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EN 50600 Data Center Standard – What is new?

What you need to know about the EN 50600

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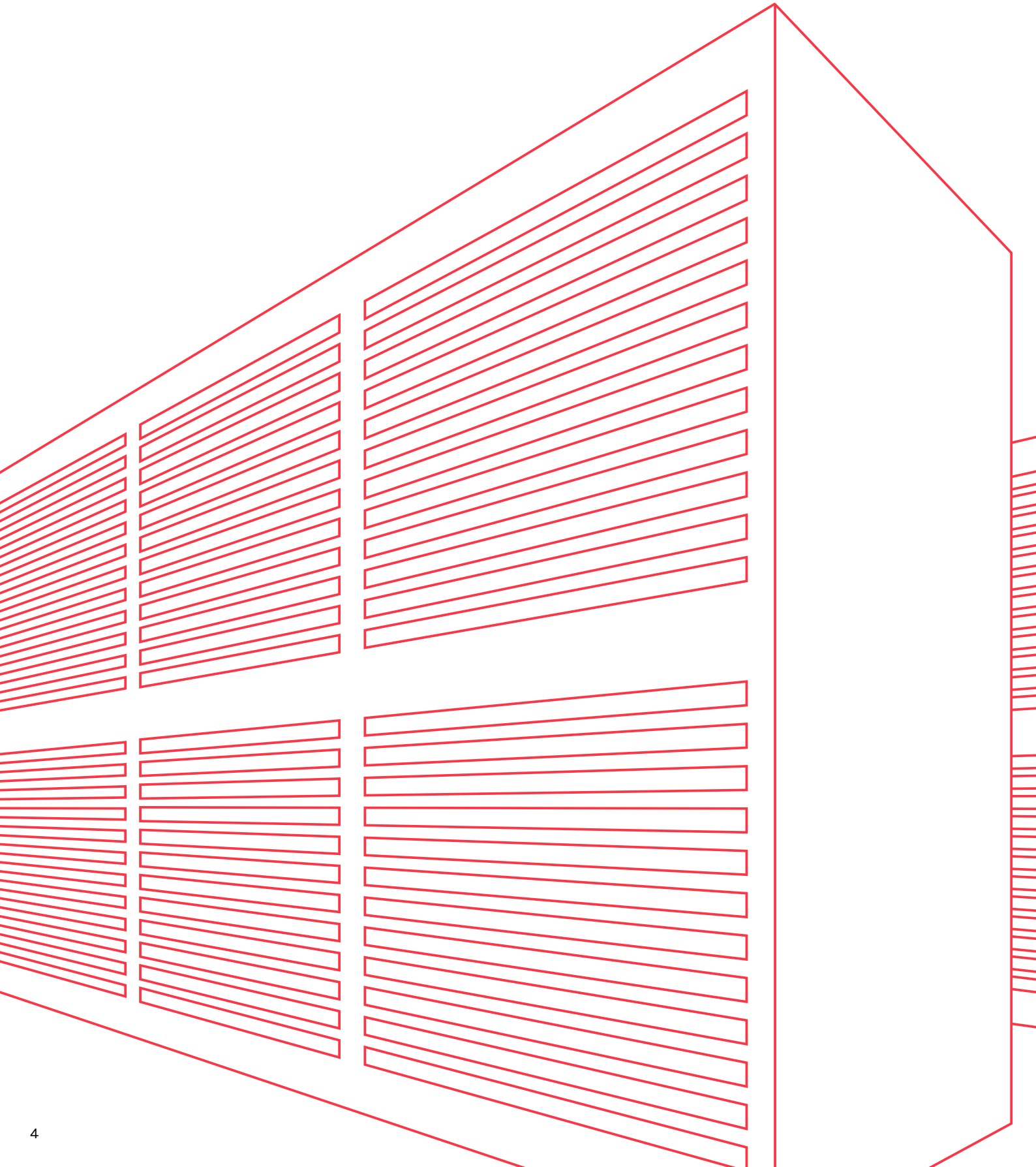


