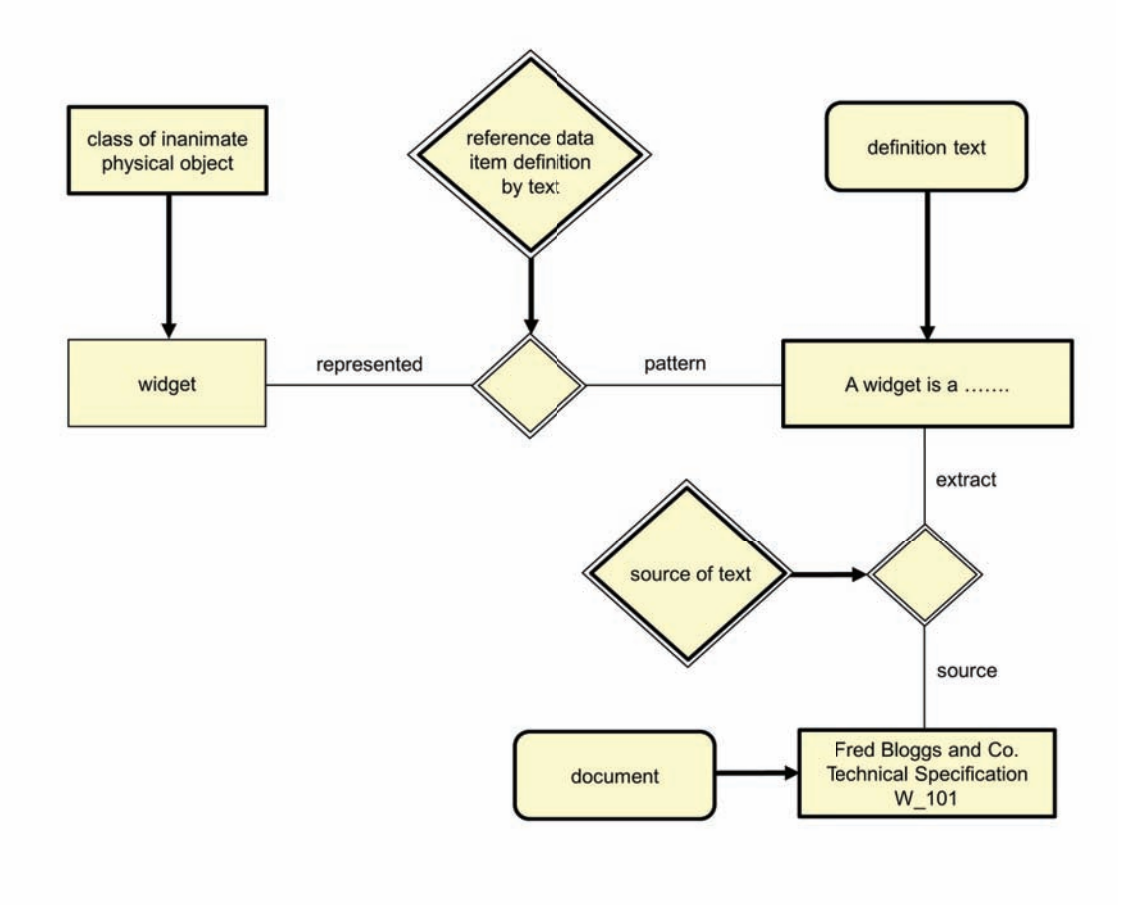

Figure 1 — Source of text as an instantiation of entity types defined in ISO 15926-2

In a representation of a reference data library in accordance with ISO 15926-2, the source of an adapted text definition is represented by an instance of the class of relationship **source of adapted text**.

EXAMPLE 2 The reference data item text description for the reference data item "pipeline scraper" is as follows:

physical object that has blades or brushes and that is intended to be inserted into a **pipeline** for cleaning purposes

NOTE 1 A **pipeline scraper** is pushed along a **pipeline** by the pressure of the **fluid** behind. A **pipeline scraper** can clean out rust, wax, scale and debris.

NOTE 2 The definition of **pipeline scraper** and NOTE 1 are adapted from the definition of "pig" in the Schlumberger Oilfield Glossary (http://www.glossary.oilfield.slb.com/). Pig is a wider concept that also encompasses devices for inspection.

In a reference data library implemented as an instantiation of entity types defined in ISO 15926-2, the instantiation of this example is as shown in Figure 2.

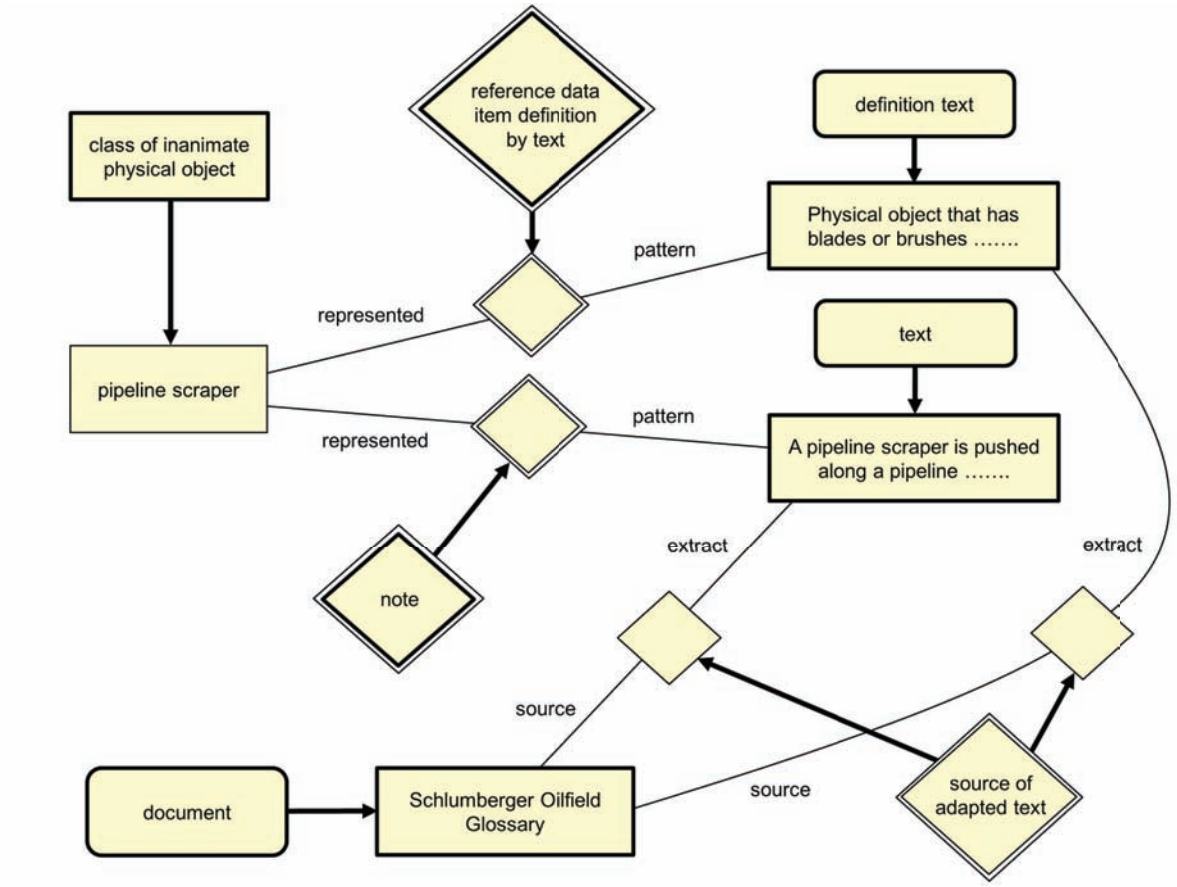

Figure 2 — Source of adapted text as an instantiation of entity types defined in ISO 15926-2

In this example, the text explaining the reason for the adaption is a second note.

6.5 Reference data item text definition by document reference

A reference data item text definition by document reference shall be of the form:

<reference data item identifier within the source document> as defined by <source document identifier>

NOTE 1 If the definition in the source document is concise, then the reference data item text description can have a note that repeats the definition.

NOTE 2 If the definition in the referenced document does not comply with one of the preferred forms for a reference data item definition by explicit text stated in 6.3, then the reference data item text description can have a note that gives an adapted definition.

EXAMPLE 1 The reference data item text description for the reference data item "person" is as follows:

person, as defined by ISO 10303-41:2004, 15.4.8

NOTE 1 The referenced definition is: "A **person** is an individual human being".

NOTE 2 A definition, which complies with a preferred form in this part of ISO 15926, is "**physical object** that is a human being". This form includes the relationship with the class **physical object**. This relationship is also stated in computer interpretable form as a specialization.

If a reference data item corresponds to one of the meanings of a word in the OED, then the reference data item text definition by document reference shall consist of:

<the word in the OED> : "<the meaning of the word specified in the OED>" as defined by <edition of the OED>

EXAMPLE 2 The reference data item text description for the reference data item "person" is as follows:

person: "individual human being" as defined by the Shorter OED edition xxxx, meaning 1

NOTE A definition, which complies with a preferred form in this part of ISO 15926, is "**physical object** that is a human being".

In a representation of a reference data library in accordance with ISO 15926-2:

— a text definition by document reference is represented by an instance of **reference data item definition by document reference** (subclass of ISO 15926 entity **class of definition**).

— the source of a normative definition is represented by an instance of **normative source of definition** (subclass of ISO 15926 entity **class of definition**).

6.6 Notes and examples for a reference data item

In a representation of a reference data library in accordance with ISO 15926-2, a note is represented by an instance of **reference data item note** (subclass of ISO 15926 entity **class of description**).

NOTE 1 A note about a reference data item can be represented in a spreadsheet in the column "notes" as shown in the spreadsheet referenced by Annex D.

In a representation of a reference data library in accordance with ISO 15926-2, a description of an example is represented by an instance of **reference data item example text** (subclass of ISO 15926 entity **class of description**).

NOTE 2 A reference data item can have any number of text notes that contain information about it.

NOTE 3 If a reference data item is a class, then a reference data item text description can have any number of text examples which describe individual members of the class.

6.7 Additional text definitions

Additional text definitions shall be notes, except where the additional text definitions are equivalent reference data item definitions by explicit text in different ISO approved languages.

NOTE 1 A reference data item text description can contain any number of additional text definitions. These text definitions can be in any language.

NOTE 2 If a reference data library definition by explicit text is translated, then a reference data item person-interpretable identifier contained within it that consists of natural language words can be translated. It is advisable that the English language person-interpretable identifier be provided in parentheses.

Each additional text definition shall be associated with a language reference that specifies the language, the country and the reference dictionary used for validating spelling and defining words.

EXAMPLE An additional text definition written in United States English could be associated with a language reference containing the following information:

— country US (defined in the ISO 3166-1 Registry)

— language eng (defined in the ISO 639-2 Registry)

— dictionary Merriam-Websters English Dictionary

In a representation of a reference data library in accordance with ISO 15926-2, a translated text definition is represented by an instance of **reference data item informative translated definition** (subclass of ISO 15926 entity **class of definition**).

7 Formal relationships

7.1 Formal relationships for structuring and representation

A reference data item shall have at least one classification as a member of a class that is an entity in ISO 15926-2.

NOTE 1 A classification as a member of a class that is an entity in ISO 15926-2 allows the reference data item to be recorded as an instance of an ISO 15926-2 entity.

NOTE 2 A reference data item can have any number of classifications.

EXAMPLE 1 The class "**centrifugal pump**" is classified as a member of the class "**class of inanimate physical object**" which is an entity in ISO/IEC 15026-2.

NOTE 3 A reference data item that is a class can have any number of superclasses. Where there is a choice, the most specialized within a hierarchy used.

EXAMPLE 2 The class "**centrifugal pump**" has the class "**dynamic pump**" as a superclass.

EXAMPLE 3 The class "**shell and tube condenser**" has the classes "**condenser**" and "**shell and tube heat exchanger**" as superclasses.

For a reference data item that is a class of relationship, the following may be specified:

— the two classes that are related by the class of relationship;

NOTE 4 The class of relationship defines a mapping.

— the role name assigned to each class in the class of relationship;

— the cardinality of the class of relationship.

This is a constraint on the number of relationships that member of a related class can participate in.

The cardinality shall be what exists in the world, rather than a constraint upon the information that is recorded.

EXAMPLE 4 The class of relationship "impeller of pump" has the following cardinality specification:

— first related class: pump, with role name "whole" and cardinality 0,1 or many;

— second related class: impeller, with role name "part" and cardinality 1.

