



CAREL

Energy saving solutions for data centres

High-efficiency technologies
for cooling, temperature
and humidity control, and
infrastructure monitoring

Data centre air conditioning

Air conditioning of data centres guarantees service continuity in these essential yet extremely energy-intensive infrastructures that continue to grow in number. The types of systems used vary according to local climatic conditions and the characteristics of the buildings.

- 50 years of innovations in cooling technology;
- multiple product platforms designed for energy savings;
- specific knowledge of data centre applications and collaboration with manufacturers in identifying the best solution.

It is estimated that this sector accounts for around 1.5% of world energy demand*. According to many estimates, the growth of AI could bring power consumption to 3-4% of the total by 2030. Sustainability and energy saving objectives can be achieved through continuous improvement of cooling solutions, which starts by adopting innovative high-efficiency technologies.

* International Energy Agency (iea.org)



Evaporative cooling units



Adiabatic humidification systems



Energy saving

CAREL's solutions are designed to achieve the highest air conditioning efficiency, both at a component and system level.



Mission critical

For these types of mission-critical applications, service continuity is essential, and therefore the solutions need to be highly reliable both in terms of component quality and system redundancy.



Flexibility

The energy-saving solutions can be adapted for use in all major application scenarios, including retrofits to improve the PUE of existing data centres.



RECUPERATOR
THE HEAT EXCHANGER
Plate air-to-air heat exchangers



Rotary air-to-air heat exchangers



Dampers



Monitoring systems



Programmable controllers



Steam humidifiers



Sensors and protection devices



Electrical panels



Compressor inverters and electronic expansion valves



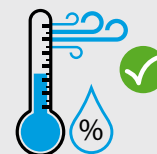
Cybersecurity

All CAREL products are developed in accordance with the latest security standards.



Connectivity

All products come with various connectivity options, while the programmable controllers in particular feature embedded solutions or optional boards for communication using the most widely-used protocols.



Temperature and humidity control

Keeping both these parameters within the guidelines suggested by ASHRAE TC 9.9 requires integrated solutions, especially in adiabatic cooling systems.

Solutions for direct freecooling + DEC

Systems that directly exploit the outside air, cooling it adiabatically with minimum energy consumption and at the same time controlling the temperature and humidity.

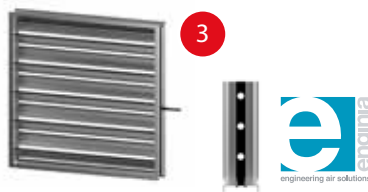
- Maximum efficiency with freecooling and evaporative cooling;
- Precise temperature and humidity control;
- Flexible installation.



humiFog multizone touch

High pressure adiabatic humidifier that atomises water through nozzles mounted on a rack into microscopic droplets, ensuring very high efficiency and precision. The inverter-driven pump and multi-zone configuration allow specific control of evaporative cooling in summer, and humidification in winter on the recirculated air.

When the outside temperature is sufficiently low, fresh outside air can be introduced via an AHU or the building's ventilation system. When the climatic conditions are favourable, during the summer the air can be cooled adiabatically by increasing its humidity content (direct evaporative cooling); during the winter the same system maintains the minimum humidity level by exploiting the recirculation of warm air.



SER100TT outside air damper

The break dampers with leakage class 4 are ideal for preventing leakages and condensation; numerous mounting options are available to suit both units and installations in the building's structure.