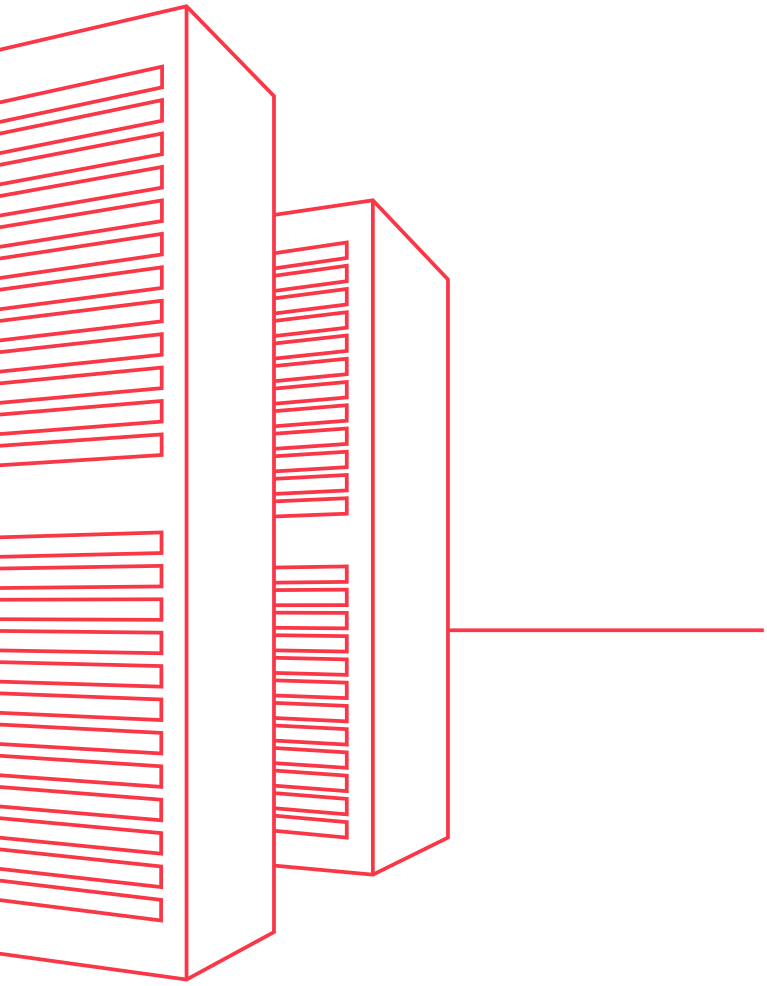
1. Introduction

This whitepaper is focused on providing an overview and update of the European standard for data centers EN 50600 and how a data center operator can achieve conformity to the standard.

You often read in the news about massive investments made in the data center industry. Although the data center industry has gained more awareness among the public, many people are still unaware that data centers have become greatly integrated indirectly into their life: every touch of the screen of a mobile phone or pressing a key of a computer keyboard results in an action somewhere in a piece of IT equipment in a data center. While it is important to raise awareness on how important data centers are, it is also the mission of the data center industry not to create negative headlines, by showing what end-users might experience when something goes wrong.

Mission-critical infrastructure for data centers means that measures need to be taken, in order to ensure the reliability of the IT-infrastructure – this leads to the European standard EN 50600.

The first comprehensive EN 50600 standard was released in 2016. In 2022 the first edition of this white paper was released in order to provide an overview of the standard and its DNA. With this updated release a focus is set to the ongoing development of the EN 50600 standard for achieving a more practical approach (parts 2-x) and to extend the energy-saving efforts (parts 4-x and part 5).



2. The EN 50600 – from where we came

The first discussions about a European standard for data centers go back to even before 2010. Back then the working groups for networking/cabling standards such as the EN 50173 and EN 50174 have introduced the idea of an European data center standard.

Resulting from those first discussions, in 2011 an initiative to develop a guideline for data centers was presented to CENELEC (short CLC), the European Committee for Electrotechnical Standardization.

With over 34 members (one member per country) the CENELEC is an international standardization body in the European Union. CENELEC recognized the potential for the new European standard and decided to form an official project group.

For this initiative, the number '50600' was assigned. From the first ideas to the first drafts of 'Part 1: General Concepts' of the standard, the EN 50600-1, it took about 18 more months.

Today EN 50600 consists of various parts, subdivided into several standard documents.

- Part 1: General Concepts
- Part 2: Data Center Design
- Part 3: Data Center Operation
- Part 4: Efficiency
- Part 5: Maturity
- Part 99: Best practices