This means that a pump can participate in 0, 1 or many "impeller of pump" relationships with the role whole, and an impeller can participate in 0 or 1 "impeller of pump" relationships with the role part. This constraint applies to a state or temporal part of a pump and a state or temporal part of an impeller, in accordance with the ISO 15926-2, 4D approach to the recording of change. During its life, different states or temporal parts of an impeller can have "impeller of pump" relationships with many different pumps.

7.2 Formal relationships for definition

A class is given a formal definition by relationship in one of the following ways:

— **intersection**: The class S is defined by a relationship with classes X_1, X, …., X_n of the form:

$S = X_1 \cap X_2 \cap \ldots. \cap X_n$

— **union**: The class S is defined by a relationship with classes X_1, X, …., X_n of the form:

$S = X_1 \cup X_2 \cup \ldots. \cup X_n$

— **difference**: The class S is defined by a relationship with classes X and Y of the form:

$S = X \cap \neg Y$

— **image**: The class S, which is a subclass of A, is defined by the class of relationship f between A and B and the class X, which is a subclass of B. S is the image of X given by the class of relationship f.

S consists of all a in A such that there exists an (a, b) in f where b is in X.

EXAMPLE The class "**dog owner**", which is a subclass of "**person**" is defined by the **class of relationship** "**owns**" between "**person**" and the "**dog**".

NOTE If a class has a formal definition by a relationship, then it does not have a reference data item definition by explicit text.

8 Administrative information

8.1 Things for which administrative information may be recorded

A thing for which administrative information may be recorded shall remain unchanged throughout its life.

NOTE 1 The administrative information about a thing will change.

EXAMPLE 1 Initially the status of a reference data item is "proposed". Subsequently, its status is progressed to "released", and ultimately to "withdrawn".

NOTE 2 A succession relationship between things can part of administrative information. A thing that succeeds another can be regarded as a new version.

NOTE 3 Whether or not a thing is expected to have a successor depends upon its type. If a thing is expected to have successors, then it is recommended that a version identifier be included within its URI.

Administrative information may be recorded for the following types of thing.

— version of a reference data library;

NOTE 4 A version of a reference data library is expected to have successors.

NOTE 5 A version of a reference data library can be a composition of other versions of reference data libraries. Each part version of a reference data library can have its own administrative information.

— reference data item;

NOTE 6 A reference data item is not expected to have successors, although it can.

NOTE 7 A user of a standard can define the meaning of engineering data by reference to a reference data item. If a reference data item were changed, then this would change the meaning of the engineering data created by the user of a standard.

NOTE 8 The information held about a reference data item can change during its life, but the meaning of the item does not. During the development phase for the reference data item, there can be some flexibility as the meaning is clarified. Once a reference data item has been released, there can be no flexibility.

A reference data library shall continue to hold released statements about a reference data item which has had its status changed to "withdrawn".

NOTE 9 The meaning of engineering data created by a user of the standard may have its meaning defined by a reference data item which is subsequently withdrawn. It remains necessary to understand the meaning of the engineering data, therefore statements about the withdrawn reference data item remain released.

— statement about a reference data item;

NOTE 10 A statement about a data item is not expected to have successors, although it can.

— reference data item library record;

NOTE 11 This is a reference data item and a set of statements about it within a reference data library, as defined in 8.5.

NOTE 12 A reference data item record is expected to have successors.

NOTE 13 When a reference data item is released, the reference data item library record has administrative information that contains at least a status, as specified in 4.3.

NOTE 14 In the spreadsheet representation of the reference data library defined by this part of ISO 15926, each row is a reference data item library record.

— set of reference data items;

NOTE 15 A set of reference data items is expected to have successors.

— set of statements;

NOTE 16 A set of statements is expected to have successors.

NOTE 17 The administrative information about a thing is expected to have successors.

NOTE 18 A thing for which administrative information is recorded is an "administered item", where the term is as defined in ISO/IEC 11179-1. Administered items in ISO standards are subject to the procedures defined in Annex SK of the ISO supplement to the ISO/IEC Directives, for the development, maintenance, review and withdrawal of any international standard consisting of "collections of items" managed in a database.

8.2 Types of administrative information

Administrative information within a reference data library is of three types:

— URIs as administrative information: this information is defined in 8.3;

— information about status and provenance: this information is defined in 8.4;

— information about succession: this information is defined in 8.5.

The documentation of an implementation of a reference data library shall specify how each type of the administrative information is recorded.

8.3 URIs as administrative information

The requirements for the assignment of URIs as administrative information are as follows.

— reference data library:

A URI shall be assigned to a reference data library.

NOTE 1 There are no requirements for the form of the URI of a reference data library.

EXAMPLE 1 The reference data library defined by editions of this part of ISO 15926 has the URI:

http://standards.iso.org/iso/15926/-6/tech/reference-data-library

— version of a reference data library:

The URI for a version of a reference data library shall have the form:

<URI of reference data library> / <version identifier>

EXAMPLE 2 The reference data library defined by the first edition of this part of ISO 15926 has the URI:

http://standards.iso.org/iso/15926/-6/tech/reference-data-library/v-1

— reference data item;

NOTE 2 The requirements for identification by a URI are stated in 5.4.

— statement about a reference data item;

NOTE 3 There are no requirements for the URI of a statement. A URI can be assigned to a statement, if it is necessary to reference it in order to record administrative information.

— reference data item library record:

A URI for a reference data library record shall have the form:

<URI of sequence of reference data libraries> /record/ <URI of reference data item> / <version identifier>

NOTE 4 A URI can be assigned to a version of a reference data item library record, if it is necessary to reference it in order to record administrative information.

— set of reference data items;

NOTE 5 There are no requirements for the URI of a set of reference data items. A URI can be assigned to a set of reference data items, if it is necessary to reference it in order to record administrative information. It is recommended that the URI for a set of reference data items includes a version identifier.

— set of statements;

NOTE 6 There are no requirements for the URI of a set of statements. A URI can be assigned to a set of statements if it is necessary to reference it in order to record administrative information. It is recommended that the URI for a set of statements includes a version identifier.

— administrative information.

A URI for administrative information shall have the form:

<URI of the thing that the administrative information is about> /administrative-data/ <version identifier>

NOTE 7 Recommendations for a URI scheme used by a standard reference data library are contained in Annex E.

8.4 Status of things and their provenance

The status and provenance of a thing during its life shall be specified by the activities in which it is involved during its life. The provenance of a thing is specified by the activities:

— submission for inclusion within a reference data library;

— stewarding within a reference data library.

The status of a thing is specified by the class its stewarding activity as follows;

— stewarding as “proposed”;

— stewarding as “rejected”;

— stewarding as “draft”;

— stewarding as “released”;

— stewarding as “to be revised”;

— stewarding as “confirmed”.

NOTE 1 Each type of status is defined and linked to an ISO stage code within the reference data for a reference data library defined in Annex C.

Once a thing has been submitted to a reference data library, it shall be stewarded by an activity of one of these classes for the remainder of the life of the reference data library.

A status of a thing in a reference data library is not inherited by any other thing, except that a status assigned to a reference data item library record is inherited by:

— the reference data item;

— the set of statements about a reference data item.

There are constraints upon stewarding as “released”, as follows:

— a set of reference data items shall not be stewarded as “released” unless each reference data item within the set is stewarded as “released”;

— a set of statements shall not be stewarded as “released” unless each statement within the set is stewarded as “released”;

— a reference data library shall not be stewarded as “released” unless all reference data items and statements within it are stewarded as “released”.

NOTE 2 This inheritance corresponds to the assignment of a status to a row is a spreadsheet representation of a reference data library and having that status inherited by the reference data item and all the statements represented by that row.

A stewarding activity may contain part activities of the classes:

— processing an issue;

— making a change.

NOTE 3 During the life of a reference data library a thing can change its status. Also statements about a thing can be added, and can change their status. All these changes are not to do with temporal parts of the thing, but are to do with the activity of maintaining the reference data library and of providing statements about the thing. For this reason, change is recorded by considering temporal parts of the stewarding activity.

EXAMPLE Figure 3 shows the provenance and status data for reference data item RDL101. The reference data item is submitted by Fred Bloggs and Co., and thereafter it is stewarded by ISO TC184/SC4.

While stewarded by ISO TC184/SC4, the status of RDL101 changes from “proposed” to “draft”, “released”, “to be revised” and finally “withdrawn”. The activity “issue X on RDL101” is part of the stewarding activity, and includes the activity “change Y on RDL101”.

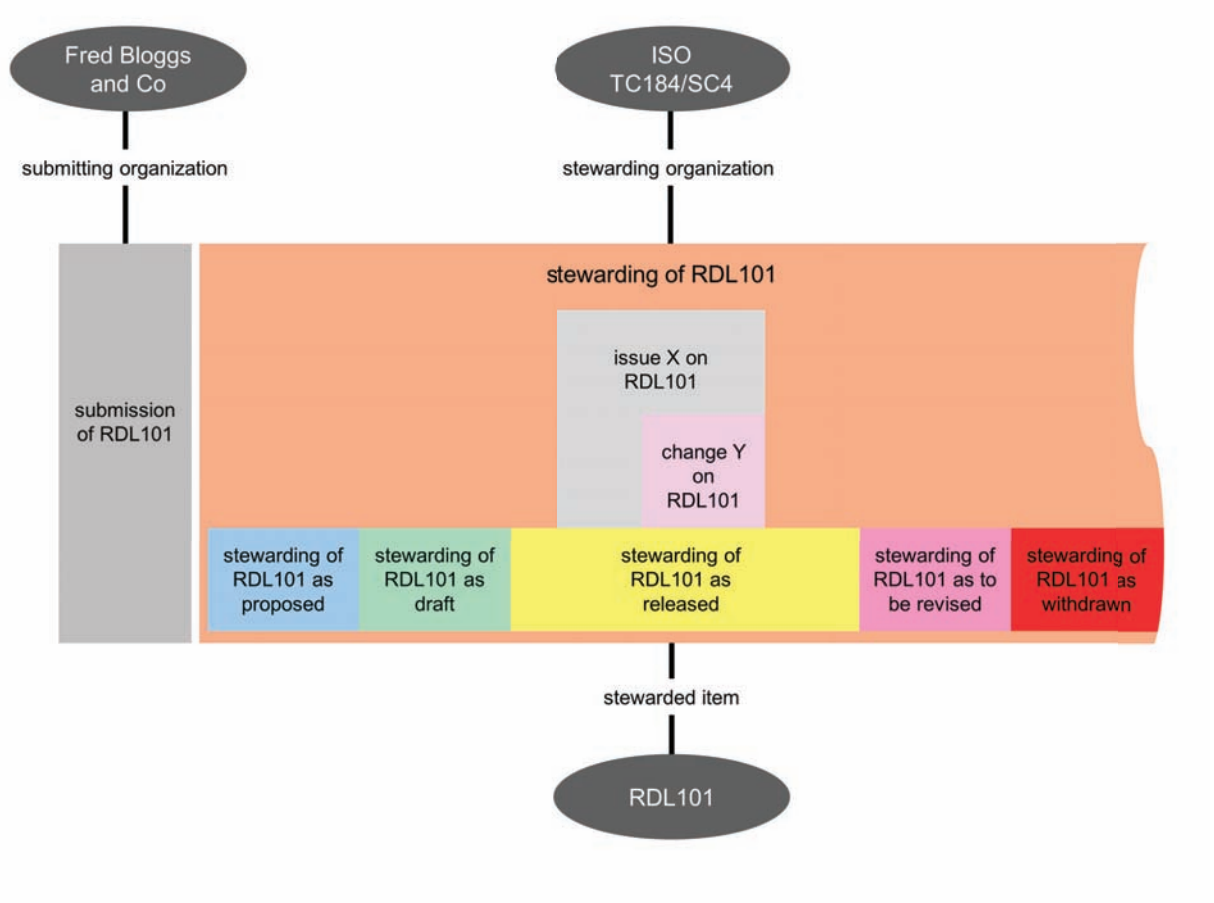

Figure 3 — Example activities for the management of a reference data item

NOTE 4 This part of ISO 15926 defines an implementation of ISO/IEC 11179 except that a URI as defined in 5.4 is used instead of an International Registration Data Identifier (IRDI) as defined in ISO/IEC 11179-6.

The provenance and status administrative information are defined in ISO/IEC 11179-3, and shall be implemented as shown in Table 1.

