Technical Specification

ISO/TS 15926-4

Third edition
2024-07

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

Part 4: Core 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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Contents

Page

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 document 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.

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.

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

This third edition replaces the second edition (ISO 15926-4:2019), which has been technically revised.

The main changes are as follows:

— The list of spreadsheets has been updated and includes the correct address on www.standards.iso.org and with the correct version number of the spreadsheets;

— The content of the spreadsheets has been updated to reflect the projects of the past years. In each spreadsheet insert, a list has been included of the changes compared to the previous version;

— The list of attributes has been aligned to ISO/TS 15926-6;

— Informative Annex E that describes types of libraries and collections of terms related to reference data libraries, has been added;

— Informative Annex F has been added that describes the application of ISO/TS 15926-4 (this document) in other parts of the ISO 15926 series, including conformance criteria and an example of integration of various reference data libraries into a specific project reference data library.

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.

Introduction

The ISO 15926 series provides a 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.

The ISO 15926 series is a series of parts, each published separately. This document specifies the core set of reference data items. This document is a taxonomy of classes, and of properties which are unrelated to each other. This document also contains non-plant classes (e.g. activity classes, milestones, statuses).

The reference data in this document have been developed since 1990 from the experience of operators, contractors and equipment suppliers operating in the plant engineering supply chain. The reference data therefore largely cover process plants installed in the oil, gas, process and power industries. The reference data can be extended though change requests (CRs) with data that have not yet been covered, such as specific nuclear data and specific pulp and paper equipment data. Such CRs will be processed according to the ISO TC 184/SC4 procedure for maintenance of reference data. In this procedure, the ISO/TS 15926-6 reference data are checked against the technical rules given in ISO/TS 15926-6.

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

Part 4: Core reference data

1 Scope

This document specifies the 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;

— information about a reference data item.

NOTE The total set of information about a reference data item can be found in Table B.1.

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*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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

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

— IEC Electropedia: available at https://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 — editorial updates to Note 2 to entry.]

3.1.2
commodity product class
manufactured 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 usage defined by the commodity product class.

Note 3 to entry: Adapted from ISO 15926-1:2004, 3.1.2.

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

3.1.3
core class
class that is a commonly used subdivision corresponding to terms used in common language

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

[SOURCE: ISO 15926-1:2004, 3.1.4, modified — Note 1 to entry was deleted.]

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

[SOURCE: ISO 10303-2:2024, 3.1.207]

3.1.5
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 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.

EXAMPLE USB port and HB pencil are de facto classes.

[SOURCE: ISO 15926-1:2004, 3.1.8, modified — Editorial update to Note 1 to entry, EXAMPLE 1 changed to Note 2 to entry and updated, EXAMPLE 2 is now EXAMPLE and updated.]

3.1.6
information
facts, concepts, or instructions

EXAMPLE 1 The unique name of a reference data item is information about that reference data item.

EXAMPLE 2 The definition of a reference data item is information about that reference data item.

[SOURCE: ISO 10303-1:2021, 3.1.41, modified — Examples 1 and 2 added.]

3.1.7
manufactured product class
class 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 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 "EN 228" unleaded petrol is a manufactured product class whose members are continuous.

[SOURCE: ISO 15926-1:2004, 3.1.14, modified — Editorial update to Note 1 to entry, example updated]

3.1.8
product class
artefact that has been designed by a manufacturer and whose members may fulfil the requirements set forth in an instance of an asset requirement class

3.1.9
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]

3.1.10
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 its 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]

3.1.11
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]

3.1.12
reference data item
thing that is defined within a reference data library

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

Note 2 to entry: A registration authority can regard a reference data item as an administered item as defined in ISO/IEC 11179-6.

3.1.13
reference data library
managed collection of reference data items

[SOURCE: ISO 15926-1:2004, 3.1.19, — "items" added to definition.]

3.1.14
reference data library module
collection of reference data items within a reference data library that shares the same subject area

EXAMPLE Electrical is a reference data library module, represented by a specific spreadsheet, which contains reference data library items (classes) that are of direct interest for the electrical engineering discipline, which in this case is the subject area. In the context of ISO 15926-2 the reference data library module is a class of class with as members all classes contained by the corresponding spreadsheet.

3.1.15
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 need only constrain one particular aspect and can often be insufficient to determine usage or be a full manufacturing specification.

EXAMPLE 1 ASME B16.9 constrains the dimensions and shapes of steel buttwelding 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, modified — Editorial update to Note 1 to entry and EXAMPLES.]

3.2 Abbreviated terms

ID	identifier
RDL	reference data library
URI	uniform resource identifier

4 Reference data library

The background of the principles for having a data model and reference data library is described in ISO 15926-1.

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

The normative representations of the versions of the reference data library modules are spreadsheets. These spreadsheets can be obtained by dereferencing the URI given in Annex C in combination with the contents of Annex A, Table A.2.

The types of content in the columns of the spreadsheets are described in Table B.1.

This document gives the content of the reference data library modules and its structure. The content itself is a result of applying the rules as defined in ISO/TS 15926-6. For this reason, ISO/TS 15926-6 is not defined as normative for this document.

Reference data items in a project RDL can be core classes, standard classes, de facto classes, manufactured product classes, commodity product classes and proprietary product classes. The terms for these different types of classes are further explained in Annex D.

The basis for the core classes as defined in the reference data library modules is described in ISO 15926-2. Each reference data item that is a class shall be directly or indirectly a subclass of an entity in ISO 15926-2.

The core classes as defined reference data library modules can be used by other parts of the ISO 15926 series.

Given that there are several types of libraries and it is not always clear how they relate to each other, Annex E provides an explanation of the various libraries and their role from the perspective of the ISO 15926 series.

Annex F gives examples of how this document has been applied in the different parts of the ISO 15926 series supporting life cycle data integration. Based on this, it can be determined how this document can be used on itself in a private data integration application.

Annex A
(normative)

Reference data library module versions

The spreadsheet representations of the versions of the reference data library modules specified by this document has engineering disciplines as listed in Table A.1.