3. EN 50600 – where we are

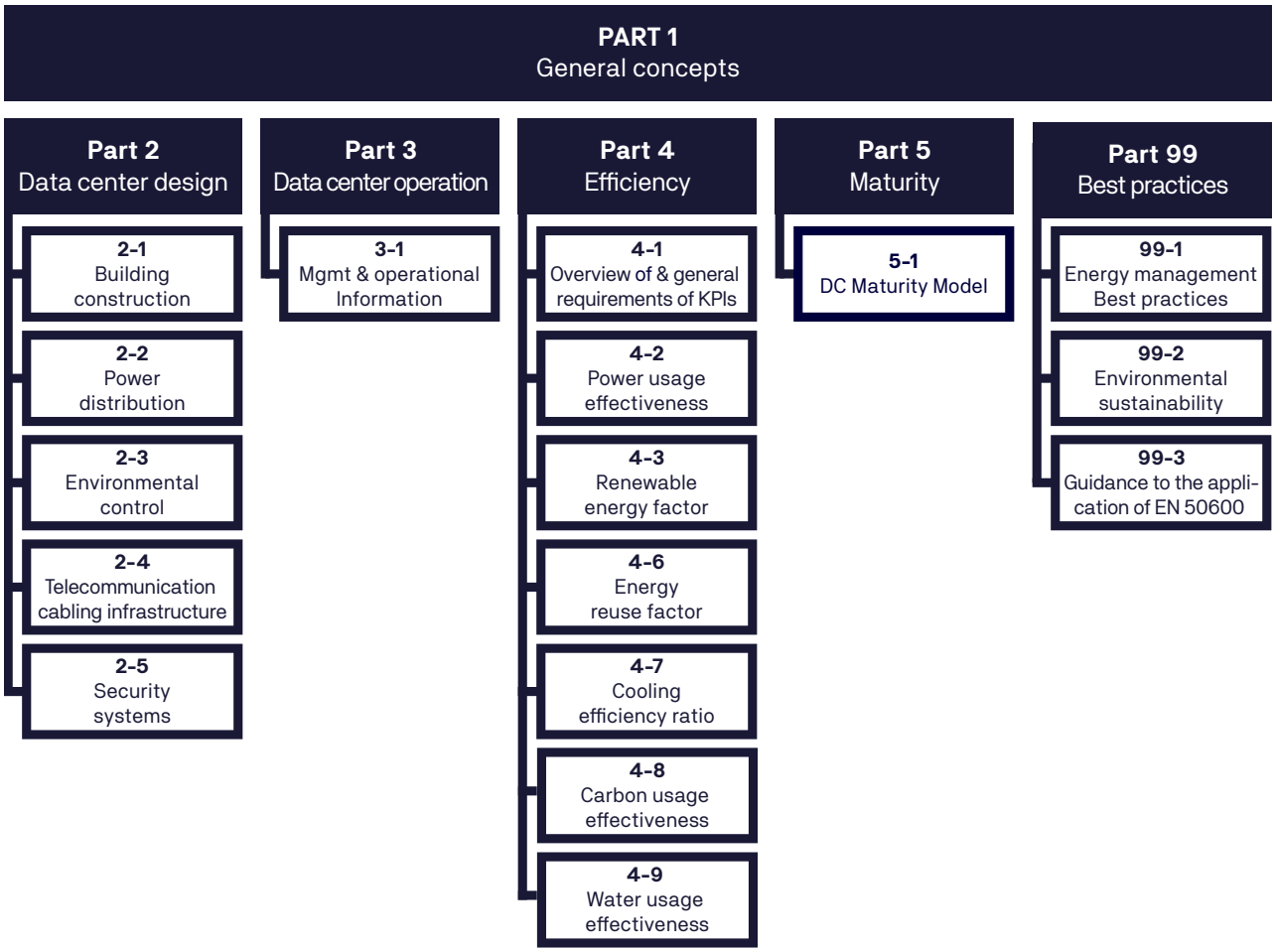


Figure 1: The expanded scope of EN 50600 today

There is a continuous update and development process regarding the EN 50600 standard. This results in an expanded scope. The standard specifies general requirements for all kinds of data centers irrespective of their size and physical construction:

- it describes general aspects of the facilities and infrastructure required to support effective operation of telecommunications within data centers,
- it specifies a classification system, based upon the key criteria of “availability”, “security” and “energy efficiency” over the planned lifetime of the data center, for the provision of effective facilities and infrastructure, and
- it describes the general design principles for data centers upon which the requirements of the EN 50600 series are based, including symbols, labels, coding in drawings, quality assurance and education.

3.1 Parts 1 - 3

Parts 1 – 3 have been developed from the very beginning. Since 2016 several standards within these parts have been updated. The following list shows each of these standards with a short overview of its contents and its latest release date as well as a comment on its major modifications.

50600-1: General Concepts
Current Version released 2019

- Business risk analysis
- Spaces and facilities
- Availability
- Physical security
- Energy efficiency
- Design of data centers

Major Modifications

- Clause of availability has been revised. The availability classes are specified more homogeneously.
- The design processes and design principles have been moved from an annex to the main body of the document.

50600 2-1: Building Construction
Current Version released 2021

- Location
- Site
- Outside spaces
- Building construction
- Design of data center spaces
- Construction of data center spaces
- Fire compartments and fire barriers

Major Modifications

- the interrelationship between EN 50600-2-1 and EN 50600-2-5 concerning constructional prerequisites for the implementation of security concepts and desired security systems has been more clearly presented;
- Clause “Site configuration” has been split and relevant subclauses have been moved into a new Clause “Outside spaces”;
- Clause “Building construction” has been completely reworked to present all requirements and recommendations in a single clause
- Clause “Data center spaces and access routes” has been revised to focus on the design of data center spaces
- A new Clause “Construction of data center spaces” has been added;
- Clause “Fire compartments, fire barriers and fire suppression systems” has been revised.

50600 2-2: Power Supply and Distribution
Current Version released 2019

- Functional elements and dimensioning
- Availability
- Physical security
- Energy efficiency

Major Modifications

- Clause “Power supply and power distribution in DCs” has been updated.
- Availability classes has been aligned to EN 50600-1
- Availability class 3 requires n+1 additional power sources in case of solely primary sources.
- The CEP-bridge has to be monitored.
- The requirements of granularity levels have been modified
- The requirements for physical security
- have been updated, especially regarding power distribution spaces.

3rd edition is on it’s way!

50600 2-3: Environmental Control
Current Version released 2019

- Environmental control of data center spaces
- Availability
- Physical security
- Energy efficiency

Major Modifications

- Environmental control of various DC areas has been updated.
- Availability classes have been aligned to EN 50600-1, especially “extended class 4” has been removed.
- The measurement requirements of granularity levels have
- been modified.

3rd edition is on its way!

50600 2-4: Telecommunications Cabling Infrastructure

Current Version released 2023

- Cabling within the data center
- Implementation of cabling in accordance with
- EN 50173-5
- Physical Security
- Availability classification
- Management and operation

Major Modifications

- The document setup has been completely revised.
- The availability classes have been updated.
- Clause “Physical measurements” has been added.
- Several appendixes have been added for a better understanding.

50600 2-5: Security Systems

Current Version released 2021

- Physical Security
- Protection against unauthorized access
- Protection against intrusion to data center spaces
- Protection against fire events igniting within data center spaces
- Protection against environmental events (other than fire) within data center spaces
- Protection against environmental events outside the data center spaces
- Systems to prevent unauthorized access and intrusion

Major Modifications

- Technical update to all clauses in response to user feed-back.
- New clause on protection classes against intrusion to data center spaces added and clause “Protection against unauthorized access” restructured accordingly.
- References to relevant provisions of EN 50600-2-1:2021 added.
- Various editorial updates.

New: 50600 2-10: Earthquake Risk and Impact Analysis

Current Version released 2021

- Availability Class
- Overview of seismic risk
- Risk assessment of seismic activity
- Risk reduction
- Disaster recovery planning

50600 3-1: Management and Operational Information

Current Version released 2016

- Operational information and parameters
- Acceptance tests
- Operational processes
- Management processes

2nd edition is on its way!