Table 1 — Provenance and status administrative information

Administrative information name	Description of the administrative information	Clause in ISO/IEC 11179-3:2013
administrative note	An administrative note about a thing in a reference data library, which is about the stewarding activity for the thing. This is implemented by the administrative information **note on stewardship** defined in Annex D.	8.1.2.6.2.4
change description	A description of the difference between a thing in a reference data library and its predecessor or predecessors, which is about the most recent change activity within the stewarding activity for the thing. This is implemented by the administrative information **description of change** defined in Annex D.	8.1.2.2.3.2
creation date	The date of creation of a thing in a reference data library, which is the start date of the stewarding activity for the reference data item.	8.1.2.2.3.1
effective date	The date of the start of the "stewarding as released" activity within the stewarding activity for the thing in a reference data library.	8.1.2.6.2.2
explanatory comment	A description of the reason for the creation of a thing in a reference data library, which is about the stewarding activity. This is implemented by the administrative information **explanatory comment about stewardship** defined in Annex D.	8.1.2.2.3.4
last change date	The date of the last change to a thing in a reference data library, which is the end date of the most recent change activity within the stewarding activity for the thing.	8.1.2.2.3.2
registration status	The status of a thing in a reference data library, which is defined by the subclass of the stewarding activity	8.1.2.6.2.1
stewardship contact	The name of the person who is the contact for the stewardship activity for a thing in a reference data library. This is implemented by the administrative information **stewarding contact** defined in Annex D.	8.1.2.7.2.2
stewardship organization	The name of the organization that performs the stewardship activity for a thing in a reference data library. This is implemented by the administrative information **stewarding organization** defined in Annex D.	8.1.2.7.2.1
submission contact	The name of the person who is the contact for the "submission" activity for a thing in a reference data library. This is implemented by the administrative information **submission contact** defined in Annex D.	8.1.2.8.2.2
submitting organization	The name of the organization that performs the "submission" activity for a thing in a reference data library. This is implemented by the administrative information **submitting organization** defined in Annex D.	8.1.2.8.2.1
unresolved issues	A description of a "processing an issue" activity which is continuing within the stewarding activity for a thing in a reference data library. This is implemented by the administrative information **description of issue** defined in Annex D.	8.1.2.6.2.5

8.5 Succession of things and sets of statements about things

A **succession** relationship between two things within a reference data library states that the successor is preferred to the predecessor. The **succession** relationship is defined in Annex C.

NOTE 1 A succession relationship is often defined when a thing in a reference data library is withdrawn.

NOTE 2 A succession relationship can be between two sets of statements, two reference data library item library records or between two reference data libraries.

The description of a thing by a set of statements is stated by a **description by class of relationship** relationship. The **description by class of relationship** relationship is defined in Annex C.

NOTE 3 A set of statements can be about a single reference data item or about a set of reference data items.

EXAMPLE The set of statements "centrifugal pump data v1" about the reference data item **centrifugal pump** contains the incorrect statement "**centrifugal pump** is a subclass of **positive displacement pump**". The set of statements "centrifugal pump data v2" contains the correct statement "**centrifugal pump** is a subclass of **dynamic pump**".

Both sets of statements are information about **centrifugal pump**. After the error has been corrected, the set of statements "centrifugal pump data v1" have the status "withdrawn"; the set of statements "centrifugal pump data v2" have the status "released"; and there is a "superseded by" relationship between the two sets of statements.

The relationships between the reference data item and the sets of statements are shown informally in Figure 4.

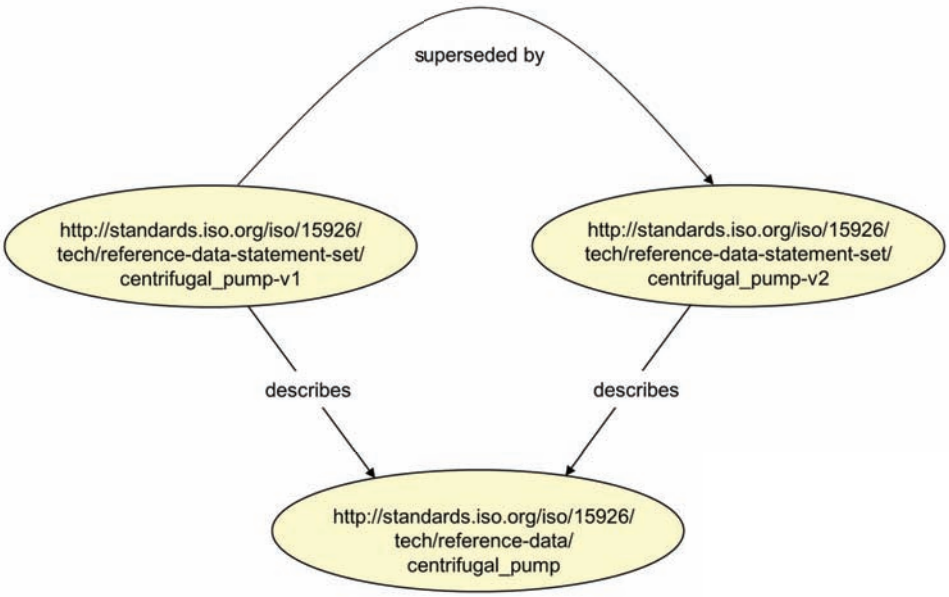

Figure 4 — Information about a reference data item

In Figure 4, the objects are identified by URIs as follows:

centrifugal pump	http://standards.iso.org/iso/15926/tech/reference-data/centrifugal_pump
centrifugal pump data v1	http://standards.iso.org/iso/15926/tech/reference-data-statement-set/centrifugal_pump-v1
centrifugal pump data v2	http://standards.iso.org/iso/15926/tech/reference-data-statement-set/centrifugal_pump-v2

The reference data item **centrifugal pump** remains unchanged. There are two sets of statements about the reference data item. One set is superseded by the other.

Figure 4 can be interpreted as an RDF[14] diagram in which the objects “centrifugal pump data v1” and “centrifugal pump data v2” are named graphs.[15] The RDF in this figure has been created for explanatory purposes, and is not derived from the OWL implementation of templates defined in ISO/TS 15926-8.

The set of statements “centrifugal pump data v1” and the reference data item “centrifugal pump” can be as a single reference data item library record, as shown in Figure 5.

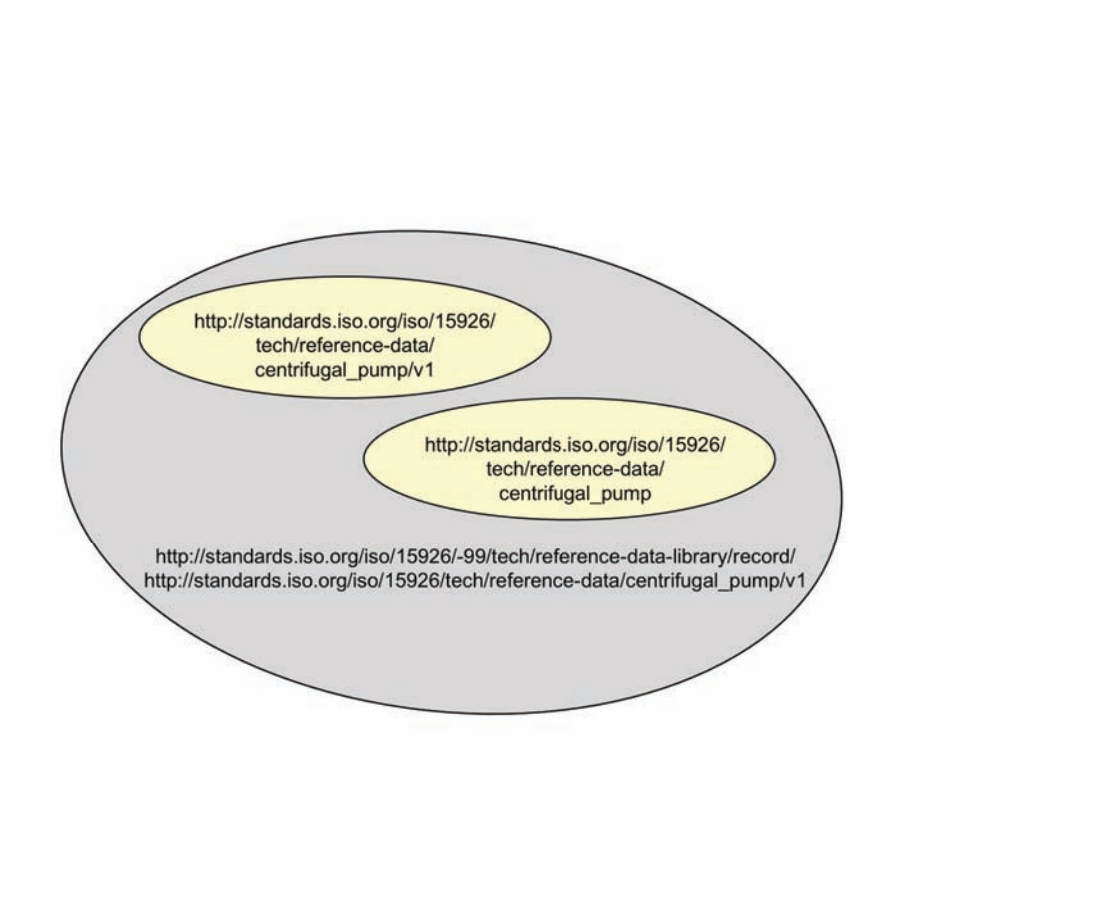

Figure 5 — A reference data item library record

A succession relationship can be recorded between reference data item library records, as shown in Figure 6.

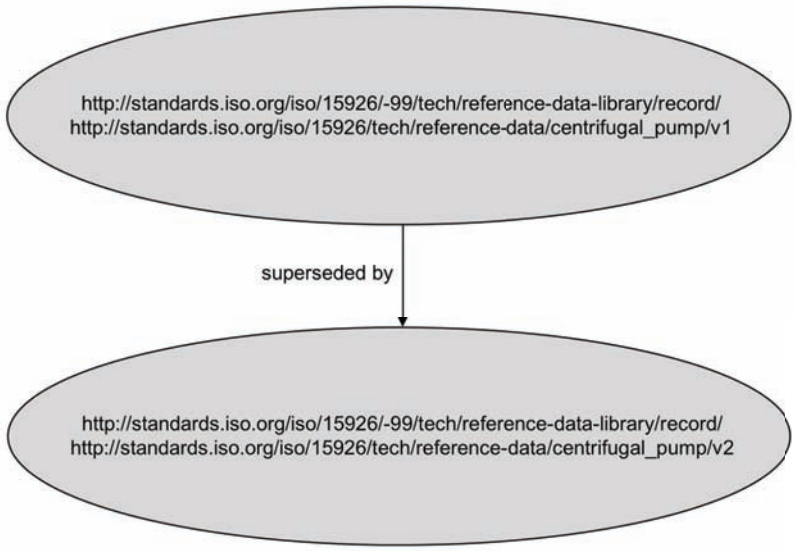

Figure 6 — Succession of reference data item library records

9 Representation of a reference data library

A reference data library shall be represented in a format that:

— is an implementation semantics defined by ISO 15926-2 as extended by the reference data defined in this part of ISO 15926;

— can hold the minimum information about a reference data item defined in 4.3;

— can hold the administrative information defined in Clause 8 deemed necessary by the organization that maintains the reference data library.

NOTE 1 A reference data library can be represented in more than one format. If a reference data library is published as an ISO standard, then only one format can be normative.

NOTE 2 The spreadsheet representation defined in Annex D is used in Annex C to represent the reference data library defined by this part of ISO 15926.

Annex A
(normative)

Information object registration

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

{iso standard 15926 part{6} version {1}}

is assigned to this part of ISO 15926. The meaning of this value is defined in ISO/IEC 8824-1, and is described in ISO 10303-1.

Annex B
(normative)

Document URN

To provide for unambiguous identification of an information object on the Internet, the object identifier:

urn:iso:std:iso:ts:15926:-6:ed-1

is assigned to this part of ISO 15926. The meaning of this value is defined in the document "A Uniform Resource Name (URN) Namespace for the International Organization for Standardization (ISO)"

The set of reference data items specified by this part of ISO 15926 is identified by the URN:

urn:iso:std:iso:ts:15926:-6:tech:reference-data-library:v-1

Annex C
(normative)

Reference data library for the recording of a reference data library

The reference data library for the recording of a reference data library that is defined by part of ISO 15926, and by its subsequent editions and amendments, has the URI:

http://standards.iso.org/iso/15926/-6/tech/reference-data-library

The version of the reference data library that is defined by this edition of this part of ISO 15926 has the URI:

http://standards.iso.org/iso/15926/-6/tech/reference-data-library/v-1

The version of the reference data library that is defined by this edition of this part of ISO 15926 is represented as an Excel spreadsheet. This representation has the URI:

http://standards.iso.org/iso/15926/-6/tech/reference-data-library/v-1.xls

The format of the representation is defined by Annex D.

NOTE Each item in the reference data library is defined by a clause within this part of ISO 15926.

The following copyright statement applies to the set of reference data items, and is included within the representation of the set of reference data items.

Annex D
(normative)

Spreadsheet representation of the reference data library for the recording of a reference data library

The spreadsheet representation of the reference data library for the recording of a reference data library defined in this annex may be used for any reference data library.

