

# Rittal – Aisle containment

## Simple and efficient

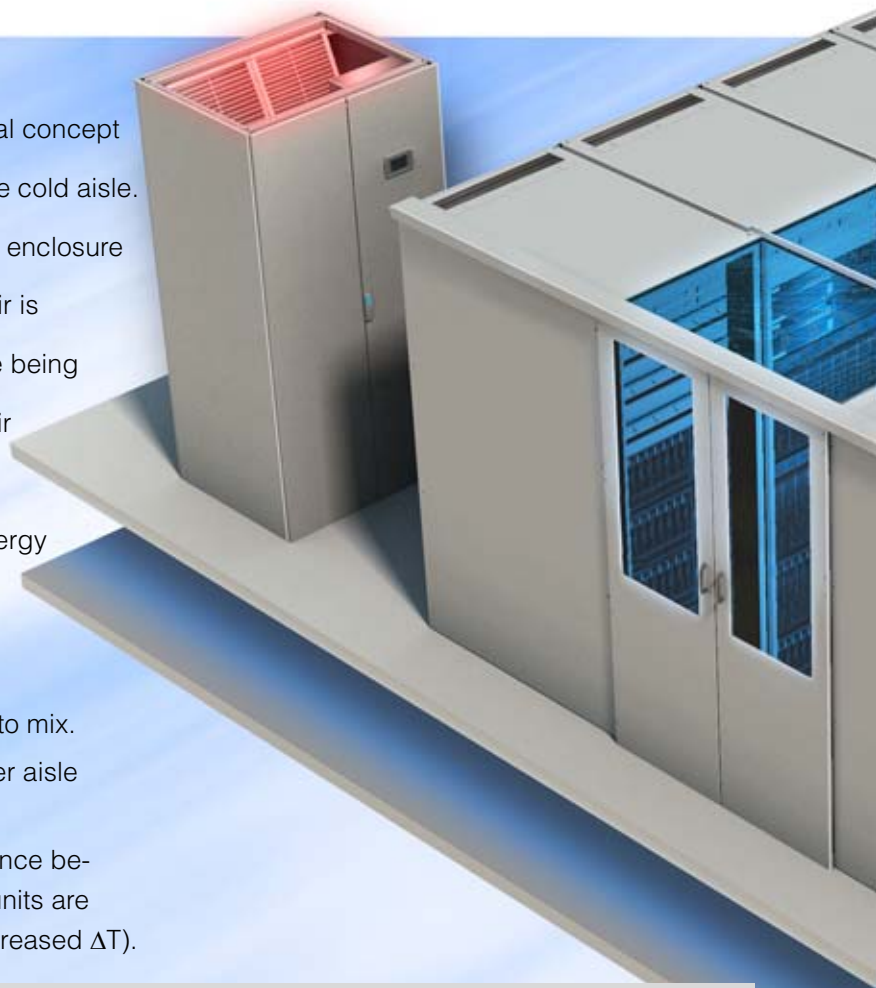


Efficient cooling saves money

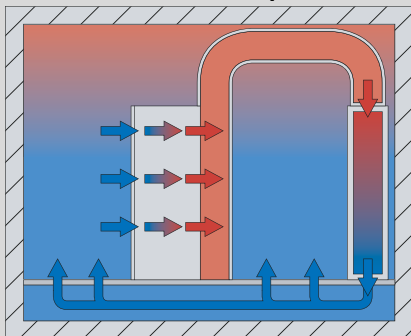
# High-efficiency climate control concepts from Rittal

Instead of flooding the room with cold air, this Rittal concept routes the cold air directly to the equipment via the cold aisle. Cold air is directed across the whole height of the enclosure ensuring that there are no hot-spots and the hot air is exhausted out of the system. Due to the cold aisle being contained there is no chance of the hot exhaust air mixing with the cold inlet air, therefore there is an increase in system efficiency. The outstanding energy efficiency of the Rittal cold aisle concept has a simple explanation:

1. Intake air (cold) and waste air (hot) are unable to mix.
2. The system can be operated with a much higher aisle temperature level (reduction in hot-spots).
3. As a result of the increased temperature difference between intake air and waste air, climate control units are operated at an optimum thermal difference (increased  $\Delta T$ ).



