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Information technology — Data centre facilities and infrastructures —

Part 1: General concepts

Technologie de l'information — Installation et infrastructures de centres de traitement de données —

Partie 1: Concepts généraux

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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/directives or www.iec.ch/members_experts/refdocs).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see patents.iec.ch).

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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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 39, *Sustainability, IT & Data Centres*.

This first edition cancels and replaces the first edition (ISO/IEC TS 22237-1:2018), which has been technically revised.

The main changes are as follows:

— reference to Key Performance Indicators of ISO/IEC 30134 series has been included;

— Clause 7 (Availability) has been revised;

— the design processes (Clause 8) and design principles (Clause 9) have been moved from an annex to the main body of the document;

— the existing Annex A has been removed;

— new Annexes A and B have been added.

A list of all parts in the ISO/IEC 22237 series can be found on the ISO and IEC websites.

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 and www.iec.ch/national-committees.

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Introduction

The unrestricted access to internet-based information demanded by the information society has led to an exponential growth of both internet traffic and the volume of stored/retrieved data. Data centres are housing and supporting the information technology and network telecommunications equipment for data processing, data storage and data transport. They are required both by network operators (delivering those services to customer premises) and by enterprises within those customer premises.

Data centres need to provide modular, scalable and flexible facilities and infrastructures to easily accommodate the rapidly changing requirements of the market. In addition, energy consumption of data centres has become critical, both from an environmental point of view (reduction of carbon footprint), and with respect to economic considerations (cost of energy) for the data centre operator.

The implementation of data centres varies in terms of:

a) purpose (enterprise, co-location, co-hosting or network operator facilities);

b) security level;

c) physical size; and

d) accommodation (mobile, temporary and permanent constructions).

NOTE Cloud services can be provided by all data centre types mentioned.

The needs of data centres also vary in terms of availability of service, the provision of security and the objectives for energy efficiency. These needs and objectives influence the design of data centres in terms of building construction, power distribution, environmental control, telecommunications cabling and physical security. Effective management and operational information are required to monitor achievement of the defined needs and objectives.

The ISO/IEC 22237 series specifies requirements and recommendations to support the various parties involved in the design, planning, procurement, integration, installation, operation and maintenance of facilities and infrastructures within data centres. These parties include:

1) owners, operators, facility managers, ICT managers, project managers, main contractors;

2) consultants, architects, building designers and builders, system/installation designers, auditors, test and commissioning agents;

3) suppliers of equipment; and

4) installers, maintainers.

At the time of publication of this document, the ISO/IEC 22237 series comprises the following documents:

— ISO/IEC 22237-1 (this document), *Information technology — Data centre facilities and infrastructures — Part 1: General concepts*;

— ISO/IEC TS 22237-2, *Information technology — Data centre facilities and infrastructures — Part 2: Building construction*;

— ISO/IEC 22237-3, *Information technology — Data centre facilities and infrastructures — Part 3: Power distribution*;

— ISO/IEC 22237-4, *Information technology — Data centre facilities and infrastructures — Part 4: Environmental control*;

— ISO/IEC TS 22237-5, *Information technology — Data centre facilities and infrastructures — Part 5: Telecommunications cabling infrastructure*;

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— ISO/IEC TS 22237-6, *Information technology — Data centre facilities and infrastructures — Part 6: Security systems*;

— ISO/IEC TS 22237-7: *Information technology — Data centre facilities and infrastructures — Part 7: Management and operational information*.

The inter-relationship of the specifications within the ISO/IEC 22237 series is shown in Figure 1.

