PD ISO/TS 18101-1:2019



BSI Standards Publication

Automation systems and integration — Oil and gas interoperability

Part 1: Overview and fundamental principles

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee AMT/4, Industrial data and manufacturing interfaces.

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

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Published by BSI Standards Limited 2023

ISBN 978 0 539 02094 6

ICS 25.040.40; 75.020

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 March 2023.

Amendments/corrigenda issued since publication

Date	Text affected

PD ISO/TS 18101-1:2019

TECHNICAL SPECIFICATION

ISO/TS 18101-1

First edition
2019-06-05

Automation systems and integration — Oil and gas interoperability —

Part 1: Overview and fundamental principles

Systèmes d'automatisation et intégration — Interopérabilité entre les industries du pétrole et du gaz —

Partie 1: Vue d'ensemble et principes fondamentaux

Reference number
ISO/TS 18101-1:2019(E)

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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).

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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*.

This document provides an overview and outlines the fundamental principles of the ISO 18101 series. Future parts of the ISO 18101 series will be developed including sets of industry developed use cases, once the use cases have been documented using the Open Industrial Interoperability Ecosystem (OIIE) use case architecture and validated using the OIIE Oil and Gas Interoperability (OGI) Pilot, with the results captured in Technical Reports. These use cases will incrementally define industry prioritized elements of the secondary business process, which is the scope of the ISO 18101 series.

A list of all parts in the ISO 18101 series can be found on the ISO website.

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

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Introduction

It is difficult for the oil and gas industry, and other asset-intensive process industries, to adopt and adapt digital capabilities for many core business functions. For example:

— Why is it not possible for key industrial systems and applications to "plug and play" like consumer electronics do?

— Why is it so difficult and expensive to find, capture, manage and use the information that we need to:

  — engineer, design and build industrial plants, platforms and facilities?

  — operate and maintain industrial plants, platforms and facilities safely, reliably and profitably?

These issues significantly contribute to consistent patterns of major cost and schedule overruns in capital projects. They also lead to inefficient operations and maintenance spanning the entire life-cycle of the resulting plants, platforms and facilities. Clearly, this group of industries needs a better solutions model to help manage operational risks throughout the life-cycle of its plants, platforms and facilities.

Despite many improvements in individual business functions, the oil and gas industry (upstream, midstream and downstream) as well as other asset-intensive, process industries still struggle with many inefficient business practices. Many of these inefficiencies stem from how the entire industry and its primary participants are organized in 'silos'. This is particularly true for life-cycle asset management related business processes. These processes span many industry silos, crossing life-cycle phases, while including both intra and inter-enterprise activities. Meanwhile, participating systems, equipment, devices, materials, and services suppliers are also organized in their own industry sector silos. Despite many efforts to break these silos down, they are persistent and are often re-enforced by current industrial IM solutions, practices, and standards.

Digital business transformation is now being discussed as the solution for many of these issues. Unfortunately, this industry group lacks a pragmatic, supplier-neutral basis for achieving this objective and the sought-after business benefits in a timely manner.

The digital ecosystem concept was created for such purposes and has been successfully used in a variety of industry groups, but for the concept to succeed, it needs to be thoughtfully specialized to address included industry sectors, while achieving the largest practical scale. Other industry sectors such as banking, semiconductors, aerospace, consumer electronics and eCommerce have adopted this model using a combination of open standards and proprietary methods. Each industry has unique characteristics resulting in industry specific methods, with some basic common denominators such as the basic standards which define the internet and the World Wide Web.

The oil and gas industry shares many of the same engineering and work practices, while also using many of the same system (software and hardware), equipment and device classes as many other asset-intensive, process industries. This provides a mutually beneficial opportunity to share a supplier-neutral industrial digital ecosystem, where the scale of the aggregated market helps encourage its adoption. A successful industrial digital ecosystem needs to be supplier-neutral, because no single supplier has the scale and coverage to impose its will on the entire industry, including all its key participants.

While standards such as ISO 55000 specify good practices for all types of asset management, this document specifies how those good practices can be implemented using an industrial digital ecosystem. This document is intended to facilitate discussions between process industry decision-makers and the specialists who design, build and maintain the processes and systems that enable enterprises to function. The OIIE provides an example of the proposed, supplier-neutral industrial digital ecosystem. Key inter-enterprise relationships for the process industry digital ecosystem have been represented in Figure 1. It depicts the three-way relationship among Owner/Operators (O/O), Engineering, Procurement, Construction (EPC) organizations and Original Equipment Manufacturers (OEM), which forms the backbone of the secondary business process spanning the entire asset life-cycle.

