



DPC: 25/30480650 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 06 August 2025

Origin: International

Latest date for receipt of comments: 29 September 2025

Project No. 2023/02254

Responsible committee: AMT/4 Industrial data and manufacturing interfaces

Interested committees:

Title: Draft BS ISO 23247-5 Automation systems and integration - Digital twin framework for manufacturing. Part 5: Digital thread for digital twin.

Please notify admin.start@bsigroup.com if you are aware of any keywords that might assist in clarifying or identifying the standard or of the content of this standard:

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 29 September 2025

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

E-mail: admin.start@bsigroup.com

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

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 23247-5

Automation systems and integration — Digital twin framework for manufacturing —

Part 5: Digital thread for digital twin

ICS: 25.040.40; 35.240.50

ISO/TC 184/SC 4

Secretariat: **ANSI**

Voting begins on:
2025-08-06

Voting terminates on:
2025-10-29

This document is circulated as received from the committee secretariat.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENTS AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

Reference number
ISO/DIS 23247-5:2025(en)

Full document details: 25/30480650 DC

© ISO 2025  **Documents**
Document Sharing Hub



COPYRIGHT PROTECTED DOCUMENT

© ISO 2025

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 and definitions	1
4 General	2
4.1 Concept of digital thread for digital twins	2
4.2 Digital twin utilisation of digital thread	3
4.3 Structure of a digital thread	5
4.4 Data flows enabled by digital threads	6
5 Digital thread entity	6
5.1 General	6
5.2 Digital thread ledger	7
5.3 Digital thread management	8
5.4 Digital thread metadata	8
5.5 Digital thread query and response	8
6 Digital thread life cycle	9
6.1 General	9
6.2 Digital thread creation	10
6.3 Digital thread maintenance	10
6.3.1 Overview	10
6.3.2 Concept and definition	10
6.3.3 Conceptual design	11
6.3.4 Detailed engineering	11
6.3.5 Prototype and validation	11
6.3.6 Manufacturing planning	11
6.3.7 Production and assembly	11
6.3.8 Deployment and distribution	11
6.3.9 Operation and monitoring	11
6.3.10 Maintenance support	11
6.4 Digital thread obsolescence	11
7 Requirements on Digital Threads	12
7.1 Defining digital threads	12
7.2 Publishing digital threads	12
7.3 Searching for digital twins and digital threads	13
7.4 Support for accessing digital twin	13
7.5 Updating digital thread links	13
7.6 Digital thread management	13
7.7 Digital thread interoperability	14
Annex A (informative) Digital twin prototype, digital twin instance, and digital twin aggregate	15
Annex B (informative) Scenarios between digital twin and digital thread	17
Bibliography	23

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, *Industrial 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: Digital thread for digital twin;
- ISO 23247-6: Digital twin composition.

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

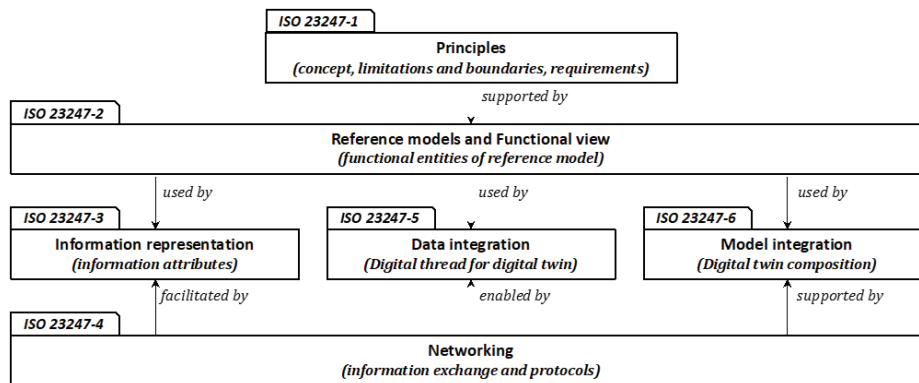


Figure 1 — ISO 23247 series relationships

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 delays, information duplications, and disruption. These problems hinder manufacturers in conducting simulations and analyses with digital twins, as these functions depend on a continuous and integrated data 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.

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

There are no normative references in this document.

3 Terms and definitions

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 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 entity* (3.2) can link digital twins using data structure, URL, Universally Unique Identifier (UUID), DB query, or other mechanisms.

3.4**data 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, 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* (3.3) 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* (3.6).

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 OME, including, but is 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* (3.7) 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* (3.8).

3.9**observable manufacturing elements**

OME

element that has an observable physical presence or operation in manufacturing

Note 1 to entry: *Observable manufacturing elements* (3.9) 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*]

4 General**4.1 Concept of digital thread for digital twins**

The digital thread tracks the life cycle of digital twins over time. In manufacturing, a digital twin is a digital representation of an observable manufacturing element (OME). Before a digital twin exists, a product to be manufactured (product OME) is designed to meet requirements through a digital twin prototype. When the OME is in place, plans are made for its manufacture. When the necessary equipment has been allocated, the