ISO/IEC ~~DIS~~ FDIS 27402:2023(E)

ISO/IEC JTC 1/SC 27

Secretariat: DIN

Date: 2023-~~03-20~~07-24

Cybersecurity — IoT security and privacy — Device baseline requirements

Style Definition: Heading 1: Indent: Left: 0 pt, First line: 0 pt, Tab stops: Not at 21.6 pt

Style Definition: Heading 2: Font: Bold, Tab stops: Not at 18 pt

Style Definition: Heading 3: Font: Bold

Style Definition: Heading 4: Font: Bold

Style Definition: Heading 5: Font: Bold

Style Definition: Heading 6: Font: Bold

Style Definition: ANNEX

Style Definition: zzCopyright

Style Definition: Body Text Indent 2

Style Definition: Body Text Indent 3

Style Definition: AMEND Terms Heading: Font: Bold

Style Definition: AMEND Heading 1 Unnumbered: Font: Bold

Formatted: Font: Bold

Formatted: Font: Bold

Formatted: Font: Bold

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: Font: Bold

ISO ~~copyright office~~Copyright Office

CP 401 • ~~Ch. de Blandonnet 8~~

CH-1214 Vernier, Geneva

Phone: + 41 22 749 01 11

~~Fax: +41 22 749 09 47~~

~~Email: copyright@iso.org~~

Email: copyright@iso.org

Website: ~~www.iso.org~~www.iso.org

Published in Switzerland.

Formatted: Font color: Custom Color(RGB(33;29;30))

Formatted: Font color: Custom Color(RGB(33;29;30))

Formatted: No page break before, Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: English (United Kingdom)

Formatted: English (United Kingdom)

Formatted: English (United Kingdom)

Formatted: Adjust space between Latin and Asian text, Adjust space between Asian text and numbers

Formatted: Font color: Custom Color(RGB(33;29;30))

Formatted: Font color: Custom Color(RGB(33;29;30))

Contents

Foreword iv

Introduction v

1 Scope 1

2 Normative references 1

3 Terms, definitions and abbreviated terms 1
3.1 Terms and definitions 1
3.2 Abbreviated terms 4

4 Overview 4

5 Requirements 5
5.1 Requirements for IoT device policies and documentation 5
5.1.1 Risk management 5
5.1.2 Information disclosure 6
5.1.3 Vulnerability disclosure and handling processes 7
5.2 Requirements for IoT device capabilities and operations 7
5.2.1 General 7
5.2.2 Configuration 8
5.2.3 Software reset 8
5.2.4 User data removal 9
5.2.5 Protection of data 9
5.2.6 Interface access 11
5.2.7 Software and firmware updates 12

Annex A (informative) Risk management guidance 14

Bibliography 16

Formatted: Font color: Custom Color(RGB(33;29;30))

Formatted: Font color: Custom Color(RGB(33;29;30))

Foreword

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.

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 document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directiveswww.iso.org/directives or www.iec.ch/members_experts/refdocswww.iec.ch/members_experts/refdocs).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC 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, ISO and IEC 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 and https://patents.iec.ch.www.iso.org/patents and https://patents.iec.ch. ISO and IEC 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.www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standardswww.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC- 1, *Information technology*, Subcommittee SC 27, *Information security, cybersecurity and privacy protection*.

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.htmlwww.iso.org/members.html and www.iec.ch/national-committeeswww.iec.ch/national-committees.

Formatted: Font color: Custom Color(RGB(33;29;30))

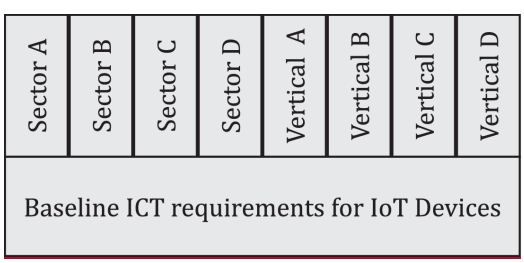
Formatted: Font color: Custom Color(RGB(33;29;30))

Introduction

With the increasing number of Internet of Things (IoT) devices and increasing reliance on such devices, the security and privacy risks relating to those "things" is expected to grow. Their widespread deployment in networks and systems make them easy and prime targets for cyber attacks.