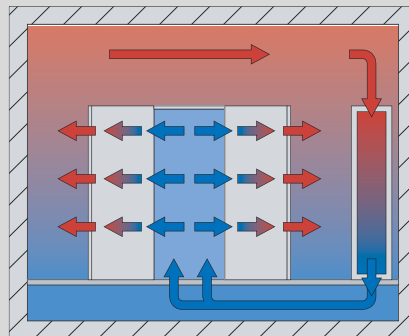
## Standard market concepts



### Hot air extraction using a duct system

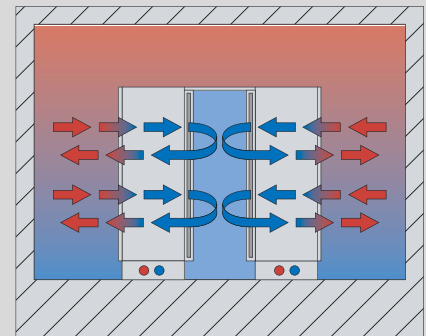
- Complex and costly duct system.
- Larger surface area and height requirements.
- Limitation of the raised floor height.
- No uniform cooling air supply to the room area.
- Cable management is more difficult.
- Limited rack positioning due to the air duct connection.
- Extremely high pressure loss on the air side, leading to increased energy consumption of the fans.

## Rittal



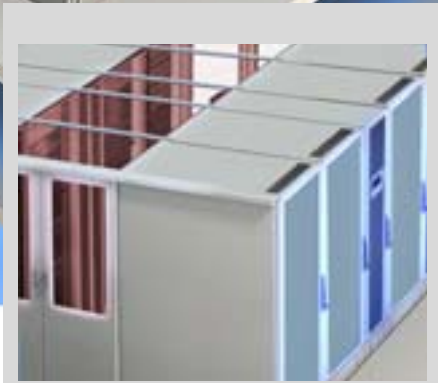
### Rittal aisle containment (cold aisle) with raised floor (CRAC)

- Use of standard inexpensive air circulation cooling units. Positioned outside the server area.
- Even with low room heights, maximisation of the raised floor height for cooling air supply without flow losses.
- Undisturbed and uniform air flow distribution of cooling air in the cold aisle guarantees high-efficiency.
- Favourable working conditions in the cold aisle due to low temperature, flow and noise load conditions.
- Hardware racks not connected to the enclosure do not impair the cooling efficiency of the cold aisle.



### Rittal aisle containment (cold aisle) without raised floor (Inline Cooling)

- Direct connection of the liquid cooling packages to an external cold water supply.
- Simple laying of pipework in the rack base/plinth.
- Homogeneous distribution of cooling air in the cold aisle guarantees a high level of efficiency.
- Favourable working conditions in the cold aisle due to low temperature, flow and noise load conditions.
- Hardware racks not connected to the containment system do not impair cooling efficiency via the cold aisle.
- Room heights play only a minimal role.



