

# INTERNATIONAL STANDARD



**Internet of Things (IoT) – Compatibility requirements and model for devices  
within industrial IoT systems**



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INTERNATIONAL  
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# INTERNET OF THINGS (IoT) – COMPATIBILITY REQUIREMENTS AND MODEL FOR DEVICES WITHIN INDUSTRIAL IoT SYSTEMS

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

FDIS	Report on voting
JTC1-SC41/251/FDIS	JTC1-SC41/265/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, available at [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs) and [www.iso.org/directives](http://www.iso.org/directives).

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## INTRODUCTION

Dynamic growth and embracing of digital technologies in all spheres of human life has created the conducive basis for transitioning toward the digital economy, while adoption of Industrial Internet of Things (IIoT) is one of the major technology directions of the digital economy growth. As it is essential to implement IIoT technologies in enterprises worldwide, the issue of practical aspects in the realization of the IIoT concepts has gained vital importance. In particular, one of the existing problems is unavailability of transparent mechanisms in terms of how and in what way to establish connections of industrial equipment to cloud platforms designed for data collection and analysis.

As soon as numerical programmable tools became widely available, the development of technologies and protocols enabling management and control of the industrial equipment control software utility within an enterprise network became necessary. At that time, management of such control utility over Internet was out of question. In parallel, a number of concerns arose due to the design and development of proprietary technologies and protocols; in most cases, they are incompatible with each other. Since such technologies and protocols were the intellectual property (IP) of the relevant enterprise, no legal framework describing structure and operation principles of such technologies and protocols existed. As the IIoT concept started to appear, activities aimed at standardizing and documenting the previously developed technologies and protocols began. As a result of the analysis of existing protocol elements, a document having a general list or register of protocols was developed. Notwithstanding, the compiled document contained just descriptions of the existing set of technologies and protocols, without the information about their ability to interact with each other, or about the methods of connecting to cloud-based platforms. Each manufacturer built the systems based on those protocols that the manufacturer considered to be the most suitable for solving specific tasks. Numerous manufacturers' equipment use specific protocols that were specially developed by the manufacturers for the management and data delivery tasks for different industrial solutions. For instance, the protocols described in IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, Modbus, DNP3, etc. are widely used today.

In the initial stages, developers and large enterprises insisted on using their own proprietary protocols, arguing that their protocols were designed and developed for executing specific functions. For instance, IEC 61850 (describing some protocols) is widely applied for power substations while Modbus is used for transmitting raw data from pressure sensors. Controller area network (CAN) technology is mostly adopted in the automotive industry and robotics (see ISO 11898 series). As a variety of protocol versions started to emerge, different version and metadata format incompatibility became apparent. A majority of production hardware supports Modbus-RTU and Modbus-ASCII, while a more advanced version of Modbus-TCP protocol no longer requires such complications as RTU and ASCII. The major problems are data conversion from one protocol to another and protocol identification using certain attributes (semantic) for seamless interoperability of the IIoT devices and platforms. The interoperability issues can be resolved by defining particular compatibility requirements for the IIoT devices, applications, systems, components, and other IIoT entities.

This document specifies compatibility requirements for various entities of the IIoT systems that can be used as guidance for connecting, configuring and testing of industrial hardware.

# INTERNET OF THINGS (IoT) – COMPATIBILITY REQUIREMENTS AND MODEL FOR DEVICES WITHIN INDUSTRIAL IoT SYSTEMS

## 1 Scope

This document specifies network models for IIoT connectivity and general compatibility requirements for devices and networks within IIoT systems in terms of:

- a) data transmission protocols interaction;
- b) distributed data interoperability and management;
- c) connectivity framework;
- d) connectivity transport;
- e) connectivity network;
- f) best practices and guidance to use in IIoT area.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

### 3.1

#### **co-existence**

degree to which a product can perform its required functions efficiently while sharing a common environment and resources with other products, without detrimental impact on any other product

[SOURCE: ISO/IEC 25010:2011, 4.2.3.1]

### 3.2

#### **compatibility**

degree to which a product, system or component can exchange information with other products, systems or components, and/or perform its required functions, while sharing the same hardware or software environment

[SOURCE: ISO/IEC 25010:2011, 4.2.3]

### 3.3

#### **edge gateway**

heterogeneous IoT gateway that takes part in functionality of mobile edge host, especially its data processing functions