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

GB/T 45616.1-2026

**Automation systems and integration - Digital twin framework
for manufacturing - Part 1: Overview and general principles**

自动化系统与集成 面向制造的数字孪生框架 第1部分：综述和一般原则

(English Translation)

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is Part 1 of GB/T 45616 "Automation Systems and Integration. A Digital Twin Framework for Manufacturing".

The following sections have been released.

---Part 1: Overview and General Principles;

---Part 2: Reference Architecture;

---Part 3: Numerical Representation of Manufacturing Elements;

---Part 4: Information Exchange.

This document is equivalent to ISO 23247-1:2021 "Automation systems and integration - Digital twin framework for manufacturing - Part 1.

Overview and general principles.

The following minimal editorial changes have been made to this document.

---Based on the specific citations in the text, the informative reference IEC 62264-1 has been adjusted to a normative reference.

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China Machinery Industry Federation.

This document is under the jurisdiction of the National Technical Committee on Standardization of Automation Systems and Integration (SAC/TC159).

Introduction

GB/T 45616 (all parts) defines a framework to support the creation of observable digital twins of manufacturing elements, including personnel, equipment, etc.

Equipment, materials, manufacturing processes, facilities, environment, products, and supporting documentation.

Digital twins can help detect anomalies in the manufacturing process, enabling real-time control, predictive maintenance, in-process adjustments, and big data analytics.

Functional objectives include analysis and machine learning. Digital twins monitor observable manufacturing processes by continuously updating relevant operational and environmental data.

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

The manufacturing type supported by implementing the GB/T 45616 (all parts) framework depends on the standard available for producing observable manufacturing elements.

Standards and technologies. Different manufacturing sectors may use different data standards. As a framework, this document does not specify specific data formats.

and communication protocols.

GB/T 45616 "Automation Systems and Integration. A Digital Twin Framework for Manufacturing" is proposed to consist of four parts.

---Part 1: Overview and General Principles. The aim is to clarify the general principles and requirements for developing digital twins in the manufacturing process.

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

---Part 3: Numerical Representation of Manufacturing Factors. The purpose is to standardize the basic informational attributes of observable manufacturing factors.

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

The structure of GB/T 45616 (all parts) is shown in Figure 1.

Figure 1. Structure of GB/T 45616 series standards

Appendix A to Appendix E of GB/T 45616.4-2025 provide use cases illustrating the framework of a manufacturing-oriented digital twin system.

The use cases are primarily located in the discrete manufacturing field, and the digital twin is modeled using ISO 10303 (all parts). In other fields, it is possible to use...

Same standards and technologies. For example, in the oil and gas sector, digital twins use ISO 15926 (all parts) for modeling, while in building construction...

For industry applications, digital twins are modeled using ISO 16739 (all parts).

Automation Systems and Integrated Manufacturing-Oriented Digital Twins Framework Part 1: Overview and General Principles

1 Scope

This document provides an overview of manufacturing-oriented digital twin frameworks and establishes general principles.

This document applies to the terminology, definitions, and principles for building manufacturing-oriented digital twin frameworks.