This document provides a baseline set of information and communication technologies (ICT) requirements so that IoT devices are able to support security and privacy controls. A risk assessment is required to develop a risk treatment plan that identifies the necessary IoT device features and countermeasures. The management of systems which use IoT devices depends upon the capabilities of those devices (among other factors).

Broadly speaking, this document addresses ICT requirements for IoT devices that are made available to the market. The requirements in this document are intended as a baseline, upon which vertical markets (such as health, financial services, industrial, consumer electronics and transportation) can build additional requirements for the expected use and risks of IoT devices in their applications, as depicted in Figure 1. In addition to this document, various sectors (e.g. private/industrial, public, defence, national security) and vertical markets have sector- or vertical-specific requirements, for example those found in ETSI EN 303 645[11] for consumer devices and the IEC 62443 series for industrial devices and systems. While this document can provide requirements for a conformity assessment scheme, it is expected that stakeholders for specific sectors and vertical markets will develop consensus around requirements specific to their contexts, building "on top" of this document. Subsequently, conformity assessment programmes can be developed around those specific sectors and vertical markets. This document would be effectively integrated into such programmes while providing a common set of baseline requirements.



NOTE Additional requirements may be developed or required by specific sectors and vertical markets.

Figure 1 — Relationship between baseline requirements in this document and potential additional requirements

Formatted: Font color: Custom Color(RGB(33;29;30))

Formatted: Font color: Custom Color(RGB(33;29;30))

As the complex technical landscape of IoT devices evolves, this document can support a scalable globally harmonized approach to the baseline security and privacy requirements and inform technical policy and regulatory initiatives.

Cybersecurity — IoT security and privacy — Device baseline requirements

1 Scope

This document provides baseline ICT requirements for IoT devices to support security and privacy controls.

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 27000, *Information technology — Security techniques — Information security management systems — Overview and vocabulary*

ISO/IEC 27400:2022, *Cybersecurity — IoT security and privacy — Guidelines*

ISO 31000:2018, *Risk management — Guidelines*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 27000, ISO/IEC 27400, ISO 31000, 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~~https://www.iso.org/obp

— IEC Electropedia: available at ~~https://www.electropedia.org/~~https://www.electropedia.org/

3.1.1
identifier
information that unambiguously distinguishes one entity from another one in a given identity context

[SOURCE: ISO/IEC 23093-1:2022, 3.2.7]

3.1.2
user interface
set of all components of an interactive system that provide information and controls for the user to accomplish specific tasks with the interactive system

[SOURCE: ISO 9241-110:2020, 3.10]

Formatted: Font: 11.5 pt, Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: English (United States)
Formatted: std_publisher
Formatted: std_docNumber
Formatted: std_docTitle
Formatted: std_publisher
Formatted: std_docNumber
Formatted: std_docTitle
Formatted: std_publisher
Formatted: std_docNumber
Formatted: std_docTitle
Formatted: std_publisher
Formatted: std_docNumber
Formatted: std_publisher
Formatted: std_docNumber
Formatted: std_publisher
Formatted: std_docNumber
Formatted: Font: Times New Roman
Formatted: Font: Times New Roman, English (United States)
Formatted: std_publisher
Formatted: std_docNumber
Formatted: std_docPartNumber
Formatted: std_year
Formatted: std_section
Formatted: std_publisher
Formatted: std_docNumber
Formatted: std_docPartNumber
Formatted: std_year
Formatted: std_section
Formatted: Font: Not Bold
Formatted: Font: Not Bold

3.1.3
internet of things
IoT
infrastructure of interconnected entities, people, systems and information resources together with services which processes and reacts to information from the physical world and virtual world

[SOURCE: ISO/IEC 20924:2021, 3.2.4]

3.1.4
IoT system
system providing functionalities of *internet of things (IoT)* (3.~~2~~1.3)

Note 1 to entry: An IoT system can include, but not limited to, *IoT devices* (3.1.5), *IoT gateways* (3.1.7), sensors, and actuators.

