ISO/IEC 30178

Edition 1.0 2026-07

# INTERNATIONAL STANDARD

## Internet of Things (IoT) - Data format, value and coding for interoperability

ISO/IEC 30178: 2026-07(en)

ICS 35.020

ISBN 978-2-8327-1410-2

# CONTENTS

# Information technology - Internet of Things (IoT) - Data format, value and coding for interoperability

## 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 30178 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-SC41/597/FDIS | JTC1-SC41/620/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 transformation depends strongly on data. Within the field of Internet of Things (IoT), many leading organizations try to model physical entities and environments with structured data.

Digital twins, city and building information models, process industry, automation, automotive and even healthcare, are all technologies or fields in which data models are developed to accommodate domain-specific needs.

Sensors form the backbone of live data generation and help synchronize the digital world with the real world. Numerous data and information models occur in the Information Technology (IT) and Operational Technology (OT) landscape, at various layers in digital systems. Some are verbose, text-based formats (e.g. XML or JSON) that come with more or less rich metadata, while some formats contain only minimal metadata.

The huge variability in how sensory data are represented poses a problem for all parties in the value chain – not least for the data producers themselves. This variability not only affects interoperability but also has significant economic implications. This often puts the economic viability of data collection out of reach, since low data accessibility for data consumers also means poor return of economic value for the data producer.

This has often limited large-scale data collection to domains in which there is a strong need for very specific data collection (such as the automotive industry), and favoured applications where a single data producer has a direct business agreement with the data consumer, and full control over the data model. The design of the data gathering process has often been guided by a single customer's need, with one fixed requirement for data quality.

General purpose data collection remains challenging in the context of Big Data.

The variability in format and inconsistency in data quality are issues that undermine new stakeholders' trust in third-party value chains. Where data might have been accurate enough, an insufficient amount of consistent data-source documentation dissuaded any potential new data consumers – further limiting the capital value of data.

In the end, it has proven difficult for data producers to generate data that is cost-effective to produce and consume – especially with data about physical environments.

This document provides guidance by outlining principles and technical solutions for overcoming this variability and proposes a fundamental representation of data points for sensors and physical quantities that can be used everywhere in the digital landscape to improve the consistency of how both data and metadata are to be interpreted by application logic. When applied correctly, with an agnostic attitude towards application requirements, these principles also help form a baseline for data quality and accessibility.

With the perspective taken in this document, sensory data (after their collection) are regarded as descriptions of a physical entity. This also includes any other physical measurement, such as the physical parameters of real-world objects and systems. The intention is to allow for sensory data to be possible to integrate seamlessly with other data points in physical models under a shared, homogeneous interpretation.

# 1 Scope

This document defines common formats, values, and coding for data interoperability and exchange among systems in the Internet of Things (IoT).

# 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 20924, *Internet of Things (IoT) and digital twin - Vocabulary*

ISO/IEC Guide 99, *International vocabulary of metrology - Basic and general concepts and associated terms (VIM)*

# Bibliography

[1] ISO/IEC 1539-1:2023, *Programming languages - Fortran - Part 1: Base language*

[2] ISO/IEC 11404, *Information technology - General-Purpose Datatypes (GPD)*

[3] IEC 61360-4, *Common Data Dictionary* (CDD)
available at: https://cdd.iec.ch/cdd/iec61360/iec61360.nsf

[4] SAREF-Compliant Knowledge Discovery for Semantic Energy and Grid Interoperability. Amelie Gyrard, Antonio Kung, Olivier Genest, Alain Moreau. *IEEE World Forum on Internet of Things* (WF-IoT 2021).

[5] RFC 8428: *Sensor Measurement Lists (SenML)*,
https://datatracker.ietf.org/doc/rfc8428/

[6] BIPM, *The international System of Units (SI)*
Available at: https://www.bipm.org/en/publications/si-brochure/

[7] Quantities Units Dimensions and Data types
Available at: https://qudt.org/

[8] IEC 60050-723, *International Electrotechnical Vocabulary (EV) - Chapter 723: Broadcasting: Sound, television, data*

[9] ISO/IEC 60559:2022, *Floating-point arithmetic*[20]

[10] ISO/IEC 21823 (all parts), *Internet of things (IoT) - Interoperability for IoT systems*

[20] Equivalent with the IEEE-754 standard.