TECHNICAL SPECIFICATION

ISO/TS 15926-4

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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*

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

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

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

ISO 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
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 reference data library (RDL)
managed collection of reference data

3.2.10
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 **c**onstrains 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 Other terms and definitions

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

3.3.1
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 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 1 — Sets of reference data items

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

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 2 — URLs of the sets of reference data items

name of set	URL of set
activity	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/activity.xls
basics	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/basics.xls
class of class	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/class_of_class.xls
connection material	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/connection_material.xls
electrical	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/electrical.xls
encoded information	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/encoded_information.xls
control function	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/control_function.xls
heat transfer	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/heat_transfer.xls
information	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/information.xls
instrumentation	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/instrumentation.xls
ISO 15926-2 superclasses	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/iso15926-2_superclasses.xls
piping	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/piping.xls
property	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/property.xls
protection	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/protection.xls
solid handling	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/solid_handling.xls
static equipment	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/static_equipment.xls
transport	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/transport.xls
uom	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/uom.xls
valve	http://www.tc184-sc4.org/ts/15926/-4/ed-1/tech/rdl/valve.xls

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:

`urn:iso:std:iso:ts:15926:-4:ed-1`

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

Table B.1 — URNs of the sets of reference data items

name of set	URN of set
activity	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:activity
basics	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:basics
class of class	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:class_of_class
connection material	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:connection_material
electrical	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:electrical
encoded information	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:encoded_information
control function	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:control_function
heat transfer	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:heat_transfer
information	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:information
instrumentation	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:instrumentation
ISO 15926-2 superclasses	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:15926-2_superclasses
piping	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:piping
property	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:property
protection	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:protection
solid handling	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:solid_handling
static equipment	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:static_equipment
transport	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:transport
uom	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:uom
valve	urn:iso:std:iso:ts:15926:-4:ed-1:tech:rdl:valve

Annex C
(normative)

Spreadsheet representation of the 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

column number	column name	information contained	format
1	unique name	The unique name of the reference data item	ID
2	text definition	The text definition for the reference data item.	text
3	source	The source of the text definition for the reference data item.	text
4	notes	Notes and other informative text about the reference data item.	text
5	superclass 1	The designation of a class that is a superclass.	ID
6	superclass 2	The designation of a class that is a superclass.	ID
7	superclass 3	The designation of a class that is a superclass.	ID
8	ISO 15926-2 entity	The name of the ISO 15926-2 entity that has the reference data item as a member.	ID
9	classification 1	The designation of a class that has the reference data item as a member.	ID
10	classification 2	The designation of a class that has the reference data item as a member.	ID
11	classification 3	The designation of a class that has the reference data item as a member.	ID

Table C.2 — Additional columns for a spreadsheet representation of units of measure

column number	column name	information contained	format
12	symbol	The symbol used to represent a unit of measure. EXAMPLE 1 The unit of measure 'metre per second' has the symbol m s^{-1}.	ID
13	operator	The operator which defined a unit of measure by an expression. The allowed values are 'multiply', 'divide', 'factor', and 'exponentiate'. EXAMPLE 2 The unit of measure 'metre per second' is defined by the 'divide' operator with operands metre and second.	keyword
14	first operand	The designation of the first unit of measure in a 'multiply', 'divide', 'factor' or 'exponentiate' operation.	ID
15	second operand	The designation of the second unit of measure in a 'multiply' or 'divide' operation.	ID
16	factor/prefix	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. EXAMPLE 3 The unit of measure 'kilometre' is defined by the 'factor' operator with first operand 'metre' and the factor/prefix 'kilo'. EXAMPLE 4 The unit of measure 'inch' is defined by the 'factor' operator with first operand 'metre' and the factor/prefix 0.0254.	# or keyword
17	exponent	The integer number which is used to derive one unit of measure from another in an 'exponentiate' operation. EXAMPLE 5 The unit of measure 'square inch' is defined by the 'exponentiate' operator with first operand 'inch' and the exponent 2.	#

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

format code	meaning
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 definition 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.

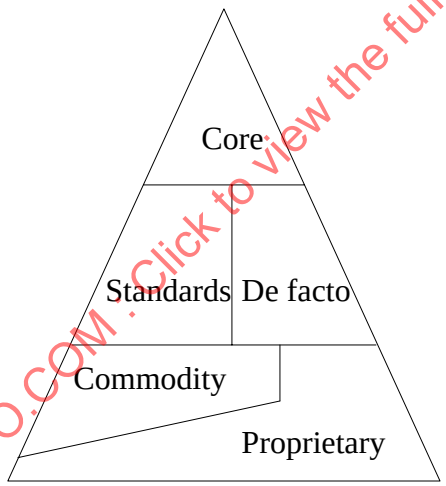

Figure D.1 — Types of classes

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 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 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-proofnes.

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
concept 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]