



Technical Specification

**ISO/IEC TS
22237-31**

Information technology — Data centre facilities and infrastructures —

Part 31: Key performance indicators for resilience

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

Partie 31: Indicateurs clés de performance pour la résilience

**Second edition
2026-02**



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2026

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms, definitions, symbols and abbreviated terms	1
3.1 Terms and definitions	1
3.2 Symbols and abbreviated terms	6
3.2.1 Symbols	6
3.2.2 Abbreviated terms	7
4 Area of application	8
4.1 General	8
4.2 DCI service definition	8
5 Resilience considerations as part of the life cycle	9
5.1 Implementation in the design process	9
5.1.1 General	9
5.1.2 Phase 1 — Strategy	9
5.1.3 Phase 2 — Objectives	10
5.1.4 Phase 3 — System specifications	10
5.1.5 Phase 4 — Design proposal	10
5.1.6 Phase 6 — Functional design	10
5.1.7 Phase 8 — Final design and project plan	10
5.1.8 Phase 10 — Construction	11
5.1.9 Phase 11 — Operation	11
5.2 Documentation during operation	11
5.3 Documentation of resilience level	11
5.3.1 General	11
5.3.2 Requirements	12
5.4 Documentation of dependability	12
5.4.1 Requirements	12
5.4.2 Recommendations	12
5.5 Documentation of fault tolerance	12
5.6 Documentation of availability tolerance	12
5.6.1 Requirements	12
5.6.2 Recommendations	12
6 Determination of KPIs for resilience	13
6.1 General	13
6.2 Structuring of the KPIs for resilience	13
6.2.1 General	13
6.2.2 KPIs	14
6.2.3 Metrics	15
6.3 Dependability	16
6.3.1 Provided KPIs	16
6.3.2 Reliability	17
6.3.3 Availability	18
6.3.4 Failure rate	19
6.4 Fault tolerance	20
6.4.1 General	20
6.4.2 Single point of failure (SPoF)	20
6.4.3 Double point of failure (DPoF)	20
6.5 Availability tolerance	20
6.5.1 General	20
6.5.2 Single point of reduced availability (SPoRA)	21
6.5.3 Double point of reduced availability (DPoRA)	21

6.6	Resilience level (RL).....	21
6.6.1	General	21
6.6.2	Operation at normal resilience level.....	22
6.6.3	Operation at reduced resilience level (RRL).....	23
6.7	Application to data centre infrastructures.....	24
6.7.1	Methodology and analysis considerations.....	24
6.7.2	Analysis process	25
6.7.3	Method of reliability block diagrams (RBD).....	25
6.7.4	Method of failure mode effects and criticality analysis (FMECA)	26
Annex A (informative) Failure mode effects and criticality analysis.....		27
Annex B (informative) Dependability data		29
Annex C (informative) Resilience analysis for DCIs.....		47
Annex D (informative) SPoF Analysis for DCIs.....		52
Annex E (informative) Resilience level analysis for DCIs.....		55
Annex F (informative) Interval of confidence		57
Bibliography.....		60

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).

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>. 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. 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 and data centres*.

This second edition cancels and replaces the first edition (ISO/IEC TS 22237-31:2023), which has been technically revised.

The main changes are as follows:

- Annex B was added to provide dependability data for items of data centre infrastructures;
- all subsequent annexes were reviewed and reordered;
- terms and definitions were clarified.

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.

Introduction

The various parts of the ISO/IEC 22237 series reference four qualitative Availability Classes as well as structural definitions to categorize different designs. The documents also refer to resilience criteria in order to improve structural requirements for a qualitative approach.

In order to meet the requirements for evaluating or comparing different designs or for validating service level agreements (SLAs) for data centres, this document introduces quantitative metrics as key performance indicators (KPIs). The proposed KPIs cover resilience attributes, including dependability and fault tolerance metrics. The characteristics of aging of infrastructures are covered by reliability criteria.

