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

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

bsi.

National foreword

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A list of organizations represented on this committee can be obtained on request to its committee manager.

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Part 11: Simplified industrial usage of reference data 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: RDFS méthodologie pour un usage industriel simplifié des données de référence

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Foreword

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

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.

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.

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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.

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.

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

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tunnel installations where the methodology of this document is used to justify the performance to the ministry of transportation in the Netherlands.

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.

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

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

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.

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*

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