HOW TO USE THE EN 50600 TO DESIGN AN ENERGY EFFICIENT DATA CENTRE
About the Legrand Group

GLOBAL SPECIALIST IN ELECTRICAL AND DIGITAL BUILDING INFRASTRUCTURES

- **Complete offer** for the Residential, Commercial and Industrial markets.
- **Strategic Focus on** Data Centre market penetration
- **68% of sales generated by** products ranked No. 1 or No. 2 on their respective markets.
About the Legrand Group

AN INTERNATIONAL GROUP WITH STRONG POTENTIAL FOR EXPANSION

2018 FIGURES

- € 6,0 billion of sales.
- Present 180 countries.
- Approximately 38,000 employees.
About the Legrand Group

Commit to our EMPLOYEES
All over the world, we are committed on behalf of our employees to respecting human rights, diversity, health and safety at work, and nurturing the talents of each individual.

Act ethically towards SOCIETY
Our responsibility is based on strict observance of ethical standards, particularly with our suppliers. We also promote sustainable access to electricity for all.

Limit our impact on the ENVIRONMENT
It is also our responsibility to respect the environment, particularly by reducing our energy consumption.

Offer USERS sustainable solutions
Every day we innovate so that we can offer sustainable solutions and drive progress in the electrical sector.
Niek van der Pas

Lead Data Centre Expert Minkels
Coordinator Europe, DC Standards, Legrand

Chair of the Dutch Standards committee NEN
‘Computerruimtes en datacenters’

Active contributor to the EN 50600 and ISO/IEC data centre standards
An energy-efficient data centre using the EN 50600

https://www.minkels.com/whitepapers
**Title:** Information technology - Data centre facilities and infrastructures
EN 50600-1 Design Phases

1. Owner
   - Strategy

2. Owner
   - Objectives

3. Owner
   - System specification

4. Designer
   - Design proposal

5. Owner
   - Decision

6. Designer
   - Functional design

7. Owner/Designer
   - Approval

8. Designer
   - Final design & Project plan

9. Owner/Designer
   - Contract

10. Owner/Designer
    - Construction

11. Owner
    - Operation

Boden Type Data Center One in

The project funded by EU’s innovation and research programme Horizon 2020. The prototype facility will accommodate 500 kW of IT
EN 50600-1 Design Phases

Change costs

Impact on cost control

Strategy
Objectives
System specification
Design proposal
Decision
Functional design
Approval
Final design & Project plan
Contract
Construction
Operation
EN 50600 Classification

Availability  
Energy Efficiency  
Security
Business risk analysis

- Downtime cost analysis

- Risk analysis
### D.3 Designed PUE (dPUE)

The energy efficiency of a data centre can be predicted at the design stage based on:

a) the scenario for growth or expectation of occupancy,
b) the timeline for increases and/or decreases in energy consumption.

Table D.1 shows an example, for a containerised data centre, of such predictions using expected loads based on target occupation of a data centre leading to a designed PUE (dPUE) for each stage - and resulting in an annualised value of dPUE of 1.2.

<table>
<thead>
<tr>
<th>Nr</th>
<th>Days</th>
<th>Average load</th>
<th>Energy used</th>
<th>Average load</th>
<th>Energy used</th>
<th>Energy used</th>
<th>Energy used</th>
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<th>Energy used</th>
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<th>Total data centre in</th>
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*Forecasted use or estimate.
Chose your PUE

Capgemini opens Merlin data center in UK with PUE of 1.1

Built on a brownfield site near London, Merlin is Capgemini’s showcase green data center.

By Peter Sayer
Senior Editor, IDG News Service | OCTOBER 12, 2005 | IDG NEWS

Driving Efficiency in Design and Performance through Sustainability

As more enterprises focus on energy efficiency to cut data center costs, more are looking to providers with a solid sustainability strategy who can offer cost-effective, green data center options. For colocation customers, better use of energy delivers lower costs.

Our data centers are designed to require fewer construction materials to construct while delivering industry-leading PUE (power usage effectiveness) levels—resulting in a smaller carbon footprint when compared to similar data centers. Our clients have delivered data centers with design PUEs as low as 1.12. We utilize water-efficient and free cooling technologies and tap into reclaimed water supplies where available to minimize our use of potable water. We continue to expand our ability to reduce the carbon footprint of our data centers as they become operational by pairing our facilities with sources of renewable energy.
Gaseous contaminants should be measured periodically or monitored continuously according to ANSI/ISA 71.04-2013. Visual inspection of hardware within the space should be performed as part of the maintenance routines to mitigate the potential risk of damage due to corrosion.

