

# Data Centre Cooling Solutions

Systemair – Cooling the ones and zeros



# Systemair makes it easy: Data centre cooling – from concept to completion

The data centre industry is growing rapidly, with ever greater focus on faster connections and increasing uptime. Cloud data centre traffic will grow every year, and the need for greater online storage will drive server capacities higher and higher.

The huge growth in the number of users connected to the internet and the enormous enlargement of data have led companies to invest in data centres that are increasingly large in size, with greater energy density per m<sup>2</sup>. Nowadays, it is essential to have an energy-efficient cooling system, since savings in energy costs will largely contribute to the profitability of data centres.

The companies within Systemair develop and deliver reliable data centre cooling concepts. Our companies Menerga and Systemair stand for both: customised or out-of-the-box solutions – making your data centre run cool, smart and safe. As your reliable partner for data centre cooling, we are by your side from concept to completion and long after.

With this application brochure we want to show you all the important aspects to be considered when designing a data centre with high levels of energy efficiency. Furthermore, we will show you the possibilities and chances on the way to a cooling solution that is economically sustainable and that has low environmental impact by using solutions from Systemair and Menerga.

**1974**

founded in Sweden

**50**

countries with own  
sales organisations

**25**

production facilities



10

technology centres

3

distribution centres

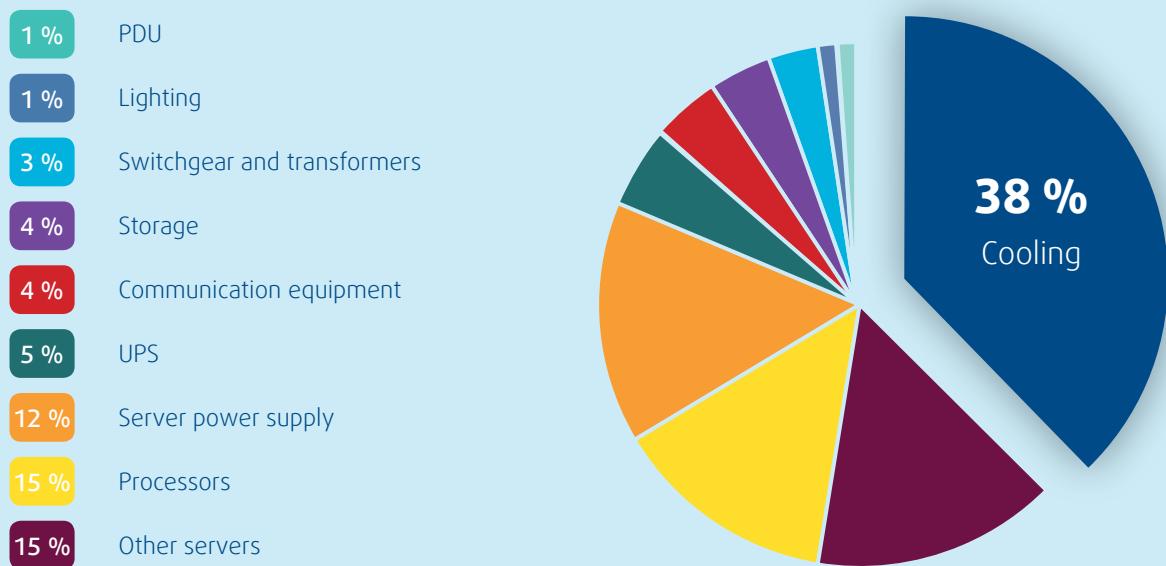
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number of countries  
exported to

# Secure high quality and save money where you can

Cooling represents the biggest slice of the total cost in a data centre. And with more capacity and higher density, there is increased need for energy-efficient cooling of IT equipment.

## Energy demand in data centres



The most energy-efficient data centres use products and innovative techniques that significantly reduce energy consumption and leave minimum carbon footprints. New legislation and directives like F-gas, Eco Design and ASHRAE Guidelines are driving new solutions for cooling.

The industry has been focusing on PUE as the leading metric for energy efficiency, but is now also focusing more and more on other metrics, such as TCO (total cost of ownership), WUE (water-use effectiveness), CUE (carbon use effectiveness) and ERE (energy re-use effectiveness) - in which the data centre can be used as a source of energy.

With the adoption of the Kyoto Protocol, the European Union committed itself to a reduction of at least 20 % in CO<sub>2</sub> emissions by 2020.

In 2009, the ErP Directive (Energy-Related Products Directive) was signed. It is often simply referred to as the Ecodesign Directive.