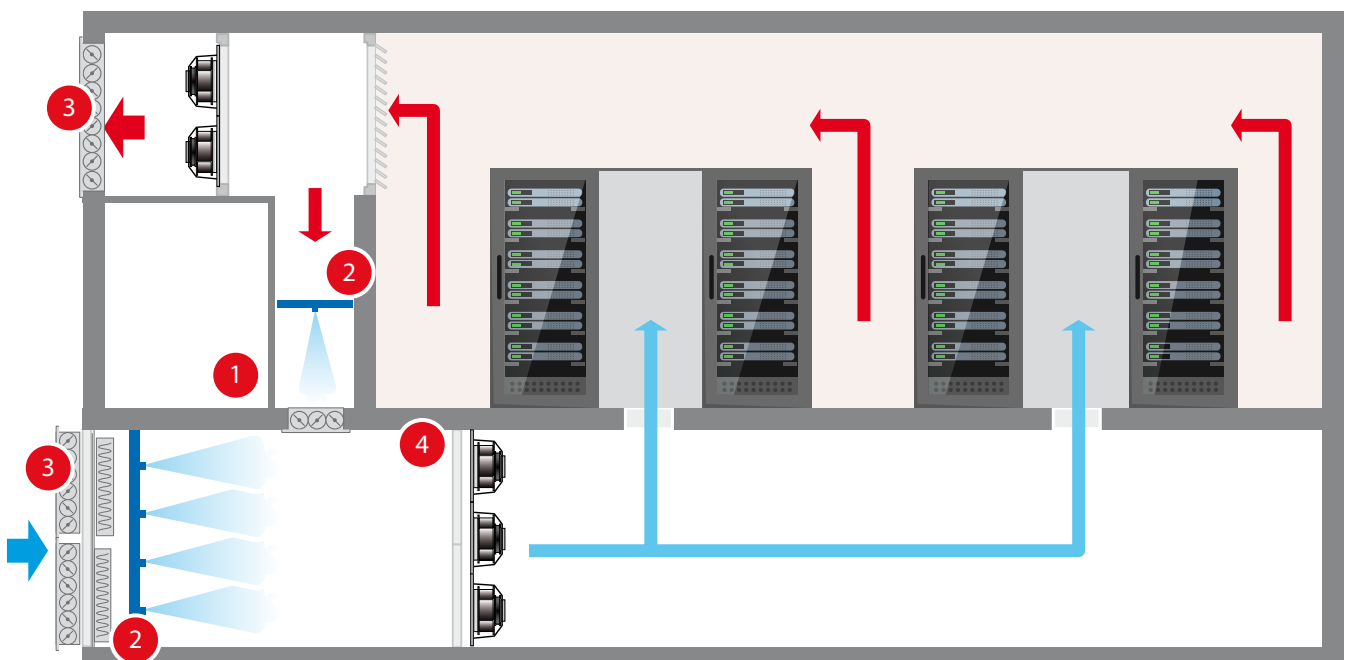
Reverse osmosis

Water treatment is essential to minimise nozzle maintenance and avoid the introduction of harmful dust.



Programmable controller

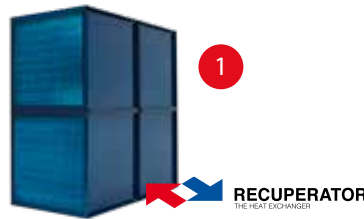
The programmable controller is the heart of the system, controlling temperature and humidity at the same time by coordinating the operation of the various devices, using a vast library of functions and CAREL's know-how of psychrometric processes.



Solutions for indirect freecooling + IEC

Systems that exploit evaporative cooling of the outside air cool the data centre air via a heat exchanger.

Indirect evaporative cooling units use a heat exchanger to cool the recirculated air in the data centre using outside air; the indirect heat exchange avoids the introduction of contaminants and exploits evaporative cooling of the outside air, bringing it to saturation. Units can also include a refrigerant circuit that supplements cooling when the environmental conditions are unfavourable, or as a backup.



B-BLUE air-to-air heat exchanger

B-Blue is a heat exchanger with an absorbent hydrophilic coating designed to optimise heat exchange and enhance evaporation due to surface wetting (efficiency up to 15% higher than traditional coatings); corrosion resistance and water tightness (tested on 100% of units manufactured) guarantee the highest reliability.

- Evaporative cooling extended to multiple climatic conditions;
- Air recirculation without introducing contaminants;
- Built-in refrigerant circuit.



High efficiency technologies

Essential for maximising the efficiency of the built-in refrigerant circuit and controlling air supply temperature and humidity.