EN 50600-2-3 version 2 2019 DRAFT
Energy Efficiency EN 50600-2-2
Energy Efficiency: ATOS
**Table 2 — Measurement requirements by Granularity Level**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Granularity Level</th>
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<td>Level 1</td>
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<td></td>
<td>Level 2</td>
</tr>
<tr>
<td></td>
<td>Level 3</td>
</tr>
<tr>
<td>Inlet Air Temperature</td>
<td>Single sensor in proximity to IT equipment</td>
</tr>
<tr>
<td></td>
<td>One sensor per cold aisle</td>
</tr>
<tr>
<td></td>
<td>One sensor per 10 cabinets or racks (5 on each side of the aisle)</td>
</tr>
<tr>
<td>Return Air Temperature</td>
<td>Single sensor in proximity to intake of return air to the cooling equipment</td>
</tr>
<tr>
<td></td>
<td>One sensor at the air intake per CRAH</td>
</tr>
<tr>
<td></td>
<td>One sensor at the intake per CRAH</td>
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</table>
Table A.1 provides a summary of the requirements for environmental conditions of this standard.

<table>
<thead>
<tr>
<th>Subclause</th>
<th>What</th>
<th>Where</th>
<th>Dp</th>
<th>Minimal T</th>
<th>Maximal T</th>
<th>Type</th>
<th>Condition</th>
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<tr>
<td>5.2.15.3</td>
<td>air</td>
<td>Accommodation Batteries</td>
<td>18</td>
<td>22</td>
<td>M</td>
<td>5.2.15.3 Where batteries are located away from the UPS equipment that they serve where no information exists or where the equipment manufacturer is not specified.</td>
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<td>5.2.15.1</td>
<td>air</td>
<td>Accommodation Static and CRUPS</td>
<td>Anti Condensatio n</td>
<td>15</td>
<td>35</td>
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<td>5.2.15.1 Where the manufacturer is not known.</td>
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<tr>
<td>5.2.15.1</td>
<td>air</td>
<td>Accommodation Static and CRUPS</td>
<td>15</td>
<td>35</td>
<td>M</td>
<td>5.2.15.1 Where no information exists or where the equipment manufacturer is not specified.</td>
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<tr>
<td>5.1.3</td>
<td>humidity</td>
<td>all spaces where there is a risk of damage to static-sensitive</td>
<td>5.5</td>
<td>M</td>
<td></td>
<td>5.1.3 Where no information exists or where the equipment manufacturer is not specified.</td>
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<td>5.2.9</td>
<td>supply air/temperature/humidity</td>
<td>Computer room spaces and associated lobbies spaces</td>
<td>CLC/CTR 500-50-1</td>
<td>CLC/CTR 500-50-1</td>
<td>CLC/CTR 500-50-1</td>
<td>M</td>
<td>5.2.9 Supply air/temperature/humidity to the computer room spaces.</td>
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<td>5.2.12</td>
<td>temperature/humidity</td>
<td>Control room spaces</td>
<td>Comfort</td>
<td>Comfort</td>
<td>Comfort</td>
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<td>5.2.12 Comfort environmental.</td>
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<td>defined data centre spaces</td>
<td>CLC/CTR 500-50-1</td>
<td>CLC/CTR 500-50-1</td>
<td>CLC/CTR 500-50-1</td>
<td>M</td>
<td>5.1.4 Temperature/humidity to the data centre spaces.</td>
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<td>Electrical distribution spaces</td>
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<td>40</td>
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<td>5.2.6 Where no information exists or where the equipment manufacturer is not specified.</td>
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<td>Electrical distribution spaces</td>
<td>10</td>
<td>R</td>
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<td>5.2.6 Where no information exists or where the equipment manufacturer is not specified.</td>
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<td>humidity</td>
<td>Electrical distribution spaces</td>
<td>Anti Condensatio n</td>
<td>M</td>
<td></td>
<td>5.2.6 M generators and switchgear.</td>
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<td>5.2.10</td>
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<td>Electrical distribution spaces</td>
<td>Anti Condensatio n</td>
<td>M</td>
<td></td>
<td>5.2.10 M generators and switchgear.</td>
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<td>Electrical distribution spaces</td>
<td>EN 61439-1</td>
<td>EN 61439-1</td>
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<td>5.2.10 Where the manufacturer is not known.</td>
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<td>5.2.4.2</td>
<td>fuel temperature</td>
<td>fuel storage systems</td>
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<td>M</td>
<td></td>
<td>5.2.4.2 fuel storage systems be protected against continuous sub-zero.</td>
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<tr>
<td>5.2.4.2</td>
<td>fuel temperature</td>
<td>fuel storage systems</td>
<td>10</td>
<td>P</td>
<td></td>
<td>5.2.4.2 fuel storage systems.</td>
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</tr>
</tbody>
</table>

