ISO/PRF TS 15926-11

ISO/TC 184/SC 4

Secretariat: ANSI

Date: 2023-02-21

Deleted: /WG 3 N-2876

Deleted: Second Edition

Deleted: 2022-12-22

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

Deleted: —

Deleted: —

Part 11: Methodology for simplified industrial usage of reference data

Deleted: based on RDFS methodology

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 11: Méthodologie pour un usage industriel simplifié des données de référence

Deleted: ¶
DTS

Deleted: ¶
Warning for WDs and CDs¶
This document is not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard.¶
Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.¶
¶

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9e37-ad51-4...
13d887871ffa/iso-prf-ts-15926-11

© ISO 2023 – All rights reserved

© ISO 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: + 41 22 749 01 11
E-mail: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Deleted: 2022

Deleted: Email

Deleted: www.iso.org

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9c37-ad51-46e8-8221-13d887871ffa/iso-prf-ts-15926-11

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9c37-ad51-46e8-8221-13d887871ffa/iso-prf-ts-15926-11

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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

For an explanation 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

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 15926-11:2015), which has been technically revised.

https://standards.iteh.ai/catalog/standards/sist/341b9e37-ad51-...-8221-
13d887871ffa/iso-prf-ts-15926-11

The main changes are as follows:

— as a basis for the initial set of relationships a set of use cases in the context of systems engineering ISO/IEC/IEEE 15288 is used rather than a set of formal information models derived from systems engineering;

— the document has been aligned with ISO 15926-2;

— a resource description framework (RDF) statement has been added as reification method additional to the RDF named graph;

— a method has been added for applying configuration management using this document;

— a method has been added to create a data exchange file between involved parties in a project.

— 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.

—

Deleted: of ISO 15926-11 constitutes a technical revision of...

Deleted: ,

Deleted: is provisionally retained in order to support continued use and maintenance of implementations based on the first edition and to satisfy the normative references of other parts of ISO 15926

Deleted: following

Deleted: have been made with respect to edition one

Deleted: ISO15288

Deleted: a full connection is made to ISO

Deleted: is

Deleted: is

Deleted: ISO 15926-11

Deleted: is

 © ISO 2023 – All rights reserved

Introduction

The ISO 15926 series describes 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. Another application is to create handover files containing explicit, unambiguous life-cycle data which complies with a commonly shared data model and reference data library (RDL).

The data model of the ISO 15926 series is designed to be used in conjunction with reference data, i.e. standard instances that represent information common to a number of users, production facilities, or both. The support for a specific life-cycle activity depends on the use of appropriate reference data in conjunction with the data model.

This document focuses on a simplified implementation of the afore mentioned data model in the context of systems engineering data in the area of the process industry, including the oil, gas, power (fossil, nuclear and renewable energy), but can also be used in the area of manufacturing and aerospace industries. It is intended for developers of configuration management processes and systems in general. This document offers a dual use methodology. Alternatives include a Common Data Environment (CDE) or data handover environment using design tools that create project and systems engineering data.

Systems engineering deals with the development of requirements, their allocation to the items that are being designed and developed when these items are considered as part of a system. This document concentrates on the system as a whole, as distinct from the parts considered individually. It requires verification that the design is properly built and integrated and how well the system meets its initial by stakeholders stated goals.

iTeh STANDARD PREVIEW

This document provides the capability to express a product model and or systems engineering data with RDF triples which can be reified by means of an RDF statement or RDF named graphs and a standardized set of natural language relationships. The results can be used for an exchange or handover file that can be shared and relatively easily understood in industry.

(standards.iteh.ai)

There is an industry need for this document:

— The triple relationships are easy to understand by an engineer so that an engineer can understand the product model intuitively. This has been proven by the Program Integral Collaboration for the Maritime Industry which developed an RDF based implementation for standardized exchange of product data. This project was completed in 2013 by a group of Dutch shipbuilding companies, its contractors and its suppliers.

