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Interested committees:

Title: Draft BS ISO 23247-6 Automation systems and integration — Digital twin framework for manufacturing. Part 6: Digital twin composition.

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For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 23247-6

Automation systems and integration — Digital twin framework for manufacturing —

Part 6: Digital twin composition

*Systèmes d'automatisation et intégration — Cadre technique de
jumeau numérique dans un contexte de fabrication —*

Partie 6: Composition d'un jumeau numérique

ICS: 35.240.50; 25.040.40

ISO/TC 184/SC 4

Secretariat: **ANSI**

Voting begins on:
2025-08-13

Voting terminates on:
2025-11-05

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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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This document was prepared by Technical Committee *[or Project Committee]* ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

A list of all parts in the ISO 23247 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.

Introduction

The ISO 23247 series defines a framework to support the creation of digital twins of observable manufacturing elements, including personnel, equipment, materials, manufacturing processes, facilities, environment, products, and supporting documents throughout their lifecycles.

A digital twin assists with detecting anomalies in manufacturing processes to achieve functional objectives such as real-time monitoring and control, predictive maintenance, in-process adaptation, Big Data analytics, and machine learning. A digital twin monitors its observable manufacturing element by constantly updating relevant operational and environmental data. The visibility into process and execution enabled by a digital twin helps optimize manufacturing operations and enhance business cooperation.

The type of manufacturing supported by implementing the ISO 23247 framework depends on the standards and technologies available to model the observable manufacturing elements. Different manufacturing domains can use different data standards. As a framework, this document does not prescribe specific data formats and communication protocols.

The scopes of the four parts of this series are defined below:

- ISO 23247-1: General principles and requirements for developing digital twins in manufacturing;
- ISO 23247-2: Reference architecture with functional views;
- ISO 23247-3: List of basic information attributes for the observable manufacturing elements;
- ISO 23247-4: Technical requirements for information exchange between entities within the reference architecture;
- ISO 23247-5: Requirements and guidance to use digital threads for connecting manufacturing lifecycle data to digital twins;
- ISO 23247-6: Requirements and guidance for performing digital twin compositions, supporting communication, collaboration, and interoperability between digital twins in manufacturing.

[Figure 1](#) shows how the six parts of the series are related.

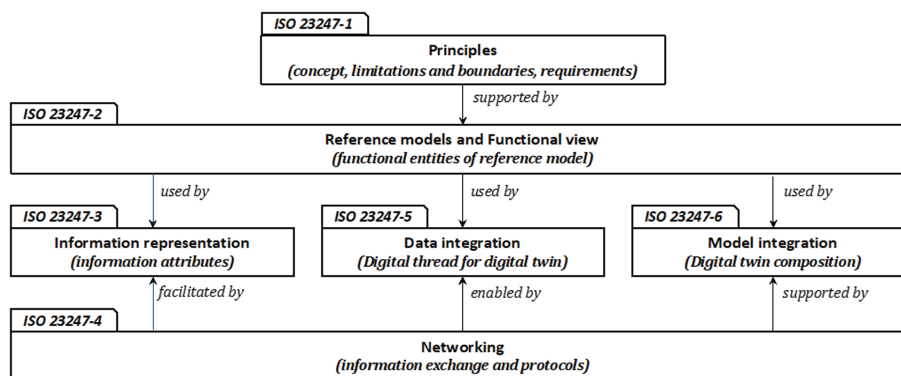


Figure 1 — ISO 23247 structure

Manufacturing involves many complex systems. One approach to managing manufacturing is to create a digital twin encompassing all related assets. However, in practice, it is often impossible to build a single digital twin that meets all the requirements for a factory floor or a supply chain. The digital twins of each element in a complex system will need to be built independently and then integrated together using a digital twin composition.

This document describes principles, methodologies, and use-case examples for digital twin composition in manufacturing so that digital twins can be configured for communication, aggregation, and interoperability.

throughout the product lifecycle. With digital twin composition, individual digital twins can collaborate to enable reusability and scalability.

This document identifies three types of digital twin composition (integrated, unified, and federated) and develops requirements and implementation procedures for each type. It offers structured approaches to integrating multiple digital twins, enabling manufacturers to manage complex systems with enhanced reusability, scalability, and flexibility. By employing standardized protocols and methodologies, manufacturers can ensure seamless interoperability between digital twins from various parties (e.g., vendors, solution providers, in-house developers). One significant objective of digital twin composition is to reuse digital twins, which helps reduce effort and costs, by allowing individual digital twins to be used multiple times for various purposes, rather than creating them from scratch every time.

This document provides requirements, and step-by-step implementation guidelines, for integrated, unified, and federated digital twin compositions. It also includes real-world use cases demonstrating the practical applications of these guidelines. By following the analyses and procedures, manufacturers can determine appropriate approaches to create scalable, flexible, and interoperable digital twin systems.

Automation systems and integration — Digital twin framework for manufacturing —

Part 6: Digital twin composition

1 Scope

This document specifies digital twin compositions in manufacturing by defining principles, describing methodologies, and providing use-case examples of digital twin communication, aggregation, and interoperation.

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 23247 (all parts), *Automation systems and integration — Digital twin framework for manufacturing*

3 Terms, definitions, and abbreviations

3.1 Terms and definition

For the purposes of this document, the terms and definitions given in the ISO 23247 series, and the following apply.

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>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1.1

digital twin composition

DTC

process of selecting, connecting, and combining digital twins

Note 1 to entry: The process for creating a digital twin is described in the ISO 23247 series.