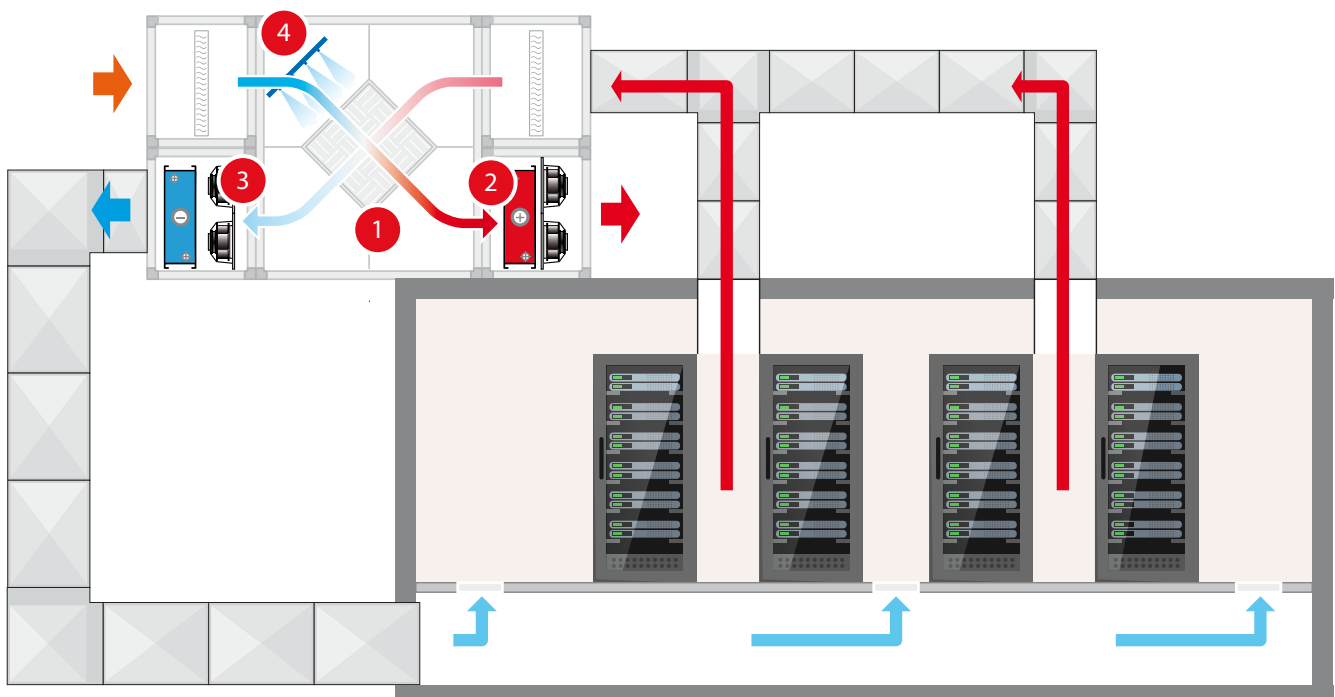
c.pCO programmable controller

An integrated solution is essential for selecting the best operating mode based on outside conditions, between indirect freecooling, IEC and mechanical air conditioning.



KEC

Evaporative cooler that atomises water using a highly-flexible nozzle distribution system that can be adapted to the layout of different units. IEC Special baffles increase air turbulence for better droplet distribution. The pump is variable-speed and is controlled by an inverter (available on a separate module for installation flexibility) to optimise feedwater supply.



Solutions for CRAH and cooling wall systems

Systems with traditional air recirculation cooling technologies made more efficient by the hot aisle-cold aisle layout.

- solutions suitable for more traditional layouts and retrofits;
- high connectivity to field devices and monitoring systems;
- precise humidity control with minimum energy consumption.



Serial probes

The adoption of large chilled water coils such as in cooling walls makes it necessary to measure temperature and humidity in several points of the air flow, so as to manage the devices appropriately and ensure optimal air distribution. Modbus communication makes it easy to install numerous probes on a single communication bus, with less wiring.

Recirculation system solutions are very widespread, in particular those using chilled water; various air distribution configurations and compartmentalisation make it possible to increase the air supply temperatures, using freecooling to cool the water most of the year. Many recirculation systems do not include humidifiers in the air conditioning units due to the absence of dehumidification, however the effect of low outside humidity can lead to dangerous limits being reached in terms of electrostatic discharges, making a humidification solution in the room necessary.



Overpressure damper

Extruded aluminium overpressure dampers with snap-on flanges and combined blade movement are ideal for fan wall configurations, as they prevent the recirculation of air when no fan is operating. In particular, the new versions with vertical blades minimise pressure drop and require less maintenance.



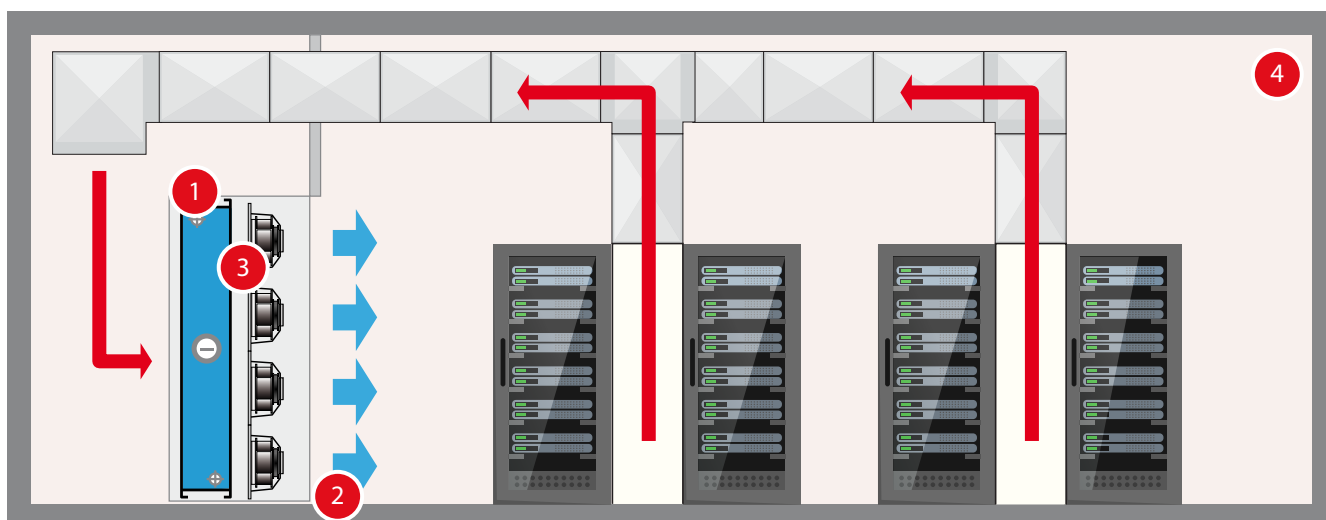
c.pCO electronic controller and boss one