— The standard data sheets from, e.g. the American Petroleum Institute (API), NORSOK, used in industry for pumps, compressors, instruments, etc. can be supported by an RDF product model enabling industry to continue to work with their specific data sheets and yet exchange the data in a standardized way according to this document.

— It is used in some projects, e.g. the Pallas nuclear facility project in the Netherlands, in which based on the ISO 19650 series, a CDE is built upon this document, including facility data handover to the client.

— This document can be used as a front-end engineering layer for the template methodology used by ISO/TS 15926-7 and ISO/TS 15926-8. This makes the content of those projects easier to access by engineers.

— This document can be used in combination with reference data libraries from various sources. In process industries ISO/TS 15926-4 would typically be used as RDL to which missing reference data would be added.

— An engineering, procurement and construction (EPC) contractor has used this document in various tunnel projects for information modelling in systems engineering which was required by the Dutch authority regulations. With this document enriched by the knowledge from ISO/IEC/IEEE 15288, this became possible. They also built a performance measuring system for operational data in tunnel installations where the methodology of this document is used to justify the performance to the ministry of transportation in the Netherlands.

- **Deleted:** of international standards describe
- **Deleted:** .
- **Deleted:** that is,
- **Deleted:**)
- **Deleted:** could
- **Deleted:** The standard concentrate
- **Deleted:** —
- **Deleted:** NL Ship Building group who
- **Deleted:** —
- **Deleted:** ,
- **Deleted:** etc.
- **Deleted:** exchanging
- **Deleted:** new standard
- **Deleted:** —
- **Deleted:** for instance
- **Deleted:** Common data Environment
- **Deleted:** ISO 15926-11
- **Deleted:** —
- **Deleted:** -
- **Deleted:** -
- **Deleted:** reference data library
- **Deleted:** —
- **Deleted:** ISO 15926-11

© ISO 2023 – All rights reserved

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

NOTE 1 For examples and representing the ontology of this document, TriG is used as serialisation method in this document.

NOTE 2 RDFS doesn't include reasoning based on OWL and or SHACL. If one wishes this kind of functionality, one can make use of SPARQL, which is used in this document for validation purposes. It is broadly implementable and relatively simple. That is why references in this document only make use of RDFS.

—

Deleted: -

Deleted: 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 3: Reference data for geometry and topology* [Technical Specification];¶
— *Part 4: Initial reference data* [Technical Specification];¶
— *Part 6: Methodology for the development and validation of reference data* [Technical Specification];¶
— *Part 7: Implementation methods for the integration of distributed systems: Template methodology* [Technical Specification];¶
— *Part 8: Implementation methods for the integration of distributed systems: Web Ontology Language (OWL) implementation* [Technical Specification];¶
— *Part 10: Conformance testing* [Technical Specification]¶
— *Part 11: Simplified industrial usage of reference data based on RDFS methodology* [Technical Specification]¶
— *Part 12: Life cycle integration ontology represented in OWL* [Technical Specification]¶
Part 13: Integrated planning for assets throughout their life-cycle. [Technical Specification]¶
The following parts are under preparation:¶
Part 14: Data model adopted for OWL 2 Direct Semantics.¶
¶

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9e37-ad51-46e8-8221-13d887871ffa/iso-prf-ts-15926-11

 © ISO 2023 – All rights reserved

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

Part 11: Methodology for simplified industrial usage of reference data

1 Scope

This document enables a flexible creation of product knowledge models and data that supports systems engineering processes. The payload or design data can be exchanged across organizations or with the supply chain by combining resource description framework (RDF) triples, reference data dictionaries and a standardized set of relationships.

This document is appropriate for use with the ISO 15926-series based reference data libraries, and it is applicable to the process industry, including oil, gas and power. However, manufacturing and aerospace industries can also benefit from this document.

