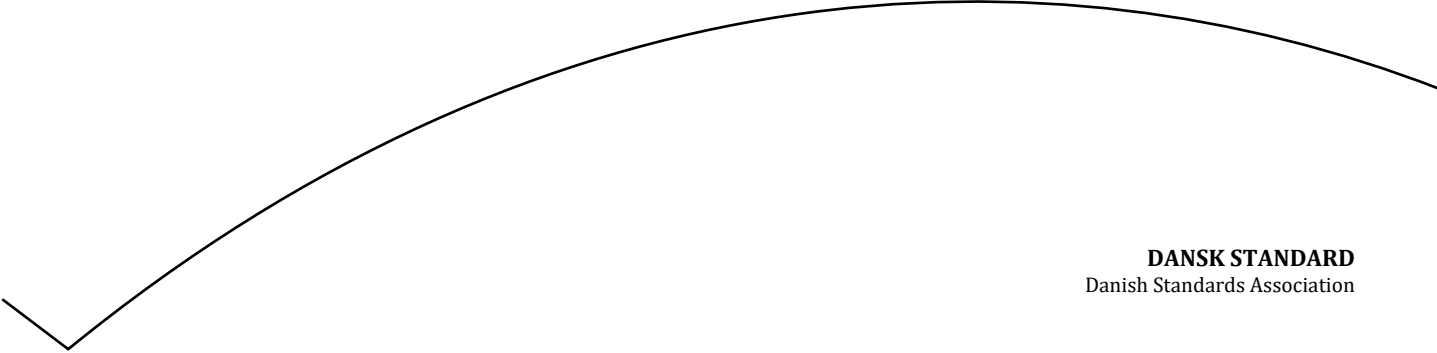


2026-06-29

Automationssystemer og integration – Rammer for produktion ved brug af digital tvilling-teknologi – Del 5: Digital tråd i digital tvilling-teknologi

Automation systems and integration – Digital twin framework
for manufacturing – Part 5: Digital thread for digital twin



DANSK STANDARD
Danish Standards Association

Göteborg Plads 1
DK-2150 Nordhavn

Tel: +45 39 96 61 01
dansk.standard@ds.dk
www.ds.dk

DS/ISO 23247-5:2026

København

DS projekt: M394145

ICS: 25.040.40

ICS: 35.240.50

Første del af denne publikations betegnelse er:

DS/ISO, hvilket betyder, at det er en international standard, der har status som dansk standard.

IDT med: ISO 23247-5:2026

DS-publikationen er på engelsk.

I tilfælde af redaktionelle fejl i DS-publikationen kan der skrives til:

editorial-mistakes@ds.dk

ADVARSEL: DS-publikationer revideres over tid. Derudover kan sådanne publikationer ændres ved rettelsesblade og/eller tillæg. Der kan også udgives rettelsesblade, der udelukkende angår oversættelsen af en publikation. Det er derfor vigtigt at sikre sig, at man benytter en gældende udgave, medmindre fx lovgivning kræver andet. Den enkelte publikations status fremgår af <https://webshop.ds.dk/>. Her kan man desuden tilmelde sig en gratis notifikationservice og følge en udgivet DS-publikations udvikling ved at klikke på "Følg".

En oversigt over forskellige DS-publikationstyper og -betegnelser findes her:

<https://www.ds.dk/publikationstyper>

Indholdet i dette dokument er ophavsretligt beskyttet, herunder tekst, grafik, billeder og lyd. Fonden Dansk Standard forbeholder sig udtrykkeligt alle rettigheder til at udnytte indholdet til tekst- og datamining, jf. ophavsretslovens § 11 b, stk. 2, og artikel 4 i direktiv (EU) 2019/790. Enhver udnyttelse af indholdet i dette dokument til tekst- og dataminingformål kræver forudgående skriftlig, specifik tilladelse fra Fonden Dansk Standard.

In case of editorial errors in the DS publication, please write to:

editorial-mistakes@ds.dk

NOTICE: DS publications are revised over time. In addition, such publications may be altered by corrigenda and/or amendments. Also, corrigenda may be published solely in relation to the translation of a publication. It is therefore important to ensure that the edition used is valid, unless, for example, legislation requires otherwise. The status of each publication can be found at <https://webshop.ds.dk/>. Here you can also sign up for a free notification service and follow the progress of a published DS publication by clicking on "Follow".

An overview of different DS publication types and designations can be found here:

<https://www.ds.dk/publikationstyper>

The content of this document, including text, graphics, images, and audio, is protected by copyright. The Danish Standards Foundation explicitly reserves all rights regarding the use of its content for text and data mining purposes in accordance with Section 11b(2) of the Danish Copyright Act and Article 4 of Directive (EU) 2019/790. Any use of the content of this document for text and data mining purposes requires prior, written, specific permission from the Danish Standards Foundation.