The programmable controller ensures optimum management of any type of recirculation unit: the boss one option it is ideal for integration into supervisory systems, feature high security of the protocols and access control. The flexibility of this family of controllers means they are the most widely-used controllers also on chiller units and outdoor evaporative towers.



humiSonic direct

Ultrasonic humidifiers have a high modulation capacity and produce microscopic droplets that are absorbed in very small distances. They are ideal for various in-room installations, depending on the space available. Supplied with water from reverse-osmosis, they feature high reliability and low maintenance.



CDU (coolant distribution unit) solutions for liquid cooling

A complete and flexible range of solutions for both floor-mounted and rack-mounted CDUs

The growth in high performance computing is leading to a staggering increase in the density of heat to be expelled, so much so that liquid cooling solutions, both immersion and in contact, are needed to remove the heat. The heart of the system is the CDU (coolant distribution unit) which, via a heat exchanger, transfers the heat extracted from the chips by a liquid (typically water and propylene glycol) or a two-phase fluid, to the FWS (facility water system), where the heat is then transferred to the outside environment using a chiller or dry cooler, depending on the climate. Some CDUs reject heat into an air-source heat exchanger, meaning space cooling is required.



FLOE-FLOR flood sensor

The use of water in units installed in data centres, often close to critical equipment, requires sensors that can detect leaks.

- flexible solutions for liquid cooling;
- high-performance controllers and sensors for precise CDU control;
- IT standard communication with Redfish protocol, ideal for these applications.



c.pCO electronic controller

A range of solutions for controlling different types of CDUs, both rack-mounted - with a compact controller such as cpCOMini - and floor mounted units, with larger controllers equipped with a dual Ethernet port to create flying master unit networks.



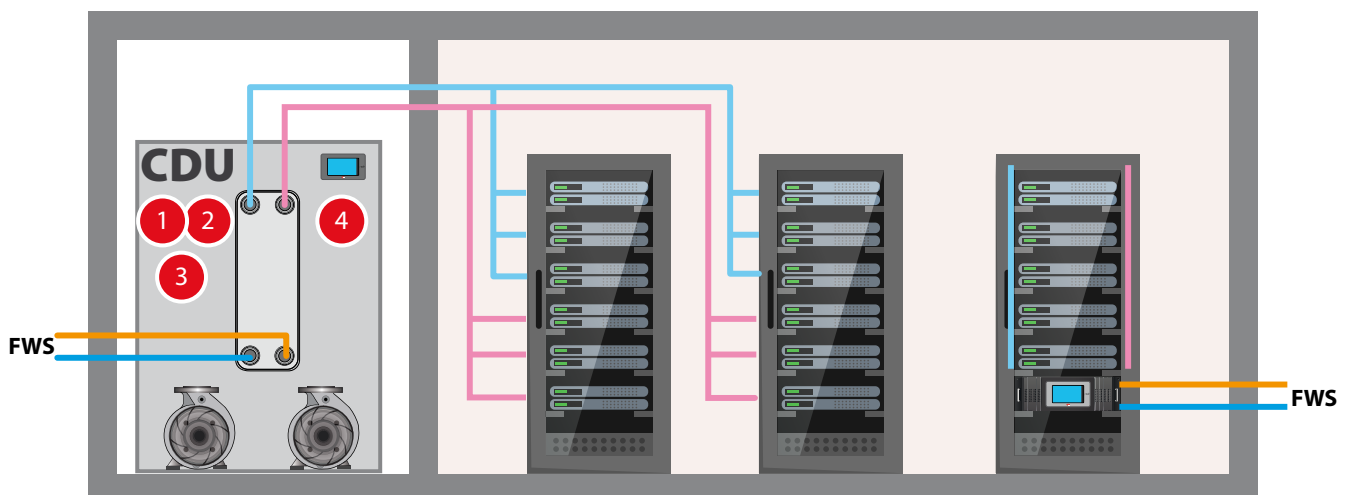
p.COe A-IN

The new expansion board adds a further 16 analogue inputs, for control solutions that require an ever-increasing number of sensors to be connected, including redundant ones, for temperature, pressure and other fluid parameters.