NOTE 1 This part of ISO 15926 does not require that this representation be used.

This spreadsheet representation has one row for each reference data item. The cells in a row contain information about the reference data item.

NOTE 2 This representation cannot hold all possible information within a reference data library. However, this representation can hold a useful subset of the possible information.

Table D.1 specifies:

— the order of the columns in the spreadsheet;

— the name of each column, which is specified in the first row of the spreadsheet;

— a description of the information in the column.

— the format of the data in the column;

— optionally a reference to a subclause in this part of ISO 15926 which defines the information in the column.

Table D.1 — Columns of a spreadsheet representation of a reference data library

Column number	Column name	Information contained	Format	Clause reference
1	URI 1	A URI of the reference data item	text	5.4
2	URI 2	A URI of the reference data item	text	5.4
3	URI 3	A URI of the reference data item	text	5.4
4	non-person-interpretable identifier	The non-person-interpretable identifier of the reference data item	#	5.2
5	person-interpretable identifier	The person-interpretable identifier of the reference data item	ID	5.3
6	synonym 1	A synonym for the person-interpretable identifier of the reference data item	text	5.5
7	synonym 2	A synonym for the person-interpretable identifier of the reference data item	text	5.5
8	text definition	The text definition for the reference data item.	text	6.2.1
9	source	The source of the text definition for the reference data item.	text	6.2.2
10	notes	Notes and other informative text about the reference data item.	text	6.6
11	superclass 1	The person-interpretable identifier of a class that is a superclass.	ID	7.1
12	superclass 2	The person-interpretable identifier of a class that is a superclass.	ID	7.1

Table D.1 *(continued)*

Column number	Column name	Information contained	Format	Clause reference
13	superclass 3	The person-interpretable identifier of a class that is a superclass.	ID	7.1
14	ISO 15926-2 entity	The person-interpretable identifier of the ISO 15926-2 entity that has the reference data item as a member.	ID	7.1
15	classification 1	The person-interpretable identifier of a class that has the reference data item as a member.	ID	7.1
16	classification 2	The person-interpretable identifier of a class that has the reference data item as a member.	ID	7.1
17	classification 3	The person-interpretable identifier of a class that has the reference data item as a member.	ID	7.1
24	first related class	The person-interpretable identifier of the first class that has a role in a **class of relationship** (alphabetically the first role name as ISO 15926-2)	ID	7.1
25	role of first related class	The role that is played by the first class in a **class of relationship**	ID	7.1
26	first related class cardinality	The cardinality of the first related class. This is an integer range defined by two integers separated by commas. The second integer can be replaced by "inf" to denote infinity. The default value is "0, inf".	#, # or #, inf	7.1
27	second related class	The person-interpretable identifier of the second class that has a role in a **class of relationship** (alphabetically the last role name as ISO 15926-2)	ID	7.1
28	role of second related class	The role that is played by the second class in a **class of relationship**	ID	7.1
29	second related class cardinality	The cardinality of the second related class. This is an integer range defined by two integers separated by commas. The second integer can be replaced by "inf" to denote infinity. The default value is "0, inf".	#, # or #, inf	7.1
30	administrative note	An administrative note about a reference data item library record.	text	8
31	change description	A description of the most recent change.	text	8
32	creation date	The date of creation of a reference data item library record within the reference data library.	UTC date	8
33	effective date	The date of the status of the release of the reference data item library record (if released).	UTC date	8
34	explanatory comment	A description of the reason for the creation of the reference data item library record.	text	8
35	last change date	The data of the last change to the reference data item library record.	UTC date	8
36	registration status	The status of the reference data item library record.	ID	8
37	stewardship contact	The name of the person who is the contact for the stewardship of a reference data item library record.	text	8
38	stewardship organization	The name of the organization that performs the stewardship of a reference data item library record.	text	8
39	submission contact	The name of the person who is the contact for the submission of a reference data item library record.	text	8
40	submitting organization	The name of the organization that performs the submission of a reference data item library record.	text	8
41	unresolved issues	A description of any unresolved issues for a reference data item library record.	text	8

In Table D.1, the format is indicated by a code as shown in Table D.2.

Table D.2 — Format code

Format code	Meaning
ID	This denotes the person-interpretable identifier of a reference data item. A person-interpretable identifier is contained in column 5 for exactly one row within the reference data library. A person-interpretable identifier contained in any other column is a reference to a reference data item which is defined elsewhere in the reference data library.
text	This denotes person readable text. For this part of ISO 15926, the text is in English.
#	This denotes a number. The number is expressed in a decimal format. It can, but need not, have a decimal point.

The scope of the spreadsheet representation format does not include:

— reference data items which are not classes;

— reference data items for which more than three superclasses are specified;

— reference data items for which more than three classifications, in addition to the ISO 15926-2 classification, are specified;

— reference data items which have a formal definition, as defined in 7.2;

— administrative information about the history of changes to a reference data item, as defined in Clause 8.

NOTE 3 The scope of the spreadsheet representation covers much of the information found in a dictionary or thesaurus, but only a small part of the information found in a formal ontology.

Annex E
(informative)

Recommendations for a person-interpretable identifier

Recommendations for a reference data item person-interpretable identifier are as follows:

— If a reference data item person-interpretable identifier is also used outside the reference data library within a context other than the English language, then that context should be stated in a note. A context may be a language other than English, a community, or a class of activity.

— If a reference data item is commonly identified by more than one name, then the most frequently used is usually recommended. However, a standard name that is already widely used may be prefered.

— If a commonly used name is a trade mark, and if a reference data library is an international standard, then an alternative person-interpretable identifier may be preferred. If a reference data library is created by a supplier company, then the trade mark may be preferred.

— If a reference data item is defined in a standard, then usually a reference to the standard should be included in the person-interpretable identifier. A reference to the standard may not be needed if the reference data item has a widely used name.

NOTE A company can define a commodity class, which it uses for procurement, with respect to reference data items defined in standards. In such cases, an explicit reference to the standard is usually needed.

EXAMPLE 1 The commodity class "**3 inch PWLCAEABGA001B**", which is defined by Company C, is a subclass of the following standard classes:

— material specification (form and rating): ASME B16.9 NPS 3 SCH 80

— material specification (material properties and manufacture): ASTM A234 GR WPB

— material specification (corrosion resistance): NACE MR-01–75

— material specification (certification): BS-EN-10204:3.1B

In each case, the person-interpretable identifier shown includes, or is, a reference to the standard.

— If a reference data item is commonly identified by a natural language word or phrase, then that word or phrase is usually preferred in the singular form. An exception is made where a word or phrase only has a plural form.

EXAMPLE 2 The following are preferred as person-interpretable identifiers because the only form of the English word is plural:

— scissors;

— tongs;

— trousers.

— Parentheses should not be used within a reference data item person-interpretable identifier. An exception is made for pharmaceutical and chemical identifiers which commonly use parentheses.

EXAMPLE 3 The following is used as a person-interpretable identifier.

N-(1-NAPTHYL)-ETHYLENEDIAMINE DIHYDROCHLORIDE

— Except for reference to widely known organizations such as ISO, IEC, ASTM, and CEN, a person-interpretable identifier should not contain abbreviations, acronyms or initialisms.

— The person-interpretable identifier for a class of activity should be the gerund of an English language verb.

EXAMPLE 4 The class "cooling" is a class of activity with the following reference data item text definition: "**activity** that is intended to reduce the temperature of a **physical object**".

Annex F
(informative)

Recommendations for a reference data item text definition

Recommendations for a reference data item text definition are as follows:

— A reference data item text definition should have one of the standard forms defined in 6.3.

— If a reference data item person-interpretable identifier is a term, then reference data item text definition should be in the form of a term definition as defined by ISO 1087-1.

NOTE ISO 1087-1 requires that a definition can replace a term in a text without loss of or change in meaning (see also ISO 704:2009, 6.3.5). This ability to replace the term is called the "principle of substitution".

— A reference data item text definition should not contain an abbreviation or acronym unless:

  — the abbreviation or acronym is defined in the definitions clause of the standard containing the reference data library;

  — the abbreviation or acronym is a reference data item person-interpretable identifier; or

  — the meaning of the abbreviation or acronym is explained.

  Normally abbreviations or acronyms are included within the definitions clause of a standard. In the case of a standard containing a reference data library with many items, it is not always possible to ensure that the definitions clause for the standard contains all the abbreviations and acronyms.

— If a reference data item is a class of individual, class of class of individual, etc., then a reference data item text definition should define a single member of the class.

EXAMPLE 1 The definition of the class "**pump**" is:

"**physical object** that is intended to impart mechanical energy to a **fluid**",

and not:

"**physical objects** that are intended to impart mechanical energy to a **fluid**".

— If possible, a reference data item text definition should state what a reference data item is and not what it is not.

EXAMPLE 2 The classes "goy" (a person who is not a Jew) and "sassenach" (a person who is not a Scot) are examples of classes necessarily defined by what they are not.

Annex G
(informative)

Recommendations for URIs for ISO standard reference data libraries and reference data items

G.1 URIs for a standard reference data item

The following forms of URI are recommended for a reference data item that is identified by an ISO standard:

— URN:

urn:iso:std:iso:nnnn:tech:reference-data:dddd; or

urn:iso:std:iso:nnnn:-m:tech:reference-data:dddd

where:

— nnnn is the ISO standard number;

— m is the ISO part number;

— dddd is the person interpretable identifier of the reference data item defined in 5.3, with any blank characters replaced by underscore.

— HTTP URI without fragment ID:

http://standards.iso.org/iso/nnnn/tech/reference-data/dddd; or

http://standards.iso.org/iso/nnnn/-m/tech/reference-data/dddd

where:

— nnnn is the ISO standard number;

— m is the ISO part number;

— dddd is the person interpretable identifier of the reference data item defined in 5.3, with any blank characters replaced by underscore.

— HTTP URI with fragment ID:

http://standards.iso.org/iso/nnnn/tech/reference-data#xxxx; or:

http://standards.iso.org/iso/nnnn/-m/tech/reference-data#xxxx

where:

— nnnn is the ISO standard number;

— m is the ISO part number;

— xxxx is the non-person interpretable identifier of the reference data item defined in 5.3, with any blank characters replaced by underscore.

The forms of URI defined in this clause are consistent with ISO/TC 184/SC 4 N2328[11].

G.2 URIs for a standard reference data library

The following forms of URI are recommended for reference data library that is contained within a part of an ISO standard:

— reference data library:

http://standards.iso.org/iso/nnnn/-m/tech/reference-data-library/<library>

where:

— nnnn is the ISO standard number;

— m is the ISO part number;

— <library> is the identification of the library within the standard.

If the ISO part contains only one library, the identification of the library can be omitted to give:

http://standards.iso.org/iso/nnnn/-m/tech/reference-data-library

EXAMPLE 1 The reference data library defined by this part of ISO 15926 has the URI:

http://standards.iso.org/iso/15926/-6/tech/reference-data-library

— version of a reference data library:

http://standards.iso.org/iso/nnnn/-m/tech/reference-data-library/<library>/<version identifier>

where:

— nnnn is the ISO standard number;

— m is the ISO part number;

— <library> is the identification of the library within the standard;

— <version> is the identification of the version of the library.

If the ISO part contains only one library, the identification of the library can be omitted to give:

http://standards.iso.org/iso/nnnn/-m/tech/reference-data-library/<version identifier>

EXAMPLE 2 Version 1 of the reference data library defined by this part of ISO 15926 has the URI:

http://standards.iso.org/iso/15926/-6/tech/reference-data-library/v-1

Annex H
(informative)

Example of version control for a reference data library

H.1 Administrative information for a reference data item

The reference data item **centrifugal pump** is stewarded as "released" from 2009 to 02-13. This is represented as instances of entity types defined in ISO 15926-2, as shown in Figure H.1.

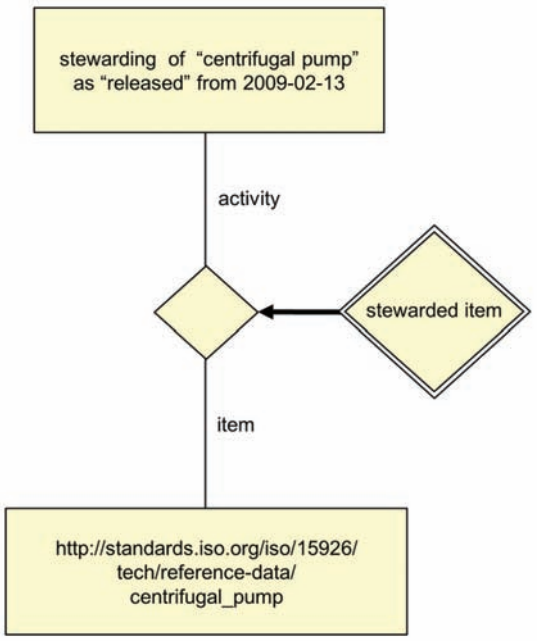

Figure H.1 — Administrative information for a reference data item as an instantiation of entity types defined in ISO 15926-2

Figure H.1 is interpreted as follows:

— The class **centrifugal pump** is identified by its URI:

  http://standards.iso.org/iso/15926/tech/reference-data/centrifugal_pump

— For simplicity, a description of the stewarding activity is shown rather than its identifier. In an implementation, the information contained in the description would be represented in a computer interpretable form.

