TECHNICAL SPECIFICATION

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Second edition
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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

Reference number
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CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

This second edition cancels and replaces the first edition (ISO/TS 15926-4:2007), which has been technically revised. It also incorporates the Amendment ISO/TS 15926-4:2007/Amd.1:2010.

The main changes compared to the previous edition are as follows:

— revision of the units of measure module to comply with ISO 80000 and IEC 80000;

— incorporation of the amendment to the first edition.

A list of all parts in the ISO 15926 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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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 document 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 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/TS 15926-6 specifies the information necessary within a reference data library used by a part of ISO 15926;

— ISO/TS 15926-7 specifies an implementation method for ISO 15926-2 using templates;

— ISO/TS 15926-8 specifies an OWL representation of the data model in ISO 15926-2 for use with templates;

— ISO 15926-10 specifies conformance requirements for process plant data according to ISO 15926-2;

— ISO/TS 15926-11 specifies a simplified implementation methodology ISO 15926-2 using RDF triples;

— ISO/TS 15926-12 contains an OWL representation of the ISO 15926-2 data model, with a direct semantics subset;

— ISO 15926-13 specifies the use of the ISO 15926-2 data model for the representation of asset planning information and contains an XML schema for the exchange of this information between systems.

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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

1 Scope

This document 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 document:

— 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 3.1. A discussion about the different types of classes is contained in Annex D.

NOTE 2 A core class defined by this document can be used by ISO 15926-2, ISO/TS 15926-7, ISO/TS 15926-8, ISO/TS 15926-11, ISO/TS 15926-12, ISO 15926-13 and ISO 10303-221.

— the unique name for each reference data item;

— the definition of each reference data item;

— subclass and classification relationships between reference data items;

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

NOTE 3 Each reference data item that is a class is directly or indirectly a subclass of an entity in ISO 15926-2.

The following are outside the scope of this document:

— data requirements for additional reference data items;

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 15926-2:2003, *Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities — Part 2: Data model*

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3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
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 the spatio-temporal paradigm is used to define individuals in this document, all classes are non-well-founded sets. These are explained in ISO 15926-2:2003, D.2.4.

[SOURCE: ISO 15926-1:2004, 3.1.1, modified — Note 2 to entry has been modified.]

3.1.2
commodity product class
manufactured product class (3.1.7) whose members conform to open agreed standards

Note 1 to entry: Commodity product classes have sufficient characterization to indicate suitability of use. They are specializations of one or more *de facto classes* (3.1.5), *standard classes* (3.1.12), 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 product class.

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

3.1.3
core class
class (3.1.1) 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, so understanding of the class may be conveyed by example.

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

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

3.1.4
data
representation of *information* (3.1.6) in a formal manner suitable for communication, interpretation, or processing by human beings or computers

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

3.1.5
de facto class
class (3.1.1) corresponding to common natures that are widely recognized but not formally agreed or defined

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

Note 2 to entry: A manufacturer can 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.

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EXAMPLE USB port and HB pencil are de facto classes.

[SOURCE: ISO 15926-1:2004, 3.1.8, modified — Notes to entry and Example have been modified.]

3.1.6
information
facts, concepts, or instructions

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

3.1.7
manufactured product class
class (3.1.1) whose members are individuals produced by a manufacturing process

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

Note 2 to entry: 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 of type "60 W 230 V E27" is a manufactured product class whose members are discrete.

EXAMPLE 2 Unleaded petrol to "EN 228" is a manufactured product class whose members are continuous.

[SOURCE: ISO 15926-1:2004, 3.1.14, modified — Notes to entry and Example have been modified.]

3.1.8
proprietary class
class (3.1.1) 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]

3.1.9
proprietary product class
class (3.1.1) that is a *manufactured product class* (3.1.7) and a *proprietary class* (3.1.8)

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* (3.1.2), *de facto classes* (3.1.5), 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 that is marketed under and protected by a registered trade name, is the basis for a proprietary product class.