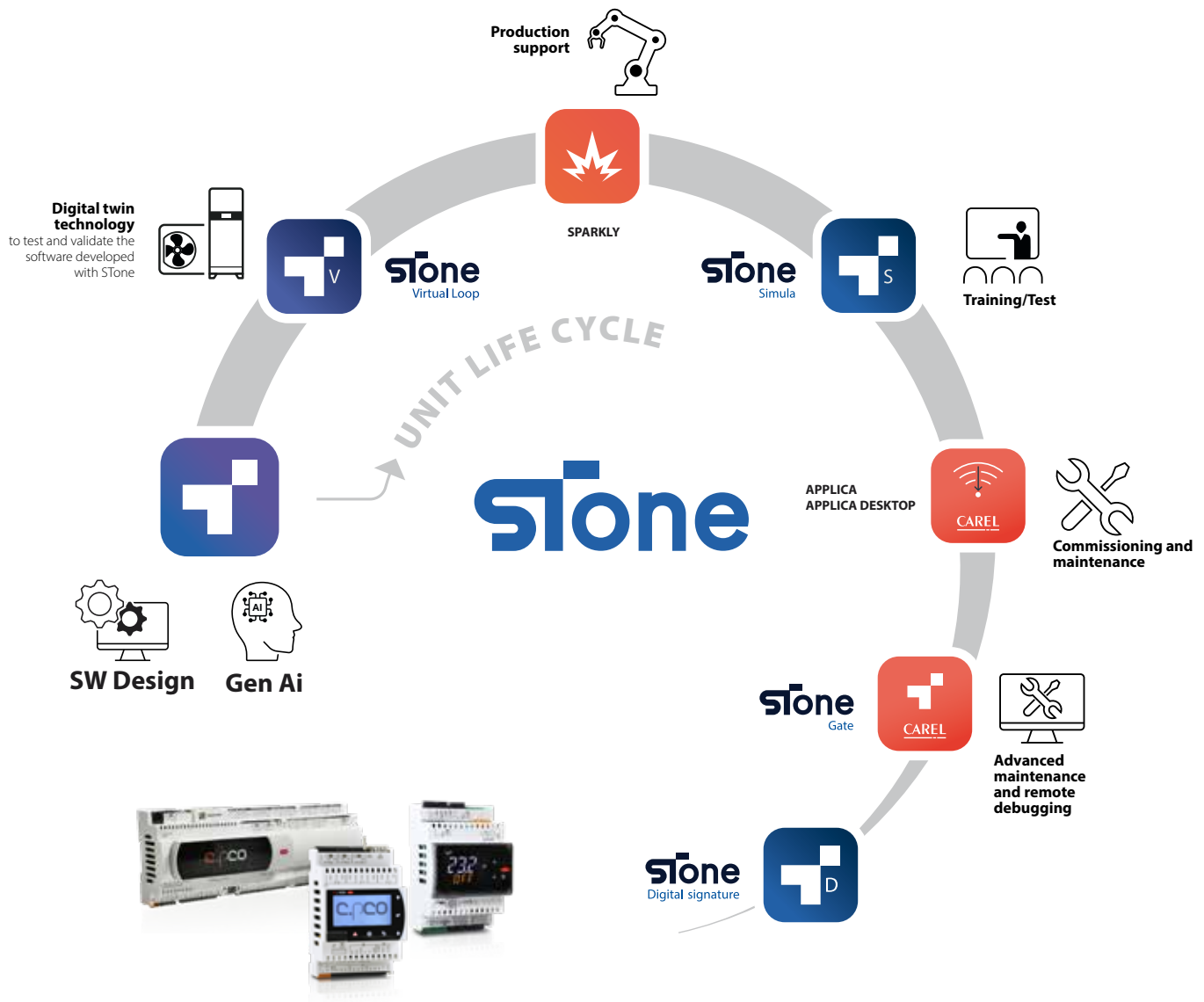
boss micro

The adoption of a liquid cooling solution is often based on a close interaction with the servers, and therefore the cooling system requires an edge device capable of communicating with DCIM systems, using the same security standards and sophisticated interfacing methods. Boss micro is the ideal solution for this purpose, both compact and extremely powerful.



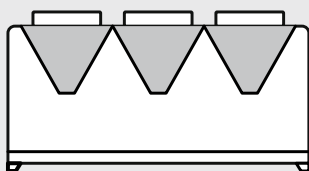
STone, the ecosystem for optimising the development of highly-customised software

A complete ecosystem for software management spanning the entire lifecycle, from design to production, commissioning to maintenance.



A single tool for all data centre cooling solutions

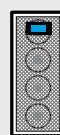
The high-performance programming suite enables the development of solutions for any type of cooling unit, ensuring fast, safe, and reliable customisation for mission-critical applications.