Note 2 to entry: Conventional IT devices such as smartphones and laptops can form part of an IoT system.

Note 3 to entry: IoT systems also include cloud and network connectivity.

[SOURCE: ISO/IEC 20924:2021, 3.2.9, modified — Notes 2 and 3 to entry have been added.]

3.1.5
IoT device
entity of an *internet of things (IoT) system* (3.1.4) that interacts and communicates with the physical world through sensing or actuating

Note 1 to entry: An IoT device can be a sensor or an actuator.

Note 2 to entry: An IoT device, in this context, is an assembled device usable for its intended IoT functions without relying on being embedded or integrated into any other product.

Note 3 to entry: IoT devices generally interact via communication interfaces.

[SOURCE: ISO/IEC 20924:2021, 3.2.6, modified — Notes 1, 2 and 3 to entry have been added.]

3.1.6
IoT device developer
entity that creates an assembled final *internet of things (IoT) device* (3.1.5)

Note 1 to entry: "~~final~~Final" in this definition means the stage of delivery to the IoT service developer in the assemble process.

[SOURCE: ISO/IEC 27400:2022, 3.4]

3.1.7
IoT gateway
entity of an IoT system that connects one or more proximity networks and the IoT devices on those networks to each other and to one or more access networks

[SOURCE: ISO/IEC 20924:2021, 3.2.8]

3.1.8
trusted computing base
TCB

Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font: Not Bold
Formatted: Font: Not Bold

totality of protection mechanisms within a computer system, including hardware, firmware and software, the combination of which is responsible for enforcing a security policy

3.1.9
cryptographic module
set of hardware, software, and/or firmware that implements security functions and are contained within the cryptographic boundary

[SOURCE: ISO/IEC 19790:2012, 3.25]

3.1.10
critical security parameter
CSP
security-related information whose disclosure or modification can compromise the security of a *cryptographic module* (3.1.9)

Note 1 to entry: A CSP can be plaintext or encrypted.

Note 2 to entry: In the example, "certificates" refers to private keys matching public keys inside certificates.

EXAMPLE 1: Secret and private cryptographic keys, authentication data such as passwords, PINs, certificates or other trust anchors.

EXAMPLE 2: Configuration settings required for initialization.

[SOURCE: ISO/IEC 19790:2012, 3.18, modified — ~~Note~~ note 2 to entry and ~~Example~~ example 2 have been added.]

3.1.11
~~**public security parameter**~~
~~**PSP**~~
~~security-related public information whose modification can compromise the security of a *cryptographic module* (3.1.10)~~

~~EXAMPLE: Public cryptographic keys, public key certificates, self-signed certificates, trust anchors, one-time passwords associated with a counter and internally held date and time.~~

~~Note 1 to entry: A PSP is considered protected if it cannot be modified or if its modification can be determined by the module.~~

~~Note 2 to entry: Here "public key certificates" refers to "public key contained in certificates".~~

~~[SOURCE: ISO/IEC 19790:2012, 3.99, modified — Note 2 to entry has been added.]~~

~~**3.1.12**~~
sensitive security parameter
SSP
critical security parameters (~~*CSP)* (~~3.1.~~11~~10) and public security parameters ~~*(PSP)* (3.1.12)~~

[SOURCE: ISO/IEC 19790:2012, 3.110]

~~**3.1.13**~~
3.1.12
factory default

Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font: Not Bold
Formatted: Font: Not Bold

state of the device after factory reset or after final production/assembly

Note 1 to entry: This includes the physical device and software (including firmware) that is present on it after assembly.