EXAMPLE 2 Lightbulbs of type "60 W 230 V E27" manufactured by Phillips are members of a proprietary product class.

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

3.1.10
reference data item
reference data
process plant life-cycle *data* (3.1.4) that represents *information* (3.1.6) about *classes* (3.1.1) or individuals which are common to many process plants or of interest to many users

Note 1 to entry: A registration authority can regard a reference data item as an administered item as defined in ISO/IEC 11179-6.

[SOURCE: ISO 15926-1:2004, 3.1.18, modified — The word "item" has been added to the preferred term to remove ambiguity between singular and plural, and Note 1 to entry has been added.]

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3.1.11
reference data library
managed collection of *reference data items* (3.1.10)

[SOURCE: ISO 15926-1:2004, 3.1.19, modified — The abbreviated term "RDL" has been removed and the word "items" has been added to the definition to remove ambiguity between singular and plural.]

3.1.12
standard class
class (3.1.1) 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 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.

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

3.2 Abbreviated terms

ID Identifier

URI Uniform Resource Identifier

4 Reference data library

The version of the reference data library specified by this document consists of the versions of the modules listed and described in Table 1.

Table 1 — Reference data library module versions

Module	Version	Description of module
activity	1	activities, including physical processes carried out within process plants and engineering activities carried out by people
basics	1	generic engineering classes which are referenced by other sets, but which are not specific to an engineering discipline
class of class	1	classifications of classes for information management purposes
connection material	1	equipment items and features of equipment items which are involved in the making of process connections
electrical	1	electrical equipment items including motors, generators, uninterruptible power supplies and transmission and distribution equipment
encoded information	1	languages and formats for information
control function	1	functions implemented by automatic control systems
heat transfer	1	heat transfer equipment
information	1	document types, including documents which specify process plant operations, and identifier types
instrumentation	1	equipment items involved in monitoring, communications, recoding and control

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Table 1 *(continued)*

Module	Version	Description of module
ISO 15926-2 superclasses	1	ISO 15926-2 entities which are superclasses of reference data items specified by this document, or which have reference data items specified by this document as instances
piping	1	pipes and piping components
property	1	physical quantities and physical properties possessed by equipment items
protection	1	insulation (thermal and electrical) and safety systems for the protection of personnel and equipment
rotating equipment	1	rotating equipment, including pumps, compressors, expanders and mixers
solid handling	1	handling of solid objects, including billets and particulate materials
static equipment	1	static process equipment, excluding heat exchangers, valves and piping. Within scope are tanks and vessels, reactors, separators, filters and static mixers.
transport	1	vehicles, and associated civil and marine structures and facilities
uom	2	units of measure and scales
valve	1	valves (for the control or prevention of fluid flow)

The normative representations of the versions of the modules are spreadsheets. These spreadsheets shall be obtained by dereferencing the URIs given in Annex A.

The content in the columns of the spreadsheet shall be interpreted as described in Annex B.

The items in the module “ISO 15926-2 superclasses” shall be as defined in ISO 15926-2.

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Annex A
(normative)

URIs for the reference data library module versions

The spreadsheet representations of the versions of the modules specified by this document have URIs with the prefix:

https://standards.iso.org/iso/15926/-4/reference-data-library/

and suffices as listed in Table 2. The spreadsheets are obtained by dereferencing these URIs.

Table 2 — Module version spreadsheet URIs

Module	Version	URI suffix
activity	1	activity-v1.xlsx
basics	1	basics-v1.xlsx
class of class	1	class-of-class-v1.xlsx
connection material	1	connection-material-v1.xlsx
electrical	1	electical-v1.xlsx
encoded information	1	encoded-information-v1.xlsx
control function	1	control-function-v1.xlsx
heat transfer	1	heat-transfer-v1.xlsx
information	1	information-v1.xlsx
instrumentation	1	instrumentation-v1.xlsx
ISO 15926-2 superclasses	1	iso-15926-2-superclasses-v1.xlsx
piping	1	piping-v1.xlsx
property	1	property-v1.xlsx
protection	1	protection-v1.xlsx
rotating equipment	1	rotating-equipment-v1.xlsx
solid handling	1	solid handling-v1.xlsx
static equipment	1	static-equipment-v1.xlsx
transport	1	transport-v1.xlsx
uom	2	uom-v2.xlsx
valve	1	valve-v1.xlsx

NOTE A representation of Table 2 as HTML, with hypertext links to the spreadsheets, can be obtained by dereferencing the URI given in Annex C.