Notes:
- **EN 50600 2-3**
- **M** = requirement (mandatory)
- **R** = recommendation

- **TEMPERATURE**
- **VIBRATION**
- **AIRFLOW**
- **DIFFERENTIAL AIR PRESSURE**
- **WATER/LEAK**
- **CONTACT CLOSURE**
- **RACK INLET TEMPERATURE AND HUMIDITY**
Datum decided to select the Minkels VariCondition Vertical Exhaust Duct solution, as well as a range of their other data centre products.

Adiabatic cooling is just one of many unique features in this mission critical facility, ensuring operational excellence and maximum energy efficiency with a calculated PUE of 1.25.

“The flexibility of this solution and the superb integration with all the other data centre components is really impressive,” said Garner. “We just got a flat pack of modular components delivered, after which Minkels’ team of engineers built them together into an outstanding, custom made product.”
Using KPI's in designing a Data centre

- **EN 50600-4-3** Renewable Energy Factor REF

  The formula is: \( \text{REF} = \frac{E_{\text{ren}}}{E_{\text{DC}}} \)

  - \( E_{\text{ren}} \) = is the renewable energy in kWh owned and controlled by a data centre
  - \( E_{\text{DC}} \) = is the total data centre energy consumption (annual) in kWh

  REF is a KPI which can be used in reporting CSR goals. REF doesn’t need any measurement.
Using KPI's in designing a Data centre

- EN 50600-4-6 Energy Reuse Factor ERF

The formula is: \[ \text{ERF} = \frac{E_{\text{reuse}}}{E_{\text{DC}}} \]

- \( E_{\text{ren}} \) is the energy from the data centre that is used outside of the data centre and which substitutes partly or totally energy needed outside the data centre boundary (annual)

- \( E_{\text{DC}} \) is the total data centre energy consumption (annual) in kWh

REF is a KPI which can be used in reporting CSR goals. REF doesn’t need any measurement

The Netherlands Reuse Heat from Data Centres with an ROI < 5 year

www.RVO.nl
Using TR 50600-99-1 in designing a Data centre

Using TR 50600-99-1 in designing a Data centre

6.2.1.2.1 Requirements

The selection of components of the power supply system (e.g. transformers and generators within the premises) shall:

a) allow a modular solution which takes into account the initial load and the maximum planned load while maintaining optimum efficiency;
Using EN 50600 2-2 in designing a Data centre
Airtight cabinets and air ducting accessories

<table>
<thead>
<tr>
<th>5.17.59</th>
<th>5.1.5</th>
<th>Cabinet/rack airflow management</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Install aperture brushes (draught excluders) or cover plates and panels to minimize all air leakage in each cabinet/rack and across raised floor areas when a raised floor is used as a cooling air supply plenum.</td>
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<tr>
<td></td>
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<td><strong>Note 1</strong> This includes floor openings at the base of the cabinet/rack and gaps at the sides, top and bottom of the rack between equipment or mounting rails and the perimeter of the cabinet.</td>
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<td><strong>Note 2</strong> This is in addition to Practice 5.17.10</td>
</tr>
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CLC/TR 50600-99-1 Recommended practices for energy management
VISIT Legrand AT DATA CENTRE WORLD 2019
AT STAND D420
EN 50600 Series

An energy-efficient data centre using the EN 50600

By Niek van der Pas

https://www.minkels.com/whitepapers
THANK YOU FOR YOUR ATTENTION