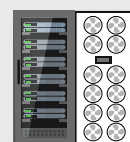
chiller



CRAC



In row



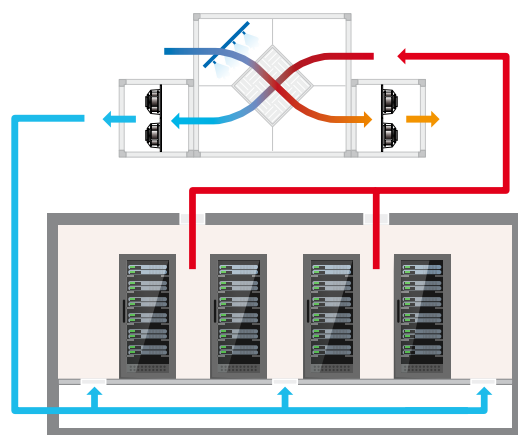
RDHX (Rear Door Heat exchanger)

Solutions for retrofits and improving energy efficiency

Many data centres have been operating for several years now, and the facilities increasingly need to be overhauled or upgraded, both to ensure uncompromising reliability and to meet efficiency regulations, replacing obsolete or damaged components with higher-performance ones.

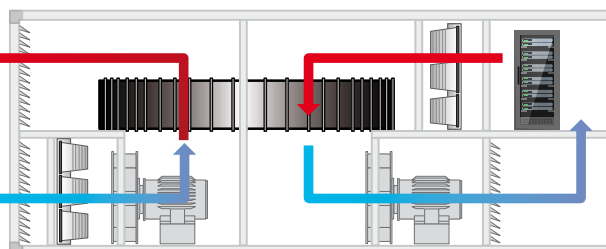
Replacement of obsolete plate heat exchangers for IEC

The V series heat exchanger is suitable for replacing air-to-air heat exchangers in indirect evaporative cooling units, especially where there are corrosion problems: the heat exchanger, made from PVC plates with ultrasound welding, is highly resistant to wear and tear and extremely tight against water leaks.



Overhauls of indirect freecooling wheels

In more temperate climates, solutions are available that use thermal wheels to provide indirect freecooling: maintenance of the wheels is essential to keep them in perfect working order. Klingenburg can provide these services, which also include replacing the heat exchanger with a solution featuring less than 5% bypass.



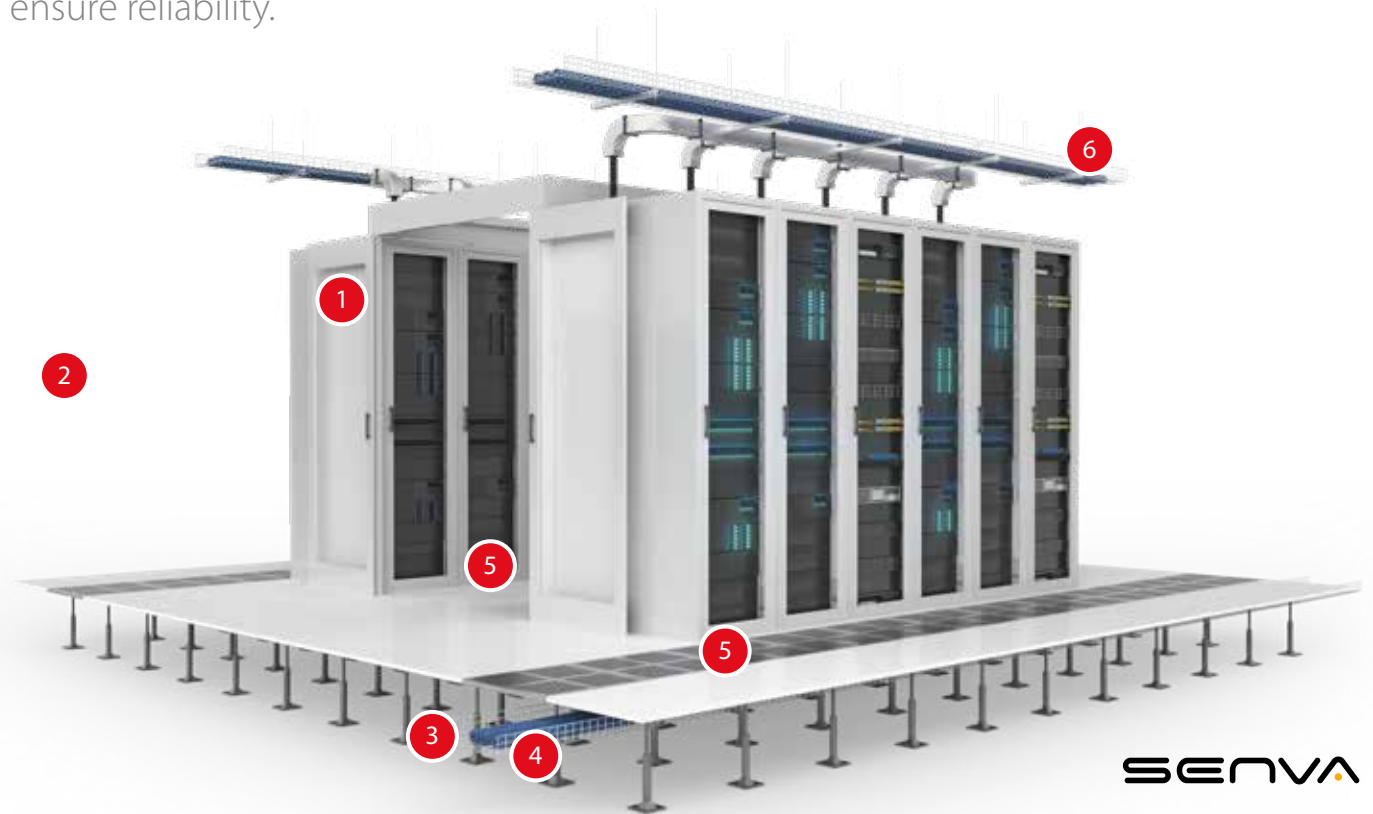
Improve the efficiency of chillers and dry coolers