— For simplicity, the label of the **class of relationship** "stewarded item" is shown rather than its URI.

This example can also be represented as a RDF[14] implementation of ISO 15926, as shown in Figure H.2.

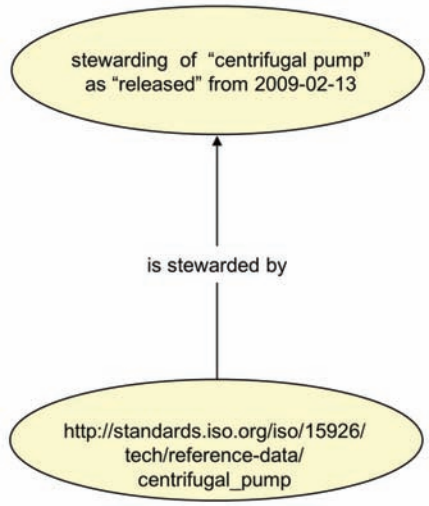

Figure H.2 — Administrative information for a reference data item as an RDF implementation of ISO 15926-2

Figure H.2 is interpreted as follows:

— for simplicity the label of the property "is stewarded by" is shown rather than its URI;

— the property "is stewarded by" is an OWL[8] **AnnotationProperty**.

H.2 Administrative information for a statement about a reference data item

An implementation of a reference data library regards each of the following as a separate statement about a **centrifugal pump**:

— **centrifugal pump** is identified by the person-interpretable identifier "centrifugal pump";

— **centrifugal pump** has the text definition "**dynamic pump** that contains impellers provided with vanes to generate centrifugal force to achieve the required pressure head";

— **centrifugal pump** is a subclass of **positive displacement pump**;

— **centrifugal pump** is an instance of the ISO 15926-2 entity **class of inanimate physical object**;

— **centrifugal pump** is a member of the class rotating equipment class.

These statements were released on 2009-02-13. The statement "**centrifugal pump** is a subclass of **positive displacement pump**" is incorrect, and was replaced by the statement "**centrifugal pump** is a subclass of **dynamic pump**" on 2010-10-27. The text definition has the "qualified superclass" standard form which is recommended in Annex F. In this example, the superclass in the text definition is inconsistent with the computer processable statement about the superclass.

The administrative information recorded for the reference data item **centrifugal pump**, and for the statements about **centrifugal pump**, is as follows:

— stewarded with the status "released" beginning 2009-02-13:

  The reference data item **centrifugal pump**.

  The statements:

  — **centrifugal pump** is identified by the unique person-interpretable identifier "centrifugal pump";

— **centrifugal pump** has the text definition "**dynamic pump** that contains impellers provided with vanes to generate centrifugal force to achieve the required pressure head";

— centrifugal pump is an instance of the ISO 15926-2 entity **class of inanimate physical object**;

— centrifugal pump is a member of the class rotating equipment class.

— stewarded with the status "released" beginning 2009-02-13 and ending 2010-10-27, and with the status "withdrawn" beginning 2010-10-27:

The statement:

— **centrifugal pump** is a subclass of **positive displacement pump**.

— stewarded with the status "released" beginning 2010-10-27:

The statement:

— **centrifugal pump** is a subclass of **dynamic pump**.

The administrative information about the reference data item **centrifugal pump**, and about the statement "**centrifugal pump** is a subclass of **positive displacement pump**", is shown as instantiations of entity types defined in ISO 15926-2 in Figure H.3.

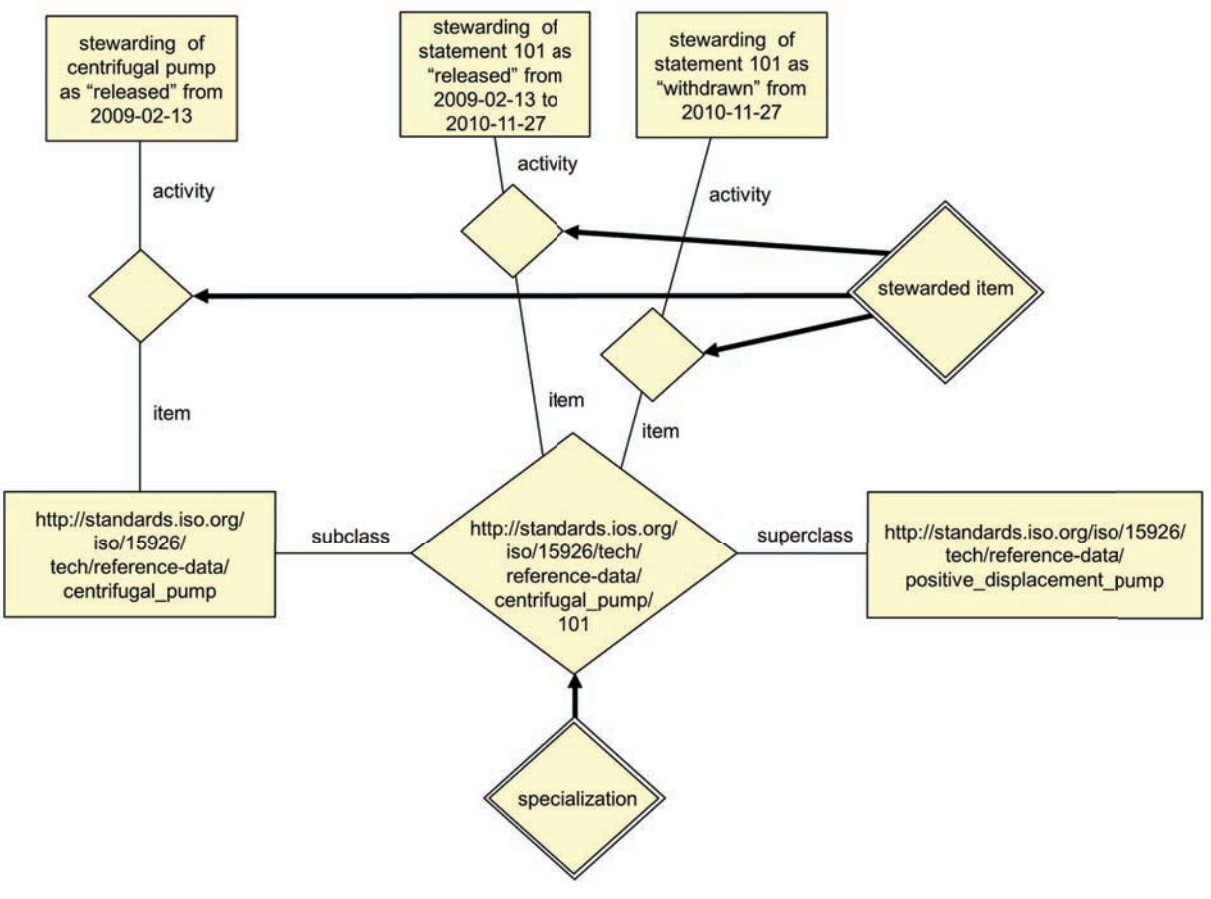

Figure H.3 — Administrative information for a reference data item and a statement as an instantiation of entity types defined in ISO 15926-2

The example can also be represented as a RDF implementation of ISO 15926, as shown in Figure H.4.

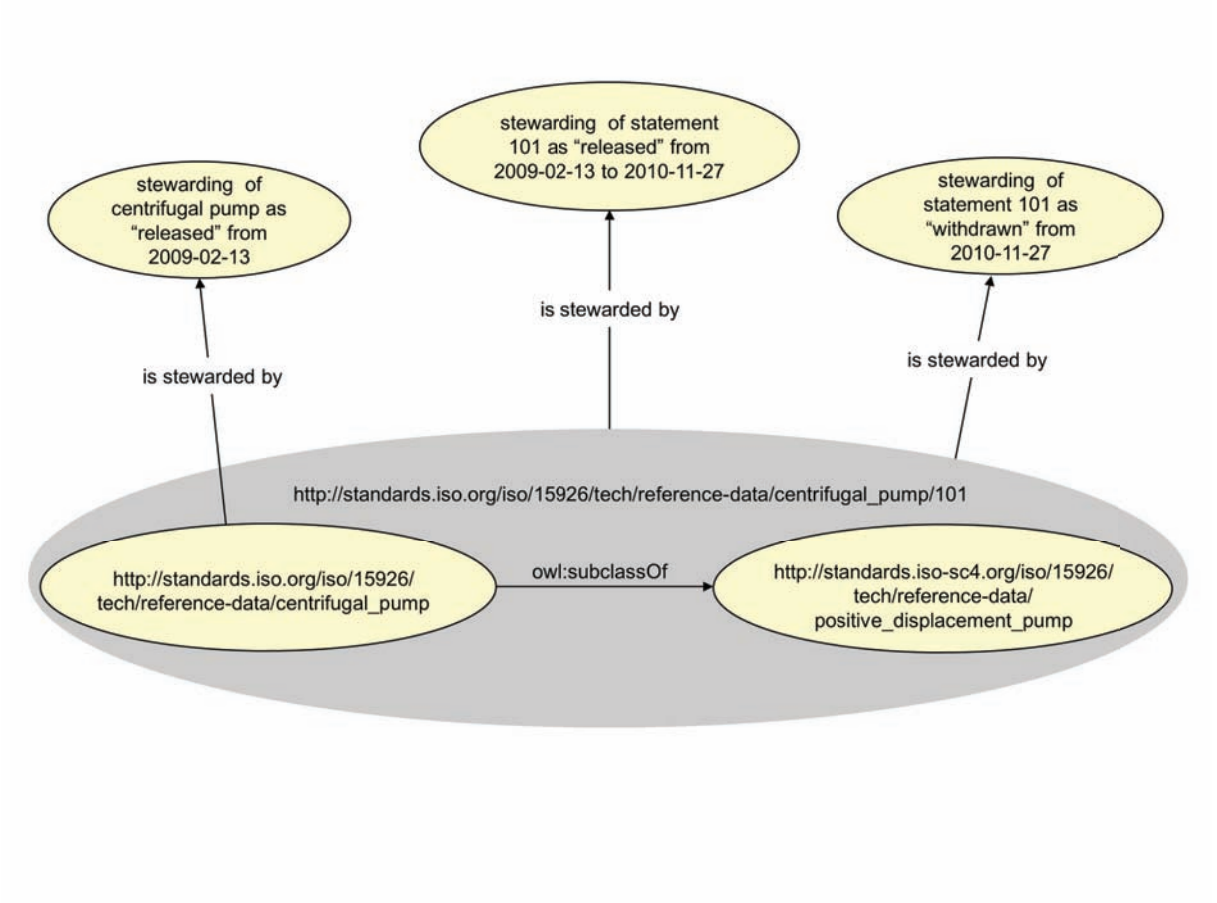

Figure H.4 — Administrative information for a reference data item and a statement in an RDF implementation of a reference data library based upon ISO 15926-2

The administrative information can include a "succession" relationship between:

— the statement "**centrifugal pump** is a subclass of **positive displacement pump**" with URI: http://standards.iso.org/iso/15926/tech/reference-data/centrifugal_pump/101;

— the statement "**centrifugal pump** is a subclass of **dynamic**" with URI: http://standards.iso.org/iso/15926/tech/reference-data/centrifugal_pump/102.

This relationship is shown in Figure H.5 and Figure H.6.