Through the use of KPIs, the comparison of designs, functional elements and components of infrastructure designs becomes possible. In addition, it is possible to optimize data centre infrastructures (DCIs) with holistic targets. It is recommended to use the KPIs of this document in combination with the efficiency and sustainability KPIs of the ISO/IEC 30134 series.

ISO/IEC 22237-1:2021, Annex A, demonstrates that a single KPI, such as Availability, is not sufficient to describe the complexity of a DCI. In recognition, this document has been developed in order to compare and value different designs with different Availability Classes of DCIs based on a set of selected KPIs.

Furthermore, this document has been created to establish KPIs for resilience of DCIs with defined resilience levels. The resilience objectives can vary depending on the outcome of the ISO/IEC 22237-1 risk analysis, the process criticality of the end user's information technology equipment (ITE), and the data centre type of business.

Using the different stages of a data centre design process, this document describes in which phases the application of KPIs for resilience is appropriate. With its assistance, data centre designers, planners and operators will be supported in defining resilience levels, performing theoretical assessments and designing and operating DCIs which are able to meet SLAs.

Information technology — Data centre facilities and infrastructures —

Part 31: Key performance indicators for resilience

1 Scope

This document:

- a) defines metrics as key performance indicators (KPIs) for resilience, dependability, fault tolerance and availability tolerance for data centres;
- b) covers the data centre infrastructure (DCI) of power distribution and supply, and environmental control;
- c) can be referred to for covering further infrastructures, e.g. telecommunications cabling;
- d) defines the measurement and calculation of the KPIs and resilience levels (RLs);
- e) targets maintainability, recoverability and vulnerability;
- f) provides examples for calculating these KPIs for the purpose of analytical comparison of different DCIs.

This document does not apply to IT equipment, cloud services, software or business applications.

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

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 30134-1, *Information technology — Data centres — Key performance indicators — Part 1: Overview and general requirements*

Bibliography

- [1] U. Müller, K. Strunz, *Resilience of data centre power system: modelling of sustained operation under outage, definition of metrics, and application*, IET The Institution of Engineering and Technology, Journal of Engineering, Vol. 2019 Iss. 12, pp. 8419-8427
- [2] IEEE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS. Power & Energy Society, Industry Technical Support Task Force, Technical Report PES-TR65, April 2018, *The Definition and Quantification of Resilience*
- [3] ITIC Information Technology Industry Council, CBEMA Computer Business Equipment Manufacturers Association curve
- [4] IEEE Institute of Electrical and Electronics Engineers Std 493, 2007, *Design of reliable industrial and commercial power systems*
- [5] IEC 60050-192:2015, *International Electrotechnical Vocabulary (IEV)*
- [6] IEC 60300, *Dependability management*
- [7] IEC 60605-4, *Equipment reliability testing - Part 4: Statistical procedures for exponential distribution - Point estimates, confidence intervals, prediction intervals and tolerance intervals*
- [8] IEC 60812, *Failure modes and effects analysis (FMEA and FMECA)*
- [9] IEC 61025, *Fault tree analysis*
- [10] IEC 61165, *Application of Markov techniques*
- [11] IEC 62551, *Analysis techniques of Dependability – Petri net techniques*
- [12] ISO/IEC/TS 22237-7:2018, *Information technology — Data centre facilities and infrastructures — Part 7: Management and operational information*
- [13] ISO/IEC 22237-5, *Information technology — Data centre facilities and infrastructures — Part 5: Telecommunications cabling infrastructure*
- [14] HALE P.S., ARNO R.G., DYLIS D.D. *Reliability and availability data collection program for power distribution, power generation, and HVAC components of commercial industrial, and utility installations*, IEEE Systems Technical Conference on Industrial and Commercial Power 2005, Saragota Springs, NY, USA, 2005, pp. 199-203, © 2005 IEEE
- [15] IEC 61078, *Reliability block diagrams*