chillbooster is the ideal atomisation solution to avoid downtime on chillers and dry coolers when peak conditions are reached, both due to the heat island effect and the rising maximum summer temperatures: with very low air-side pressure drop, this appliance can lower the temperature by 10°C, improving system efficiency. A versatile distribution system makes it ideal for retrofits.



Sensors for monitoring server rooms

A complete range for measuring various environmental and electrical parameters, meeting the growing need for monitoring to optimise power consumption and ensure reliability.



DPWS and Total Sense probes

Temperature and humidity probes: serial versions at different points in the hot and cold aisles to identify hot spots. The total sense probe can measure PM to limit freecooling when particulate matter levels are high.



TG toxic gas probes

Highly configurable sensors for monitoring hazardous gases such as hydrogen (H₂); in particular, measuring hydrogen sulphide (H₂S) is important for direct freecooling systems, to prevent damage due to corrosion.



FLOR and LD W/F flood sensors

Sensors for detecting leaks from water circuits: point and tape versions for larger areas, with built-in contact or with panel module. LD IPX7 floor and wall.



Water sensors

Temperature and pressure sensors and accessories for water circuits, AISI 316L versions for glycol systems. The PW31 differential pressure sensor with 0.25% accuracy for monitoring water flow, filters and manifolds.



P4 air pressure sensors

Compact, calibrated (NIST Certified) air pressure transducers with 0.5% or 0.25% accuracy, ideal for measuring differential pressure between the hot and cold aisles or in ducts and for checking air flow.



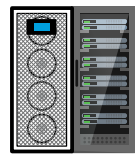
Multi-Circuit Branch Meter (CM series)

Monitoring of electrical parameters with 0.2% accuracy (voltage, current, power consumption, THDI,...) on rack or module subsystems, with up to 96 connectable circuits thanks to various CT formats. Ethernet interface and datalogging for monitoring and sharing with DCIM.

CAREL solutions for modular data centres

Scalable, highly-efficient solutions for micro data centres, containers, and hyperscale modules, with technologies designed to ensure reliability, continuous monitoring, and energy optimisation.

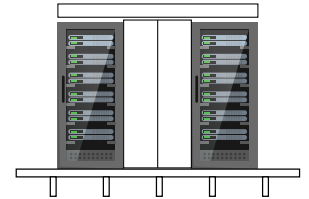
The growing demand for flexibility, scalability, and rapid deployment has led to the development of modular data centres, available in various configurations: from mini data centres for edge applications, to all-in-one containers and prefabricated modules for large-scale infrastructure. In these environments, precise and integrated monitoring of critical parameters such as temperature, humidity, air flow, and energy consumption is essential to ensure operational efficiency. CAREL solutions allow intelligent management of both cooling and power consumption, ensuring high performance and service continuity.



micro data centre



containerised



module

1



TG hydrogen sensors

The TG series includes models for hydrogen (H₂) monitoring, essential when there are UPSs with lithium batteries. The sensor enables extra ventilation to be activated by opening outside air dampers when hydrogen concentration reaches a set limit.