A representation of Table A.1 as HTML, with hypertext links to the editions of ISO/TS 15926-4 (this document) and their spreadsheet versions, can be obtained by dereferencing the URI given in this Annex.

In this edition of this document each reference data library module corresponds with a spreadsheet whose structure is defined in Annex B.

Table A.1 — Reference data library module versions

Module	Version	Description of module
ACTIVITY OR EVENT	2	Activities, including physical processes carried out within process plants and engineering activities carried out by people. EXAMPLE AUTOMATIC TESTING, COLD PRESSING
MULTI SUBJECT AREA	2	Generic engineering classes which are referenced by other sets, but which are not specific to an engineering discipline. EXAMPLE AIR HANDLER COMPONENT, ENGINEER NOTE ARTEFACT is the top class in MULTI SUBJECT AREA that stands for everything given shape by man; the top of the taxonomy for physical classes. The FunctionalObject class in ISO15926-2 ENTITY TYPE is the top of the taxonomy for functional classes. Each physical class has at least these two parent classes through their taxonomies.
CLASS OF CLASS	2	Classifications of classes for information management purposes. EXAMPLE ELECTRICAL, CONNECTION MATERIAL NOTE Class of class suitable for standardization are the subject areas of the spreadsheets. There are many arbitrary classes of class (e.g. bar profile class) that are not suitable to be used in a standard.
CONNECTION MATERIAL	2	Equipment items and features of equipment items which are involved in the making of process connections. EXAMPLE CLEVIS PIN, LAP WELD JOINT
ELECTRICAL	2	Electrical equipment items including motors, generators, uninterruptible power supplies and transmission and distribution equipment. EXAMPLE AUTO-TRANSFORMER, BUS DUCT
HEATERS, COOLERS AND HEAT TRANSFER	2	Heat transfer equipment EXAMPLE AIR COOLER, INLET LOUVER, REHEATER
INFORMATION AND INFORMATION CARRIER	2	Document types, including documents which specify process plant operations, and identifier types. EXAMPLE HAZARD ANALYSIS REPORT, APPROVAL STAMP

Table A.1 *(continued)*

Module	Version	Description of module
INSTRUMENTATION	2	Equipment items involved in monitoring, communications, recoding and control. EXAMPLE ABSOLUTE PRESSURE GAUGE, DENSITY MEASURING INSTRUMENT – MICROWAVE NOTE Some instrument classes need to be combined to give the aspects to the instance plant item. For example, an instance object must be classified by DIFFERENTIAL PRESSURE TRANSMITTER and by DIFFERENTIAL PRESSURE MEASURING ELEMENT – BELLOWS to combine the method of measuring. There are the taxonomies MEASURING INSTRUMENT and MEASURING ELEMENT for this.
ISO 15926-2 ENTITY TYPE	2	ISO 15926-2 entities which are super classes of reference data items specified by this document, or which have reference data items specified by this document as instances. EXAMPLE Class of person, person
MISSING SUPER CLASSES	1	Missing super classes needed for completeness and consistency from an integrated point of view over all reference data library modules. EXAMPLE CONCRETE
PIPING	2	Pipes and piping components. EXAMPLE SPOOL PIECE, TUBING SPOOL
PROPERTY AND STATUS	2	Physical quantities and physical properties possessed by equipment items. EXAMPLE FAULT CORRECTION TIME, GROSS TOTAL WEIGHT
PROTECTION	2	Insulation (thermal and electrical) and safety systems for the protection of personnel and equipment. EXAMPLE FIRE FIGHTING SYSTEM, TRACING SYSTEM
ROTATING EQUIPMENT	2	Rotating equipment, including pumps, compressors, expanders and mixers. EXAMPLE CENTRIFUGAL PUMP, CRANKSHAFT GEAR NOTE There are classes that need to be combined to express if the instance object is a system or a bare object. For example, to express a centrifugal pump skid (foundation, pump, gearbox, driver), classify the object by CENTRIFUGAL PUMP and by PUMP SYSTEM. If it is a bare pump, classify by CENTRIFUGAL PUMP and by BARE PUMP.
SOLIDS HANDLING	2	Handling of solid objects, including billets and particulate materials EXAMPLE CRUSHER, PEBBLE MILL
STATIC EQUIPMENT	2	Static process equipment, excluding heat exchangers, valves and piping. Within scope are tanks and vessels, reactors, separators, filters and static mixers. EXAMPLE PLUG MILL
TRANSPORT	2	Vehicles and associated civil and marine structures and facilities. EXAMPLE HELICOPTER
UOM (SCALE)	3	Units of measure and scales. EXAMPLE METRE
VALVE CLASSES	2	Valves (for the control or prevention of fluid flow). EXAMPLE CAGE CHOKE VALVE

NOTE The reference data library modules control function and encoded information (both version '1') are taken out of the original series of data library models since the content has been included in the other spreadsheets.

In Table A.2 the file names of the spreadsheets are given that represent the reference data library modules that are modified as a result of this edition of ISO/TS 15926-4 (this document).

Table A.2 — File names of the changed and added reference data library modules

Name of reference data library module	File name spreadsheet
ACTIVITY OR EVENT	activity-v2.xlsx
CLASS OF CLASS	class_of_class-v2.xlsx
CONNECTION MATERIAL	Connection_material-v2.xlsx
ELECTRICAL	electrical-v2.xlsx
HEATERS, COOLERS AND HEAT TRANSFER	heaters_coolers_and_heat_transfer-v2.xlsx
INFORMATION AND INFORMATION CARRIER	information_and_information_carrier-v2.xlsx
INSTRUMENTATION	instrumentation-v2.xlsx
ISO 15926-2 ENTITY TYPE	iso15926-2_entity_type-v2.xlsx
MULTI SUBJECT AREA	multi_subject_area-v2.xlsx
MISSING SUPER CLASSES	missing_superclasses_v1.xlsx
PIPING	piping-v2.xlsx
PROPERTY AND STATUS	property-v2.xlsx
PROTECTION	protection-v2.xlsx
ROTATING EQUIPMENT	rotating_equipment-v2.xlsx
SOLIDS HANDLING	solids_handling-v2.xlsx
STATIC EQUIPMENT	static_equipment-v2.xlsx
TRANSPORT	transport-v2.xlsx
VALVE CLASSES	valve_classes-v2.xlsx
UOM (SCALE)	uom_v3.xlsx

Annex B
(normative)

Columns in the spreadsheets representing the attributes of ISO/TS 15926-4:20— (this version of this document)

Each version of a reference data library 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 B.1 specifies:

— the attributes of a spreadsheet representation of a reference data library, represented by the name of each column;

— the order of the columns in the spreadsheet;

— a description of the information in the column;

— the format of the data in the column.