**Rittal aisle containment (hot aisle) without raised floor**

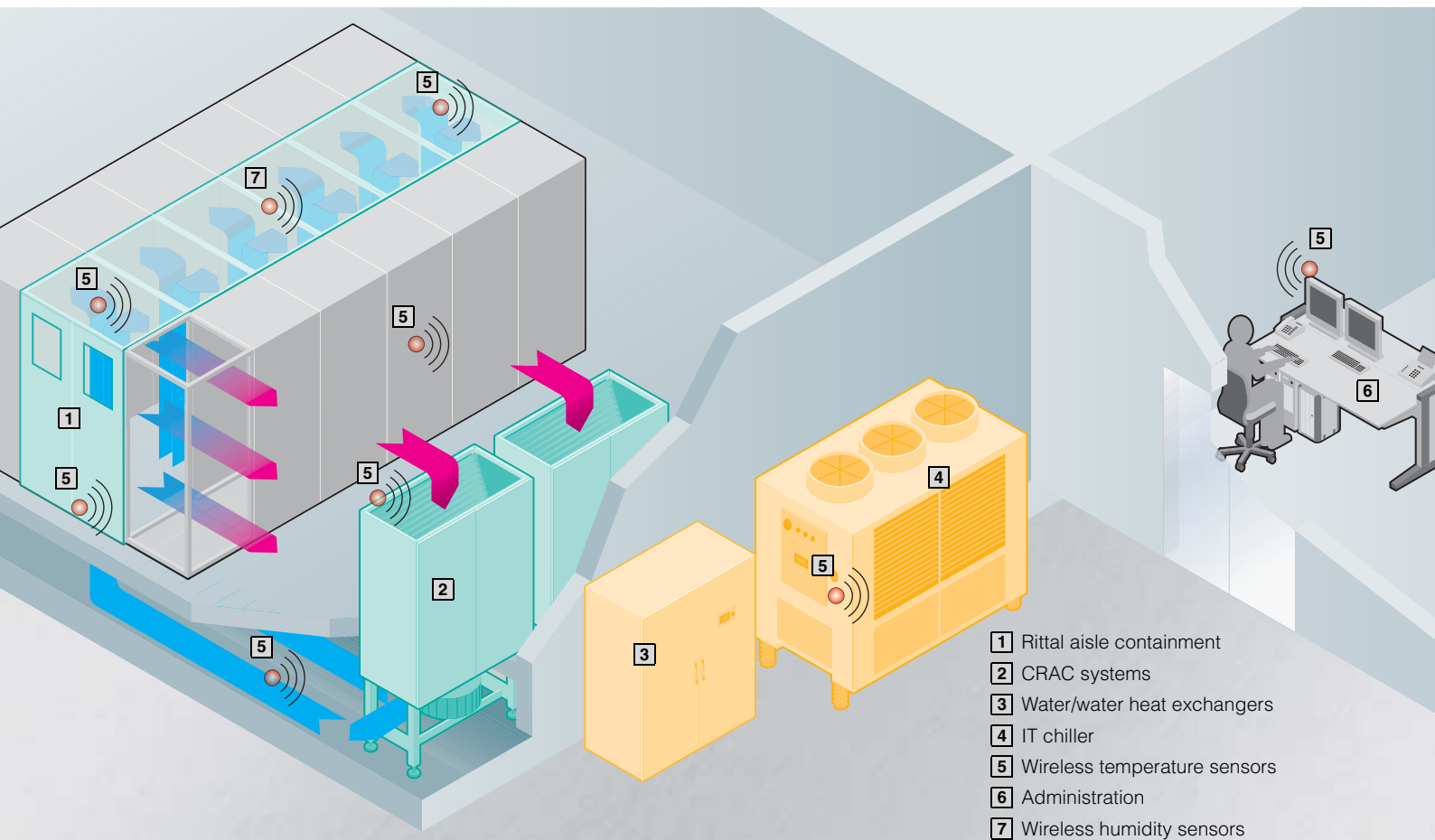
- Simple assembly using the existing components of Rittal aisle containment.
- Direct connection of the liquid cooling packages (LCP Inline) to an external cold water supply.
- Simple laying of pipework in the rack base/plinth.
- Suitable for use with high heat losses.
- Room-neutral dissipation of the heat loss.

**Three systems with a high level of efficiency**

Nowadays, servers are increasingly positioned in rooms that were not designed as data centres. As a result of hot air cushions below the ceiling, in particular, hot-spots in hot-spot racks are not dissipated. In order to consistently address this problem, Rittal has developed three systems for aisle containment. In the two variants of cold aisle (CRAC and Inline Cooling), we are able to provide a solution that is independent of whether there is a false floor available or not. Both provide cold air to the aisle, where it is then absorbed by the server inlets. In the third system, the hot air is extracted from the hot aisle, via the LCP Inline, without influencing the ambient temperatures, and then selectively re-emitted as cold air in the proximity of the equipment.