2



High efficiency technologies

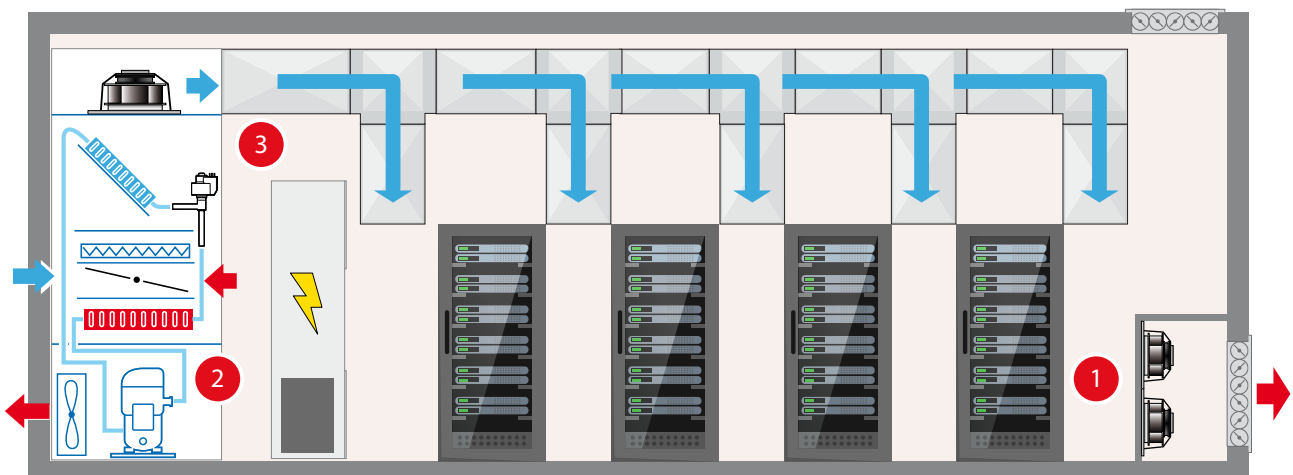
For modular containerised data centres, direct expansion systems are still popular solutions: variable-flow technologies with power+ and ExV minimise power consumption and allow the use of partial freecooling. Integration with the controllers allows optimal temperature control and reliability through management of the compressor envelope.

3



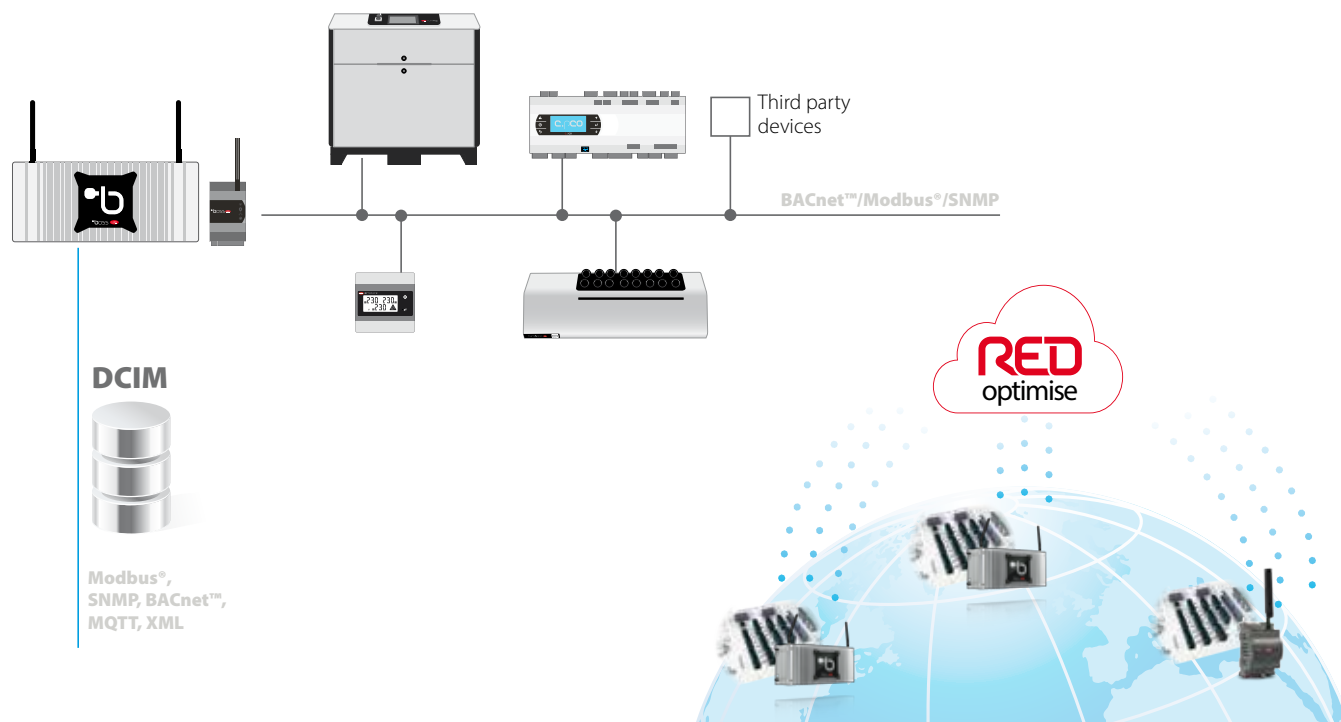
boss

The ideal solution for monitoring both environmental parameters with dedicated serial probes, and the status of cooling devices. It can also be used to monitor electrical equipment such as UPSs and loads with Energy Meter, via standard protocols such as Modbus and SNMP, collecting data from the field and sharing it with centralised monitoring systems.



A complete range of edge devices for data centre monitoring

Solutions for the integration of power and cooling infrastructures, both at a unit and system level, or remotely.



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