This is a preview of DS/ISO 23247-5:2026. [Click here to purchase the full version from the ANSI store.](#)

Contents

Page

Foreword	iii
Introduction	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 General	
4.1 Concept of digital thread for digital twins	
4.2 Digital twin utilisation of digital thread	
4.3 Structure of a digital thread	
4.4 Data utilisation facilitated by digital threads	
5 Digital thread entity	
5.1 General	
5.2 Digital thread ledger	
5.3 Digital thread management	
5.4 Digital thread metadata	
5.5 Digital thread query and response	
6 Digital thread life cycle	
6.1 General	
6.2 Digital thread creation	
6.3 Maintenance of digital thread ledger	
6.3.1 Overview	
6.3.2 Validating digital thread links	
6.3.3 Managing digital thread metadata and its attributes	
6.3.4 Performance monitoring	
6.3.5 Error handling	
6.4 Digital thread life cycle and standards integration	
6.4.1 Overview	
6.4.2 Concept and definition	
6.4.3 Conceptual design	
6.4.4 Detailed engineering	
6.4.5 Prototype and validation	
6.4.6 Manufacturing planning	
6.4.7 Production and assembly	
6.4.8 Deployment and distribution	
6.4.9 Operation and monitoring	
6.4.10 Maintenance support	
6.5 Digital thread obsolescence	
7 Requirements on digital threads	
7.1 Digital thread entity	
7.2 Defining digital threads	
7.3 Publishing digital threads	
7.4 Searching for digital twins and digital threads	
7.5 Support for accessing digital twin	
7.6 Updating digital thread links	
7.7 Digital thread management	
7.8 Digital thread interoperability	
Annex A (informative) Digital twin prototype, digital twin instance, and digital twin aggregate	

This is a preview of DS/ISO 23247-5:2026. [Click here to purchase the full version from the ANSI store.](#)

Annex B (informative) Scenarios between digital twin and digital thread	
Bibliography	3



International

This is a preview of DS/ISO 23247-5:2026. [Click here to purchase the full version from the ANSI store.](#)

ISO 23247-5

**Automation systems and
integration — Digital twin
framework for manufacturing**

**Part 5:
Digital thread for digital twin**

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

Partie 5: Continuité numérique pour le jumeau numérique

**First edition
2026-06**

This is a preview of DS/ISO 23247-5:2026. Click [here](#) to purchase the full version from the ANSI store.



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
Tel. + 41 22 749 01 11
E-mail copyright@iso.org
Website www.iso.org

Published in Switzerland

This is a preview of DS/ISO 23247-5:2026. Click here to purchase the full version from the ANSI store.

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.

This is a preview of DS/ISO 23247-5:2026. Click [here](#) to purchase the full version from the ANSI store.

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.

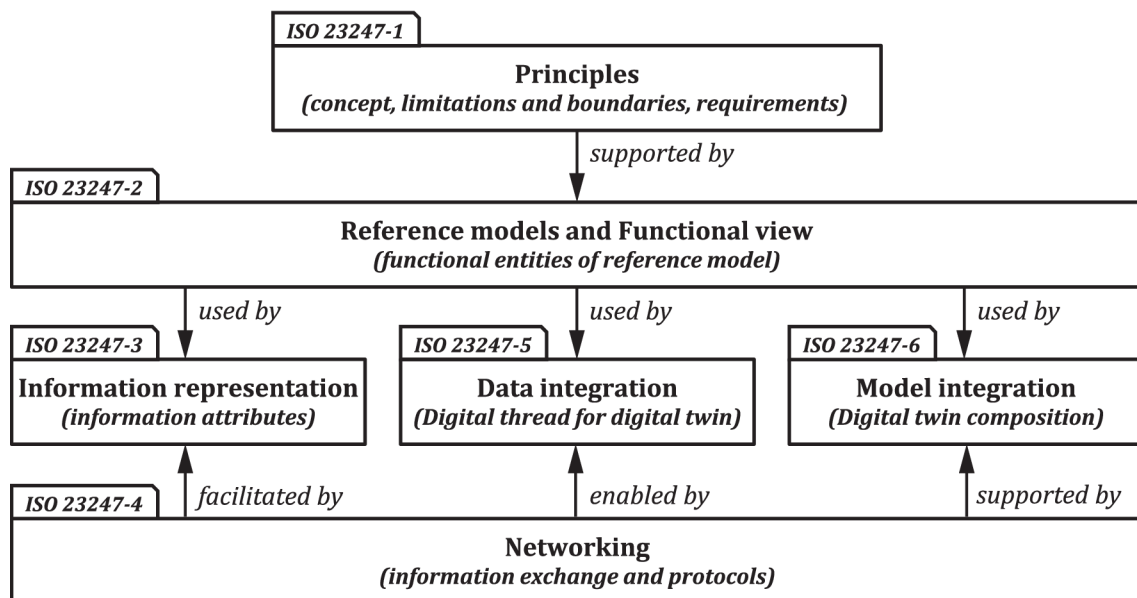


Figure 1 — [ISO 23247](#) series relationships

This document describes how the digital thread supports the generation, implementation and transformation of digital twins in manufacturing.

