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

Part 4:
Initial 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 4: Données de référence initiales
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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 Electro technical Commission (IEC) on all matters of electro technical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75% of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50% of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed every three years with a view to deciding whether it can be transformed into an International Standard.

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

ISO/TS 15926-4 was prepared by Technical Committee ISO/TC 184, Industrial automation systems and integration, Subcommittee SC 4, Industrial data.

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

— Part 1: Overview and fundamental principles

— Part 2: Data model


The following parts are under preparation:

— Part 3: Ontology for geometry and topology [Technical Specification]

— Part 7: Implementation methods for data exchange and integration [Technical Specification]

A complete list of parts of ISO 15926 is available from the Internet:

<http://www.tc184-sc4.org/titles/OIL_GAS_Titles.htm>
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.

ISO 15926 is organized as a series of parts, each published separately. This part of ISO 15926 specifies the initial set of reference data items.

The structure of ISO 15926 is as follows:

— ISO 15926-1 provides an overview of ISO 15926;
— ISO 15926-2 contains a generic, conceptual data model that supports representation of all life-cycle aspects of a process plant;
— ISO/TS 15926-3\(^1\) contains a reference data library for geometry and topology;
— ISO/TS 15926-4 contains a reference data library for physical objects, activities, properties and other reference data necessary to record information about a process plant;
— ISO 15926-5\(^2\) specifies the procedures to be followed for the maintenance of the reference data library ISO/TS 15926-4;
— ISO 15926-6\(^3\) specifies the information that is recorded for reference data items of ISO/TS 15926-4;
— ISO/TS 15926-7\(^4\) specifies implementation methods for the integration of distributed systems.

\(^1\) To be published.
\(^2\) Under preparation.
\(^3\) Under preparation.
\(^4\) To be published.
Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities —

Part 4: Initial reference data

1 Scope

This part of ISO 15926 specifies the initial set of core reference data items which can be used to record information about process plants, including oil and gas production facilities.

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

— core classes for process plants, including oil and gas production facilities;

NOTE 1 Reference data items can be core classes, de facto classes, commodity classes and manufactured product classes. Reference data items can also be standard classes or proprietary classes.

The terms for the different types of class are defined in 3.2. A discussion about the different types of classes is contained in Annex D.

— the unique name for each reference data item;

— the definition of each reference data item;

— subclass and classification relationships between reference data items;

NOTE 2 Each reference data item that is a class is directly or indirectly a subclass of an entity in ISO 15926-2.

— the entity within ISO 15926-2 which can be used to record each reference data item.

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

— data requirements for additional reference data;

— a numeric identifier for each reference data item;

NOTE 3 Numeric identifiers may be assigned by a registration authority.

— the procedures to be followed for registration and maintenance of additional reference data.

NOTE 4 A core class defined by this part of ISO 15926 can be used by ISO 15726-2, ISO/TS 15926-7 or ISO 10303-221.
2 Normative references

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


ISO 15926-1:2004, Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities — Part 1: Overview and fundamental principles

ISO 15926-2:2003, Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities — Part 2: Data model

3 Terms, definitions, and abbreviations

3.1 Terms defined in ISO 10303-1

For the purposes of this document, the following terms and definitions given in ISO 10303-1 apply. They are repeated below for convenience.

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

3.1.2 information
facts, concepts, or instructions

3.2 Terms defined in ISO 15926-1

For the purposes of this document, the following terms and definitions given in ISO 15926-1 apply. They are repeated below for convenience.

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

NOTE 1 A class need not have any members (things that satisfy its criteria for membership).

NOTE 2 Because the spatio-temporal paradigm is used to define individuals in this part of ISO 15926, all classes are non-well-founded sets. These are explained in ISO 15926-2:2003, D.2.4

3.2.2 commodity product class
manufactured product class whose members conform to open agreed standards
NOTE Commodity product classes have sufficient characterization to indicate suitability of use. They are specializations of one or more de facto classes, standard classes, or both. The resulting specification is non-proprietary, as no one organization controls it.

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

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

NOTE 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.

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

NOTE 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.

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

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

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

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

EXAMPLE 2 “BS4040 Leaded Petrol” is an example of a manufactured product class whose members are continuous.

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

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

NOTE 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 Lightbulbs 60 W 230 V E27 manufactured by Phillips are members of a proprietary product class.

3.2.8 \textbf{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

3.2.9 \textbf{reference data library (RDL)}
managed collection of reference data

3.2.10 \textbf{standard class}
class whose specification for membership is owned or controlled by a standardization body and is publicly available

NOTE 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 The ASME B16.9 standard constrains the dimensions and shapes of steel buttwelding pipe fittings.