The following are within the scope of this document:

— process plants in accordance with ISO 15926-1;

— a methodology with low threshold for using reference data in combination with RDF triples for representing statements as defined in the ISO 15926 series;

— an initial set of relationships required for process plant life-cycle representation;

— a method to implement configuration management to trace back additions, changes and deletions in product and project data and enabling baselining;

— data sharing, integration, exchange, and hand-over between computer systems.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9e37-ad51-46e8-8221-13d887871ffa/iso-prf-ts-15926-11

The following are outside the scope of this document:

— serialisation methods;

— definition of reference data libraries;

— the syntax and format of implementations of either product data models or instance data using this document, or both;

— any specific methods and guidelines other than RDF(S) for implementing ISO 15926-2.

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, *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

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

Deleted: Part 11: Simplified industrial usage of reference data based on RDFS methodology

Deleted: RDF

Deleted: ,

Deleted: also

Deleted: —

Deleted: -

Deleted: —

Deleted: —

Deleted: —

Deleted: .

Deleted: —

Deleted: —

Deleted: —

Deleted: and/

Deleted: —

Deleted: -

Deleted: <#>Note 1: For examples and representing the ISO 15926-11 ontology, TriG is used as serialisation method in this document.¶
Note 2: RDFS doesn't include reasoning based on OWL and or SHACL. If one wishes this kind of functionality, one can make use of SPARQL what is used in ISO 15926-11 for validation purposes. It is broadly implementable and relatively simple. That is why references in this document only make use of RDFS in ISO 15926-11. ¶
¶

Deleted: -

Field Code Changed

© ISO 2023 – All rights reserved

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

3.1.1
asset
any item, thing or entity that has potential or actual value to an organization

[SOURCE: ISO 55000:2014, 3.2.1, modified — Notes 1 to 3 to entry were deleted.]

3.1.2
attribute
quality or feature of something

3.1.3
blank node
node in a resource description framework (RDF) graph representing a resource for which a literal is not given

Note 1 to entry: The resource represented by a blank node is also called an anonymous resource. According to the RDF standard W3C RDF-1.1,[16] a blank node can only be used as subject or object of an RDF triple.

3.1.4
constraint
thing that limits something, or limits one's freedom to do something

EXAMPLE A design constraint, legal constraint or implementation constraint.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.1.5
data
representation of information in a formal manner suitable for communication, interpretation, or processing by human beings or computers

[SOURCE: ISO 10303-1:2021, 3.1.29]

ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9e37-ad51-46e8-8221-13d887871ffa/iso-prf-ts-15926-11

3.1.6
designing
activity of developing by creating, planning, calculation, or laying out for a predetermined purpose

3.1.7
domain
set of all possible independent values the relationship can take

Note 1 to entry: It is the collection of all possible inputs (the "left-hand" of a relationship).

3.1.8
engineering
activity of designing or producing by methods of technical sciences

Note 1 to entry: During the activity, the properties of matter and the sources of energy in nature are made useful for human beings in structures, machines, and products.

3.1.9
engineered item
type of equipment created by specific and unique engineering and specifications, developed with a supplier or manufacturer

Note 1 to entry: An engineered item has a unique identifier (UID).

3.1.10
engineering data
data that represents the design and or engineering of a system or a system element

© ISO 2023 – All rights reserved

Field Code Changed

Deleted: NOTE Definitions copied verbatim from other standards are followed by a reference to the source standard in square brackets. Definitions that have been adapted from other standards are followed by an explanatory note.¶

Deleted:]

Deleted: [SOURCE: EOD]¶

Deleted: an

Deleted: [SOURCE: EOD]¶

Deleted: -

Deleted: [SOURCE: ISO 15926-4]¶

Deleted: the

Deleted: relation

Deleted: relation

Deleted: the

Deleted: mankind

Deleted: [SOURCE: ISO 15926-4]¶

Deleted: and is

Deleted: .