The outcome is the same with all three systems: Increased reliability, greater cooling capacity and simultaneously improved energy efficiency.

# Rittal cold aisle containment with CRAC system and sensors



By using Rittal aisle containment, climate control of the room (in conjunction with the Rittal CRAC system) may be optimised in terms of energy efficiency and cooling output.

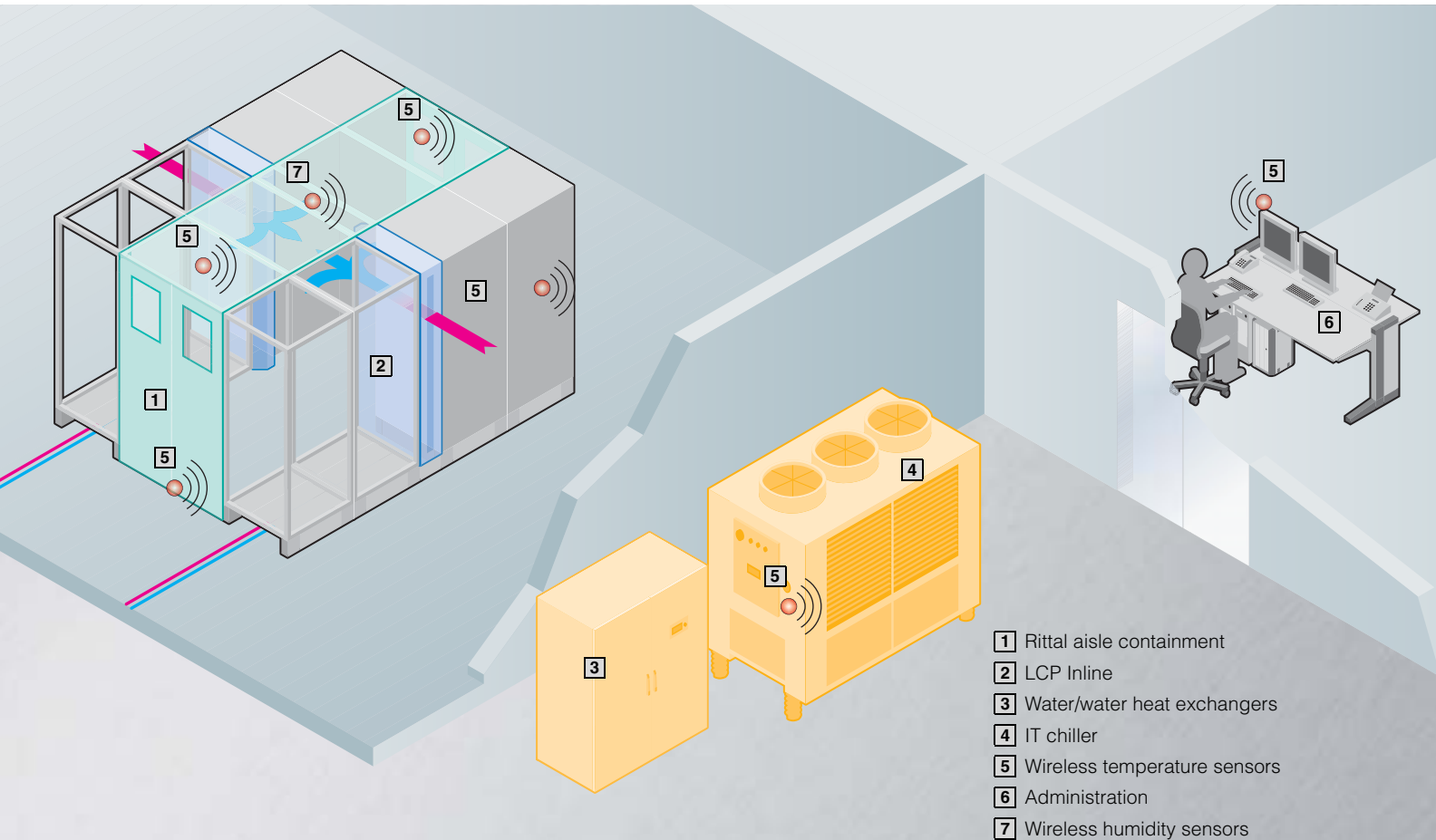
- High energy efficiency
- Increased cooling output per server rack
- Easily retro-fitted to existing systems
- Protection of your existing infrastructure
- The MTBF of existing systems can be significantly extended



In conjunction with the LCP Inline, aisle containment is a further option for the efficient dissipation of high heat loads from server racks.