Table B.1 — Attributes of a spreadsheet representation of a reference data library

Attribute number	Attribute name	Attribute description	Format[a]
1	**URI**	A URI of the reference data item NOTE The attribute URI is already included as a reservation.	text
2	**UniqueNumber**	A non-human interpretable identifier of the reference data item EXAMPLE 1 For the 'centrifugal pump', UniqueNumber = 7436. EXAMPLE 2 For the 'metre per second', UniqueNumber = 9604.	ID
3	**UniqueName**	A human-interpretable identifier of the reference data item EXAMPLE 1 For the 'centrifugal pump', UniqueName = 'CENTRIFUGAL PUMP'. EXAMPLE 2 For the 'metre per second', UniqueName = 'METRE PER SECOND'.	text
4	**Synonym1**	A synonym for the human-interpretable identifier of the reference data item EXAMPLE Synonym1 = 'COOLING APPLIANCE' where UniqueName = 'COOLER.'	text
5	**Synonym2**	A synonym for the human-interpretable identifier of the reference data item	text
6	**TextDefinition**	The text definition for the reference data item EXAMPLE 1 For the 'centrifugal pump', TextDefinition = 'A <CENTRIFUGAL PUMP> is an <ARTEFACT> and a <BARE PUMP> in which centrifugal force imparted by the impeller is covered to pressure in the volute casing'. EXAMPLE 2 For the 'metre per second', TextDefinition = 'dm: Scale'.	text
7	**Source**	The source of the text definition for the reference data item EXAMPLE 1 For the 'centrifugal pump', Source = none.	text
8	**Notes**	Notes and other informative text about the reference data item EXAMPLE Notes = 'Chain pumps normally applied to lift water' where UniqueName = 'CHAIN PUMP'.	text

Table B.1 *(continued)*

Attribute number	Attribute name	Attribute description	Format[a]
9	**Superclass1**	The human-interpretable identifier of a class that is a superclass EXAMPLE 1 For the 'centrifugal pump', Superclass1 = 'ARTEFACT'. EXAMPLE 2 For the 'metre per second', Superclass 1 = 'PropertyQuantification'.	ID
10	**Superclass2**	The human-interpretable identifier of a class that is a superclass EXAMPLE 1 For the 'centrifugal pump', Superclass2 = 'BARE PUMP'. EXAMPLE 2 For the 'metre per second', Superclass2 = none.	ID
11	**Superclass3**	The human-interpretable identifier of a class that is a superclass EXAMPLE For the 'centrifugal pump', Superclass3 = none.	ID
12	**Superclass4**	The human-interpretable identifier of a class that is a superclass EXAMPLE For the 'centrifugal pump', Superclass4 = none.	ID
13	Superclass5	The human-interpretable identifier of a class that is a superclass EXAMPLE For the 'centrifugal pump', Superclass5 = none.	ID
14	ISO15926-2Entity	The human-interpretable identifier of the ISO 15926-2 entity that has the reference data item as a member EXAMPLE 1 For the 'centrifugal pump', ISO15926-2Entity = 'ClassOfInanimatePhysicalObject'. EXAMPLE 2 For the 'metre per second', ISO15926-2Entity = 'Scale'.	ID
15	**Classification1**	The human-interpretable identifier of a class that has the reference data item as a member EXAMPLE 1 For the 'centrifugal pump', Classfication1 = 'ROTATING EQUIPMENT'. EXAMPLE 2 For the 'metre per second', Classification1 = 'velocity scale'.	ID
16	**Classification2**	The human-interpretable identifier of a class that has the reference data item as a member EXAMPLE For the 'centrifugal pump', Classfication2 = none.	ID
17	**Classification3**	The human-interpretable identifier of a class that has the reference data item as a member EXAMPLE For the 'centrifugal pump', Classfication3 = none.	ID
18	**Classification4**	The human-interpretable identifier of a class that has the reference data item as a member EXAMPLE For the 'centrifugal pump', Classfication4 = none.	ID
19	**Symbol**	The symbol used to represent a unit of measure EXAMPLE For the 'metre per second', Symbol = 'm/s'.	ID
20	**Operator**	The operator defines a unit of measure by an expression. The allowed values are 'multiply', 'divide', 'factor', 'prefix' and 'exponentiate'. EXAMPLE For the 'metre per second', Operator = 'divide'.	text
21	**FirstOperand**	The designation of the second unit of measure in a 'multiply' or 'divide' operation EXAMPLE For the 'metre per second', SecondOperand = 'metre'.	ID
22	**SecondOperand**	The designation of the second unit of measure in a 'multiply' or 'divide' operation EXAMPLE For the 'metre per second', SecondOperand = 'second'.	ID

Table B.1 *(continued)*

Attribute number	Attribute name	Attribute description	Format[a]
23	**Factor**	The real number that is used to derive one unit of measure from another in a 'factor' operation EXAMPLE For the 'inch', Factor = 0,0254, where the FirstOperand = 'metre', and Operator = 'factor'.	#
24	**Prefix**	Either a number or an ISO prefix, such as 'milli' or 'kilo' can be specified EXAMPLE For the 'kilometre', Prefix = 'kilo', where the FirstOperand = 'metre', and Operator = 'prefix'.	text
25	**Exponent**	The integer number which is used to derive one unit of measure from another in an 'exponentiate' operation EXAMPLE For the 'metre squared', Exponent = 2, where Operator = 'exponentiate'.	#

[a] The format is indicated by a code, as shown in Table B.2.

