



International
Standard

ISO 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

**First edition
2026-07**

Sample Document

get full document from standards.iteh.ai



COPYRIGHT PROTECTED DOCUMENT

© ISO 2026

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviations	1
3.1 Terms and definitions	1
3.2 Abbreviations	3
4 Overview and benefits of digital twin composition	3
4.1 Concept of digital twin composition	3
4.2 Benefits of digital twin composition	5
5 Classification of digital twin composition	5
5.1 General	5
5.2 Integrated digital twin composition	6
5.3 Unified digital twin composition	6
5.4 Federated digital twin composition	7
5.5 Summary of digital twin composition kinds	8
6 Lifecycle of a digital twin composition	9
6.1 General	9
6.2 Specification stage of a digital twin composition	10
6.3 Design stage of a digital twin composition	10
6.4 Development stage of a digital twin composition	11
6.5 Operation stage of a digital twin composition	11
7 Requirements of digital twin compositions	11
8 Development procedure for digital twin composition	13
8.1 Overview	13
8.2 Deployment procedure for integrated digital twin composition	13
8.3 Deployment procedure for unified digital twin composition	16
8.4 Deployment procedure for federated digital twin composition	18
Annex A (informative) Integrated digital twin composition use case — Robot arm with end effector	20
Annex B (informative) Unified digital twin composition use case — Cutting process	24
Annex C (informative) Federated digital twin composition use case — Using an AGV to deliver parts between automated assembly lines	27
Bibliography	31

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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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*.

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 digital twins in manufacturing. A digital twin assists with detecting events in manufacturing processes to achieve functional objectives such as real-time control, predictive maintenance, in-process adaptation, big data analytics, process and manufactured component validation, and machine learning. A digital twin monitors its observable manufacturing elements by constantly updating and analysing relevant operational and environmental data as process/part changes. This visibility into process and execution enabled by a digital twin enhances manufacturing operations and business cooperation.

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 or communication protocols.

The subject areas of the six 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 composition.

Figure 1 shows how the six parts of the series are related.

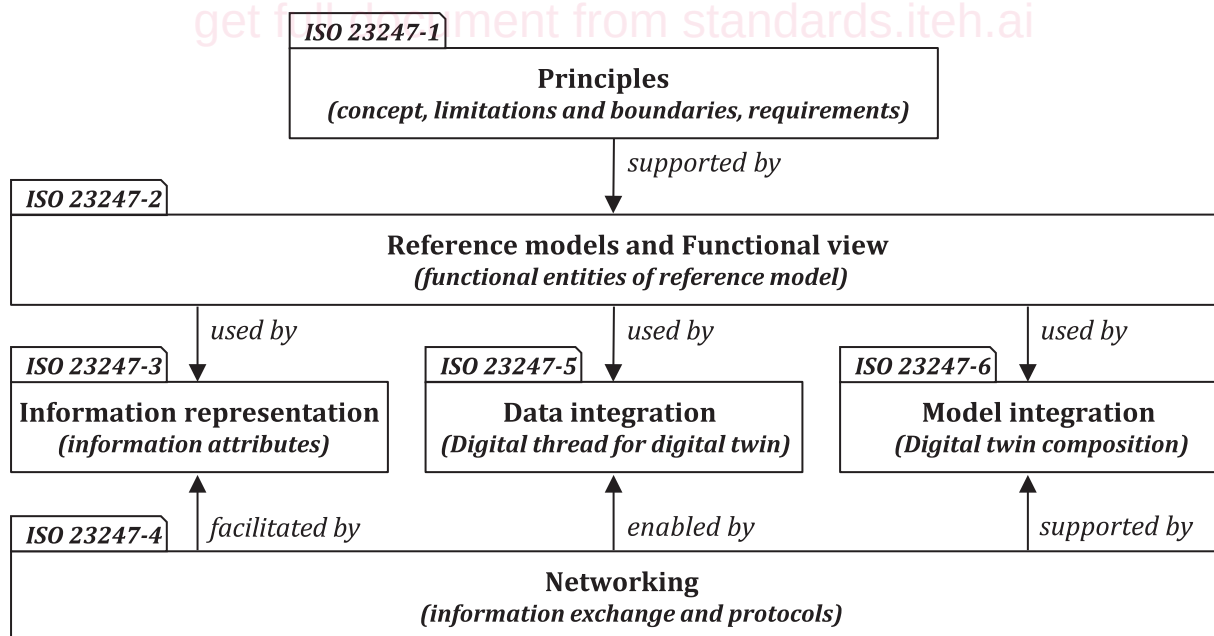


Figure 1 — ISO 23247 series structure

Digital 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. With digital twin composition, individual digital twins can collaborate to enable reusability and scalability, enabling individual digital twins to be used multiple times for various purposes, rather than creating them from scratch every time.

Sample Document

get full document from standards.iteh.ai

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.

This document identifies three kinds of digital twin composition (integrated, unified, and federated) and specifies requirements and step-by-step implementation guidelines for each kind. It provides structured approaches for composing multiple digital twins to support interoperability among digital twins developed by different parties, such as vendors, solution providers, and in-house developers. The document also includes illustrative use cases to demonstrate the practical application of the specified composition approaches.

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 23247-1:2021, *Automation systems and integration — Digital twin framework for manufacturing — Part 1: Overview and general principles*

ISO 23247-2:2021, *Automation systems and integration — Digital twin framework for manufacturing — Part 2: Reference architecture*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in the ISO 23247-1, 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: Digital twin composition produces a *composed digital twin* (3.1.6) using *component digital twins* (3.1.5)

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) with peer-to-peer coordination

3.1.5

component digital twin

digital twin that participates in a *digital twin composition (DTC)* (3.1.1)

3.1.6

composed digital twin

digital twin produced by a *digital twin composition (DTC)* (3.1.1)

Note 1 to entry: The composed digital twin can be integrated, unified or federated.

Note 2 to entry: A composed digital twin can be a component digital twin for another DTC which can be a different kind.

3.1.7

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 documentation.

[SOURCE: ISO 23247-1:2021, 3.2.5, modified — “item” was replaced by “element”.]

3.1.8

data exchange

exchange of machine-interpretable files

[SOURCE: ISO 10303-2:2024, 3.1.212, modified — Note 1 to entry deleted.]

3.1.9

data translation

conversion of a data value from one code set to another

[SOURCE: ISO/IEC 5207:2024, 3.12, modified — EXAMPLE 1, EXAMPLE 2 and Note 1 to entry deleted.]

3.1.10

data model

graphical, lexical or combined representation of data, specifying their properties, structure, and interrelationships

[SOURCE: ISO/IEC 11179-1:2023, 3.2.24]

3.2 Abbreviations

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
FE	functional entity
TCP	transmission control protocol
OMG	object management group
IDL	Interface definition language
ROS	robot operating system
URDF	unified robot description format
DDS	data distribution service
PLM	product lifecycle management
AGV	automatic guided vehicle

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](#).