- A raised floor is not required for climate control
- For increased heat loads per server rack
- Redundancies easily achieved
- Direct supply of cold air to your server and network components
- Particularly suitable for use with low room heights

# Aisle containment with LCP Inline and sensors



With Rittal wireless sensors, all relevant climate conditions may be measured without any cabling whatsoever.

This ensures that the optimum parameters for energy-efficient climate control are available at all times.

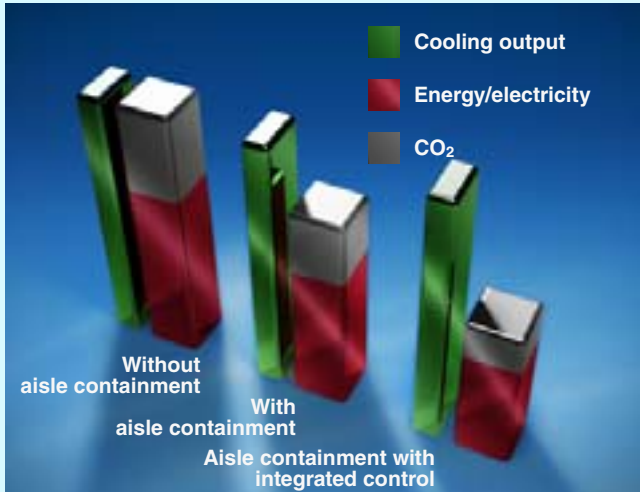
## Innovative monitoring and control for even greater efficiency

In order to further enhance efficiency with the cooling of data centres, the thermal parameters must be permanently monitored and adjusted for optimum performance.

Rittal wireless sensor technology is available for the fast logging and monitoring of these parameters. This technology supports simple, fast installation and commissioning at all key points in the data centre. Whether in the raised floor or under the ceiling, all measurements are wireless and can be processed directly using a controller.