3.2 Part 4

50600 4-1: Overview of and General Requirements for Key Performance Indicators

Current Version released 2017

Part 4 was published for the first time in 2017. PUE was defined as the first KPI. There was a need for further efficiency-KPIs of resources like water, renewable energies, and IT equipment. Part 4 of EN 50600 is harmonized with the KPIs from ISO 30134. The following list shows each of these standards with a short overview.

- KPIs for DC resource usage effectiveness
- General information regarding the use of KPIs
- Specifies a common structure, definitions, terminology and boundary conditions for KPIs
- Requirements for measurement points and procedures

50600 4-2: Power Usage Effectiveness

Current Version released 2019

- Total DC energy / IT energy
- 3 categories depending on the measurement.
- Design PUE, interims PUE and partial PUE
- Reporting requirements

Major Modifications

- All forms of energy shall be included, not only electricity.
- New calculation examples for different energy sources like district cooling, cogeneration, or PV
- Measuring points were described more precisely.

50600 4-3: Renewable Energy Factor

Current Version released 2019

- Energy from renewable sources / total DC energy
- REF as an incentive to avoid CO_2 emissions.
- Examples of calculation

Major Modifications

- All forms of renewables shall be included, not only electricity.
- Consideration of on-site generation and certificates has been specified by examples.
- Renewable energy conversion factors are provided, e.g. to calculate thermal power equivalents

50600 4-6: Energy Reuse Factor

Current Version released 2020

- Reused DC energy / total DC energy
- DC waste heat utilization using heat pumps.
- Measuring of heat reuse

Major Modifications

- Updated definitions for the reuse of energy,
- Examples for the DC internal and external energy reuse
- Effect of different DC boundaries, e.g. heat pump ownership: DC vs. 3rd party.

50600 4-7: Cooling Efficiency Ratio

Current Version released 2020 (first edition)

- Total heat removed / electrical energy used by the DC cooling system
- Measuring by heat meters
- The entire DC cooling system in operation is considered
- Relationship to energy reuse factor

50600 4-8: Carbon Usage Effectiveness

Current Version released 2022 (first edition)

- DC CO_2 emissions / IT energy
- 2 categories depending on the measurement.
- CO_2 equivalents for refrigerants etc.
- Design CUE for DC planning
- Relation to power usage effectiveness

50600 4-9: Water Usage Effectiveness

Current Version released 2022 (first edition)

- DC water consumption / IT energy
- 3 categories depending on the measurement.
- Water qualities, water stress and land consumption as evaluation factors
- Measuring of water usage
- Water reuse factor: reused water / water input

3.3 Part 5

In addition to the issues of availability and security, EN 50600 also addresses the sustainability of DC. Part 5 of the EN 50600 defines a DC Maturity Model (DCMM) for energy management and environmental sustainability. The DCMM is based on the best practices of parts 99-1 and 99-2, which were derived from the JRC1 EU Code of Conduct for Data Centers. With the revision in 2022 the parts 99-1 und 99-2 were integrated into part 5-1. Since 2023 the best practices have been listed in the DCMM.

50600-5-1:2023 Maturity Model for Energy Management and Environmental Sustainability

Current Version released 2023

- 5 maturity degrees depending on the quantity and quality of the Best Practices
- DC elements: infrastructure, ICT equipment and software, management and reporting
- Expected practices for existing, new build or retrofit and entire DC

Major Modifications

- Parts 99-1 und 99-2 were integrated.
- Best Practices were updated to the current state of the art in 2023
- Assignment of Best Practices to individual maturity degrees
- No more values of practices (see part 99-1)

[1] Joint Research Centre (europa.eu)

3.4 Part 99

The following two standards as part of the overall scope of the EN 50600 were derived from the EU Code of Conduct for Data Centers Best Practices (TR = technical report). The third part of the 99-series deals with application hints of the whole EN 50600 framework.

CLC/TR 50600-99-1: Recommended Practices for Energy Management

Current Version released 2021-12

- DC elements: infrastructure, ICT equipment and software, management and reporting
- Value of practices to indicate the level of benefit to be expected.

Major Modifications

- Best Practices were updated to the current state of the art in 2021.
- Reporting of KPIs (e.g. PUE, CER, REF)

CLC/TR 50600-99-2: Recommended Practices for Environmental Sustainability

Current Version released 2021

- Focus on Best Practices for resource efficiency
- DC processes: Life Cycle Assessment and environmental management (ISO 14001)
- Embodied impact of ICT equipment and DC infrastructure
- Source energy mix and water, carbon footprint

Major Modifications

- Best Practices for life cycle costing
- Circularity and the use of 2nd life hardware
- Update of Best Practices for water reuse

CLC/TR 50600-99-3: Guidance to the application of EN 50600 series

Current Version released 2018

Currently, it is being discussed whether these parts are still necessary or if they can be withdrawn completely. Especially because the contents of CLC/TR 50600-99-1 and -2 have been processed in the new EN 50600-5.

4. EN 50600 – who is addressed?

The EN 50600 standard involves various parties that are involved in the design, planning, procurement, integration, installation, operation and maintenance of facilities and infrastructures within data centers.