In manufacturing, without digital threads, data from various stages of the product life cycle, such as design, production, quality management, and maintenance, usually remains isolated within individual digital twins. Such isolation causes data and information to be fragmented, leading to inefficiencies such as processing

This is a preview of DS/ISO 23247-5:2026. [Click here to purchase the full version from the ANSI store.](#)

flow. The absence of digital threads makes it difficult to associate various events and complicates time series analysis. The disconnection of information can cause delays or inhibitions in retrieving and processing data, leading to poor decision-making and difficulty in addressing issues as they arise.

Digital threads connect digital twins representing different aspects of the product life cycle. The scalability and adaptability of manufacturing are enhanced by digital threads that support seamless connections between digital twins for manufacturing processes across the life cycle, and production facilities across the extended enterprise.

This document defines the concept, requirements and operational characteristics of digital threads for digital twins in manufacturing.

This is a preview of DS/ISO 23247-5:2026. [Click here to purchase the full version from the ANSI store.](#)

Automation systems and integration — Digital twin framework for manufacturing

Part 5: Digital thread for digital twin

1 Scope

This document specifies how a digital thread enables the creation, connectivity, management, and maintenance of manufacturing digital twins across the product life cycle, including design, planning, production, and testing by defining principles, presenting methodologies, and providing use case examples.

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 23247-2](#), *Automation systems and integration — Digital twin framework for manufacturing — Part 2: Reference architecture*

3 Terms and definitions

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

digital thread

digital thread for digital twins

bidirectional, dependable and trustworthy information that links digital twins with multiple data dimensions, including structure, behaviour, space, time, and lifecycle stages

Note 1 to entry: The linked digital twins can model design requirements, product models, manufacturing processes, inspection results and verification data.

Note 2 to entry: This definition was derived from a definition developed by the Digital Twin Consortium.

3.2

digital thread entity

component that manages the *digital thread for digital twins* ([3.1](#))

3.3

digital thread link

<digital twin> reference or pointer that connects one digital twin to another with *digital thread metadata* ([3.6](#)) to establish a relationship

Note 1 to entry: Depending on performance constraints, a *digital thread link* ([3.3](#)) can connect digital twins using data structure, URL, Universally Unique Identifier (UUID), DB query or other mechanisms.

This is a preview of DS/ISO 23247-5:2026. [Click here to purchase the full version from the ANSI store.](#)

<digital twin> repository that collects, organises and manages content for the digital twin(s)

Note 1 to entry: Multiple data stores can be used for the digital twins depending on their roles (e.g. design, engineering, manufacturing, verification).

Note 2 to entry: Depending on system architecture, a data store can be implemented as a relational database, a graph database, a cloud storage, a distributed ledger, or other suitable solutions.

3.5

digital thread ledger

<digital twin> repository of *digital thread links* (3.3) that identifies digital twins and their relationships with other digital twins

Note 1 to entry: In the simplest case, a *digital thread ledger* (3.5) contains a list of digital thread links for the life cycle stages of one digital twin.

3.6

digital thread metadata

<digital twin> information about the *digital thread link* (3.3) between two digital twins

Note 1 to entry: The information can describe the purpose of the link, the date of the link, summarize an aspect of the digital twins in the link, etc.

Note 2 to entry: When the term “metadata” is not further qualified, then it is assumed to be digital thread metadata.

3.7

digital twin prototype

DTP

informational sets necessary to describe and produce a *digital twin instance* (3.8) that duplicates or “twins” the corresponding *observable manufacturing element (OME)* (3.9), including, but not limited to, requirements, fully annotated 3D model, bill of materials (with material specifications), bill of processes, bill of services and bill of disposal

Note 1 to entry: A digital twin prototype is not linked to an OME.

3.8

digital twin instance

DTI

fit for purpose digital representation of an *observable manufacturing element* (3.9) with synchronisation between the element and its digital representation

Note 1 to entry: When the term “digital twin” is not further qualified, then it is assumed to be a digital twin instance.

3.9

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”.]