Table B.2 — Format of attributes of a spreadsheet representation of a reference data

Format	Format description
ID	This denotes the non-human-interpretable identifier of a reference data item. A human-interpretable identifier is contained in column 3 for exactly one row within the reference data library. A human-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 human-readable text. For this document, 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 the following:

— **reference data items** which are not **classes**;

— **reference data items** for which more than five **super classes** are specified;

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

NOTE 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. A discussion about various types of libraries and or organized collections of terms can be found in Annex E.

Annex C
(informative)

URI for the reference data library

The versions of the reference data library 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 editions of the reference data library and of the modules.

NOTE The URI can be regarded as identifying either the latest edition 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.

Annex D
(informative)

Explanation of types of classes

Reference data in the context of the ISO 15926 series is subdivided into the following types of classes (see the corresponding entry in 3.1 for their definitions):

— core classes;

— de facto classes;

— standard classes;

— manufactured product classes;

— commodity product classes;

— proprietary product classes.

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

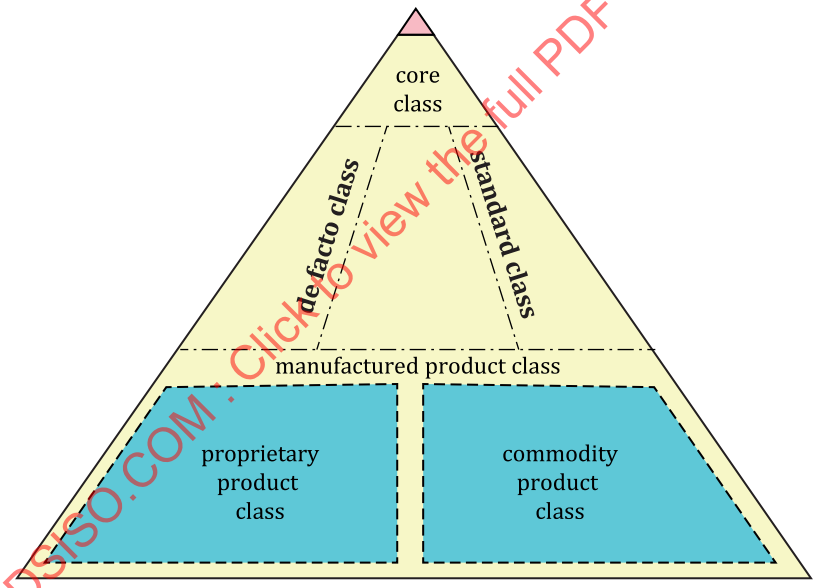

Figure D.1 — Types of classes

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.

Annex E
(informative)

Types of libraries or collections of terms related to reference data libraries

This annex discusses the usage of various types of libraries or organized collections of terms, often used in connection with reference data libraries.

The terms explained in this annex are not used in the normative text within this document, and are not included in Clause 3.

A reference data library that is used to support unambiguous exchange or sharing of data can be standardized or can be developed and agreed by the communicating parties.

Reference data is divided into the following:

— instances that represent reference classes;

— instances that represent reference individuals.

The latter division of reference data is further subdivided into the categories according to Annex D.

EXAMPLE The European Datum of 1950 (ED50) located at the geodetic observatory at Potsdam near Berlin is a reference individual.

— Controlled vocabularies: Provide a way to organize knowledge for subsequent retrieval.

  They are used in subject indexing schemes, subject headings, thesauri, taxonomies and other knowledge organization systems. Controlled vocabulary schemes mandate the use of predefined, preferred terms that have been preselected by the designers of the schemes, in contrast to natural language vocabularies, which have no such restriction.

— Taxonomy: A taxonomy is the categorization of things into a hierarchical structure.

  Each thing in a taxonomy is in one or more parent-child relationship to other things in the taxonomy. There may be different types of parent-child relationships in a taxonomy (e.g. 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, i.e. if a thing appears in multiple places in a taxonomy, then it is the same thing. Figure E.1 shows an example of poly-hierarchy were the butterfly control valves, shown two times, are both exactly 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.

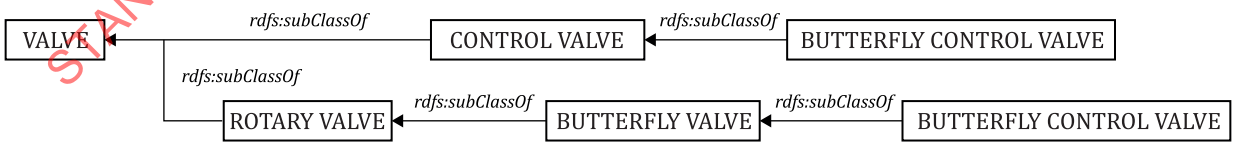

Figure E.1 — Example of poly-hierarchy

— Thesaurus: A thesaurus or synonym dictionary is a reference work which arranges words by their meanings, sometimes as a hierarchy of broader and narrower terms (e.g. defined by using SKOS), sometimes simply as lists of synonyms and antonyms.

— 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 '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 can be possible to deduce further facts.

The word "ontology" is sometimes incorrectly used as a synonym of "controlled vocabulary", "taxonomy" or "thesaurus". An ontology can also be all of these things. An ontology is distinguished from a taxonomy by having the ability to record facts by means of specifying other than associative relationships. A thesaurus can form part of an ontology.

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 (representing knowledge), and hence about what is a valid fact (actual data representing the design of a facility). 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.

For an ontology language, the syntax needs to be accompanied by semantics to state what the syntactic constructs mean.

EXAMPLE OWL and Common Logic are ontology languages.

The reference data library specified by this document is a controlled vocabulary and a taxonomy. A future edition of this document can also specify a reference data library that is an ontology.