In Part 1: "General Concepts" of the EN 50600, these parties include:

MANAGEMENT	DESIGN & CONSTRUCTION	EQUIPMENT
▪ Owner ▪ Facility management ▪ Project manager ▪ Main contractor	▪ Consultants ▪ Architects ▪ Building designers ▪ Construction companies ▪ System and installation designers	▪ Suppliers of equipment ▪ Maintenance and installation companies

Figure 2: Parties addressed by the EN 50600

It should be pointed out that three parties are not included:
- Auditors and Inspection Teams
- Law Makers and Governments
- Insurance companies

Auditors and inspection teams are not included because the EN 50600 standard is designed as a guideline. Therefore, it does not include an evaluation scheme which is necessary for neutral, comparable and consistent assessments.

A lack of an official defined evaluation scheme causes data center evaluators to come up with their own interpretation which results in assessments offered in the market to be different and not comparable.

Another stakeholder that benefits from EN 506000 here are governments or supervising institutions, as they can make use of EN 50600 in their law-making.
One example of this is the Greek government concerning the Law 5069/2023, where in Article 330 they reference EN 50600-2-5:2021 as a minimum standard in relation to fire protection requirements for newly built data centers.

Wherever there is a high financial risk, there might be an insurance company with a corresponding service. It is known that certain insurance companies do cover enterprise data centers and co-locaters in case of downtime. They may make use of such a standard by demanding compliance to EN 50600 in case an operator wants to be insured. Another possibility is to lower their rates if an operator is compliant.

5. Compliance with EN 50600

EN 50600 has a general setup of how a typical standard is structured. Important to note about the setup is that it includes a conformance clause, which defines what a data center operator needs to fulfill to achieve conformance.
EN 50600 generally differentiates between:

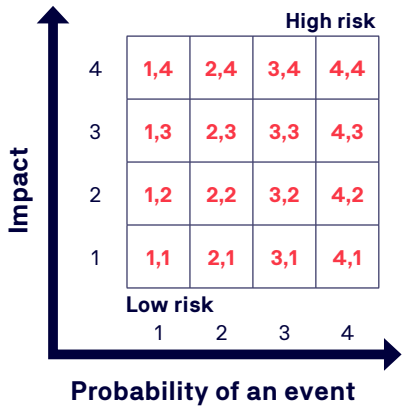
- **Recommendations**: are not mandatory for conformance. They address special aspects which should be taken into account from a best practice perspective. They are usually classified by the words “should” or “should not”.
- **Requirements:** have to be fulfilled for conformance. They are usually classified by the words “shall be” or “shall not”.
- **Conditional Requirements:** are based on the risk assessment, which one needs to perform when intending to comply with the standard. Requirements have to be fulfilled if risks are identified. Sometimes the standard demands risk awareness without defining in detail appropriate measures or requirements.

5.1 Business Risk Analysis

For any data center to conform to the EN 50600, an initial business risk analysis according to clause 5 of EN 50600-1 shall be completed.

As mentioned before some requirements are placed in the context of this risk analysis. This allows the topics to be applied more universally to a wide variety of circumstances. However, this comes at the price that ultimately the user of the standard must first determine the risk in detail, in order to then draw the correct conclusions – the EN 50600 standard greatly increases the challenge for data center designers and consultants.

The requirements of the availability of the mission-critical infrastructure (electrical and mechanical system) and cabling infrastructures and the overall availability of the data center are derived from the conclusions of the business risk analysis. If the conclusions are misinterpreted, the availability will not match the business requirements.



Impact

1 = low: Loss of non-critical services
2 = medium: Failure of critical system functional elements but no loss of redundancy
3 = high: Loss of critical system redundancy but no loss of service
4 = critical: Loss of critical service or loss of life (which may be extended to address personal injury)

Probability of an event

1 = very low
2 = low
3 = medium
4 = high

Figure 3: Source: EN 50600-1, clause 5

5.2 Classification System

EN 50600 is divided into three classifications, which address the availability, security and energy efficiency of a data center infrastructure.

These three classifications play a role in the conformance clause of Part 1 of the EN 50600.

The conformance clause demands that first of all, a business risk analysis has to be conducted. In correspondence with the risk analysis, an appropriate availability class shall be selected, depending on how critical the data center is for the organization. Different protection classes are applied and an appropriate energy efficiency enablement level has to be selected.

AVAILABILITY CLASSES (AVAILABILITY)	PROTECTION CLASSES (SECURITY)	GRANULARITY LEVELS (ENERGY EFFICIENCY)
■ 4 different availability classes ■ Availability classes deal with technical redundancies	■ 5 different protection classes ■ Protection classes deal with access to the data center or environmental factors	■ 3 different granularity levels for the monitoring and measurement of energy efficiency

Figure 4: The three classifications of the EN 50600

5.2.1 Availability Classes

Four different grades of availability classes are defined for
- EN 50600-2-2 (electrical system)
- EN 50600-2-3 (mechanical system)
- EN 50600-2-4 (cabling system)

The higher the availability class (AC), the more component and path redundancy is provided. AC 1-2 are built upon a single path layout, AC 2 with critical component redundancy, while AC 3-4 have at least a dual path, sometimes a multi path design, with component and path redundancies.