Note 1 to entry: The scope can be limited to a specific discipline (electrical, mechanical, civil), however after integrating all engineering data obtained from engineering tools, the result should represent the integrated design in a consistent way, which implies appropriate quality and harmonization of the data, obtained from the various tools.

3.1.11
enterprise
any private or public business or company

3.1.12
entity
something that exists separately from other things and has its own identity

3.1.13
enumeration
complete, ordered listing of all the items in a collection

Note 1 to entry: The term is commonly used in mathematics and computer science to refer to a listing of all of the elements of a set.

3.1.14
facility
permanent, semi-permanent, or temporary commercial or industrial property built, established, or installed for the performance of one or more specific activities or functions

EXAMPLE A building, plant, or structure.

3.1.15
functional requirement
requirement defining either the functional capabilities or behaviour, or both, that a product shall have

3.1.16
interoperability
ability of effective interaction between systems based on the exchange of information

Note 1 to entry: Systems can be computerized systems or enterprises.

3.1.17
information
facts, concepts, or instructions

[SOURCE: ISO 10303-1:2021, 3.1.41]

3.1.18
formal syntax
specification of the valid sentences of a formal language using a formal grammar

EXAMPLE An extensible markup language (XML) document type definition (DTD) is a formal syntax.

Note 1 to entry: A formal language is computer-interpretable.

[SOURCE: ISO 8000-2:2022, 3.9.1, modified — Notes 2 and 3 to entry were deleted. EXAMPLES 2 and 3 were deleted.]

3.1.19
model
simplified description, especially a mathematical one, of a system or process, to assist calculations and predictions

Deleted:)
Deleted: [SOURCE: EOD]¶
Deleted:
Deleted: [SOURCE: EOD]¶
Deleted: and/
Deleted: [SOURCE: ISO 15926-4]¶
Deleted: [SOURCE: ISO 11354-1]¶
Deleted: 7
Deleted: -
Deleted: Note 1 to entry: A formal language is computer-interpretable.¶
Deleted: [
Deleted: 2020(en),
Deleted:]

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9c37-ad51-46e8-8221-12d887871ffa/iso-prf-ts-15926-11

3.1.20
model based systems engineering
MBSE
formalized application of modelling systems engineering information

Note 1 to entry: The application of modelling supports system requirements, design, analysis, verification and validation (V&V) activities with their mutual relationships, beginning in the conceptual design phase and continuing throughout development and later life-cycle phases.

3.1.21
resource description framework graph
RDF graph
graph structure formed by a set of RDF triples[SOURCE: W3C Recommendation 2014][16]

3.1.22
resource description framework triple
RDF triple
atomic data entity in the resource description framework (RDF) data model

Note 1 to entry: An RDF-triple represents a relationship between the objects or data that it links.

Note 2 to entry: A triple comprises at least:

— an object called “subject”;

— a predicate (also called property) that denotes a relationship between a subject and an object;

— an object or data called “object”.

[SOURCE: W3C Recommendation 2014][16]

3.1.23
resource description framework statement
RDF statement
statement stating facts, relationships and data by linking resources of different kinds

3.1.24
reference data
facility life-cycle data that represent information about classes or individual things which are common to many facilities or of interest to many users

[SOURCE: ISO 15926-1:2004, 3.1.18, modified — "process plants" replaced by "facilities".]

3.1.25
range of relationship
set of all possible dependent values the relationship can produce from the domain values

Note 1 to entry: The domain values are in the “right-hand” of a relationship.

3.1.26
semantics
study of meaning, concerned with the relationship between signifiers that people use when interacting with the world, and the things in that world that these signifiers denote

EXAMPLE 1 The signifiers can be words, phrases, signs, and symbols.

EXAMPLE 2 Things denoted by signifiers can be entities, concepts, ideas.

Note 1 to entry: The goal of semantics is the creation of a common understanding of the meaning of things, helping people understand each other despite different experiences or points of view.