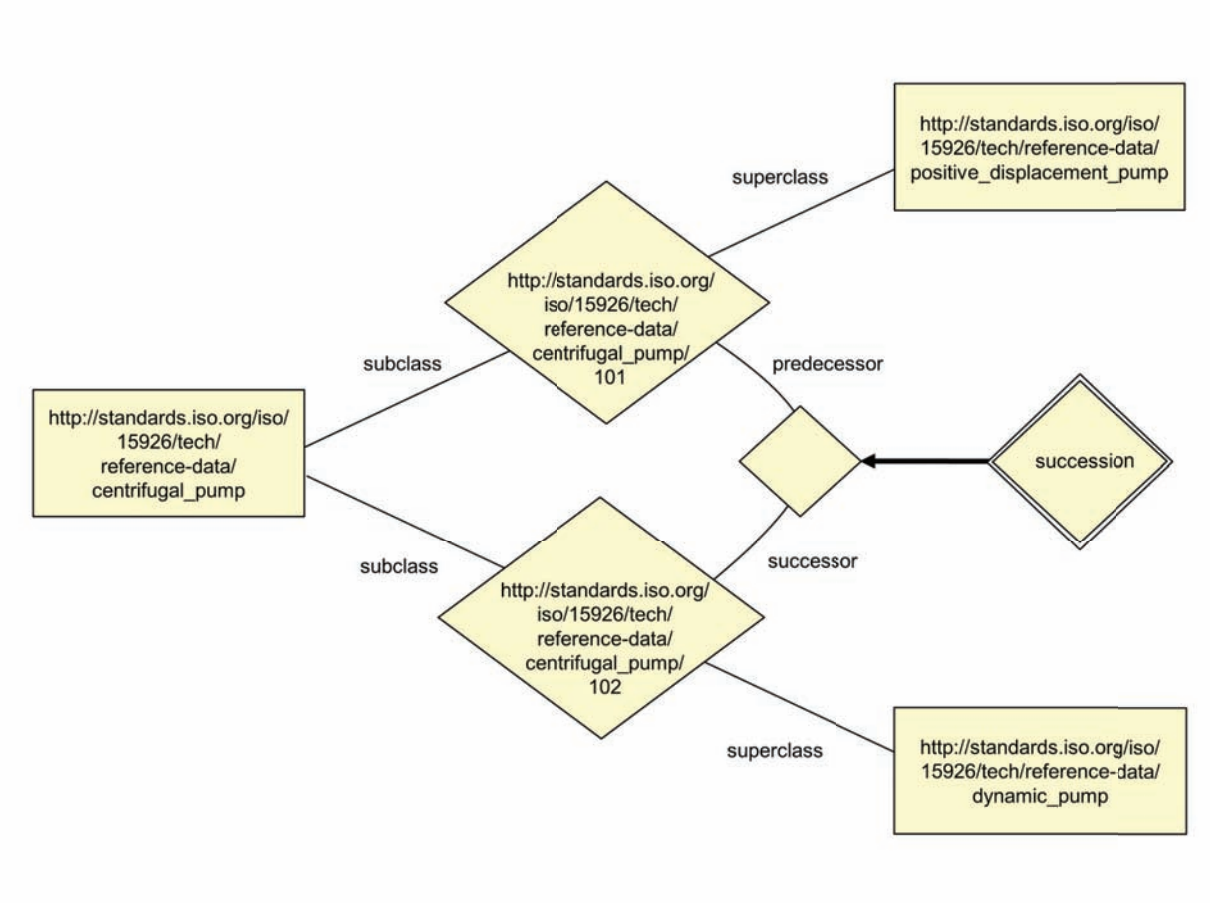

Figure H.5 — "Succession" as an instantiation of entity types defined in ISO 15926-2

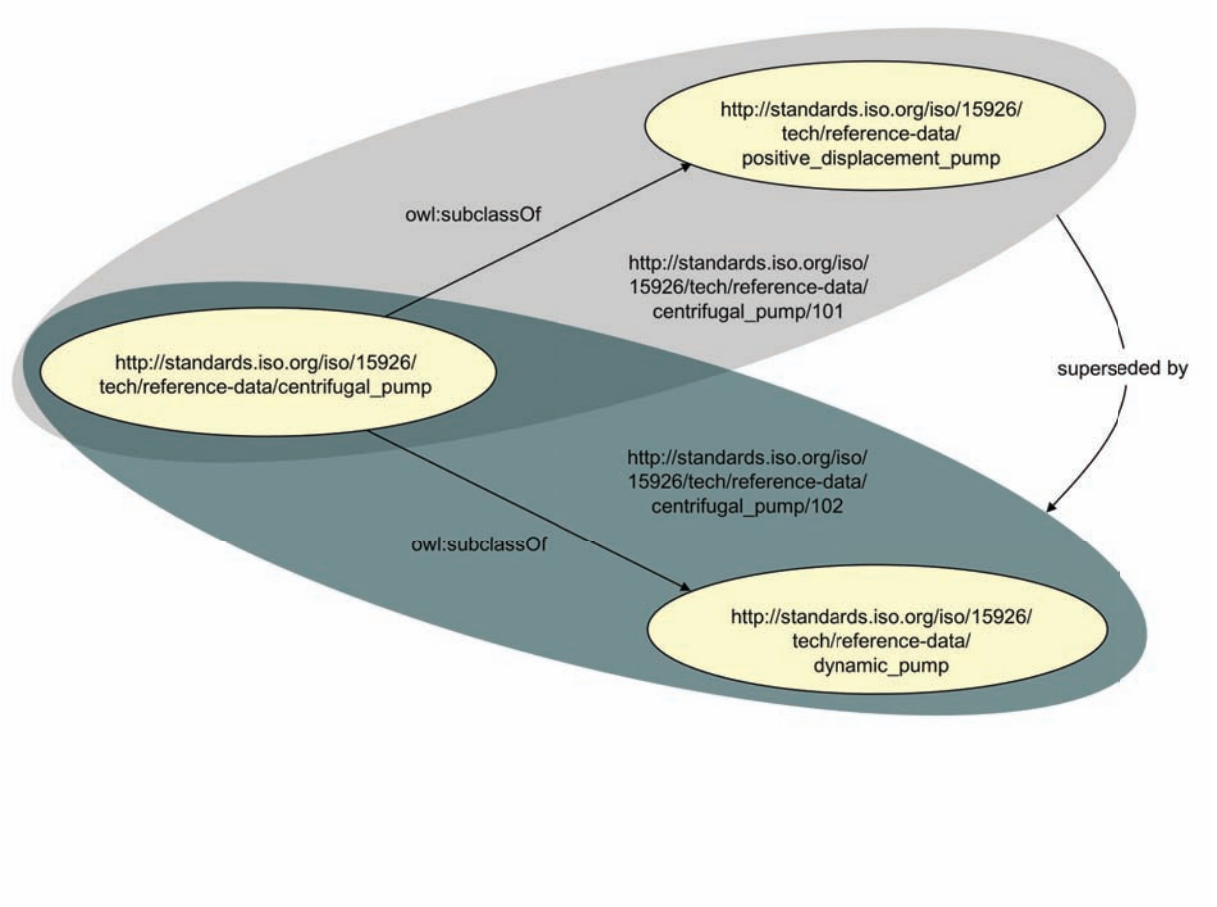

Figure H.6 — "Succession" in an RDF implementation of a referenced data library based upon ISO 15926-2

H.3 Administrative information for set of reference data items

The set of reference data items http://standards.iso.org/iso/15926/-4/tech/reference-data-item-set/rotating_equipment/v-1 has the status "released", but does not include the reference data item **vertical suspended centrifugal pump**. This reference data item is added by the following sequence of activities.

— The reference data item **vertical suspended centrifugal pump** is created with the status "proposed".

— A new set of reference data items http://standards.iso.org/iso/15926/-4/tech/reference-data-item-set/rotating_equipment/v-2 is created that consists of all the reference data items within http://standards.iso.org/iso/15926/-4/tech/reference-data-item-set/rotating_equipment/v-1 with the addition of **vertical suspended centrifugal pump**. The new set of reference data items has the status "proposed".

— The reference data item **<vertical suspended centrifugal pump>** is progressed to the status "released".

— The set of reference data items http://standards.iso.org/iso/15926/-4/tech/reference-data-item-set/rotating_equipment/v-2 is progressed to the status "released". The set of reference data items http://standards.iso.org/iso/15926/-4/tech/reference-data-item-set/rotating_equipment/v-1 is given the status "withdrawn".

— A "succession" relationship is specified between the set of reference data items http://standards.iso.org/iso/15926/-4/tech/reference-data-item-set/rotating_equipment/v-1 and the set http://standards.iso.org/iso/15926/-4/tech/reference-data-item-set/rotating_equipment/v-2.

H.4 Administrative information for set of statements

The set of statements "centrifugal pump data v1" with URI http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/centrifugal_pump/v-1 has the status "released", but contains the incorrect statement "**centrifugal pump** is a subclass of **positive displacement pump**". This statement is replaced by the correct statement "**centrifugal pump** is a subclass of **dynamic pump**" by the following sequence of activities:

— The statement "**centrifugal pump** is a subclass of **dynamic pump**" is created with the status "proposed".

— A new set of statements "centrifugal pump data v2" with URI http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/centrifugal_pump/v-2 is created that consists of:

  — all the statements within http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/centrifugal_pump/v-1;

  — the correct statement "**centrifugal pump** is a subclass of **dynamic pump**".

  The new set of statements has the status "proposed".

— The statement "**centrifugal pump** is a subclass of <dynamic pump>" is progressed to status "released". The statement "**centrifugal pump** is a subclass of **positive displacement pump**" is assigned the status "withdrawn".

— The set of statements http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/centrifugal_pump/v-2 is progressed to the status "released". The set of statements http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/centrifugal_pump/v-1 is assigned the status "withdrawn".

— The set of statements http://standards.iso.org/iso/15926/-4tech/reference-data-statement-set/centrifugal_pump/v-2 is specified as "successor to" the set http://standards.iso.org/iso/15926-4/tech/reference-data-statement-set/centrifugal_pump/v-1.

The two sets of statements are two "clouds of information" about the reference data item **centrifugal pump**. This is shown informally in Figure H.7.

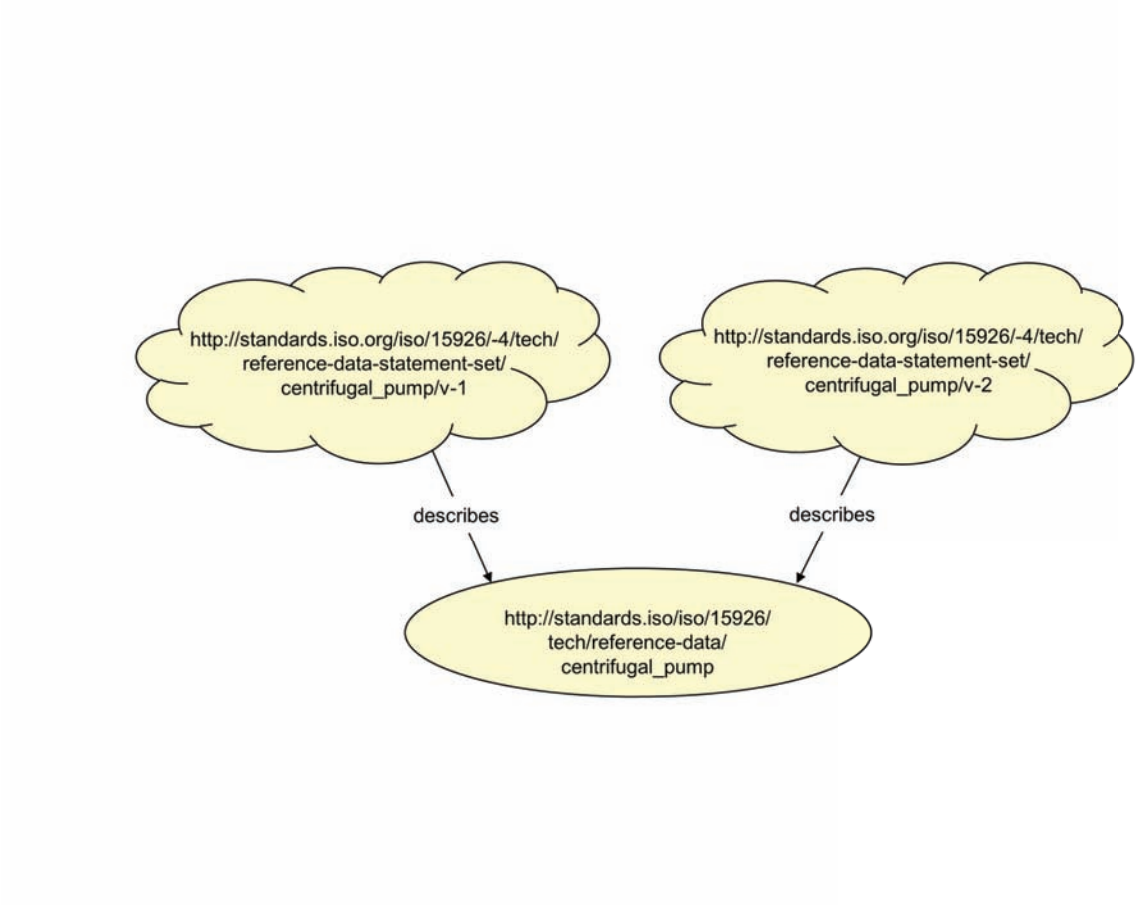

Figure H.7 — Information about a reference data item

The implementation of a “cloud of information” about a reference data item as an instantiation of entity types defined in ISO 15926-2 is shown in Figure H.8.