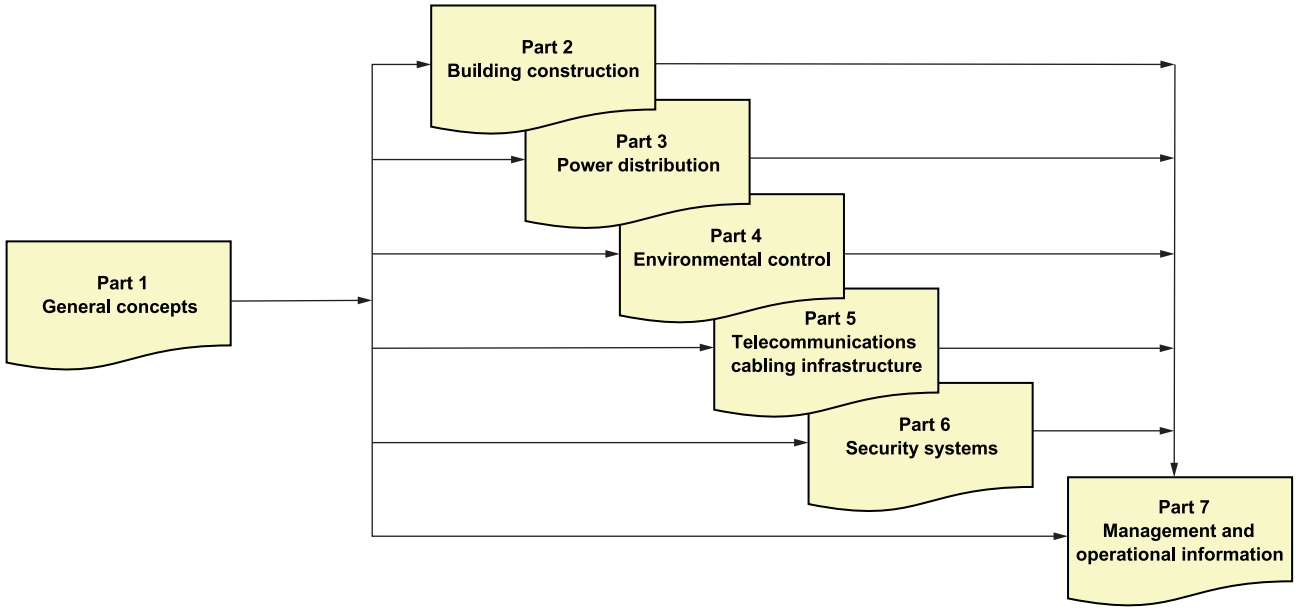


Figure 1 — Schematic relationship between the ISO/IEC 22237 series of documents

This document, ISO/IEC 22237-1, defines the general concepts for the design and operation of data centres. This includes a business risk and operational cost analysis as well as a classification system for data centres with respect to "availability", "physical security" and "energy efficiency enablement".

ISO/IEC TS 22237-2 to ISO/IEC TS 22237-6 specify requirements and recommendations for particular facilities and infrastructures to support the relevant classification for "availability", "physical security" and "energy efficiency enablement" selected from ISO/IEC 22237-1 (this document).

ISO/IEC TS 22237-7 addresses the operational and management information (in accordance with the requirements of this document).

This document is intended for use by and collaboration between architects, building designers and builders, system and installation designers.

The ISO/IEC 22237 series does not address the selection of information technology and network telecommunications equipment, software and associated configuration issues.

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Information technology — Data centre facilities and infrastructures —

Part 1: General concepts

1 Scope

This document:

a) describes the general principles for data centres upon which the requirements of the ISO/IEC 22237 series are based;

b) defines the common aspects of data centres including terminology, parameters and reference models (functional elements and their accommodation) addressing both the size and complexity of their intended purpose;

c) describes general aspects of the facilities and infrastructures required to support data centres;

d) specifies a classification system, based upon the key criteria of "availability", "security" and "energy-efficiency" over the planned lifetime of the data centre, for the provision of effective facilities and infrastructure;

e) details the issues to be addressed in a business risk and operating cost analysis enabling application of the classification of the data centre;

f) provides a reference to the operation and management of data centres.

The following topics are outside of the scope of the ISO/IEC 22237 series:

1) the selection of information technology and network telecommunications equipment, software and associated configuration issues are outside the scope of this International Standard;

2) quantitative analysis of overall service availability resulting from multi-site data centres;

3) safety and electromagnetic compatibility (EMC) requirements (covered by other standards and regulations. However, information given in this document can be of assistance in meeting these standards and regulations).