We come across this in everyday life, for example with the phasing out of traditional light bulbs or the energy-efficiency labelling on fridges, washing machines and so on.

The directive is mandatory in the EU. This requirement affects manufacturers of ventilation and air conditioning products. The ErP Regulation covers products that are produced in the European Economic Area, as well as those imported from other countries. Products outside the EU are not covered by the regulation. All affected products and solutions of Systemair and Menerga comply with the ErP Directive.

# Count on the certified quality of our cooling and ventilation systems

With more than 200 engineers and 10 R&D centres around the world, Systemair and its subsidiaries offer a wide range of robust and reliable ventilation and cooling products for all kinds and sizes of data centres – even for those in the most challenging climatic regions. Our products are developed to the latest standards and rigorously tested. That is why we can guarantee that our products always deliver optimum performance.

## Certified quality

Systemair and Menerga are certified in accordance with ISO 9001, ISO 14001, ATEX and European Fire Safety Standard EN 12101-3. Our research and development laboratories are some of the most modern in Europe; measurements are made in accordance with international standards such as AMCA and ISO.



## Save energy, lower running costs!

Our label "Green Ventilation" features products with high energy saving potential. All products labelled with "Green Ventilation" combine energy economy with energy efficiency.

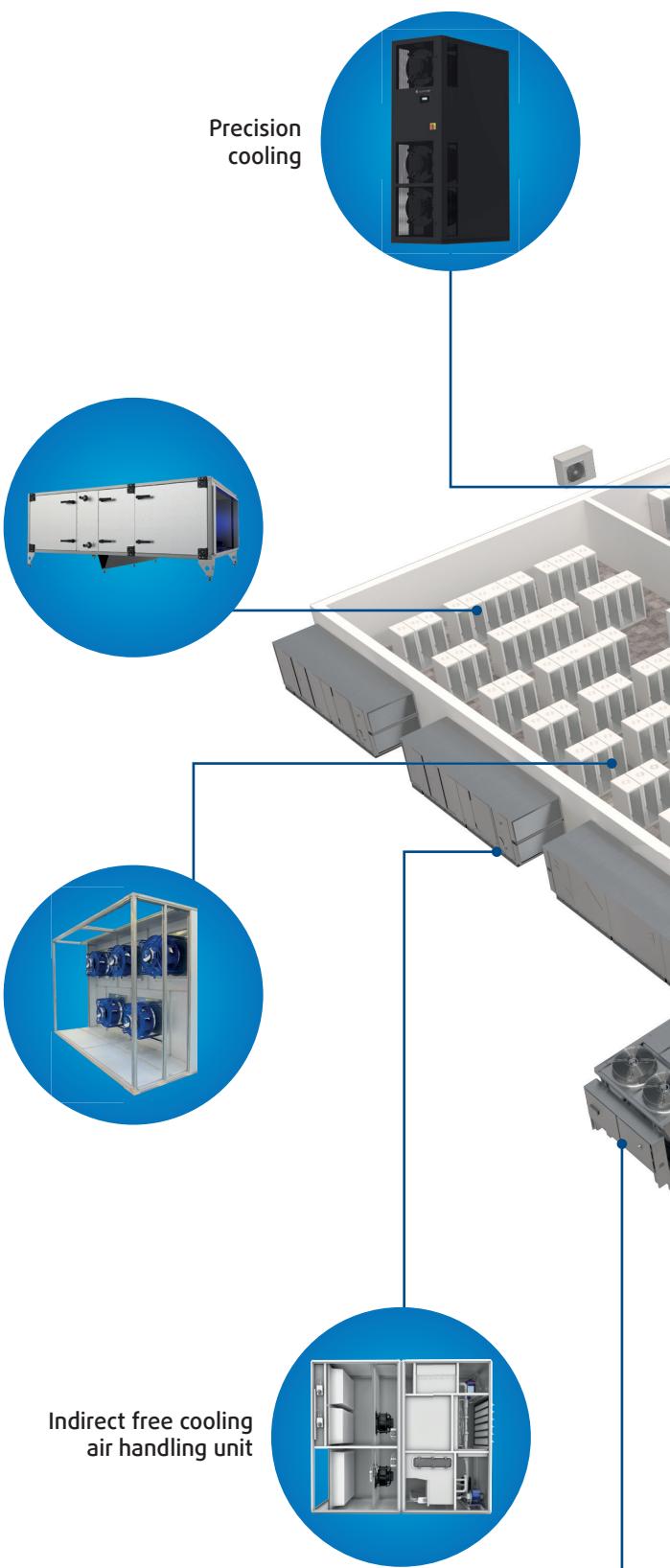


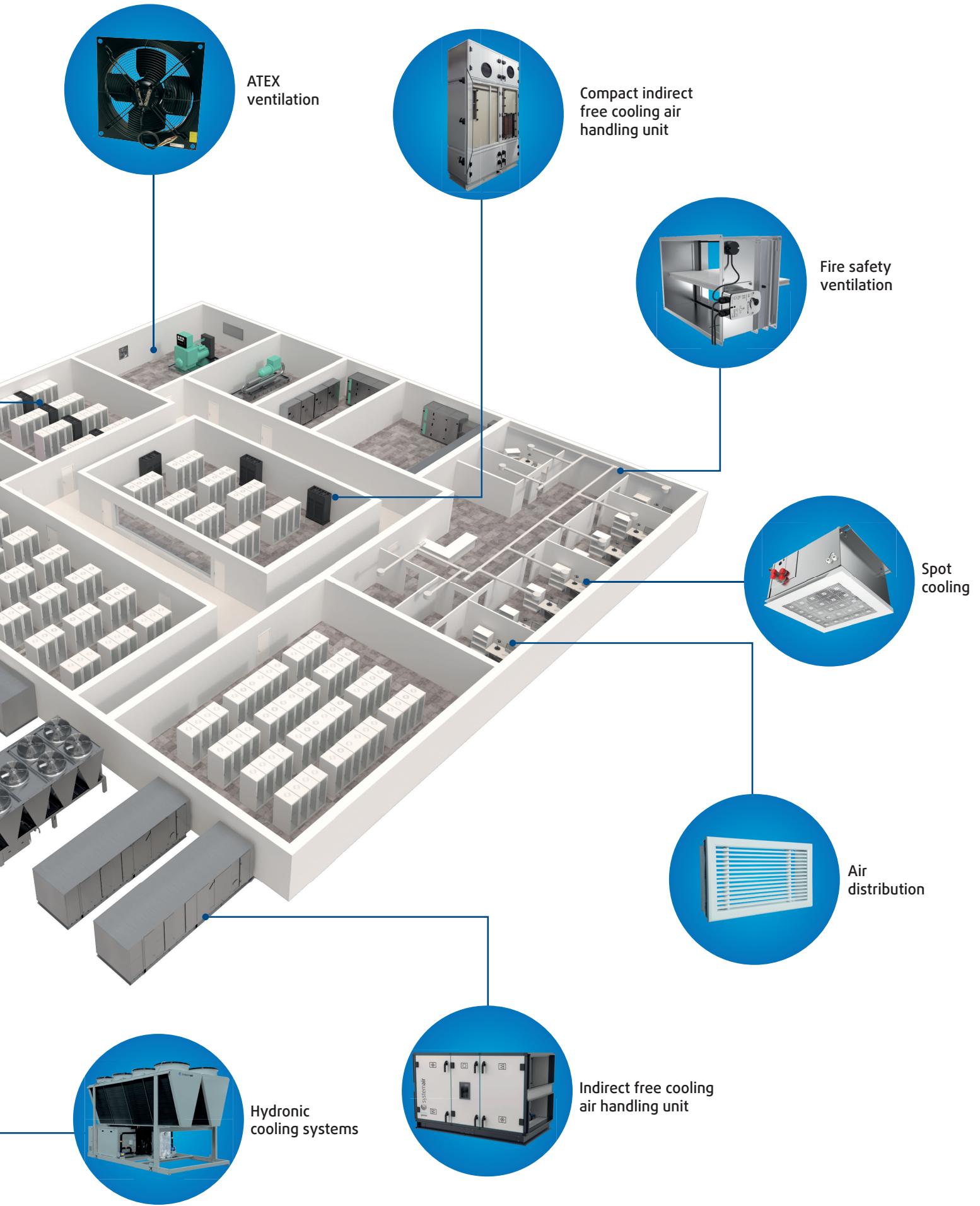
# Complete cooling concepts: broad product portfolio for your data centre

With 57 subsidiaries in 50 countries and around 5,500 employees, we are right where you need us. Around the globe our competent and experienced engineers and sales support teams are at your service, so you can trust us being your partner in helping you with comprehensive HVAC solutions and products for a super-efficient data centre in any climate zone.