3.1.~~14~~13
fail-safe mode
device or feature which, in the event of failure, responds in a way that causes no harm, or minimizes the harm, to other devices, and causes no danger, or minimizes the danger, to personnel

[SOURCE: ISO 25197:2020, 3.32]

3.2 Abbreviated terms

API	application programming interface
ASLR	address space layout randomization
CPU	central processing unit
CSP	critical security parameter
ICT	information and communication technologies
IoT	internet of things
PIN	personal identification number
PSP	public security parameter
RoT	root of trust
TCB	trusted computing base
SWID	software identification
XML	extensible markup language

4 Overview

IoT systems bring security and privacy risks, and ISO/IEC 27400 provides general information and guidance about these risks and threats to security and privacy. To address these risks, users (organizations and consumers) should implement appropriate controls, which are also detailed in ISO/IEC 27400. ~~For these~~These controls ~~to~~cannot be implemented~~,~~ if the IoT devices do not have ~~to have~~the supporting functionality (process policies, capabilities ~~and processes, and the~~ etc.)

The IoT system developers ~~will~~ are expected to develop their own requirements and seek IoT devices that support ~~necessary functionality~~them. This document provides baseline ICT requirements for IoT devices. In many cases, additional requirements will be imposed or are expected to address the security and privacy risks of specific vertical markets or higher risk environments.

Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: std_publisher
Formatted: std_docNumber
Formatted: std_publisher
Formatted: std_docNumber
Formatted: Font: Not Bold
Formatted: Font: Not Bold

5 Requirements

5.1 Requirements for IoT device policies and documentation

5.1.1 Risk management

5.1.1.1 Requirements

~~(Requirement~~ **5.1.1-.1~~)~~ .1** IoT devices shall have documentation recording the results of a risk assessment process performed at the IoT device level in the context of a risk assessment at the system level.

~~(Requirement~~ **5.1.1-.1.2~~)~~** The risk assessment process shall take into account intended outcomes for the intended use case.

~~(Requirement~~ **5.1.1-.1.3~~)~~** The risk assessment process shall also take into account the needs and expectations of interested parties (e.g. those parties on networks ~~that~~to which the IoT device is connected ~~to~~), including physical and logical undesired effects.

NOTE .1 Risk assessment techniques can be found in IEC 31010 and ISO/IEC 27005.

NOTE .2 IoT device developers will usually perform the risk assessments and produce the risk treatment plans.

~~(Requirement~~ **5.1.1-.1.4~~)~~** The risk assessment shall take into account that IoT devices can be constrained (e.g. limited battery, little memory, 'weak' CPU), which informs the risk treatment process.

~~(Requirement~~ **5.1.1-.1.5~~)~~** Risk assessment and treatment processes shall be defined and applied as follows:

a) determine if ~~a~~ separate risk assessment and treatment processes are necessary for different products;

b) select appropriate risk treatment options, taking account of the risk assessment results;

NOTE ~~3~~1 Sector- or vertical market- specific standards can be used in addition to this document. Such a standard can provide a risk assessment and/or risk treatment plan specific to the sector or vertical market~~, and complying~~. Complying with such standards can be used to satisfy requirements in this document.

c) determine all controls that are necessary to implement the risk treatment option(s) chosen;

d) identify all security and privacy features of the IoT device from the controls identified in c) above;

NOTE ~~4~~ 2 IoT device developers can design features as required or identify them from any appropriate source, such as an industry standard or sector guidance.

e) compare the features identified in ~~5.1.1~~ d) above with those in 5.2, and verify that no necessary features have been omitted;

NOTE ~~5~~ 3 5.2 contains a list of baseline features. Users of this document are directed to 5.2 to ensure that no requirements are overlooked.

Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font color: Custom Color(RGB(33;29;30))
Formatted: Font: Not Bold
Formatted: Font: Not Bold