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

3.3 \textbf{Other terms and definitions}
For the purposes of this document, the following terms and definition apply.

3.3.1 \textbf{reference data item}
thing that is defined within a reference data library

NOTE A registration authority may regard a reference data item as an administered item as defined in ISO/IEC 11179-6.

3.4 \textbf{Abbreviated terms}
For the purposes of this document, the following abbreviated terms apply.

ID identifier

RDL Reference Data Library (see 3.2.9)

URL Uniform Resource Locator

URN Uniform Resource Name
4 Initial reference data

4.1 Sets of reference data items

The sets of reference data items defined by this part of ISO 15926 are listed in Table 1.

<table>
<thead>
<tr>
<th>name of set</th>
<th>description of set</th>
</tr>
</thead>
<tbody>
<tr>
<td>activity</td>
<td>activities, including physical processes carried out within process plants and engineering activities carried out by people</td>
</tr>
<tr>
<td>basics</td>
<td>generic engineering classes which are referenced by other sets, but which are not specific to an engineering discipline</td>
</tr>
<tr>
<td>class of class</td>
<td>classifications of classes for information management purposes</td>
</tr>
<tr>
<td>connection material</td>
<td>equipment items and features of equipment items which are involved in the making of process connections</td>
</tr>
<tr>
<td>electrical</td>
<td>electrical equipment items including motors, generators, uninterruptible power supplies and transmission and distribution equipment</td>
</tr>
<tr>
<td>encoded information</td>
<td>languages and formats for information</td>
</tr>
<tr>
<td>control function</td>
<td>functions implemented by automatic control systems</td>
</tr>
<tr>
<td>heat transfer</td>
<td>heat transfer equipment</td>
</tr>
<tr>
<td>information</td>
<td>document types, including documents which specify process plant operations, and identifier types</td>
</tr>
<tr>
<td>instrumentation</td>
<td>equipment items involved in monitoring, communications, recoding and control</td>
</tr>
<tr>
<td>ISO 15926-2 super-classes</td>
<td>ISO 15926-2 entities which are superclasses of reference data items in this part of ISO 15926, or which have reference data items in this part of ISO 15926 as instances</td>
</tr>
<tr>
<td>piping</td>
<td>pipes and piping components</td>
</tr>
<tr>
<td>property</td>
<td>physical quantities and physical properties possessed by equipment items</td>
</tr>
<tr>
<td>protection</td>
<td>insulation (thermal and electrical) and safety systems for the protection of personnel and equipment</td>
</tr>
<tr>
<td>solid handling</td>
<td>handling of solid objects, including billets and particulate materials</td>
</tr>
<tr>
<td>static equipment</td>
<td>static process equipment, excluding heat exchangers, valves and piping. Within scope are tanks and vessels, reactors, separators, filters and static mixers.</td>
</tr>
<tr>
<td>transport</td>
<td>vehicles, and associated civil and marine structures and facilities</td>
</tr>
<tr>
<td>uom</td>
<td>units of measure and scales</td>
</tr>
<tr>
<td>valve</td>
<td>valves (for the control or prevention of fluid flow)</td>
</tr>
</tbody>
</table>

4.2 Representation of the reference data

Each set of reference data items listed in clause 4.1 is represented as a separate spreadsheet.
Each spreadsheet contains one row for each reference data item. The columns of the spreadsheets are specified in Annex C.

4.3 The URLs for the sets of reference data items

The sets of reference data items are published on the Internet as Excel spreadsheets with the URLs specified in Table 2.

<table>
<thead>
<tr>
<th>name of set</th>
<th>URL of set</th>
</tr>
</thead>
<tbody>
<tr>
<td>connection material</td>
<td><a href="http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/connection_material.xls">http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/connection_material.xls</a></td>
</tr>
</tbody>
</table>
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(4) 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

This part of ISO 15926 is identified by the URN:

```
```

The sets of reference data items are identified by the URNs specified in Table B.1.

<table>
<thead>
<tr>
<th>name of set</th>
<th>URN of set</th>
</tr>
</thead>
</table>
Spreadsheets are a powerful tool for organizing and representing data. In this section, we explore how spreadsheets can be used to represent the Reference Data Library (RDL).

The reference data library is represented as a spreadsheet with one row for each reference data item. The cells in the row contain information about a reference data item.