This is a preview of DS/ISO 23247-5:2026. [Click here to purchase the full version from the ANSI store.](#)

- [1] [IEC 62264](#) (all parts), — *Enterprise-control system integration*
- [2] [IEC 62443](#) (all parts), *Security for industrial automation and control systems*
- [3] [IEC 62541](#) (all parts), *OPC Unified Architecture*
- [4] [ISO 10303-1](#), *Industrial automation systems and integration — Product data representation and exchange — Part 1: Overview and fundamental principles*
- [5] [ISO 10303-209](#), *Industrial automation systems and integration — Product data representation and exchange — Part 209: Application protocol: Multidisciplinary analysis and design*
- [6] [ISO 10303-210](#), *Industrial automation systems and integration — Product data representation and exchange — Part 210: Application protocol: Electronic assembly, interconnect and packaging design*
- [7] [ISO 10303-233](#), *Industrial automation systems and integration — Product data representation and exchange — Part 233: Application protocol: Systems engineering*
- [8] [ISO 10303-235](#), *Industrial automation systems and integration — Product data representation and exchange — Part 235: Application protocol: Engineering properties and materials information*
- [9] [ISO 10303-238](#), *Industrial automation systems and integration — Product data representation and exchange — Part 238: Application protocol: Model based integrated manufacturing*
- [10] [ISO 10303-239](#), *Industrial automation systems and integration — Product data representation and exchange — Part 239: Application protocol: Product life cycle support*
- [11] [ISO 10303-242](#), *Industrial automation systems and integration — Product data representation and exchange — Part 242: Application protocol: Managed model-based 3D engineering*
- [12] [ISO 13374](#) (all parts), *Condition monitoring and diagnostics of machine systems — Data processing, communication and presentation*
- [13] [ISO 13399](#) (all parts), — *Cutting tool data representation and exchange*
- [14] [ISO 13584](#) (all parts), *Industrial automation systems and integration — Parts library*
- [15] [ISO 14306](#) (all parts), *Industrial automation systems and integration — JT file format specification for 3D visualization*
- [16] [ISO 22400](#) (all parts), *Automation systems and integration — Key performance indicators (KPIs) for manufacturing operations management*
- [17] [ISO 23247-1:2021](#), *Automation systems and integration — Digital twin framework for manufacturing — Part 1: Overview and general principles*
- [18] [ISO 23952](#), *Automation systems and integration — Quality information framework (QIF) — An integrated model for manufacturing quality information*
- [19] [ISO 55000](#), *Asset management — Vocabulary, overview and principles*
- [20] [ISO/IEC 11179-6](#), *Information technology — Metadata registries (MDR) — Part 6: Registration*
- [21] [ISO/IEC 20922](#), *Information technology — Message Queuing Telemetry Transport (MQTT) v3.1.1*
- [22] [ISO/IEC 17025](#), *General requirements for the competence of testing and calibration laboratories*
- [23] [ISO/IEC 17360](#), *Automatic identification and data capture techniques — Supply chain applications of RFID — Product tagging, product packaging, transport units, returnable transport units and returnable packaging items*

This is a preview of DS/ISO 23247-5:2026. Click [here](#) to purchase the full version from the ANSI store.

- [25] SAE International AIR 7161, “*Guidance in Digital Thread data standards Enablement, Monitoring and Quantification with Digital thread Index*”, Venkata and Rencher, 2024.
- [26] Grieves, M. and J. Vickers, “*Digital Twin: Mitigating Unpredictable, Undesirable Emergent Behavior in Complex Systems, in Trans-Disciplinary Perspectives on System Complexity*”, 2016.
- [27] [ISO/IEC 9834-8](#), *Information technology — Procedures for the operation of object identifier registration authorities — Part 8: Generation of universally unique identifiers (UUIDs) and their use in object identifiers*
- [28] <https://www.digitaltwinconsortium.org/>
- [29] [ISO 23247-3](#), *Automation systems and integration — Digital twin framework for manufacturing — Part 3: Digital representation of manufacturing elements*
- [30] [ISO 23247-4](#), *Automation systems and integration — Digital twin framework for manufacturing — Part 4: Information exchange*
- [31] [ISO 23247-5](#), *Automation systems and integration — Digital twin framework for manufacturing — Part 5: Digital thread for digital twin*
- [32] [ISO 23247-6](#), *Automation systems and integration — Digital twin framework for manufacturing — Part 6: Digital twin composition*

This is a preview of DS/ISO 23247-5:2026. [Click here to purchase the full version from the ANSI store.](#)



This is a preview of DS/ISO 23247-5:2026. [Click here to purchase the full version from the ANSI store.](#)

ICS 25.040.40; 35.240.50

Price based on 26 pages

© ISO 2026
All rights reserved

iso.org