

ICS 25.040.40; 35.240.50
CCS N 10;L67



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 45616.2-2025

**Automation systems and integration - Digital twin framework
for manufacturing - Part 2: Reference architecture**

自动化系统与集成 面向制造的数字孪生框架 第2部分：参考架构

(English Translation)

Issued on: August 29, 2025

Implemented on: March 1, 2026

**Issued by: State Administration for Market Regulation, National
Standardization Administration**

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is Part 2 of GB/T 45616 "Automation Systems and Integrated Digital Twin Framework for Manufacturing". The following parts have been published.

--- Part 2: Reference architecture;

--- Part 4: Information exchange.

This document is equivalent to ISO 23247-2:2021 "Automation systems and integrated digital twin framework for manufacturing Part 2: References Examination Architecture".

Introduction

GB/T 45616 (all parts) defines a framework to support the creation of digital twins of observable manufacturing elements, including personnel, equipment, equipment, materials, manufacturing processes, facilities, environment, products, and supporting documentation.

Digital twins help detect anomalies in the manufacturing process to achieve real-time control, predictive maintenance, in-process adjustments, big data The digital twin monitors its observable manufacturing requirements by continuously updating relevant operational and environmental data.

Digital twins enable visibility into processes and execution, enhancing manufacturing operations and business collaboration.

The types of manufacturing supported by the implementation of the GB/T 45616 (all parts) framework depend on the standards that can be used to make observable manufacturing elements.

Different manufacturing areas can use different data standards. As a framework, this document does not specify a specific data format. and communication protocols.

GB/T 45616 "Digital twin framework for automation systems and integration for manufacturing" is planned to consist of four parts.

--- Part 1: Overview and general principles. The purpose is to clarify the general principles and requirements for developing digital twins in manufacturing processes.

--- Part 2: Reference architecture. The purpose is to provide a reference architecture with a functional view.

--- Part 3: Digital representation of manufacturing elements. The purpose is to standardize the basic information attributes of observable manufacturing elements.

--- Part 4: Information Exchange. The purpose is to specify the technical requirements for information exchange between entities in the reference architecture.

The structure of other parts of GB/T 45616 is shown in Figure 1.

Appendices A to E of GB/T 45616.4 provide use cases that illustrate the digital twin system framework for manufacturing.

The use cases are mainly distributed in the discrete manufacturing field, and the digital twin is modeled using ISO 10303 (all parts).

For example, in the oil and gas sector, digital twins can be modeled using ISO 15926 (all parts), while in building construction, digital twins can be modeled using ISO 15926 (all parts).

For industry, digital twins are modeled using the ISO 16739 series.

1 Scope

This document provides a reference architecture for digital twins in manufacturing, specifically including.

---Reference model based on domain and entity perspective;

---Functional view, which details the functional entities supported by the entity base reference model.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

ISO 23247-1 Automation systems and integration - Digital twin framework for manufacturing - Part 1: Overview and general principles (Auto-general principles)

ISO 23247-4 Automation systems and integration - Digital twin framework for manufacturing - Part 4: Information exchange

Note: GB/T 45616.4-2025 Automation systems and integration - Digital twin framework for manufacturing - Part 4: Information exchange (ISO 23247-4. 2021, IDT)

Note: GB/T 33474-2025 Internet of Things Reference Architecture (ISO /IEC 30141:2024, NEQ)

3 Terms and Definitions

The following terms and definitions apply to this document.

The URLs for terminology databases used for standardization maintained by ISO and IEC are as follows.

3.1

The spatial/logical/functional areas of observable manufacturing resources

3.2

The use of sensors to collect data from the observable manufacturing domain (3.1) and provide services for monitoring the manufacturing process and controlling manufacturing equipment. time/logical/functional areas.