TECHNICAL SPECIFICATION

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# Information technology — Data centre facilities and infrastructures —

## Part 4: Environmental control

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

*Partie 4: Contrôle environnemental*

Reference number
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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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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).

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommitte SC 39, *Sustainability for and by Information Technology.*

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

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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 economical 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;

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

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 and physical security. Effective management and operational information is required to monitor achievement of the defined needs and objectives.

The ISO/IEC TS 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, facility managers, ICT managers, project managers, main contractors;

2) architects, building designers and builders, system and installation designers;

3) facility and infrastructure integrators, suppliers of equipment;

4) installers, maintainers.

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

ISO/IEC TS 22237-1, *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 TS 22237-3, *Information technology — Data centre facilities and infrastructures — Part 3: Power distribution*;

ISO/IEC TS 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*;

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

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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 TS 22237 series is shown in Figure 1.

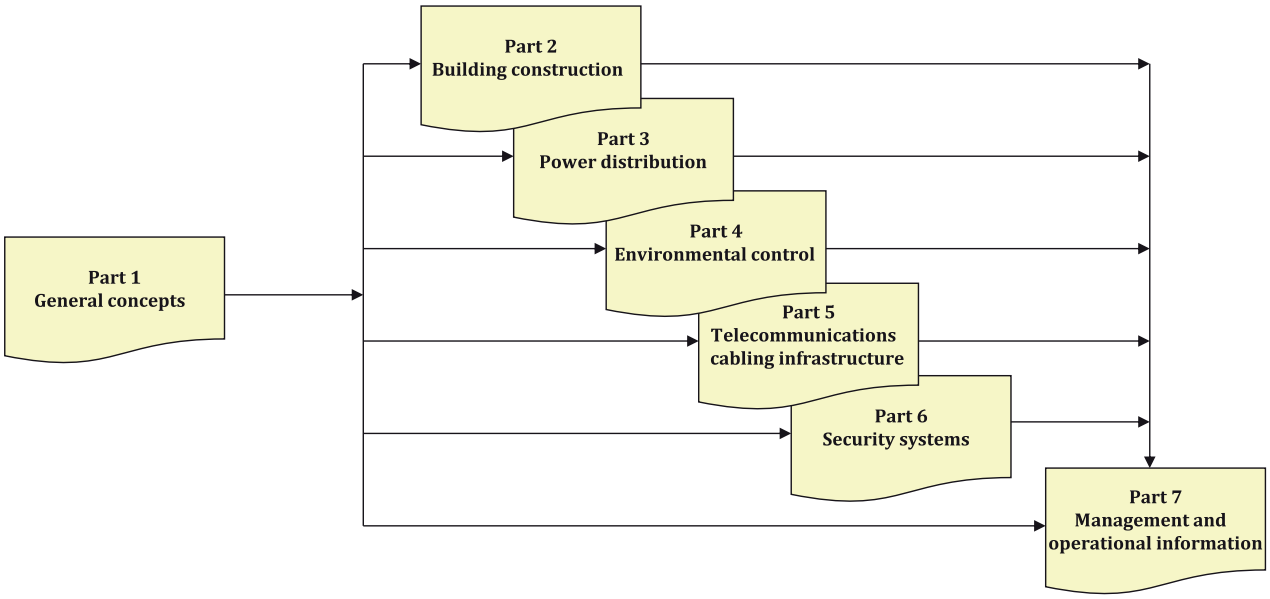



**Figure 1 — Schematic relationship between the ISO/IEC TS 22237 series of documents**

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 TS 22237-1.

This document addresses the environmental control facilities and infrastructure within data centres together with the interfaces for monitoring the performance of those facilities and infrastructures in line with ISO/IEC TS 22237-7 (in accordance with the requirements of ISO/IEC TS 22237-1).

ISO/IEC TS 22237-7 addresses the operational and management information (in accordance with the requirements of ISO/IEC TS 22237-1.