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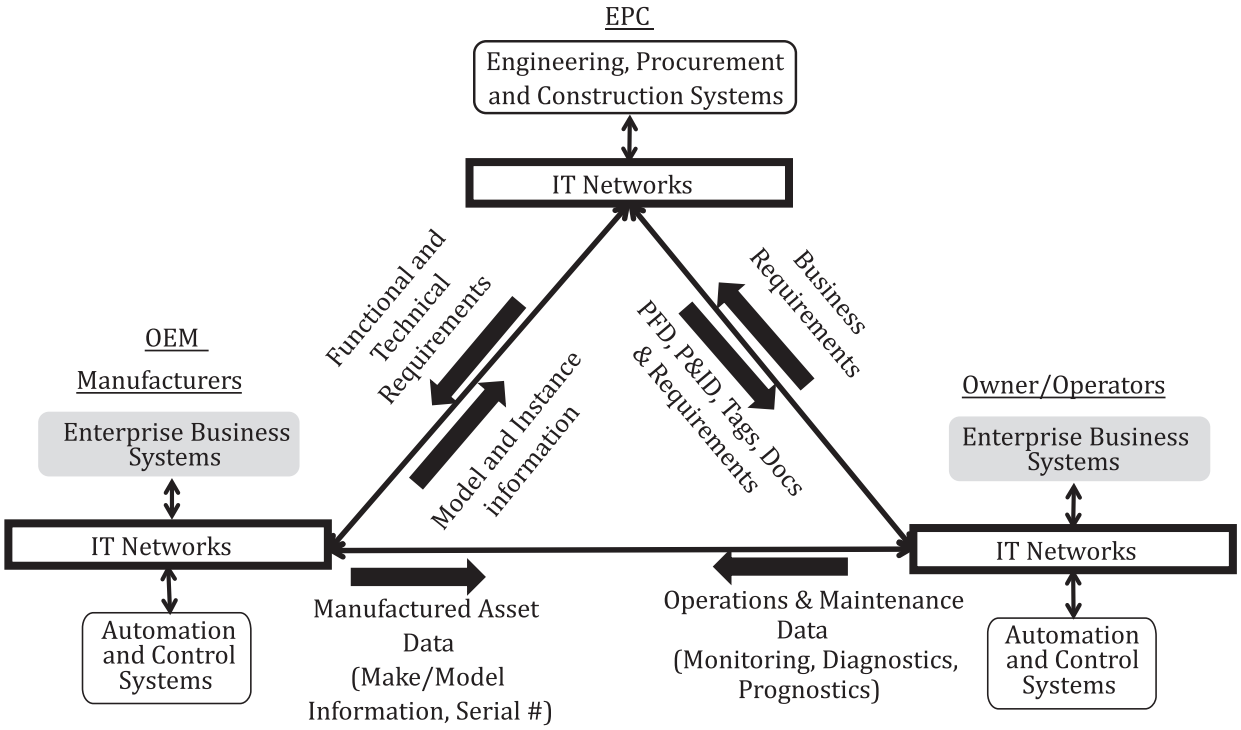


Figure 1 — OIIE inter-enterprise industrial digital ecosystem architecture

The secondary business process establishes and maintains operations capability. It spans both inter and intra-enterprise domains, based on requirements from the standard industry use cases, which are part of the portfolio of published, supplier-neutral standards and specifications which define the digital ecosystem. Using a portfolio of existing, well recognized standards, reduces risks associated with the creation of new standards. The OIIE/OGI Pilot is an interoperability test-bed and is implemented as an instance of the OIIE, which includes standard oil and gas asset classes and use cases, most of which are also applicable to other process industries.

This document identifies a portfolio of supplier-neutral IT and IM standards and specifications, including and driven by standardized industry use cases addressing life-cycle asset management. The included standards and specifications are validated to work with each other, properly supporting the standardized industry use cases, using the OIIE/OGI Pilot. Industry solutions are also validated to interoperate in the OIIE/OGI Pilot, based on the applicable standardized industry use cases, using the included standards and specifications in the specified manner. Three major phases of the OIIE/OGI Pilot have already been used to establish and validate the core methods and standards included in the OIIE. Results from new OIIE/OGI Pilot phases will be documented and published in Technical Reports, since they will be used to validate inclusions in future parts of the ISO 18101 series. This methodology provides a pragmatic, supplier-neutral basis for a digital ecosystem which meets major industry requirements for digital business transformation.

Industry implementation of the Technical Standard has the potential to substantially improve cost and risk management for the entire life-cycle of plants, platforms and facilities, following a pragmatic solutions process based largely on existing standards and widely accepted practices and methods.

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TECHNICAL SPECIFICATION **ISO/TS 18101-1:2019**

Automation systems and integration — Oil and gas interoperability —

Part 1: Overview and fundamental principles

1 Scope

This document provides requirements, specifications and guidance for an architecture of a supplier-neutral industrial digital ecosystem. It includes a standardized connectivity and services architecture, and a standardized use case architecture with methods to specify atomically re-usable scenarios and events, which can be used to specify the characteristics of standardized industry use cases.

NOTE 1 Examples of standard industry use cases included in the secondary business process are included in Annex A along with standardized use case architecture.

This document gives:

— guidance for an architecture applicable to the oil and gas, petrochemical, power generation, public utilities and other asset-intensive industries;

— requirements for interoperability among systems of systems, systems (including hardware and software) and components included in the secondary business process of a plant, platform or facility at any given time;

— guidance on how these interoperability requirements are to be achieved and sustained in support of operations in the same plant, platform or facility;

— specifications enabling the specialization of a digital ecosystem concept for the requirements of the secondary business process in included industries;

— guidance to industry participants, including owner/operators and their product and services suppliers, to support their secondary business process requirements using products, which interoperate based on the specifications included in this document.

NOTE 2 This document is focused on interoperability requirements for systems which play roles in the secondary business process, including those in domains identified in Figure 7.

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 15926-1:2004, *Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities — Part 1: Overview and fundamental principles*

ISO 18435-1:2009, *Industrial automation systems and integration — Diagnostics, capability assessment and maintenance applications integration — Part 1: Overview and general requirements*

ISO/TS 8000-1:2011, *Data quality — Part 1: Overview*

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