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Annex B
(normative)

Columns of the spreadsheets

Each version of a module of 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 3 and Table 4 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 3 — The columns of a spreadsheet representation

Column number	Column name	Information contained	Format
1	URI	URI of the reference data item NOTE The URI has the form of a the stem http://standards.iso.org/iso/15926/-4/reference-data-item/ followed by a suffix derived from the unique name of the reference data item.	URI
2	unique name	The unique name of the reference data item	ID
3	text definition	The text definition for the reference data item.	text
4	source	The source of the text definition for the reference data item.	text
5	notes	Notes and other informative text about the reference data item.	text
6	superclass 1	The designation of a class that is a superclass.	ID
7	superclass 2	The designation of a class that is a superclass.	ID
8	superclass 3	The designation of a class that is a superclass.	ID
9	ISO 15926-2 entity	The name of the ISO 15926-2 entity that has the reference data item as a member.	ID
10	classification 1	The designation of a class that has the reference data item as a member.	ID
11	classification 2	The designation of a class that has the reference data item as a member.	ID
12	classification 3	The designation of a class that has the reference data item as a member.	ID

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Table 4 — Additional columns for a spreadsheet representation of units of measure

Column number	Column name	Information contained	Format
13	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
14	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
15	first operand	The designation of the first unit of measure in a 'multiply', 'divide', 'factor' or 'exponentiate' operation.	ID
16	second operand	The designation of the second unit of measure in a 'multiply' or 'divide' operation.	ID
17	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
18	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 Table 3 and Table 4 the format is indicated by a code as shown in Table 5.

Table 5 — Format code

Format code	Meaning
URI	URI.
ID	This denotes the unique name of a reference data item. A unique name is contained in column 2 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 document.
#	This denotes a number. The number is expressed in a decimal format. It can, but need not, have a decimal point.

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Annex C
(informative)

URI for the reference data library

The versions of the modules that are part of the reference data library specified by this document are listed in the HTML file obtained by dereferencing the URI:

https://standards.iso.org/iso/15926/-4/reference-data-library

This HTML file has hypertext links to representations of the versions of the modules.

This HTML file lists the versions of the modules that are part of the versions of the reference data library specified by previous and subsequent editions of this document.

This HTML file specifies the statuses of the versions of the reference data library and of the modules.

NOTE The URI can be regarded as identifying either the latest version of the reference data library defined by this document, or the sequence of versions of the reference data library defined by editions of this document.

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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 types of classes is illustrated in Figure D.1.

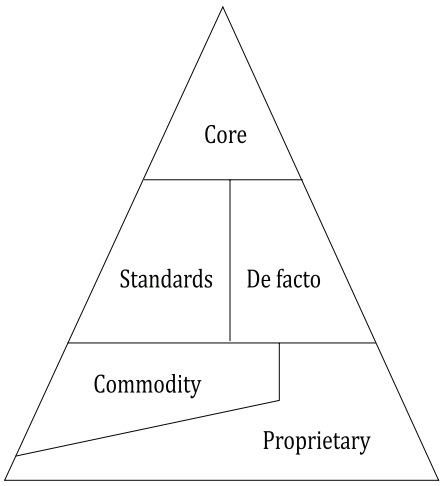

Figure D.1 — Types of classes

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.

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— **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 where-by 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.

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Bibliography

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

[2] 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*

[3] ISO 80000 (all parts), *Quantities and units*

[4] IEC 80000 (all parts), *Quantities and units*

[5] IEC 60050, *International Electrotechnical Vocabulary*

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