Annex F
(informative)

Application of ISO/TS 15926-4 (this document) in other parts of the ISO 15926 series

F.1 Overview

This document contains an online reference data library that can be used to classify objects in engineering and asset management data. It can be opened via the link defined in Annex C

The general process of data exchange in the context of the ISO 15926 series is explained by means of data exchange in terms of:

a) physically exchanging a file between two parties to exchange explicit, unambiguous engineering and or asset management information;

b) querying the remote system through use of linked data and SPARQL.

As an example, the exchange of data in the creation process of an asset owner with a contractor is used in the context of a unified interoperability approach. The principle of data exchange based on a commonly shared ontology and reference data library (RDL) is shown in Figure F.1. The handover is represented by an envelope containing the payload file or queried dataset.

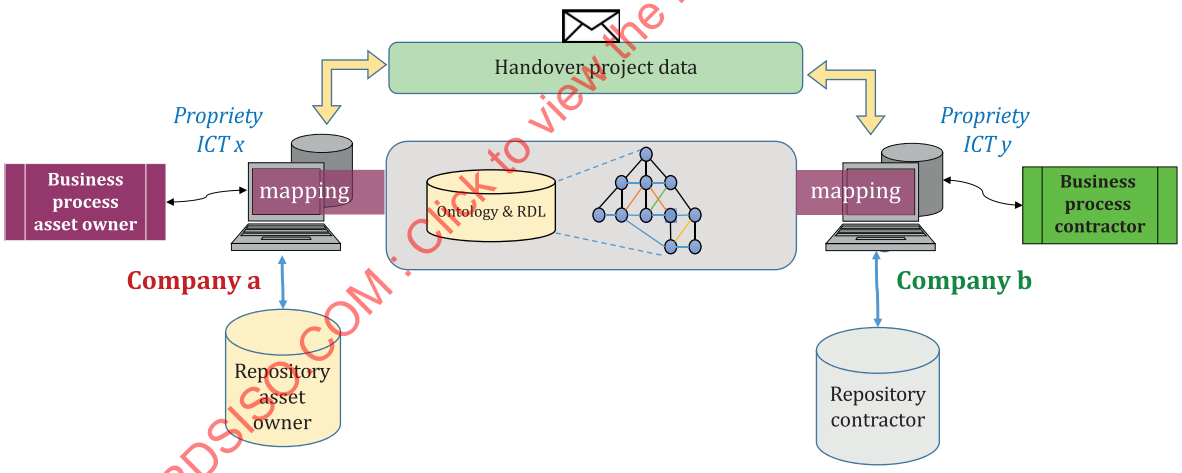

Figure F.1 — Principle of data exchange based on a commonly shared ontology and RDL

This document provides a basic level of engineering understanding that can be used by many systems for the creation and management of process plant data. A reference to this document shall specify the nature of an object or property in engineering terms.

Two systems that both conform to this document thereby share a basic engineering understanding.

Many systems for the creation and management of process plant data do not have overall conformance to the ISO 15926 series. The difference between the structure of the data held by a system and the ISO 15926 series can be so great that to map between the two is excessively complicated.

This conformance statement is limited to the classification of the following:

— physical objects and activities;

— properties (also called “quantities” in ISO/TS 15926-12);

— indirect properties (also called “physical properties” in ISO/TS 15926-12);

— property quantification, by reference to a scale or unit of measure.

Most of the content of this document is concerned with subclasses or subproperties of these classes and properties.

This document does not contain a list of properties that are related to classes, nor component models of equipment classes. This document is a taxonomy of classes and of properties which are unrelated to each other. This document also contains non-plant asset classes, e.g. activity classes, milestones, status.

The scope of data exchange can be diverse and project specific. In principle, the exchange can relate to any combination of project life cycle activities (represented by the red arrows in Figure F.2) as defined in the activity schedule from ISO 15926-1:2004, Figure F.2.

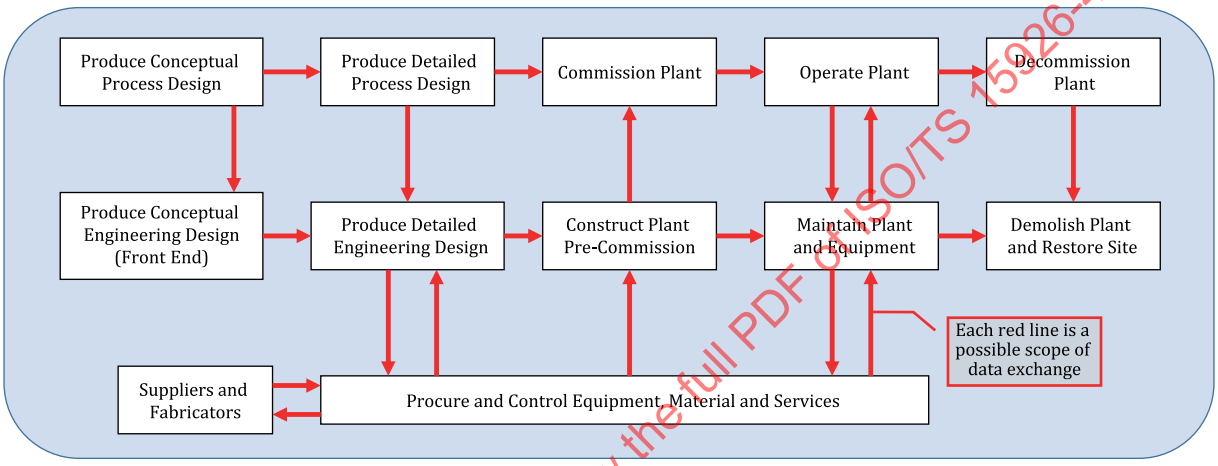

Figure F.2 — Activity model as a basis for the selection of role and scope of data exchange

F.2 Example of a data exchange scenario

In Figure F.3, a scenario is presented where the asset owner, designing a process plant, exchanges data with the contractor about this plant in the context of a contract between the asset owner and the contractor about delivering the design made by the contractor to the asset owner. The total design of the process plant is stored in a repository owned by the asset owner. The contractor does have its repository to store and maintains its design, including all information, not directly relevant to the asset owner.