Deleted: [SOURCE: EOD]¶
Deleted: relations
Deleted: 25 February
Deleted:]
Deleted: the
Deleted: relation
Deleted: —
Deleted: —
Deleted: —
Deleted: 25 February
Deleted:]
Deleted: RDF
Deleted: -
Deleted: :
Deleted:]
Deleted: range¶
Deleted: a relation is the
Deleted: relation
Deleted: relation

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9c37-ad51-46e8-8221-13d887871ffa/iso-prf-ts-15926-11

 © ISO 2023 – All rights reserved

3.1.27
semantic encoding
concept encoding
technique of replacing natural language terms in a message with identifiers that reference data dictionary entries

Deleted: EXAMPLE The signifiers can be words, phrases, signs, and symbols.¶
EXAMPLE Things denoted by signifiers can be entities, concepts, ideas.¶

EXAMPLE ISO 8000-110 specifies how semantic encoding supports the exchange of master data that is characteristic data.

Deleted: :

Deleted: -

Note 1 to entry: By applying semantic encoding to data, an organization creates a basis for portable data by ensuring the semantics of the data are explicit.

Note 2 to entry: Semantic encoding is necessary to create characteristic data, where the replaced natural language terms are properties (for each of which the data set includes a corresponding value).

[SOURCE: ISO 8000-2:2022, 3.9.2]

Deleted: 2020/Amd 1:2021(en),

3.1.28
semantic data modelling
development of descriptions and representations of data in such a way that the latter's meaning is explicit, accurate, and commonly understood by both humans and computer systems

Note 1 to entry: In semantic data modelling, all concepts used to model a system are explicitly defined by ontologies, capturing the "meaning" of data with all its inherent relationships in a single graph.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.1.29
statement
information that is regarded as indivisible and which is the case, independent of natural language

Note 1 to entry: Adapted from ISO/TS 15926-6:2013.

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

Deleted: -

Deleted: -

Deleted: [SOURCE: ISO/TS 15926-6:2013, 3.1.25]¶

https://standards.iteh.ai/catalog/standards/sist/341b9e37-ad51-46e8-8221-13d887871ffa/iso-prf-ts-15926-11

3.1.30
signature statement
statement that states that the performer of an activity applied including the sign-off date on an individual named graph

Deleted: .

3.1.31
stakeholder
person or company that is involved in a particular organization, project or system

EXAMPLE Involvement of a person or company can concern safety, environment or other.

Deleted: Note 1 to entry: Especially because they have invested money in it or have a functional responsibility.¶

Note 1 to entry: The stakeholder's involvement is especially because they have invested money in it or have a functional responsibility.

3.1.32
stakeholder requirement
requirement defining how a stakeholder wants to interact with an intended solution for a requirement

3.1.33
system element
part of a system which can be inanimate physical objects (not alive) and animate physical objects (alive)

Note 1 to entry: A system often is called a "set of elements".

© ISO 2023 – All rights reserved

3.1.34
systems engineering
interdisciplinary approach governing the total technical and managerial effort required to transform a set of stakeholder needs, expectations, and constraints into a solution

EXAMPLE A solution can be a system.

Note 1 to entry: The approach supports a solution throughout its life.

Deleted: Note 1 to entry: The approach supports a solution throughout its life.¶

Deleted: [SOURCE: ISO 15288-2015]¶

3.1.35
system requirement
result of the transformation of the stakeholder, user-oriented view of desired capabilities into a technical view of a solution that meets the operational needs of the user

3.1.36
tagged item
equipment and major electrical and instrumentation item that has a specific tag number and which is treated individually for tracking and tracing purposes

Deleted: the

Note 1 to entry: Bulk materials are excluded from this definition which normally are identified batches.

3.1.37
technical solution
solution to a problem that is dealt with so that the difficulty is removed by applying an appropriate technology or design principle

Deleted: in a way of

Deleted: it

Deleted: a

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.1.38
payload data
actual data in a data packet or data container minus all headers attached for transport and minus all descriptive meta-data

Deleted: "

Deleted: "

Note 1 to entry: In a network packet, headers are appended to the payload for transport and then discarded at their destination.

ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9e37-ad51-46e8-8221-13d887871ffa/iso-prf-ts-15926-11

3.1.39
V-model
graphical representation of a system's development life cycle

Note 1 to entry: It is used to produce rigorous development life cycle models and project management models.

Deleted: lifecycle

3.1.40
validation
proof that the system accomplishes or, toned down, can accomplish its purpose

Note 1 to entry: It is usually much more difficult and much more important to validate a system than to verify it, and give an answer to the question: 'Have we made the correct product?'

Deleted: '

Deleted: [SOURCE: ISO 15288-2015, ISO 9001]¶

3.1.41
verification
proof of compliance with the specification

Note 1 to entry: Compliance may be determined by an objective test, analysis, demonstration, inspection, etc. for each requirement or set of requirements. It answers the question: 'Have we made the product correctly?'

Note 2 to entry: In general, verification is seen as the process of checking the compliance with a requirement.

Deleted: [SOURCE: ISO 15288-2015, ISO 9001]¶

Deleted: 1

3.1.42
3D model
representation of a physical body using a collection of interconnected points in a three-dimensional space

Note 1 to entry: Interconnected points can form triangles, lines, curved surfaces.

Deleted: , etc.

 © ISO 2023 – All rights reserved

3.2 Abbreviated terms

API	American Petroleum Institute
GUID	Global Unique Identifier
GBS	Geographical Breakdown Structure
FMEA	Failure Mode and Effect Analysis
FMECA	Failure Mode, Effect and Criticality Analysis
IDM	Information Delivery Manual
ITB	Information to Bid
ITT	Information to Tender
MBSE	Model Based Systems Engineering
OWL	Web Ontology Language
P&ID	Piping and Instrumentation Diagram
RDL	Reference Data Library
RDF	Resource Description Framework
RDFS	Resource Description Framework Schema
SHACL	Shapes Constraint Language
SPARQL	Protocol and RDF Query Language
SBS	System Breakdown Structure
SE	Systems Engineering
SKOS	Simple Knowledge Organization System
URI	Uniform Resource Identifier
V&V	Verification and Validation
WBS	Work Breakdown Structure
W3C	World Wide Web Consortium

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/PRF TS 15926-11
https://standards.iteh.ai/catalog/standards/sist/341b9e37-ad51-46e8-8221-13d887871ffa/iso-prf-ts-15926-11

4 Purpose, objectives and principles

4.1 General

Deleted: <#>Introduction ¶

Systems engineering is concerned with identifying and developing requirements of a system of interest and their assignment to the items designed and built as part of the system of interest. The emphasis of systems engineering is, on the system as a whole, as distinct from the parts considered individually. It requires verification that the design is properly built and integrated and how well the system meets its intended goals (by validation). Model Based Systems Engineering (MBSE) is a methodology of systems engineering that focuses on creating and exploiting domain models as the primary means of managing conformance to requirements. Digitization of systems engineering processes is a precondition for MBSE and the latter a foundation for the creation of digital twins.

This document provides a semantic data modelling methodology of engineering data that is created and or used in systems engineering processes and that can be relatively “easily” understood by engineers and that is flexible in terms of tailoring the methodology for a specific domain or project. The provided modelling methodology is based on the existing parts ISO 15926-2 and an RDL such as ISO/TS 15926-4. To achieve this, the triple concept of the W3C RDF standard is adopted and augmented with a set of relationships further called the “initial set of relationships” (Annex A) which easily can be expanded with relationship relevant in the context of a specific project. With respect to the presented semantic modelling methodology, this document makes use of EN 17632.

Deleted: -

Deleted: like

Deleted: -

Deleted: of W3C

Deleted: (Annex A)

Deleted: relations

Deleted: Building Information Modelling (BIM) - Semantic Modelling and Linking (SML).