# Maximise potential savings!

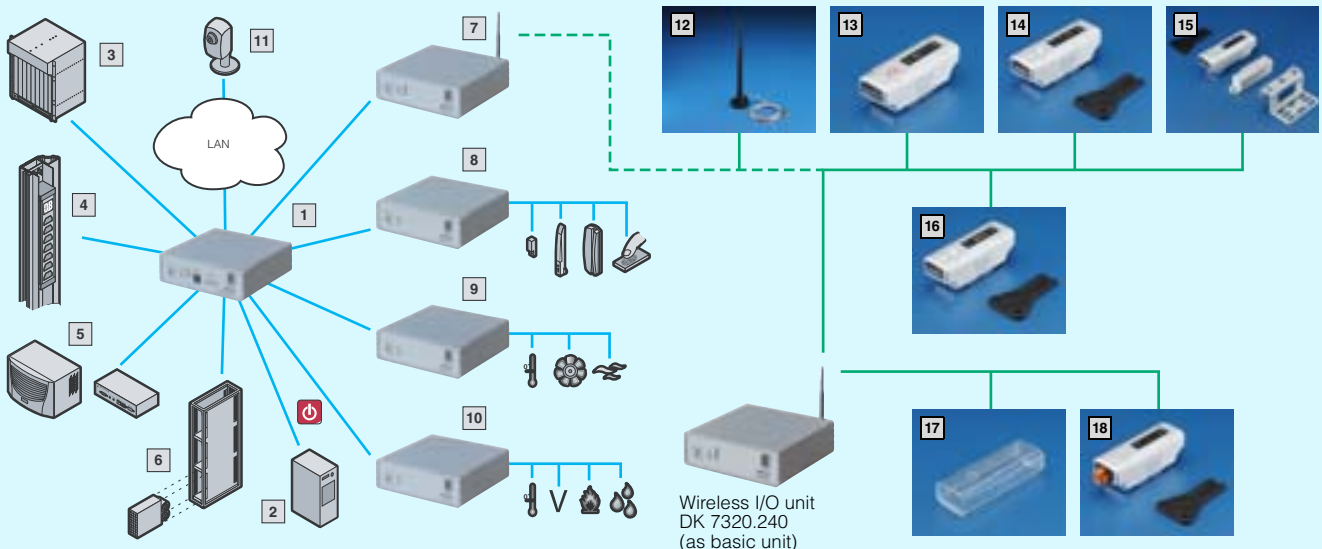
## Know-how safeguards efficiency



The potential savings that can be made with the operating costs for a data centre are shown in the diagram opposite. Despite considerable savings of energy and CO<sub>2</sub>, the operating temperature of the servers always remains within the optimum range.

We would like to prove this with some figures from our best practice example, which demonstrates the benefits of coordinated, intelligent regulation and control of all climate control components.

## Rittal wireless sensor network



- 1 Processing Unit II (PU II), the nerve centre of the CMC-TC monitoring system**  
The PU II is the coordinator between the sensor unit and the network. It is configured via the integral web server.
- 2 Server shutdown function**
- 3 Electronic systems** with monitoring of temperatures, fans and DC voltages.
- 4 Active Power System Module PSM, Power Control Unit PCU**  
The sockets may be activated directly by the Processing Unit II (max. 4 x 4 x 8 sockets), combined with an ammeter.
- 5 RTT I/O unit**  
Up to 10 climate control devices with Comfort controller may be connected via one unit in master/slave mode.
- 6 Liquid Cooling Package LCP**  
The professional LCP water cooling system for data centres may be linked directly to the Processing Unit II.
- 7 I/O wireless unit**  
Up to 16 sensors may be wirelessly incorporated into the CMC-TC system via this unit.
- 8 Access unit**  
The doors of buildings, rooms and enclosures may be monitored, activated and opened via the network.
- 9 Climate unit, Fan Control System FCS**  
Fans are controlled via temperature sensors. Airflow monitors report any contamination of the filter mat, for example. The fan speed is controlled and monitored via the FCS.
- 10 Universal I/O unit**  
This measurement and alarm module indicates motion, vibrations, doors being opened, temperatures exceeded, and much more besides. The sensors may be selected for the application.
- 11 Video network IP camera**
- 12** Alternative external aerial DK 7320.241
- 13** Wireless measurement system (must be available for commissioning) DK 7320.242
- 14** Wireless humidity sensor DK 7320.515
- 15** Wireless access sensor DK 7320.535
- 16** Wireless temperature sensor DK 7320.505
- 17** IP protective cover (optional) DK 7320.245
- 18** Wireless digital input DK 7320.585

# Easy with Rittal

## Step 1: Raise the water inlet temperature

**-26%**

<b>Q<sub>total</sub> (Q<sub>sens.</sub>)</b>	80 kW (80 kW) – 79.9 kW (79.9 kW)
<b>T<sub>air; hot</sub> (rel. humidity)</b>	26°C (45%) – 31°C (32%)
<b>T<sub>air; cold</sub> (rel. humidity)</b>	15°C (89%) – 19.8°C (62.2%)
<b>T<sub>water; inlet</sub></b>	10°C – 15°C
<b>T<sub>water; return</sub></b>	15°C – 20°C
<b>P<sub>electr. for cold water</sub></b>	190 MWh/a – 139 MWh/a

The temperature in the cold aisle is precisely definable and identical throughout, thanks to optimisation of the temperature distribution.

- Increasing the air intake temperature also increases the waste air temperature.
- Increasing the air intake temperature improves the performance of free cooling.