Within the project, a shared ontology and RDL is agreed and represents the semantics of the design to be stored and exchanged on the data level (content layer as part of the layers within the process of data exchange as by ISO 15926-10).

All objects within both the repository of the asset owner and the contractor are classified as a class in the shared RDL and are identified by commonly used identifiers (unique identifiers, either universally or local, recognised and used by both plant owner and contractor).

The moment the asset owner has the essential information in its repository to deliver to the contractor the context for the design scope, the asset owner extracts this information as a data set from their repository.

The asset owner transforms the dataset according to the semantic representation method (a specific part or coherent set of the ISO 15926 series) and verifies the data set against the classes, rules, and constraints as captured in the ontology and RDL (semantics layer as part of the layers within the process of data exchange as by ISO 15926-10).

The asset owner packs this dataset in a digital envelope according to the serialization method as specified in the handover specification and sends this envelope to the contractor.

The contractor receives the envelope and checks whether they can unpack the data set, according to the specified methods in the handover specification. The contractor verifies the data set against the classes, allowed relations, rules, and constraints as captured in the ontology and RDL.

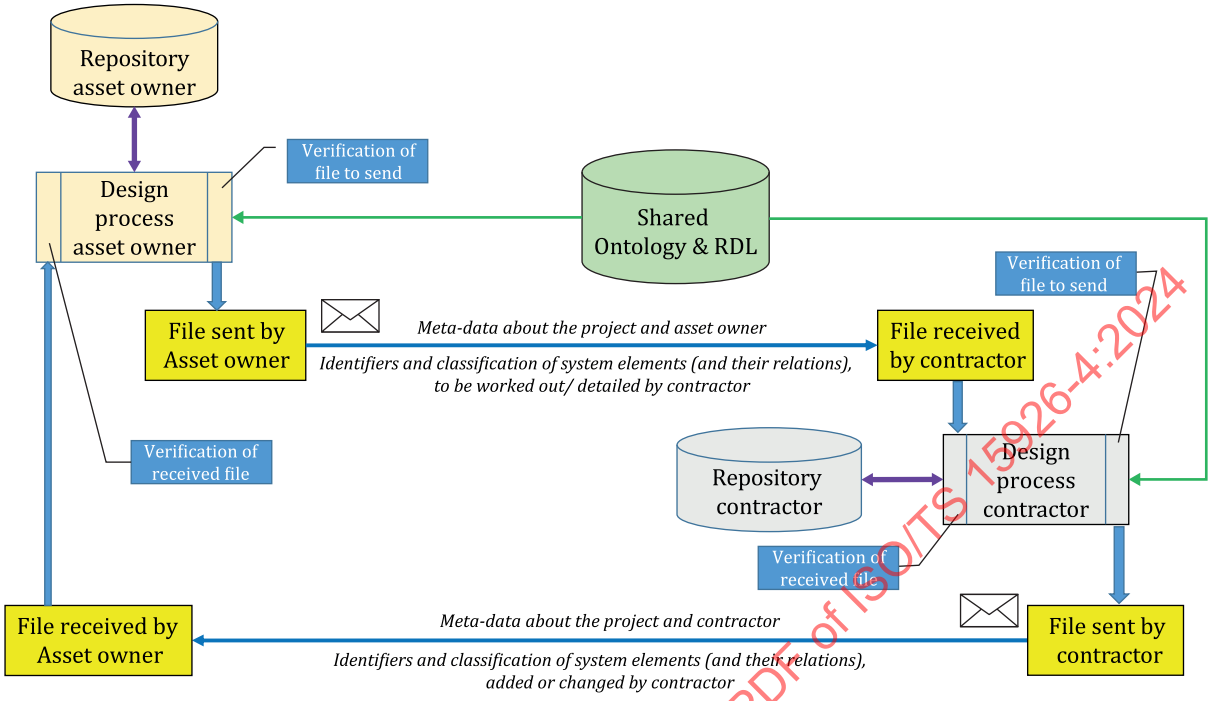

Figure F.3 — Bi-directional data exchange scenario between asset owner and contractor

The data set is imported in their repository, so the contractor now knows the context of their design scope in terms of the class of systems or equipment that has to be designed and corresponding identifiers of already defined systems and equipment with their classes within the repository of the asset owner.

The contractor adds equipment with identifiers and specifications, classified according to the ontology and RDL classes and herein defined relations to the baseline as delivered by the asset owner.

The moment the contractor wants to exchange a baseline of the contractor's design with the asset owner, the contractor extracts the relevant data set (the set of objects the contractor wants to deliver to the plant owner) from the contractor's repository.

The contractor transforms the dataset according to the semantic representation method (a specific part or coherent set of the ISO 15926 series) and verifies the data set against the classes, rules and constraints as captured in the ontology and RDL and verifies the data set against the classes, allowed relations, rules and constraints as captured in the ontology and RDL.

Then the contractor packs the dataset into the envelope, including metadata about the delivery according to the agreed scenario in the handover specification.

F.3 Conformance

If an implementation conforms to this document, the nature of, e.g. a physical object, activity, property or scale in data created by the implementation, will be defined by reference to the reference data library of this document, i.e. a receiving system can rely upon the reference data library of this document in order to interpret the data.

For a physical object, activity or property, the reference is made by a classification relationship. In an RDF/OWL implementation, this relationship is rdf:type.

For an indirect property or scale, the way that the reference is made depends upon the implementation approach, as follows:

— implementation, such as that defined by ISO/TS 15926-8, can regard an indirect property or property quantification as an object. In this case, the reference to this document is made by a classification relationship. This is also the case when using ISO/TS 15926-11;

— implementation, such as that defined by ISO/TS 15926-12, can regard an indirect property or property quantification as an RDF statement. In this case, the subproperty defined in this document is referenced as the predicate.