3.1.2

integrated digital twin composition

integration of *component digital twins* (3.1.5) using a common schema

3.1.3

unified digital twin composition

unification of *component digital twins* (3.1.5) while maintaining individual models and schemas

3.1.4

federated digital twin composition

federated communication between *component digital twins* (3.1.5) that meet service requirements

3.1.5

component digital twin

digital twin that participates in a DTC as a component

3.1.6

observable manufacturing element

OME

element that has an observable physical presence or operation in manufacturing

Note 1 to entry: Observable manufacturing elements include personnel, equipment, material, process, facility, environment, product, and supporting document.

[SOURCE: ISO 23247-1:2021(en), 3.2.5, modified — *item* changed to *element*]

3.2 Abbreviated terms

P2P	peer to peer
API	application protocol interface
KPI	key performance indicator
MQTT	message queue telemetry transport
HTTP	hypertext transfer protocol
OPC-UA	open platform communications unified architecture

4 Overview and benefits of digital twin composition

4.1 Concept of digital twin composition

Digital twin composition (DTC) refers to the process of selecting, connecting, and combining digital twins to achieve a new goal with complex tasks through cooperation, as shown in [Figure 2](#).

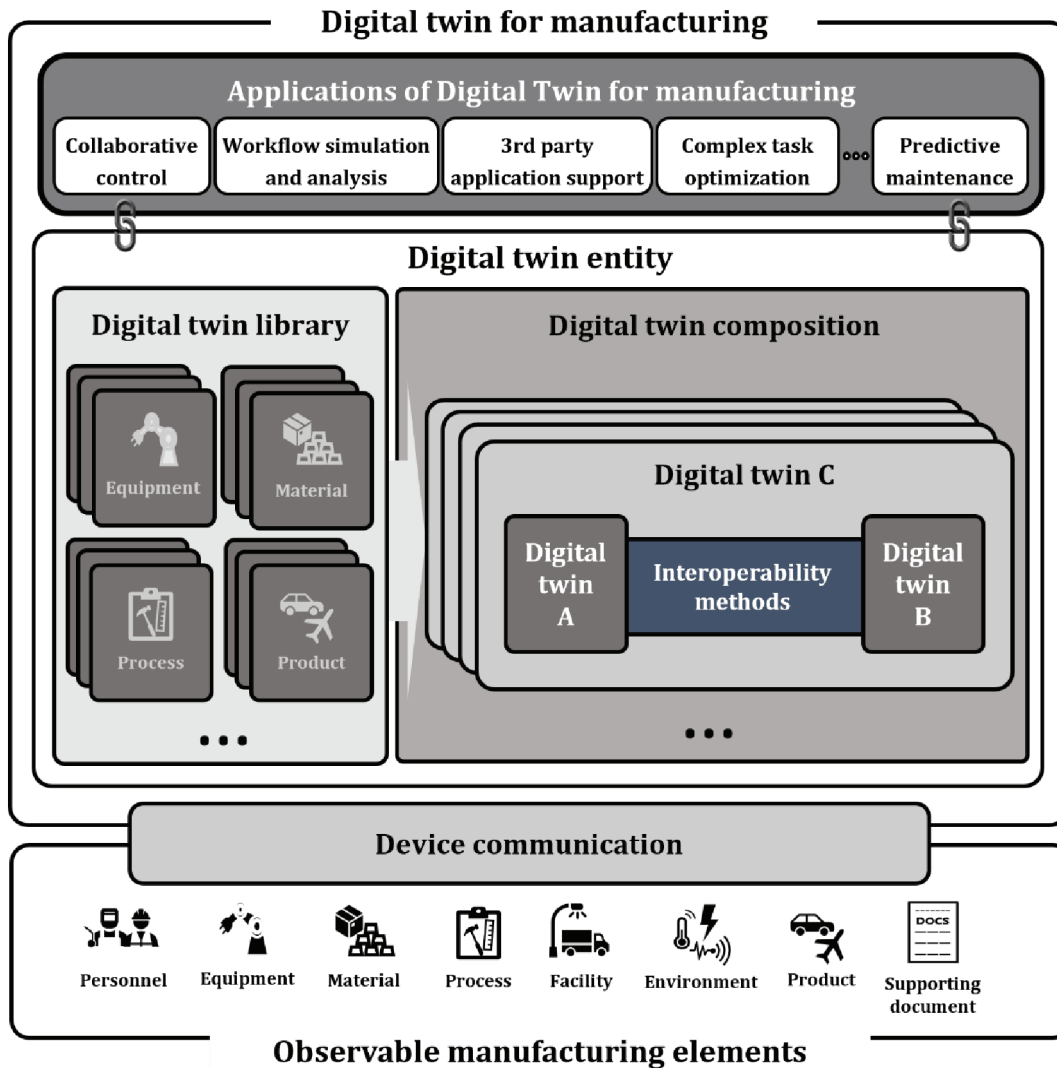


Figure 2 — Concept of digital twin composition

In manufacturing, thousands of OMEs can be connected in various ways to achieve specific purposes and capabilities. Different DTC approaches address different interoperability needs of digital twins, which also reflect interoperability across physical elements. These DTC approaches can include combining physical elements into a single piece of equipment, managing complex processes involving multiple OMEs, establishing manufacturing hierarchies, and enabling dynamic communication through peer-to-peer networks.

To enhance the reusability and development efficiency of digital twins, a DTC leverages a digital twin library containing various types of digital twins, which can be selected and combined based on specific manufacturing use case needs. By utilising existing digital twins from shop floors or suppliers, DTCs reduce the need to create new digital twins from scratch. This approach accelerates development and minimises redundancy, enabling manufacturers to benefit from existing resources and expertise.

4.2 Benefits of digital twin compositions

The benefits of a DTC include:

- Improving efficiency:

A DTC enables efficient monitoring and analysis of system performance by identifying how changes in individual components affect the overall system.