© ISO 2023 – All rights reserved

A main reason for developing this methodology can be found in the fact that product specialists and systems engineers, especially within small and medium enterprises (SMEs), who in general have limited skills in the area of information modelling and related techniques, should be supported in their product and or systems engineering knowledge modelling activities by a simple to use methodology, close to natural languages. Using this methodology will lead to models which describe specific systems engineering information by semantic encoding of this information and that in potential are upgradable to fully ISO 15926-2 compliant models, i.e. this methodology provides a bridge to the much more complex ISO 15926-2 world and provides a low entry threshold to the ISO 15926 series. Also, in design development work, humans like to work with simple table-based structures rather than relatively complicated schemes, and this should be respected as far as feasible.

Engineering data in the context of this document cover not only the output and or input of engineering processes, but also the engineering processes themselves. In this way, this document enables the integration and exchange of product data together with data, relevant in the context of systems engineering processes. Other parts of the ISO 15926 series do not sufficiently cover the features of systems engineering when exchanging information over the life cycle of a plant or when designing new products. In line with this, this document also offers a way to industry partners to set up and exchange their product model using a low-level modelling methodology based on statements which can be represented and exchanged in a table manner. For that purpose, this document provides a normative set of rules that allows engineers to build product and plant life cycle models using statements based on a normative set of relationships and normative plant reference data.

A statement can be used to classify things as "being the case", also called a "fact". Statements can be expressed in languages as relationships between two roles of things (respectively “thing playing role 1” and “thing playing role 2”). This process can be seen as semantic encoding using a formal syntax.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

From the point of view of data handover, the design, engineering and construction of a process plant or facility in general is fragmented and based on tools from different vendors and different versions of these tools, even by discipline. Over the life-cycle of a facility, in general, multiple information systems and databases from different vendors are used for different purposes. Most of these systems are not integrated with one another and cannot easily share plant data during different phases of the plant life cycle, such as design, operation, and decommissioning. This results in redundancies in capturing, handling, transferring, maintaining, and preserving facility configuration data. This lack of interoperability stems from the fragmented nature of the construction and building industry, paper-based document control systems, a lack of standardization and inconsistent technology adoption among stakeholders. With the help of the methodology described in this document, any kind of product or engineering information obtained from any tool can be expressed unambiguously and the information can be exchanged based on a managed set of reference data. This document provides a semantic modelling methodology for creating and exchanging engineering data, originating from systems engineering processes for example as described by natural language in the ISO/IEC/IEEE 15288.

4.2 Positioning of this document

4.2.1 Overview

The general process of data exchange in the context of the ISO 15926 series is explained from a practical point of view of conformance testing of the software implementation against the ISO 15926 series, not only taking into account the technology available today but also the maturity of information and communications technology (ICT) skills in modern engineering environments. This clause covers data exchange in terms of physically exchanging a file between two parties (with different software systems) to exchange explicit, unambiguous asset management information. This category of interoperability approach is defined by the enterprise interoperability framework defined in ISO 11354-1 as a “unified approach”.

As an example, the exchange of data during the creation of an asset, between the owner and a supplier, is used in the context of a unified interoperability approach (according to ISO 11354-1). The principle used in this example is shown in Figure 1. The handover from one company to another company is represented by a digital envelope containing the payload data as output of one or more business processes. The receiving company will be able to receive, understand and process the envelope and integrate the payload data within their own ICT environment since the data is defined unambiguously by means of the shared ontology and an RDL.