F.4 Example of usage of the RDL including ISO 15926-2 conformance within ISO/TS 15926-12

F.4.1 Example composition of an individual assembly and classification of components

The FPSO "UGE-1" has a separation and stabilisation system. There is a deaerator that is part of a separation and stabilization system within the FPSO, with tag "20-VH-001A". This can be recorded using ISO/TS 15926-12 as shown in Figure F.4.

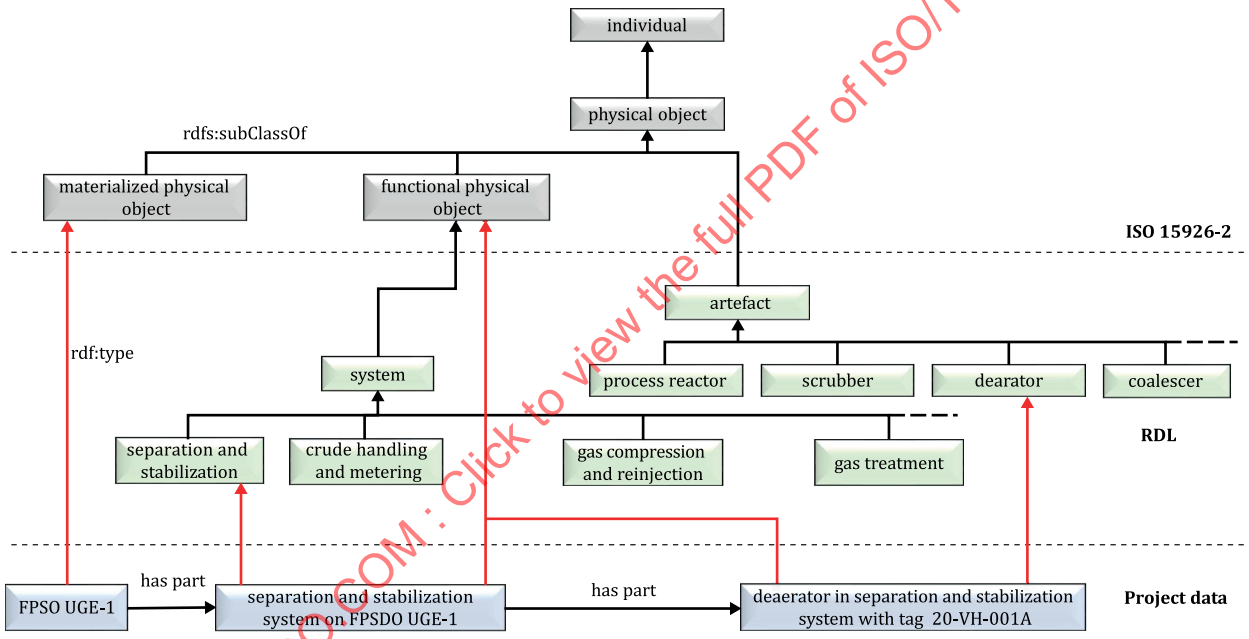

Figure F.4 — Bi-directional data exchange scenario between asset owner and contractor

Both the separation and stabilization system and the deaerator are defined by their function with FPSO "UGE-1". Hence, they are both classified as functional physical objects.

"UGE-1" is classified as an FPSO (not shown in Figure F.4) and a materialized physical object.

The class "separation and stabilisation" is defined by NORSOK. The class "dearator" is defined in a core RDL. The property hasPart ('relationship') is defined within the Life Cycle Integration schema of ISO/TS 15926-12.

F.4.2 Installation of an individual part within an assembly

The deaerator vessel with serial number "05/1234-8" is installed as the functional physical object with tag "20-VH-001A" (Figure F.4). The vessel with serial number "05/1234-8" is a materialized physical object that is also classified as a deaerator. This is shown in Figure F.5.

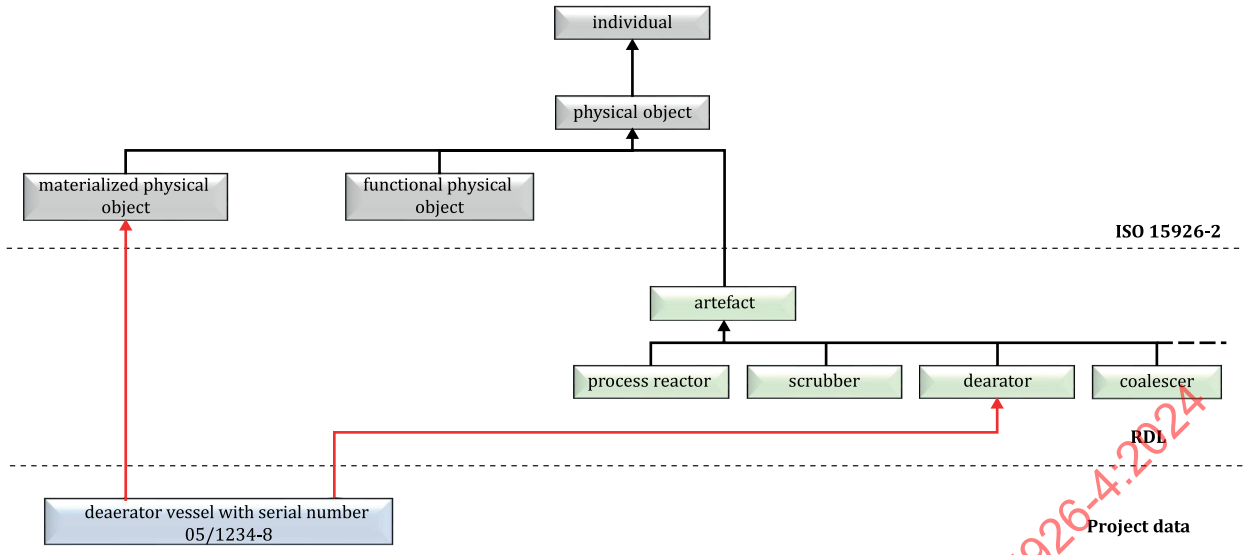

Figure F.5 — Deaerator as a materialized physical object

F.4.3 Material used in a connection

ISO/TS 15926-12 enables statements to be made about connections between physical objects at different levels of detail. If necessary, statements can be made about the physical objects that make a connection.