**Possible energy savings in cold water generation: up to 26%.**

## Step 2: Reduce the volumetric airflow

**-60%**

<b>Q<sub>total</sub> (Q<sub>sens.</sub>)</b>	79.9 kW (79.9 kW) – 88.4 kW (88.4 kW)
<b>T<sub>air; hot</sub> (rel. humidity)</b>	31°C (32%) – 36°C (25%)
<b>T<sub>air; cold</sub> (rel. humidity)</b>	19.8°C (62.2%) – 19.7°C (64.6%)
<b>V<sub>air</sub> (ext. press.)</b>	22000 m <sup>3</sup> /h (80 Pa) – 17000 m <sup>3</sup> /h (20 Pa)
<b>P<sub>electr. for UKS fan</sub></b>	3.6 kW – 1.5 kW

With a constant flow rate, the cooling output is increased by raising the  $\Delta T$  at the air end.

- By reducing the volumetric airflow, the waste air temperature and return temperature are increased.

**Possible energy savings in the power consumption of the fans: up to 60%.**

## Step 3: Reduce the throughput

**-15%**

<b>Q<sub>total</sub> (Q<sub>sens.</sub>)</b>	88.4 kW (88.4 kW) – 80 kW (80 kW)
<b>T<sub>air; hot</sub> (rel. humidity)</b>	36°C (25%) – 36°C (25%)
<b>T<sub>air; cold</sub> (rel. humidity)</b>	19.7°C (64.6%) – 21.3°C (54.2%)
<b>T<sub>water; inlet</sub></b>	15°C – 15°C
<b>T<sub>water; return</sub></b>	20.6°C – 23.5°C
<b>V<sub>water</sub> (P<sub>electr.</sub>)</b>	13.6 m <sup>3</sup> /h (3 kW) – 8.1 m <sup>3</sup> /h (2.3 kW)
<b>P<sub>electr. for cold water</sub></b>	143 MWh/a – 125 MWh/a

The pump output can be reduced due to a smaller throughput required for the same cooling output, and the return temperature is increased.

**Potential saving in the power consumption of the pump: up to 14%.**

**Potential saving in cold water generation: up to 17%.**

## Summary

**-36%**

<b>Q<sub>total</sub> (Q<sub>sens.</sub>)</b>	80 kW (80 kW) – 80 kW (80 kW)
<b>T<sub>air; hot</sub> (rel. humidity)</b>	26°C (45%) – 36°C (25%)
<b>T<sub>air; cold</sub> (rel. humidity)</b>	15°C (89%) – 21.3°C (54.2%)
<b>V<sub>air</sub> (ext. press.)</b>	22000 m <sup>3</sup> /h (80 Pa) – 17000 m <sup>3</sup> /h (20 Pa)
<b>T<sub>water; inlet</sub></b>	10°C – 15°C
<b>T<sub>water; return</sub></b>	15°C – 23.5°C
<b>V<sub>water</sub> (P<sub>electr.</sub>)</b>	13.8 m <sup>3</sup> /h (3 kW) – 8.09 m <sup>3</sup> /h (2.3 kW)
<b>P<sub>electr. for UKS fan</sub></b>	3.6 kW – 1.5 kW
<b>P<sub>electr. for cold water</sub></b>	190 MWh/a – 125 MWh/a
<b>P<sub>electr. total</sub></b>	248 MWh/a – 158 MWh/a

Energy saving:

- Fans: 19 MWh/a
- Pumps: 6 MWh/a
- Cold water production: 65 MWh/a
- Overall: 90 MWh/a

**Cost saving with Rittal aisle containment: up to 36%.**

# Rittal – System solutions



## **From system to solution: Comprehensively individual**

However individual your business, you can be sure that all Rittal climate control systems provide a comprehensive expert package:

- Exemplary energy efficiency
- Plus special project engineering
- Plus permanent innovative strength
- Plus typical Rittal high-quality production.

Rittal never loses sight of a project's particular customer requirements. The aim is always the same: to produce maximum benefits for the customer.

- **Recooling systems for IT cooling**
- **CRAC systems**
- **Aisle containment**
- **High-density cooling**
- **Piping systems**
- **Monitoring**
- **Free Cooling**

04/09 • E593

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