Table C.1 and Table C.2 specify:
- the order of the columns in the spreadsheet;
- the name of each column, which is specified in the first row of the spreadsheet;
- the information that is contained about a reference data item by a cell in the column.

**Table C.1 — The columns of a spreadsheet representation of an RDL**

<table>
<thead>
<tr>
<th>column number</th>
<th>column name</th>
<th>information contained</th>
<th>format</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>unique name</td>
<td>The unique name of the reference data item</td>
<td>ID</td>
</tr>
<tr>
<td>2</td>
<td>text definition</td>
<td>The text definition for the reference data item.</td>
<td>text</td>
</tr>
<tr>
<td>3</td>
<td>source</td>
<td>The source of the text definition for the reference data item.</td>
<td>text</td>
</tr>
<tr>
<td>4</td>
<td>notes</td>
<td>Notes and other informative text about the reference data item.</td>
<td>text</td>
</tr>
<tr>
<td>5</td>
<td>superclass 1</td>
<td>The designation of a class that is a superclass.</td>
<td>ID</td>
</tr>
<tr>
<td>6</td>
<td>superclass 2</td>
<td>The designation of a class that is a superclass.</td>
<td>ID</td>
</tr>
<tr>
<td>7</td>
<td>superclass 3</td>
<td>The designation of a class that is a superclass.</td>
<td>ID</td>
</tr>
<tr>
<td>8</td>
<td>ISO 15926-2 entity</td>
<td>The name of the ISO 15926-2 entity that has the reference data item as a member.</td>
<td>ID</td>
</tr>
<tr>
<td>9</td>
<td>classification 1</td>
<td>The designation of a class that has the reference data item as a member.</td>
<td>ID</td>
</tr>
<tr>
<td>10</td>
<td>classification 2</td>
<td>The designation of a class that has the reference data item as a member.</td>
<td>ID</td>
</tr>
<tr>
<td>11</td>
<td>classification 3</td>
<td>The designation of a class that has the reference data item as a member.</td>
<td>ID</td>
</tr>
</tbody>
</table>
Table C.2 — Additional columns for a spreadsheet representation of units of measure

<table>
<thead>
<tr>
<th>column number</th>
<th>column name</th>
<th>information contained</th>
<th>format</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>symbol</td>
<td>The symbol used to represent a unit of measure.</td>
<td>ID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EXAMPLE 1 The unit of measure ‘metre per second’ has the symbol m s⁻¹.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>operator</td>
<td>The operator which defined a unit of measure by an expression. The allowed values are ‘multiply’, ‘divide’, ‘factor’, and ‘exponentiate’.</td>
<td>keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EXAMPLE 2 The unit of measure ‘metre per second’ is defined by the ‘divide’ operator with operands metre and second.</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>first operand</td>
<td>The designation of the first unit of measure in a ‘multiply’, ‘divide’, ‘factor’ or ‘exponentiate’ operation.</td>
<td>ID</td>
</tr>
<tr>
<td>15</td>
<td>second operand</td>
<td>The designation of the second unit of measure in a ‘multiply’ or ‘divide’ operation.</td>
<td>ID</td>
</tr>
<tr>
<td>16</td>
<td>factor/prefix</td>
<td>The real number which is used to derive one unit of measure from another in a ‘factor’ operation. Either a number or an ISO prefix, such as ‘milli’ or ‘kilo’ can be specified.</td>
<td># or keyword</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EXAMPLE 3 The unit of measure ‘kilometre’ is defined by the ‘factor’ operator with first operand ‘metre’ and the factor/prefix ‘kilo’.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EXAMPLE 4 The unit of measure ‘inch’ is defined by the ‘factor’ operator with first operand ‘metre’ and the factor/prefix 0.0254.</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>exponent</td>
<td>The integer number which is used to derive one unit of measure from another in an ‘exponentiate’ operation.</td>
<td>#</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EXAMPLE 5 The unit of measure ‘square inch’ is defined by the ‘exponentiate’ operator with first operand ‘inch’ and the exponent 2.</td>
<td></td>
</tr>
</tbody>
</table>
In Tables C.1 and C.2, the format is indicated by a code as shown in Table C.3.

### Table C.3 — Format code

<table>
<thead>
<tr>
<th>format code</th>
<th>meaning</th>
</tr>
</thead>
</table>
| ID          | This denotes the unique name of a reference data item.  
               A unique name is contained in column 1 for exactly one row. This row is a defini-
               tion of the reference data item.  
               A unique name 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 in the language of the edition of this part of ISO 15926. |
| #           | This denotes a number. The number is expressed in a decimal format. It can, but  
               need not, have a decimal point. |
Annex D
(informative)

Discussion of the relationship between types of classes

Reference data is subdivided into the following types of classes:

- core classes;
- de facto classes;
- standard classes;
- commodity product classes;
- proprietary product classes.