There is a connection between pipes P-101 and P-102. In more detail, the connection is between flange 2 of pipe P-101 and flange 1 of pipe P-102. The connection is made by a bolted connection assembly which has a gasket. Hence there are relationships as follows:

level 1 (Figure F.6):

— "pipe P-101" is connected to pipe "P-102";

level 2 (Figure F.7):

— "pipe P-101" has arranged part "pipe P-101 flange 2";

— "pipe P-102" has arranged part "pipe P-102 flange 1";

— "pipe P-101 flange 2" is connected to "pipe P-102 flange 1".

level 3 (Figure F.8):

— "pipe P-101" has arranged part "pipe P-101 flange 2";

— "pipe P-102" has arranged part "pipe P-102 flange 1";

— "pipe P-101 flange 2" is part of "connection assembly P-101 to P-102";

— "pipe P-101 flange 1" is part of "connection assembly P-101 to P-102";

— "gasket in connection assembly P-101 to P-102" is part of "connection assembly P-101 to P-102";

— "connection assembly P-101 to P-102" is classified as a bolted connection.

These relationships are shown in Figure F.6, Figure F.7 and Figure F.8.

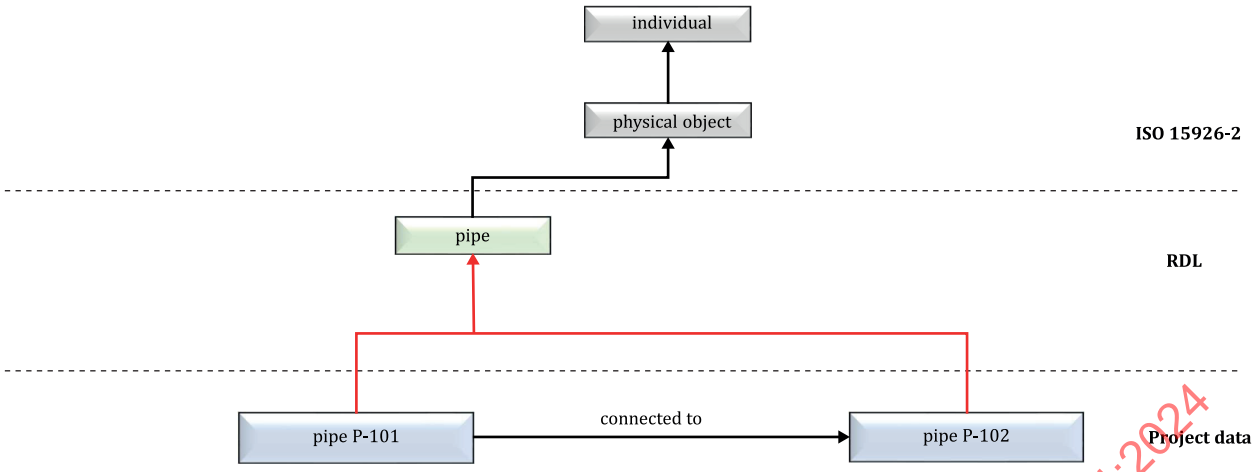

Figure F.6 — Connection between pipes level 1

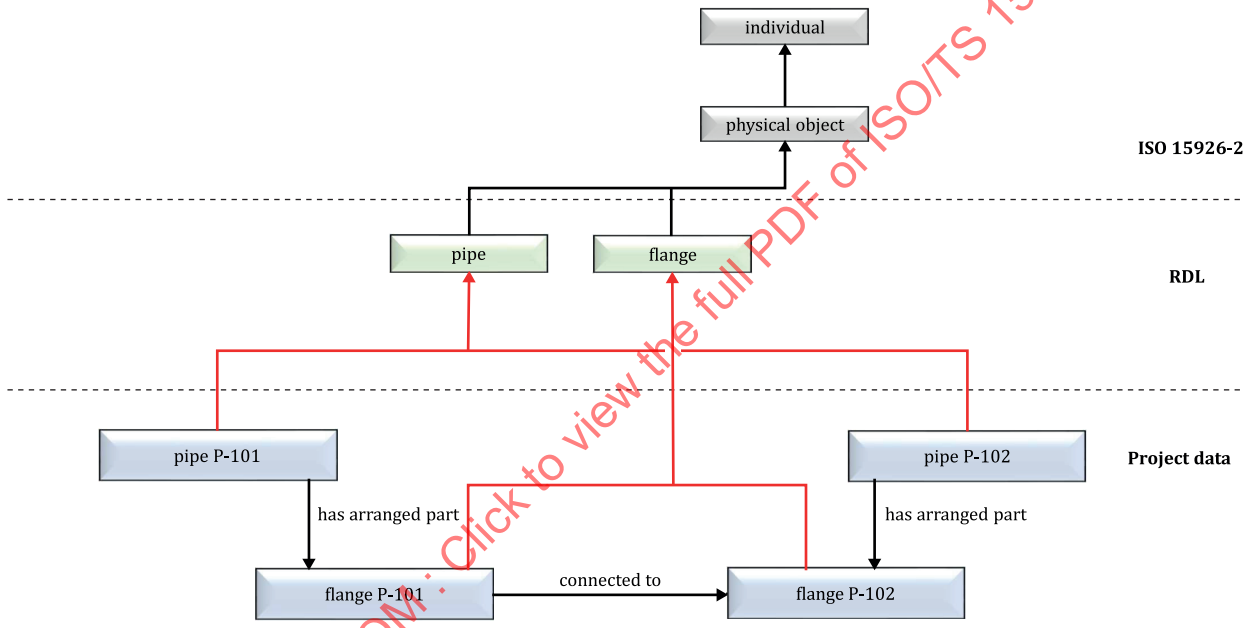

Figure F.7 — Connection between pipes level 2