# ISO/IEC 30186

Edition 1.0 2025-07

# INTERNATIONAL STANDARD

**Digital twin - Maturity model and guidance for a maturity assessment**

ICS 35.020; 35.240

ISBN 978-2-8327-0564-3

ISO/IEC 30186: 2025-07(en)

**THIS PUBLICATION IS COPYRIGHT PROTECTED**
**Copyright © 2025 ISO/IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

**About the IEC**
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

**About IEC publications**
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

**IEC publications search - webstore.iec.ch/advsearchform**
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

**IEC Just Published - webstore.iec.ch/justpublished**
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

**IEC Customer Service Centre - webstore.iec.ch/csc**
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

**IEC Products & Services Portal - products.iec.ch**
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

**Electropedia - www.electropedia.org**
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

**Warning! Make sure that you obtained this publication from an authorized distributor.**

# CONTENTS

FOREWORD ..... 3
INTRODUCTION ..... 4
1 Scope ..... 5
2 Normative references ..... 5
3 Terms and definitions ..... 5
4 Abbreviated terms ..... 6
5 Maturity model ..... 6
5.1 General ..... 6
5.2 Convergence aspect ..... 7
5.3 Capability aspect ..... 8
5.4 Integrated view aspect ..... 9
5.5 Time aspect ..... 10
5.6 Trustworthiness aspect ..... 11
6 Maturity assessment indicators ..... 12
6.1 General ..... 12
6.2 Convergence aspect ..... 13
6.3 Capability aspect ..... 14
6.4 Integrated view aspect ..... 15
6.5 Time aspect ..... 16
6.6 Trustworthiness aspect ..... 17
7 Requirements for a maturity assessment ..... 17
Annex A (informative) Example of a maturity assessment for a power digital twin ..... 18
A.1 Brief description of the Korea South-East Power Co. (KOEN) digital twin for a power plant ..... 18
A.1.1 General ..... 18
A.1.2 Functions of the KOEN digital twin ..... 19
A.2 Result of a maturity assessment ..... 21
A.2.1 General ..... 21
A.2.2 Strengths (Level 4 aspects) ..... 29
A.2.3 Areas for improvement (Level 3 aspect) ..... 30
A.2.4 Recommendations ..... 30
A.2.5 Conclusion ..... 30
Bibliography ..... 31

Figure 1 – Digital twin maturity model ..... 7
Figure A.1 – KOEN digital twin for a power plant ..... 18
Figure A.2 – KOEN digital twin configuration diagram ..... 19
Figure A.3 – KOEN digital twin configuration diagram ..... 29

Table 1 – Maturity from convergence aspect ..... 8
Table 2 – Maturity from capability aspect ..... 9
Table 3 – Maturity from integrated view aspect ..... 10
Table 4 – Maturity from time aspect ..... 11
Table 5 – Maturity from trustworthiness aspect ..... 12
Table 6 – Structure of an indicator for maturity assessment ..... 12

Table 7 – Convergence aspect assessment indicators ..... 13
Table 8 – Capability aspect assessment indicators ..... 14
Table 9 – Integrated view aspect assessment indicators ..... 15
Table 10 – Time aspect assessment indicators ..... 16
Table 11 – Trustworthiness aspect assessment indicators ..... 17
Table A.1 – Functions of the KOEN digital twin ..... 19
Table A.2 – Result of a convergence aspect maturity assessment ..... 21
Table A.3 – Result of a capability aspect maturity assessment ..... 22
Table A.4 – Result of an integrated view aspect maturity assessment ..... 24
Table A.5 – Result of a time aspect maturity assessment ..... 26
Table A.6 – Result of a trustworthiness aspect maturity assessment ..... 27

# Digital twin - Maturity model and guidance for a maturity assessment

## FOREWORD

1) ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.
2) The formal decisions or agreements of IEC and ISO on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC and ISO National bodies.
3) IEC and ISO documents have the form of recommendations for international use and are accepted by IEC and ISO National bodies in that sense. While all reasonable efforts are made to ensure that the technical content of IEC and ISO documents is accurate, IEC and ISO cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC and ISO National bodies undertake to apply IEC and ISO documents transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC and ISO document and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC and ISO do not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC and ISO marks of conformity. IEC and ISO are not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this document.
7) No liability shall attach to IEC and ISO or their directors, employees, servants or agents including individual experts and members of its technical committees and IEC and ISO National bodies for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this ISO/IEC document or any other IEC and ISO documents.
8) Attention is drawn to the Normative references cited in this document. Use of the referenced publications is indispensable for the correct application of this document.
9) IEC and ISO draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC and ISO take 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, IEC and 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 https://patents.iec.ch and www.iso.org/patents. IEC and ISO shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 30186 has been prepared by subcommittee 41: Internet of Things and Digital Twin, of ISO/IEC joint technical committee 1: Information technology. It is an International Standard.

The text of this International Standard is based on the following documents:

| Draft | Report on voting |
|---|---|
| JTC1-SC41/502/FDIS | JTC1-SC41/525/RVD |

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

# INTRODUCTION

Digital twins typically comprise several enabling technologies that are existing, under development or upcoming in the near future. Similar to other evolving digital technologies, digital twins progress through various levels of complexity. Digital twins evolve from simple to complex structures, from standalone systems to federated networks, and from requiring human intervention to achieving autonomy. Each successive level of a digital twin introduces increasingly sophisticated functionalities.

Digital twins deployed in various application domains are likely requested to cooperate with other digital twins for coping with complex problems raised across the application domains. However, different levels of features such as convergence, capabilities and integrated view prevent digital twin applications from cooperating with other digital twin applications.

In this situation, the digital twin maturity model is helpful to understand the features that should be supported by a digital twin from a low level to a higher level. The digital twin maturity model is an assessment tool of a digital twin for determining the current maturity level and common understanding of the evolution towards another level. Its purpose is to support an organization assessment of and advancement of its level of maturity in the technological capability of its digital twins. It does not provide guidance on enhancing the maturity and capability of users, or the outcomes digital twin can help deliver.

# 1 Scope

This document provides a generic digital twin maturity model, definition of assessment indicators, and guidance for a maturity assessment.

# 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/IEC 30173, *Digital twin - Concepts and terminology*

# 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 30173 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

**3.1**
**maturity level**
identified extent of measured effect

Note 1 to entry: The extent of measured effect is divided into segments, referred to as levels, of increasing competence to achieve digital twin objectives.

[SOURCE: ISO 22549-2:2020, 3.2, modified – The first preferred term “maturity level indicator” has been deleted. In the definition, “within the maturity model” has been deleted. In Note 1 to entry, “enterprise” has been replaced by “digital twin”.]

**3.2**
**maturity model**
set of information that indicates the characteristics of maturity levels

[SOURCE: ISO 22549-2:2020, 3.1, modified – In the definition, “that indicate the maturity of CII, its descriptive name and characteristics” has been replaced with “that indicates the characteristics of maturity levels”.]

**3.3**
**maturity assessment**
method for assessing the digital twin *maturity level(s)* (3.1) against a *maturity model* (3.2)

**3.4**
**convergence aspect**
<digital twin> maturity in terms of degrees of correlation between the target entity (physical states) and its corresponding digital twin(s) (digital states)

**3.5**
**capability aspect**
<digital twin> maturity in terms of abilities of a digital twin to accurately reflect and predict the behaviour of the target entity