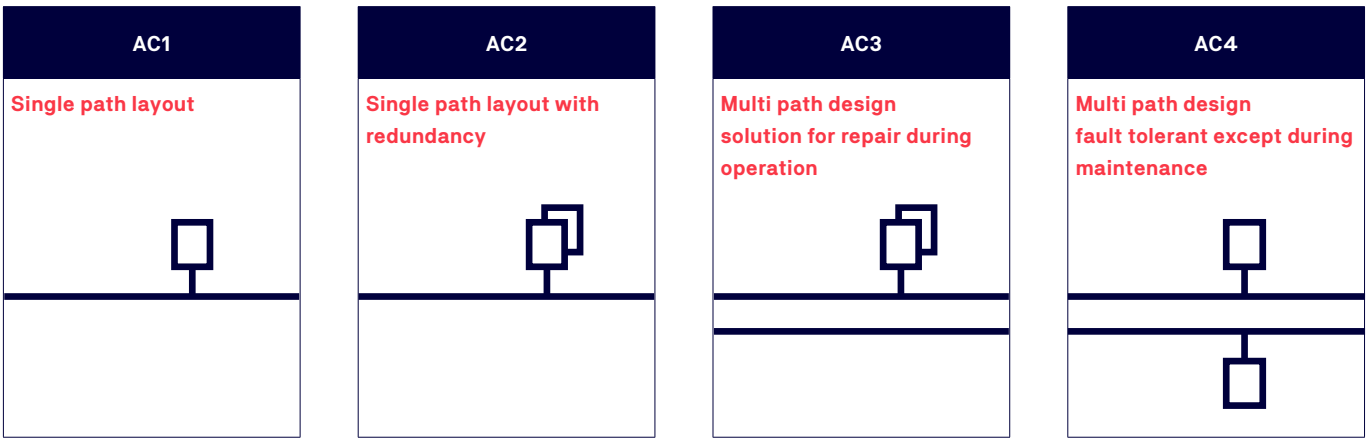


Figure 5: The path layouts of the different availability classes

5.2.2 Protection Classes

Each room or zone within a data center under EN 50600 has an assigned protection class.
Protection classes define properties to protect against:

- Unauthorized Access,
- Intrusion,
- Fire,
- Internal Environmental Events,
- External Environmental Events

*Figure 7 illustrates the properties of protection classes

Each protection class has its ranking with classes one to four, except the one dealing with external events. Typically, a higher ranking comes with more requirements.

Unfortunately, EN 50600 chose the same wording for the ranking referring to protection classes.

For the protection classes of unauthorized access and intrusion, all areas of the data center are addressed. The protection classes for the electrical and mechanical rooms are defined in part 2-2 and 2-3 of the EN 50600, which specify the rooms to be assigned to protection class 3.

Depending on your risk analysis, you have additionally to implement protective measures for all areas of the data center according to protection classes that deal with fire and other internal or external environmental events, such as listed in Figure 7.

PROTECTION CLASSES UNAUTHORIZED ACCESS	PROTECTION CLASSES AGAINST INTRUSION	PROTECTION CLASSES REGARDING FIRE
▪ At least three out of four protection classes must be implemented ▪ EN 50600-2-2 and EN 50600-2-3 define the requirements regarding their spaces	▪ Four protection classes are defined ▪ The classes are aligned to EN 1627, which defines resistance strength of constructions	Four protection classes are defined, taking into account: ▪ Compartments and barriers ▪ Fire detection ▪ Fire fighting systems

PROTECTION CLASSES INTERNAL ENVIRONMENTAL EVENTS	PROTECTION CLASSES EXTERNAL ENVIRONMENTAL EVENTS
Four protection classes are defined, dealing with ▪ EMI ▪ Vibration ▪ Flooding ▪ Gas ▪ Dust	Three protection classes are defined, dealing with ▪ EMI ▪ Vibration (incl. Earthquake) ▪ Flooding ▪ Gas ▪ Dust

Figure 6: Protection classes of the EN 50600

5.2.3 Granularity Levels

The granularity levels define to what extent the technical infrastructure is monitored and how the measurement of the energy consumption is performed. The higher the level, the more detailed the measurements for the facility. The three levels are listed below in Figure 8. For the illustration of the granularity level for the electrical system see Figure 9.

LEVEL 1	LEVEL 2	LEVEL 3
A measuring concept that provides simple, general information for the entire data center.	A measuring concept that provides detailed information for specific facilities and infrastructure within the data center.	A measuring concept that provides granular data for the systems within the areas and supply paths of the data center.

Figure 7: Granularity levels of the EN 50600

- In Level 1, the operator can distinguish between how much energy is consumed by the facility and how much energy is used for the IT.
- In Level 2, the operator needs a more detailed measurement energy concept with an in-depth overview of his distribution systems.
- In Level 3, the operator has to provide measurements for the energy consumption down to the individual electrical outlet level.