The relationship between the different class types is illustrated in Figure D.1.

![Diagram showing the relationship between core, de facto, standards, commodity, and proprietary classes.]

**Figure D.1 — Types of classes**

The position of a class relative to the top and base of the triangle indicates the degree of definition. Classes at the top are general and have few restrictions on membership, whereas those at the base are more specific. Classes at the base of the triangle are specialisations of the ones above, and so on up the triangle.

Core classes are generic subdivisions, are widely known, and correspond to terms used in common language. The conditions for membership are often undefined. Understanding of the class usually is conveyed by example.

**EXAMPLE 1** pipe, floor, pump, light bulb are all core classes.
De facto classes are further subdivisions of the core classes defined by qualities that allow interchange of class members for particular purposes. For example, 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. Often, de facto classes are later formalised by international, national or industry agreement.

EXAMPLE 2 HB pencil is a de facto class.

Standards classes result from the work of national, international or industry standardisation 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 process whereby anybody can participate. A standards class may only constrain one particular aspect and often be insufficient to determine usage or how to make it.

EXAMPLE 3 ASME B16.9 constrains the dimensions and shapes of steel butt welded pipe fittings.

EXAMPLE 4 IEC 79-1 specifies constraints on electrical equipment to ensure standard degrees of explosion-proofness.

Commodity product classes have sufficient characterisation to indicate suitability of use. They are specialisations of one or more de facto and/or standard classes. The resulting specification is non-proprietary, as no one organisation controls it.

EXAMPLE 5 The type of lightbulb known as 60 W 230 V E27 represents a commodity class.

Proprietary product classes are specializations that depend 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 and or de facto classes, 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 6 Lightbulbs 60 W 230 V E27 manufactured by Phillips represents a proprietary product class.
Annex E
(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 as follows:

concept
unit of knowledge created by a unique combination of characteristics

NOTE 1 Concepts are not necessarily bound to particular languages. They are, however, influenced by the social or cultural background which often leads to different categorizations (note in ISO 1087-1)

[ISO 1087-1:2000, 3.2.1]

individual concept
class which corresponds to only one object.

NOTE 1 Examples of individual concepts are 'Saturn', 'the Eiffel Tower'. (note in ISO 1087-1)

NOTE 2 Individual concepts are usually represented by appellations. (note in ISO 1087-1).

[ISO 1087-1:2000, 3.2.2]

general concept
concept which corresponds to two or more objects which form a group by reason of common properties

NOTE 1 Examples of general concepts are 'planet', 'tower'. (note in ISO 1087-1)

[ISO 1087-1:2000, 3.2.3]

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). (note in ISO 1087-1).

[ISO 1087-1:2000, 3.1.1]

characteristic
abstraction of a property of an object or of a set of objects

[ISO 1087-1:2000, 3.2.4]
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’ which is an entity defined in ISO 15926-2.

General concept in ISO 1087-1 is regarded as identical to the entity `class` defined in ISO 15926-2.

Individual concept in ISO 1087-1 is regarded as identical to the entity `possible individual` defined in ISO 15926-2.

Characteristic in ISO 1087-1 may correspond either to:

— physical quantity, which is the entity `property` defined in ISO 15926-2;
— a relationship between a possible individual and a physical quantity, which is the entity `indirect_property` defined in ISO 15926-2.

Many other relationships in ISO 15926-2, including some classifications, would also be regarded as characteristics according to ISO 1087-1.
Annex F
(informative)

Discussion of the terms vocabulary, taxonomy and ontology

This annex discusses some of the terms which are often used in connection with reference data libraries.

NOTE 1 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.

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 2 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 is 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”.

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 define in ISO 15926-2), individual things (entity thing 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 3  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 4  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 5  Often an ontology language contains a foundation ontology ‘hard wired’ within it. This is the case for OWL ‘Web Ontology Language’ 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 6  This part of ISO 15926 says that:
- Each item shall have exactly one designation.
- If an item is commonly identified by one or more English language terms, then it is recommended that one of these be selected as the designation.

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 7  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.

2. ISO/TS 15926-3:— 5, Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities — Part 3: Ontology for geometry and topology

3. ISO/TS 15926-7:— 6, Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities — Part 7: Implementation methods for data exchange and integration


5 To be published.

6 To be published.
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