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 TS 22237-6, *Information technology — Data centre facilities and infrastructures — Part 6: Security systems*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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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 http://www.electropedia.org/

3.1.1
availability
ability to be in a state to perform as required

[SOURCE: IEC 60050-192:2015, 192-01-23, modified — Note 1 to entry and Note 2 to entry deleted.]

3.1.2
building entrance facility
facility (3.1.16) that provides all necessary services, and which complies with all relevant regulations for the entry of specific *infrastructures* (3.1.21) or services into a building

3.1.3
building security
facilities (3.1.16) and *systems* (3.1.30) necessary to provide the required levels of security at the entrance to and within the building containing the *data centre* (3.1.8)

3.1.4
co-hosting data centre
data centre (3.1.8) in which multiple customers are provided with access to network(s), servers and storage equipment on which they operate their own services/applications

Note 1 to entry: Both the information technology equipment and the support *infrastructure* (3.1.21) of the building are provided as a service by the data centre operator.

3.1.5
co-location data centre
data centre (3.1.8) in which multiple customers locate their own network(s), servers and storage equipment

Note 1 to entry: The support *infrastructure* (3.1.21) of the building (such as power distribution and environmental control) is provided as a service by the data centre operator.

3.1.6
computer room space
area within the *data centre* (3.1.8) that accommodates the data processing, data storage and *telecommunication equipment* (3.1.33) that provides the primary function of the data centre

3.1.7
control room space
area within the *data centre* (3.1.8) used to control the operation of the data centre and to act as a central point for all control and monitoring functions

3.1.8
data centre
a structure, or group of structures, dedicated to the centralized accommodation, interconnection and operation of information technology and network *telecommunications* (3.1.31) equipment providing data storage, processing and transport services together with all the *facilities* (3.1.16) and *infrastructures* (3.1.21) for power distribution and environmental control together with the necessary levels of resilience and security required to provide the desired service *availability* (3.1.1)

Note 1 to entry: A structure can consist of multiple buildings and/or spaces with specific functions to support the primary function.

Note 2 to entry: The boundaries of the structure or space considered the data centre, which includes the information and communication technology equipment and supporting environmental controls, can be defined within a larger structure or building.

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[SOURCE: ISO/IEC 30134-1:2016, 3.1.4]

3.1.9
data centre security
necessary *facilities* (3.1.16) and *systems* (3.1.30) that provide the required levels of security at the entrance to and within the *data centre* (3.1.8)

3.1.10
demarcation point
point where the operational control or ownership changes

3.1.11
electrical distribution space
area used for housing facilities to distribute electrical power between the *transformer space* (3.1.36) and *electrical spaces* (3.1.12) within the *data centre* (3.1.8) or elsewhere within the premises or individual buildings within the premises

3.1.12
electrical space
area within the *data centre* (3.1.8) used for housing *facilities* (3.1.16) to deliver and control electrical power to the data centre spaces (including switchboards, batteries, *uninterruptible power systems* (3.1.37) (UPS), etc.)

3.1.13
enterprise data centre
data centre (3.1.8) that is operated by an enterprise which has the sole purpose of the delivery and management of services to its employees and customers

3.1.14
external premises security
facilities (3.1.16) and *systems* (3.1.30) that provide the required levels of security for the area between the building and the boundary of the premises

3.1.15
energy efficiency enablement
ability to measure the energy consumption and to allow calculation and reporting of energy efficiency of the various *facilities* (3.1.16) and *infrastructures* (3.1.21)

3.1.16
facility
spaces and pathways that accommodate a specific *infrastructure* (3.1.21)

3.1.17
functional capability
ability of the *data centre* (3.1.8) (or *system* (3.1.30) or sub-system) to deliver its intended function

3.1.18
functional element
source of supply, device or path

3.1.19
generator space
area used for housing the installation of electrical power supply generation equipment together with control *systems* (3.1.30), storage of associated fuels or energy conversion equipment

3.1.20
holding space
area within the *data centre* (3.1.8) used for the holding of equipment prior to being brought into service or having been taken out of service

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3.1.21
infrastructure
technical *systems* (3.1.30) providing *functional capability* (3.1.17) of the *data centre* (3.1.8)

Note 1 to entry: Examples are power distribution, environmental control and *physical security* (3.1.25).