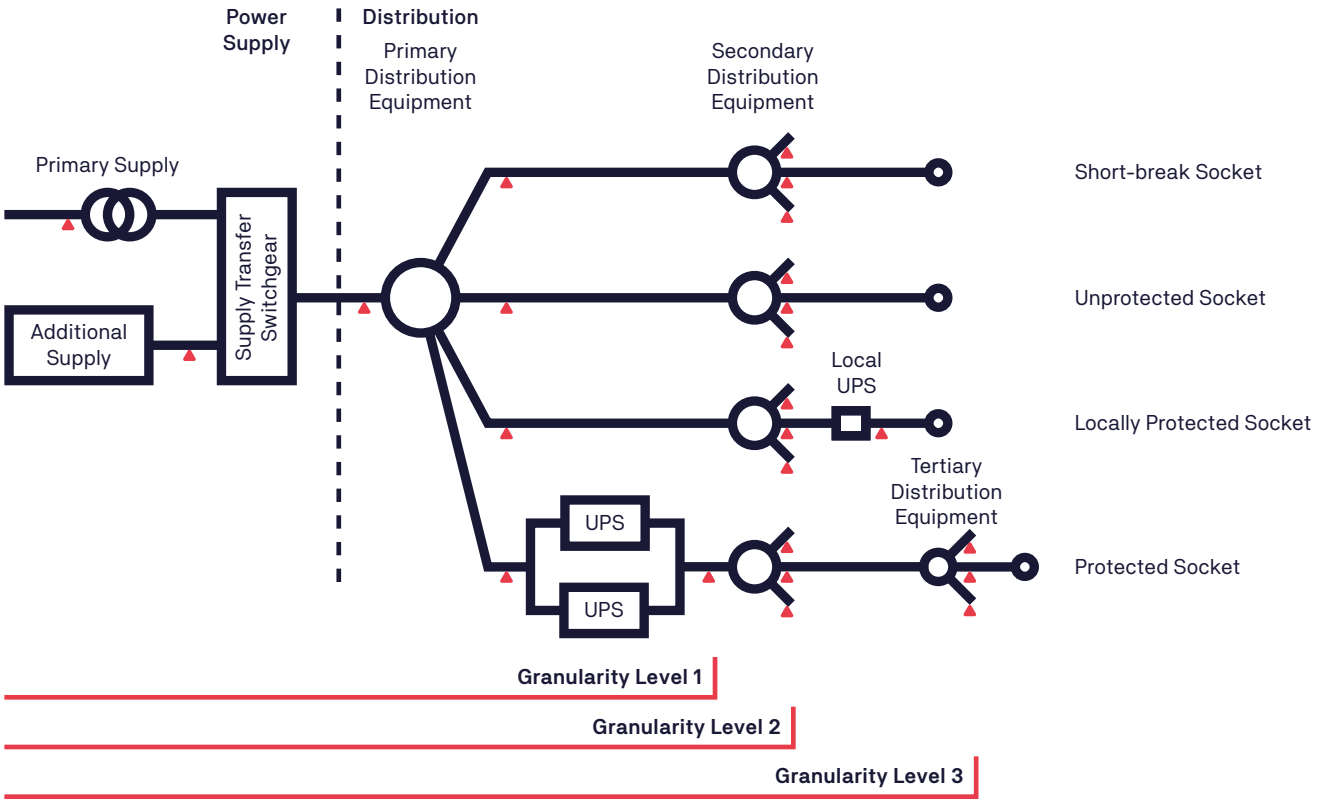


Figure 8: Source: EN 50600 2-2:2019

6. Evaluation and Certification

EN 50600 has been developed as a technical guideline. It is intended to provide assistance to all parties directly or indirectly involved in the design, development and operation of data centers. For this purpose, a holistic approach is chosen, which explains all relevant trades and organizational necessities and provides requirements as well as recommendations.

Furthermore, the requirements are partly placed in the context of a risk analysis. This means that the topics can be applied more universally to a wide range of circumstances. However, this comes at the price that ultimately the user of the standard must first determine his risk in detail in order to then draw the correct conclusions. The assistance essentially consists of the fact that EN 50600 outlines many considerations and names potential risks, but does not provide any guidance as to which concrete measures are required for which risks and which requirements are to be fulfilled in a particular case.

The standard requires the user to perform a business risk analysis (see 5.1), in which he is not only to derive security measures with basic requirements, but also to causally explain the design of individual measures.

This methodology raises the question of how conformity confirmations can be made, because there are no evaluation instructions in accordance with the requirements in ISO/IEC 17007 – after all, the EN 50600 standard primarily aims to be a guideline.

This is also the reason why the market requires additional measures for EN 50600 to serve as a suitable basis for assessment and certification.

The problems for a neutral, independent evaluation are:

- Risk assessment of the operator with regards to the necessity of implementing a measure
- No clear requirements depending on the degree of risk
- No evaluation instructions and specifications for the scope of an assessment
- No coordination body for the auditors

These problems are accompanied by the fact that the certificates issued are difficult to compare. The evaluation market is not regulated here. The disadvantages can be minimized by deriving a criteria catalog, as done by TÜV NORD with “TSI.EN50600”. This catalog defines the scope of testing as well as the requirements extracted from the standard and defined in detail. For the evaluation body and the inspected party, the inspection task is therefore clearly agreed upon and defined.

The catalog also ensures that the certificates are more comparable, because the TSI.EN50600 criteria catalog also contains instructions and interpretations for the evaluation body. The goal is to achieve a uniform evaluation. Assessments based solely on the EN 50600 standard without the criteria catalog are therefore not recommended.

7. Criteria Catalog TSI.EN50600

To make the EN 50600 standard assessable, a much-needed evaluation scheme has been adapted to the standard by TÜV NORD. The result of this is the TSI.EN50600 criteria catalog.

The relevant parts of EN 50600 that have been integrated are:

- EN50600-1
- EN50600-2-1
- EN50600-2-2
- EN50600-2-3
- EN50600-2-4
- EN50600-2-5
- EN50600-3-1

The latest revision of the criteria catalogue, TSI.EN50600 V3.0, was published on September 1, 2025, replacing Version V2.1.

Criteria Catalog TSI.EN50600

With TSI.EN50600 a proper understanding of how the requirements are intended to be implemented is provided. With the criteria catalog (roughly 40 pages), all relevant requirements are identified and summarized. They have to be fulfilled by the DC operator in order to gain a conformance confirmation.