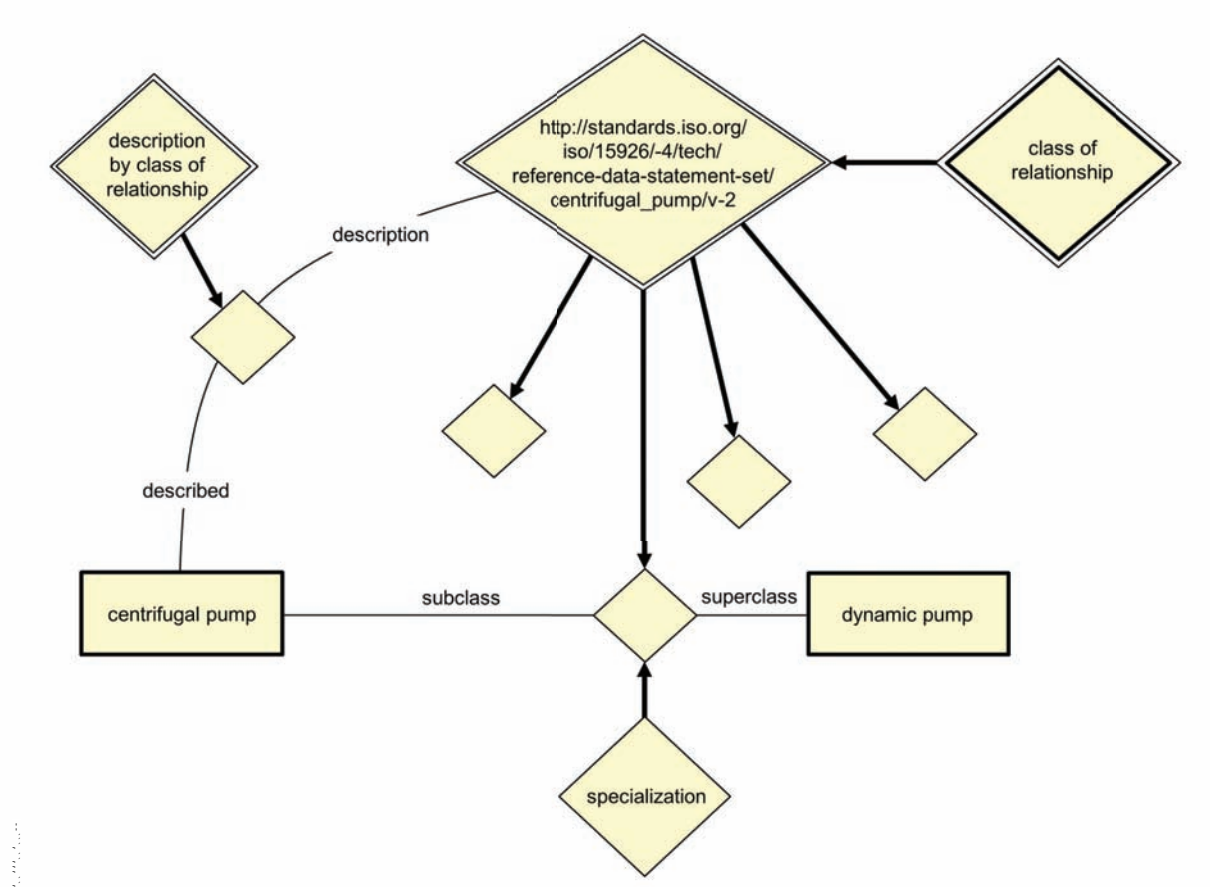

Figure H.8 — A "cloud of information" as an instantiation of entity types defined in ISO 15926-2

Figure H.8 is interpreted as follows:

— The specialization relationship between **centrifugal pump** and **dynamic pump** is one of the many relationships within the set of statements with URI http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/centrifugal_pump/v-2;

— The set of statements with URI http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/centrifugal_pump/v-2 is a description of the reference data item **centrifugal pump**.

The implementation of a "cloud of information" about a reference data item as an RDF named graph[15] is shown in Figure H.9. This figure shows that centrifugal pump and the set of statements about centrifugal pump, represented as an RDF graph, are different objects.

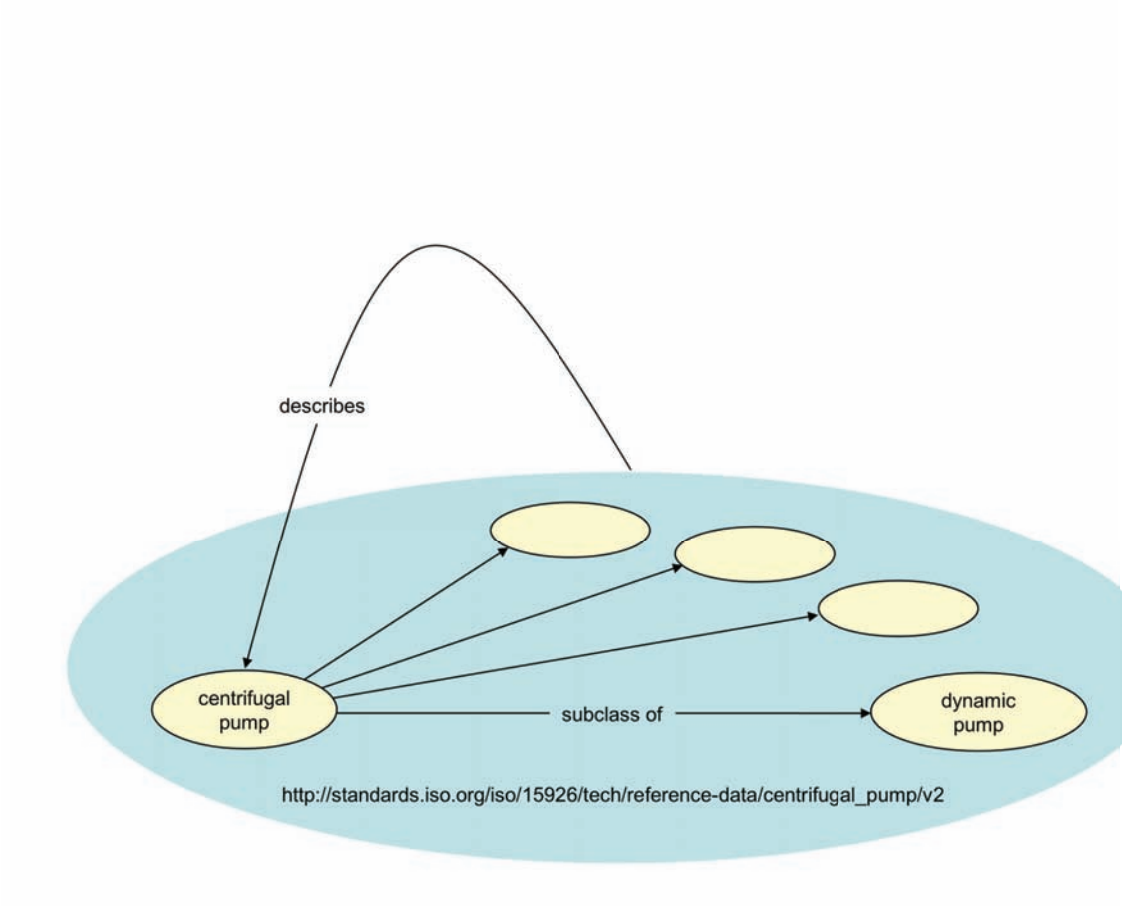

Figure H.9 — A "cloud of information" as an RDF named graph

Annex I
(informative)

Example of version control for a reference data library

This example shows how an incorrect statement within a reference data library is replaced by a correct statement. Usually each release of a reference data library incorporates many changes from the previous release. For simplicity, this example considers a new release of a reference data library to correct a single incorrect statement.

On 2009-02-13, the reference data library defined in ISO/TS 15926-4 is released containing the objects shown in Table I.1.

Table I.1 — Reference data library objects in the 2009–02–13 release

Object	URI
Release 11 of the reference data library	http://standards.iso.org/iso/15926-4/tech/reference-data-library/v-11
Release 4 of the part of the reference data library for rotating equipment	http://standards.iso.org/iso/15926/-4/tech/reference-data-library/rotating_equipment/v-4
The set of rotating equipment reference data items “v 1”	http://standards.iso.org/iso/15926/-4/tech/reference-data-item-set/rotating_equipment/v-1
The set of rotating equipment statements “v 4”	http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/rotating_equipment/v-4
The reference data item “centrifugal pump”	http://standards.iso.org/iso/15926/tech/reference-data/centrifugal_pump
The set of statements about the centrifugal pump “v 1”	http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/centrifugal_pump/v-1
The statement “centrifugal pump is a subclass of positive displacement pump”	http://standards.iso.org/iso/12345/tech/reference-data/centrifugal_pump/101

The relationship between these objects is shown informally in Figure I.1.

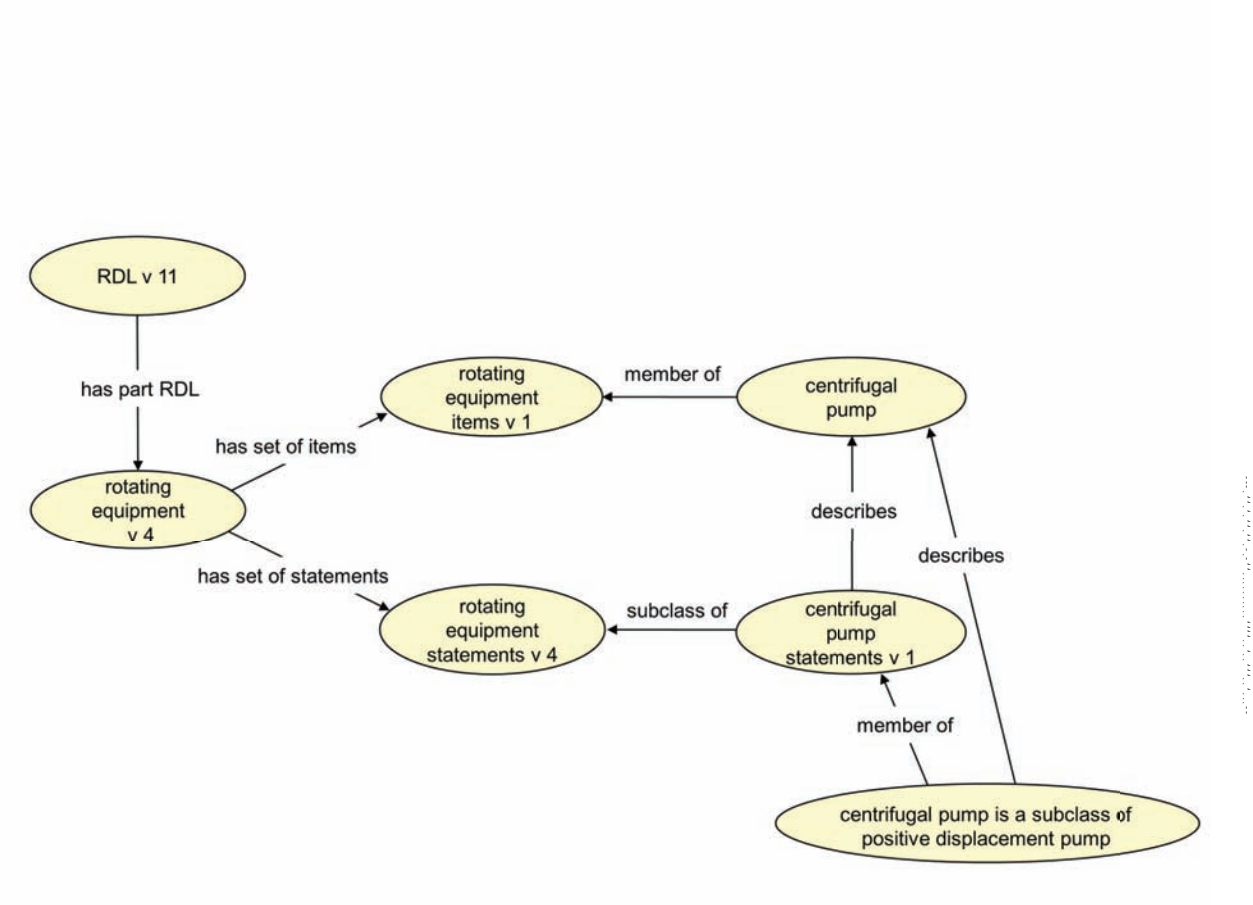

Figure I.1 — Sets of reference data items and sets of statements in a reference data library

The statement "**centrifugal pump** is a subclass of **positive displacement pump**" is incorrect.