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

The ISO/IEC TS 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 4: Environmental control

## 1 Scope

This document addresses environmental control within data centres based upon the criteria and classifications for "availability", "security" and "energy efficiency enablement" within ISO/IEC TS 22237-1.

This document specifies requirements and recommendations for the following:

a) temperature control;

b) fluid movement control;

c) relative humidity control;

d) particulate control;

e) vibration;

f) floor layout and equipment locations;

g) energy saving practices;

h) physical security of environmental control systems.

Issues related to electromagnetic environment can be found in ISO/IEC TS 22237-6.

## 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 22237-1, *Information technology — Data centre facilities and infrastructures — Part 1: General concepts*

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 terms and definitions in ISO/IEC TS 22237-1 and the following apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

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— ISO Online browsing platform: available at https://www.iso.org/obp

**3.1.1**
**adiabatic cooling**
cooling system that uses the evaporative cooling principle to reduce the air temperature

**3.1.2**
**absolute humidity**
quantity of water vapour in a given volume of air

Note 1 to entry: Expressed by mass.

**3.1.3**
**access floor**
system consisting of completely removable and interchangeable floor panels that are supported on adjustable pedestals connected by stringers to allow the area beneath the floor to be used by building services

Note 1 to entry: Also known as “raised floor”.

[SOURCE: ISO/IEC TS 22237-2:2018, 3.1.1]

**3.1.4**
**comfort environmental controls**
controls which produce an environment which is appropriate for the effective performance of personnel in a given space

**3.1.5**
**dew point**
temperature at which the water vapour in a gas begins to deposit as a liquid or ice, under standardized conditions

[SOURCE: IEC 60050-212:2010, 212-18-11]

**3.1.6**
**exhaust air temperature**
temperature of the air leaving the data centre building or the temperature of the air leaving the heat load

**3.1.7**
**fresh air cooling**
cooling system that uses the external air to cool the data centre either directly or indirectly

**3.1.8**
**heat load**
thermal power that is produced

**3.1.9**
**information technology equipment**
equipment providing data storage, processing and transport services together with equipment dedicated to providing direct connection to core and/or access networks

**3.1.10**
**outdoor air temperature**
temperature of the air measured outside of the data centre building

**3.1.11**
**relative humidity**
ratio, expressed as a percentage, of the vapour pressure of water vapour in moist air to the saturation vapour pressure with respect to water or ice at the same temperature

[SOURCE: IEC 60050-705:1995, 705-05-09]


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**3.1.12**
**return air temperature**
temperature of the air re-entering the environmental control system, e.g. the air handling unit

**3.1.13**
**supply air temperature**
temperature of the air entering the IT equipment

**3.1.14**
**ventilation**
supply of air motion in a space by circulation or by moving air through the space

Note 1 to entry: Ventilation can be produced by any combination of natural or mechanical supply and exhaust.

Note 2 to entry: Such systems can include partial treatment such as heating, relative humidity control, filtering or purification, and, in some cases, evaporative cooling.

## 3.2 Abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO/IEC TS 22237-1 and the following apply.

| | |
|---|---|
| UPS | Uninterruptible Power Supply |
| CRAC | Computer Room Air Conditioning (Unit) |
| IT | Information Technology |
| ITE | Information Technology Equipment |

# 4 Conformance

For a data centre to conform to this document:

a) it shall feature an environmental control solution that meets the requirements of Clauses 4 and 5;

b) it shall feature an approach to physical security in relation to the environmental control solution that meets the requirements of Clause 6;

c) it shall feature an energy efficiency enablement solution that meets the requirements of the relevant Granularity Level of Clause 7;

d) local regulations, including safety, shall be met.

# 5 Environmental control within data centres

## 5.1 General

### 5.1.1 Functional elements

The environmental control system is one of the most important parts of the data centre infrastructure. Excessive variations of temperature or relative humidity can directly affect the functional capability of the data centre and its infrastructures.

The functional elements of the environmental control system are divided into primary and secondary elements.

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