TÜV NORD provides its assessments and certifications of EN 50600 based on that criteria catalog. The criteria catalog addresses 9 major criteria aspects:

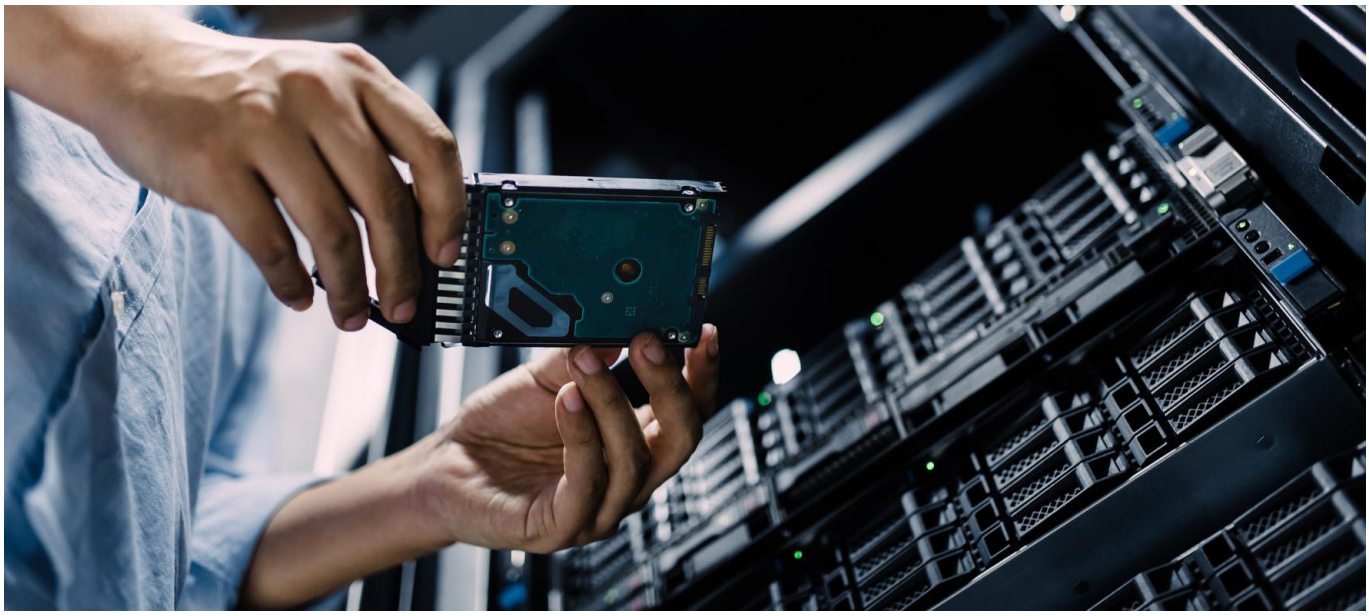
Figure 9: Illustration of the criteria aspects covered in the TSI.EN50600

There are two additional optional evaluation aspects, from which supplemental assessment results or where applicable certificates can be derived.

The EFF evaluation aspect adds an energy efficiency statement to the EN 50600 certificate.

The POC evaluation section defines requirements for a supplementary procedure to prequalify standardized, modular data center concepts.

8. EN 50600 goes ISO



EN 50600 may be a European standard; however, it also had a global impact. Some years ago the EN 50600 series has been chosen to become the foundation for the upcoming international data center standard ISO/IEC 22237. Some parts of EN 50600 will be developed into the seven parts of the new ISO/IEC standard:

- ISO/IEC 22237-1 General concepts
- ISO/IEC 22237-2 Building construction
- ISO/IEC 22237-3 Power distribution
- ISO/IEC 22237-4 Environmental control
- ISO/IEC TS 22237-5 Telecommunication cabling
- ISO/IEC 22237-6 Security systems
- ISO/IEC TS 22237-7 Management and operation

Currently parts 1 to 4 and part 6 have been officially released. Parts 5 and 7 are only available as technical specifications (draft versions), while technical committees in the background are working on the adaptation, mainly the integration of data center concepts from North America and Asia. It can be assumed that the conversion of TS 22237-5 and TS 22237-7 into the corresponding ISO/IEC standards will take place successively, but the exact timeline depends on the progress made in the standardization bodies.

The TSI.EN50600 criteria are selected in such a way that their fulfillment together with the criteria identified in ISO/IEC 22237 confirm accordance with the above series of standards. The EN 50600 availability classes correspond to the availability classes 1 - 4 of ISO/IEC 22237. Any differences will result in ISO/IEC 22237 marked criteria.

At the time of publication of this catalogue, only ISO/IEC 22237-1, -2, -3, -4 and -6 were finally available, therefore conformity is only confirmed for these parts of the standard in the evaluation.

About TÜV NORD CERT

Our know-how for your success
TÜV NORD CERT is a well-established and reliable partner for inspection and certification services throughout the world. Our experts and auditors have extensive knowledge based on experience and are in general permanently employed by TÜV NORD. This guarantees independence and neutrality and also means that we can offer continuity in supporting our clients. The benefit to you is clear: our auditors accompany and support the development of your company and provide you with objective feedback.

TSI – Trusted Site Infrastructure
We have been carrying out evaluations and certifications of data centers within the TÜV NORD GROUP since 2001. With our unique TSI methodology, we offer companies an established tool for evaluating the physical security, availability and reliability of technical infrastructures. Our TSI.STANDARD has long since become the benchmark in the data center industry in Germany and is also increasingly in demand on the international market.

The underlying criteria catalog is consistently analyzed and further developed by our experts in order to always be representative of the current state of technology and standardization. Since its market launch, over 2,000 customer projects have already been successfully completed based on this TÜV NORD owned standard.

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