On 2010-10-27, version 12 of the ISO 12345-6 reference data library corrects the error. The new release contains release 5 of the rotating equipment part reference data library. All other parts are unchanged. Release 5 of the rotating equipment part consist of:

— the set of rotating equipment reference data items "v 1";

— the set of rotating equipment statements "v 5".

The correction does not change the reference data item **centrifugal pump**, or any of the sets of reference data items. However the new correct statement "**centrifugal pump** is a subclass of **dynamic pump**" is included in new sets of statements shown in Table I.2. For this example, it is assumed that **dynamic pump** is already in the set of reference data items, so that it is available to be referenced by the new correct statement. It is also assumed that the understanding of **centrifugal pump** was correct in spite of the incorrect superclass statement, so that the reference data item is not changed.

Table I.2 — New statement and sets of statements

Object	URI
Release 12 of the reference data library	http://standards.iso.org/iso/15926/-4/tech/reference-data-library/v-12
Release 5 of the part of the reference data library for rotating equipment	http://standards.iso.org/iso/15926/-4/tech/reference-data-library/rotating_equipment/v-5
The set of rotating equipment statements "v 5", which contains the statement "**centrifugal pump** is a subclass of **dynamic pump**"	http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/rotating_equipment/v-5
The set of centrifugal pump statements "v 2", which contains the statement "**centrifugal pump** is a subclass of **dynamic pump**"	http://standards.iso.org/iso/15926/-4/tech/reference-data-statement-set/centrifugal_pump/v-2
The statement "**centrifugal pump** is a subclass of **dynamic pump**"	http://standards.iso.org/iso/15926/tech/reference-data/centrifugal_pump/102

The relationship between these objects is shown informally in Figure I.2.

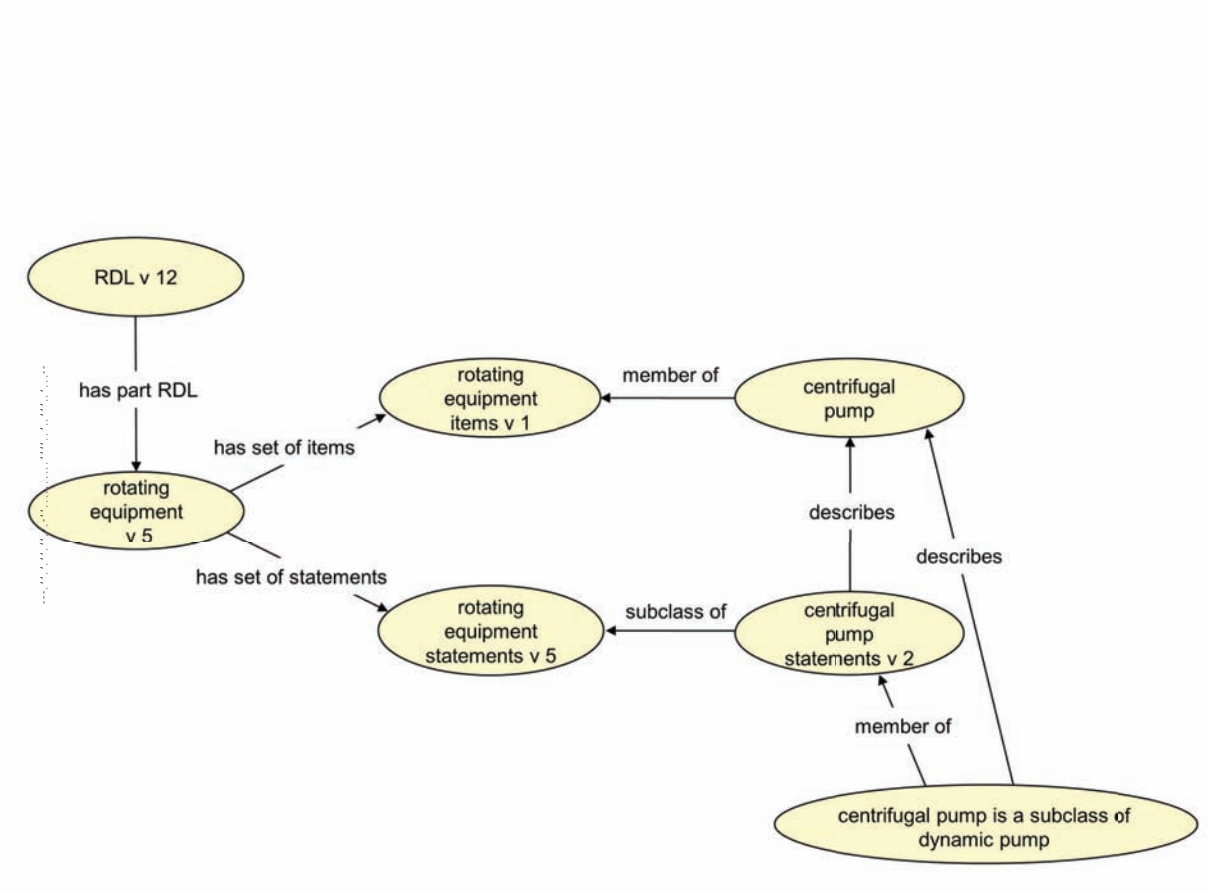

Figure I.2 — Amended sets of reference data items and sets of statements

Administrative information are recorded about the statements and sets of statements. Hence:

— stewarded with status "released" from 2009 to 02-13 until 2010-10-27, and stewarded with status "withdrawn" from 2010 to 10-27:

  — release 11 of the RDL;

  — release 4 of the rotating equipment part of the RDL;

  - set of rotating equipment statements “v 4”;
  - set of centrifugal pump statements “v 1”;
  - statement “centrifugal pump is a subclass of positive displacement pump”;
- stewarded with status “released” from 2010 to 10-27:
  - release 12 of the RDL;
  - release 5 of the rotating equipment part of the RDL;
  - set of rotating equipment statements “v 5”;
  - set of centrifugal pump statements “v 2”;
  - statement “**centrifugal pump** is a subclass of **dynamic pump**”.

In addition, “succession” relationships are recorded between:

- the statement “**centrifugal pump** is a subclass of **positive displacement pump**” and the statement “**centrifugal pump** is a subclass of **dynamic pump**;
- the set of centrifugal pump statements “v 1” and “v 2”;
- the set of rotating equipment statements “v 4” and “v 5”;
- release 4 and release 5 of the rotating equipment part of the RDL;
- release 11 and 12 of the RDL.

Annex J
(informative)

Discussion of the terminology defined by ISO 1087-1

The relationship between the terminology used in this part of ISO 15926, and the terminology defined by ISO 1087-1 is discussed in this annex.

NOTE The terms taken from ISO 1087-1 and discussed in this annex are not used in normative text within this part of ISO 15926, and are not included in Clause 3.

Some relevant terms taken from ISO 1087-1 are given in Table J.1.

Table J.1 — Relevant terms from ISO 1087-1:2000

Term in ISO 1087-1:2000	Definition
3.2.1 concept	unit of knowledge created by a unique combination of characteristics NOTE Concepts are not necessarily bound to particular languages. They are, however, influenced by the social or cultural background which often leads to different categorizations.
3.2.2 individual concept	concept which corresponds to only one object. NOTE 1 Examples of individual concepts are “Saturn”, “the Eiffel Tower”. NOTE 2 Individual concepts are usually represented by appellations.
3.2.3 general concept	concept which corresponds to two or more objects which form a group by reason of common properties NOTE Examples of general concepts are “planet”, “tower”.
3.1.1 object	anything perceivable or conceivable NOTE Objects may be material (e.g. an engine, a sheet of paper, a diamond), immaterial (e.g. a conversion ratio, a project plan) or imagined (e.g. a unicorn).
3.2.4 characteristic	abstraction of a property of an object or of a set of objects

In ISO 1087-1, it is assumed that for an object there is a triple of things as follows:

— object: something that exists in the real world;

— concept: a human understanding of an object; and

— sign: an artefact used by people to refer to a concept.

The distinction between object and concept is not made in ISO 15926. Instead there is a single object (or concept) called “thing” (see 3.1.26).

General concept in ISO 1087-1 is called “class” (see 3.1.3).

Individual concept in ISO 1087-1 is called “possible individual” (see 3.1.13).

Characteristic in ISO 1087-1 may correspond either to:

— physical quantity, or property (see 3.1.12);

— the relationship between a possible individual and a physical quantity, which is the entity **indirect property** in ISO 15926-2.

Many other relationships in ISO 15926-2, including some classifications, may also be regarded as characteristics.

Annex K
(informative)

Discussion of the terms vocabulary, taxonomy and ontology

Table K.1 discusses some of the terms which are often used in connection with reference data libraries.

NOTE The terms discussed in this annex are not used in normative text within this part of ISO 15926, and are not included in Clause 3.

Table K.1 — Other terms

Term	Definition
controlled vocabulary	A controlled vocabulary is a list of terms which has been enumerated explicitly. This list is controlled by, and is available from, a controlled vocabulary registration authority. Each term in a controlled vocabulary should have an unambiguous, non-redundant definition of the thing to which the term refers. This is a design goal which may not be true in practice. It depends on how strict the controlled vocabulary registration authority is regarding registration of terms into a controlled vocabulary. At a minimum, the following two rules should be enforced: — If the a term outside a controlled vocabulary is commonly used to refer to different things in different contexts, then the term within the controlled vocabulary is qualified to resolve this ambiguity. — If multiple terms are used to refer to the same thing, then one of the terms is identified as the preferred term in the controlled vocabulary and the other terms are listed as synonyms or aliases.
taxonomy	A taxonomy is a collection of things organized into a hierarchical structure. NOTE If each thing in a taxonomy has a term assigned to it, then the collection of things, with their terms is also a controlled vocabulary. Each thing in a taxonomy is in one or more parent-child relationships to other things in the taxonomy. There may be different types of parent-child relationships in a taxonomy (e.g. whole-part, genus-species, type-instance), but good practice limits all parent-child relationships to a single parent to be of the same type. Some taxonomies allow poly-hierarchy, which means that a thing can have multiple parents. This means that if a thing appears in multiple places in a taxonomy, then it is the same thing. Specifically, if a thing has children in one place in a taxonomy, then it has the same children in every other place where it appears.
thesaurus	A thesaurus is a controlled vocabulary that is also a network of relationships between the terms. A thesaurus uses associative relationships in addition to parent-child relationships. The expressiveness of the associative relationships in a thesaurus vary and can be as simple as “related to term” as in “term A is related to term B”.

Table K.1 *(continued)*

Term	Definition
ontology	An ontology is a theory about what exists within a domain. An ontology is specified by a collection of things which includes classes (entity "class" defined in ISO 15926-2), individual things (entity "possible individual" defined in ISO 15926-2), and relationships between things. A fact within the domain can be recorded by reference to the things within the ontology. From a set of facts recorded using an ontology, it may be possible to deduce further facts. NOTE 1 If each thing in an ontology has a term assigned to it, then the collection of things, with their terms is also a thesaurus. NOTE 2 The word "ontology" is sometimes incorrectly used as a synonym of "controlled vocabulary", "taxonomy" or "thesaurus". An ontology may also be all of these things. An ontology is distinguished from a taxonomy by having the ability to record facts. A "foundation ontology", "base ontology" or "upper ontology" is an ontology which is useful for a wide range of different activities. Such an ontology allows the recording of basic facts, such as the names of things and whole-part relationships. A "domain ontology" is an ontology which is useful for recording information with a particular scientific or engineering discipline. A "domain ontology" is often an extension of a "foundation ontology", but need not be. An ontology contains rules about what is possible, and hence about what is a valid fact. When exchanging information, there needs to be an agreement to use a specific ontology.
ontology language	An ontology language is a syntax which is used to record an ontology. Associated with an ontology language, there must also be a syntax which enables an ontology to be used to record a fact. Often, the same syntax is used for both purposes. The content of an ontology may be limited by the expressiveness of the ontology language used to record it. NOTE 1 Often an ontology language contains a foundation ontology "hard wired" within it. This is the case for OWL "Web Ontology Language"[8] and ISO 15926-2. A reference data library which complies with this part of ISO 15926 is necessarily a controlled vocabulary. Depending upon its content, such a reference data library may also be a taxonomy and an ontology. NOTE 2 This part of ISO 15926 says that: — Each item shall have exactly one name (or "person-interpretable identifier"). — If an item is commonly designated by one or more English language terms, then it is recommended that one of these be selected as the name. A reference data library which complies with this part of ISO 15926 can be recorded using OWL and ISO 15926-2. Therefore, a reference data library which complies with this part of ISO 15926 can contain an ontology within the capability of these ontology languages. NOTE 3 This part of ISO 15926 also defines a spreadsheet representation of a reference data library. This spreadsheet format does not have all the capabilities of OWL and ISO 15926-2.

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