3.1.22
main distributor
distributor used to make connections between the main distribution cabling subsystem, network access cabling subsystem and cabling subsystems and active equipment

[SOURCE: ISO/IEC 11801-5:2017, 3.1.11, modified — removed “as specified in ISO/IEC 11801-1”.]

3.1.23
mechanical space
area that is used for housing mechanical equipment and *infrastructure* (3.1.21) that provides environmental control for the *data centre* (3.1.8) spaces (including chillers and water treatment, air handling and fire suppression *systems* [3.1.30])

3.1.24
network operator data centre
data centre (3.1.8) that has the primary purpose of the delivery and management of broadband services to the operator's customers

3.1.25
physical security
measures (combining physical and technological controls), procedures and responsibilities to maintain the desired level of *availability* (3.1.1) for the *facilities* (3.1.16) and *infrastructures* (3.1.21) of the *data centres* (3.1.8) in relation to access control and environmental events

3.1.26
planned downtime
period of time during which a *system* (3.1.30) or sub-system does not provide *functional capability* (3.1.17) whilst it undergoes maintenance or is switched off to test the response of a related system or sub-system

3.1.27
premises entrance facility
facility (3.1.16) that provides all necessary services, and which complies with all relevant regulations, for the entry of specific *infrastructures* (3.1.21) or services into premises

3.1.28
reliability
ability to perform as required, without failure, for a given time interval, under given conditions

[SOURCE: IEC 60050-192:2015, 192-01-24, modified — Note 1 to entry to Note 3 to entry deleted.]

3.1.29
storage space
secured area where general goods and/or *data centre* (3.1.8) goods to be used in the premises and data centre are stored

3.1.30
system
set of interrelated *functional elements* (3.1.18) considered in a defined context as a whole and separated from their environment

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3.1.31
telecommunications
branch of technology concerned with the transmission, emission, and reception of signs, signals, writing, images, and sounds, that is, information of any nature by cable, radio, optical, or other electromagnetic *systems* (3.1.30)

[SOURCE: ISO/IEC 11801-1:2017, 3.1.51, modified.]

3.1.32
telecommunications cabling
infrastructure (3.1.21) from the *telecommunications space(s)* (3.1.34) to the *premises entrance facility* (3.1.27)

3.1.33
telecommunication equipment
equipment within the *data centre* (3.1.8) that provides telecommunication services within the data centre

3.1.34
telecommunications space
area which may house *demarcation points* (3.1.10) and *telecommunication equipment* (3.1.33) associated with the *building entrance facility* (3.1.2) and which may allow service providers restricted access to the *data centre* (3.1.8)

3.1.35
testing space
area within the *data centre* (3.1.8) used for the testing and configuring of equipment prior to being brought into service

Note 1 to entry: Testing space is sometimes called staging area.

3.1.36
transformer space
area used for housing equipment necessary to convert voltage levels and/or provide necessary isolation for the connection to the equipment within the premises or individual buildings within the premises

3.1.37
uninterruptible power system
combination of convertors, switches and energy storage devices (such as batteries), constituting a power *system* (3.1.30) for maintaining continuity of load power in case of input power failure

Note 1 to entry: Continuity of load power occurs when voltage and frequency are within rated steady-state and transient tolerance bands and with distortion and interruptions within the limits specified for the output port. Input power failure occurs when voltage and frequency are outside rated steady-state and transient tolerance bands or with distortion or interruptions outside the limits specified for the UPS.

[SOURCE: IEC 62040-1:2017, 3.101]

3.1.38
unplanned downtime
unexpected time taken, following a failure of *functional capability* (3.1.17), to repair the relevant *infrastructure* (3.1.21) together with the "re-boot" time necessary to recover functional capability following that repair

3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

CRAC computer room air conditioner/conditioning

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