Deleted: full
Deleted: -
Deleted: . In other words,
Deleted: -
Deleted: provide
Deleted: the fact
Deleted: is that
Deleted: don’t
Deleted: lifecycle
Deleted: a
Deleted: lifecycle
Deleted: ‘
Deleted: case’
Deleted: ‘
Deleted: .
Deleted: a
Deleted: one can express
Deleted: exchange this
Deleted: such
Deleted: section is about
Deleted: <#>Introduction¶
Deleted: <#>his

© ISO 2023 – All rights reserved

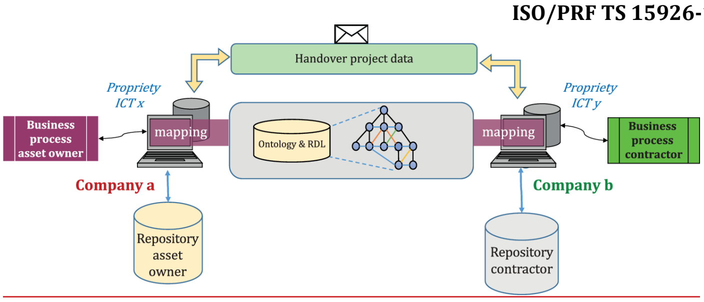

Figure 1 — Principle of data exchange on a commonly shared ontology and RDL

Deleted: –

4.2.2 Process steps in the workflow of exchange data

With respect to data exchange activities within a project, an analysis should be carried out to determine the subset of data that will be exchanged and which requires a data centric approach as delivered by this document. For that purpose, the activity model as described in ISO 15926-1 and shown in Figure 2 can be used to select one or more handover scenarios between the composing processes within a project.

Deleted: standard

iTeh STANDARD PREVIEW
(standards.iteh.ai)

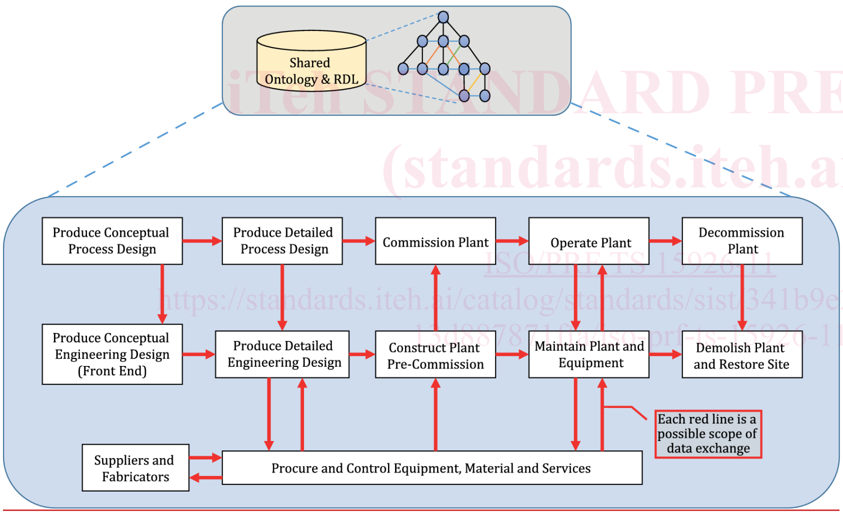

Figure 2 — Activity model as a basis for the selection of role and scope of data exchange

Deleted: –

In this document, a systematic approach and methodology based on four software implementation layers as presented in Figure 3 is followed to organise the exchange process. Figure 3 shows the four layers that can be distinguished looking at data exchange in general. The boxes on the four layers as presented on the left side of Figure 3 are defined as normative in ISO 15926-10. The boxes on the right side of Figure 3 show how these layers are implemented in this document:

Deleted: Within ISO 15926-11

Deleted: Figure 3

Deleted: shows

Deleted: ISO 15926-11.

— role and scope of the data exchange (the red arrows in Figure 2);

— content: definitions of the objects and relationships that can be found in the exchange file, classified according to the shared RDL;

Deleted: relations

— semantics (meaning) of the data exchanged defined by the part or parts of the ISO 15926 series, agreed on, mainly based on W3C recommendations for RDFS;

— syntax and storage: the method of serialization and syntax used on the data level.

© ISO 2023 – All rights reserved