Direct free cooling air handling unit





# Class-leading efficiency: Free-Cooling Air Handling Units

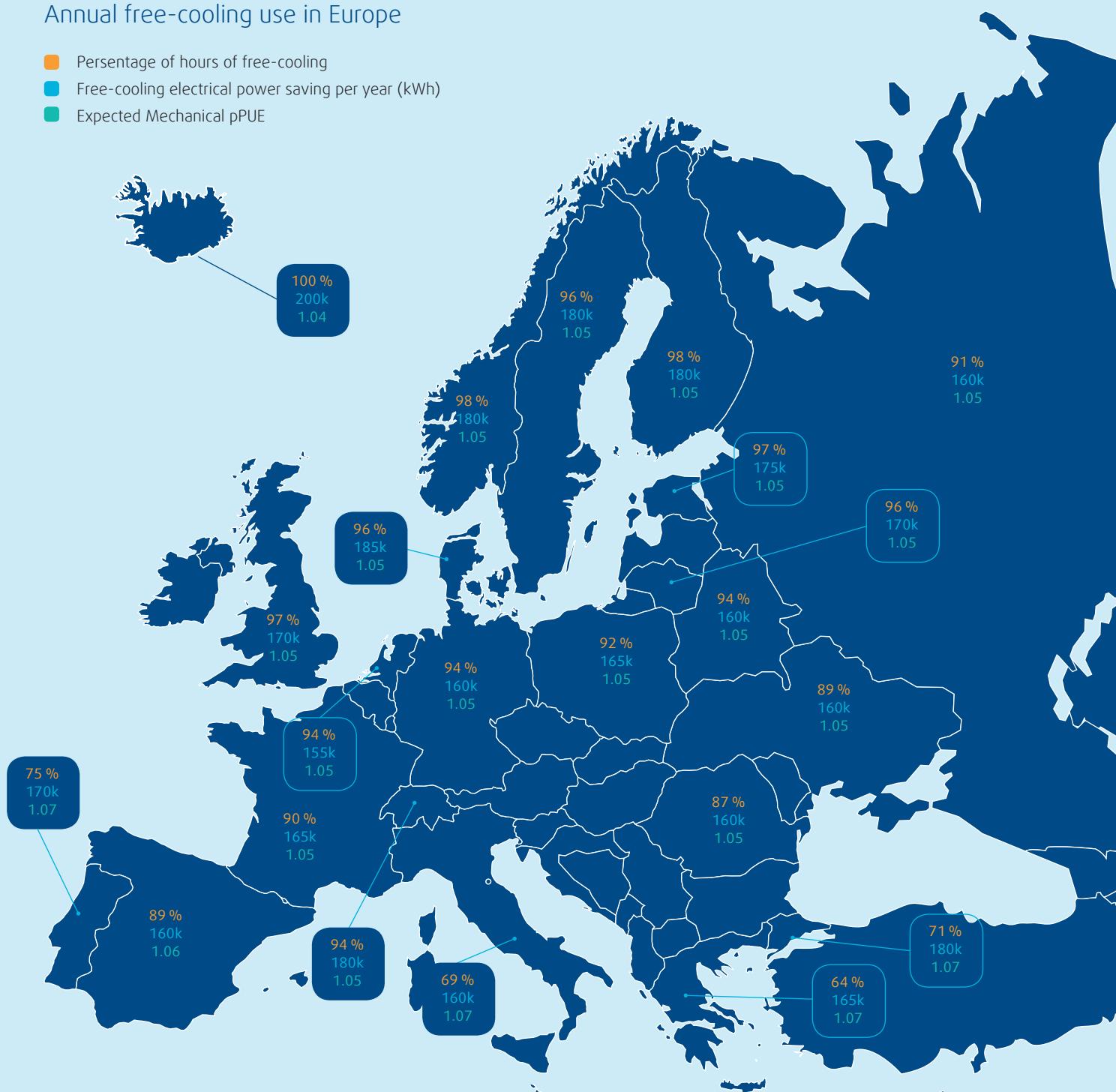
Calculations based on a one-year performance in a 1-MW data centre in Berlin, 5+1 redundancy installation, 24 °C supply and 38 °C extract, show that the system will work with an average pPUE of 1.05 and extremely low WUE of only 0.2 l/kWh. To supply air with a temperature of 24 °C, mechanical support is needed only during 6 % of the time.

If it is allowed to rise the supply air temperature to 27 °C (within the ASHRAE recommended temperature envelope), mechanical support will not be needed at all.

A 1-MW cooling system based on indirect free-cooling units IFC during 5 years of operation will give an average energy saving of 4,800,000 kWh. In terms of money savings, this is equal to approximately €576,000 in the city of Berlin.

## Annual free-cooling use in Europe

- Percentage of hours of free-cooling
- Free-cooling electrical power saving per year (kWh)
- Expected Mechanical pPUE



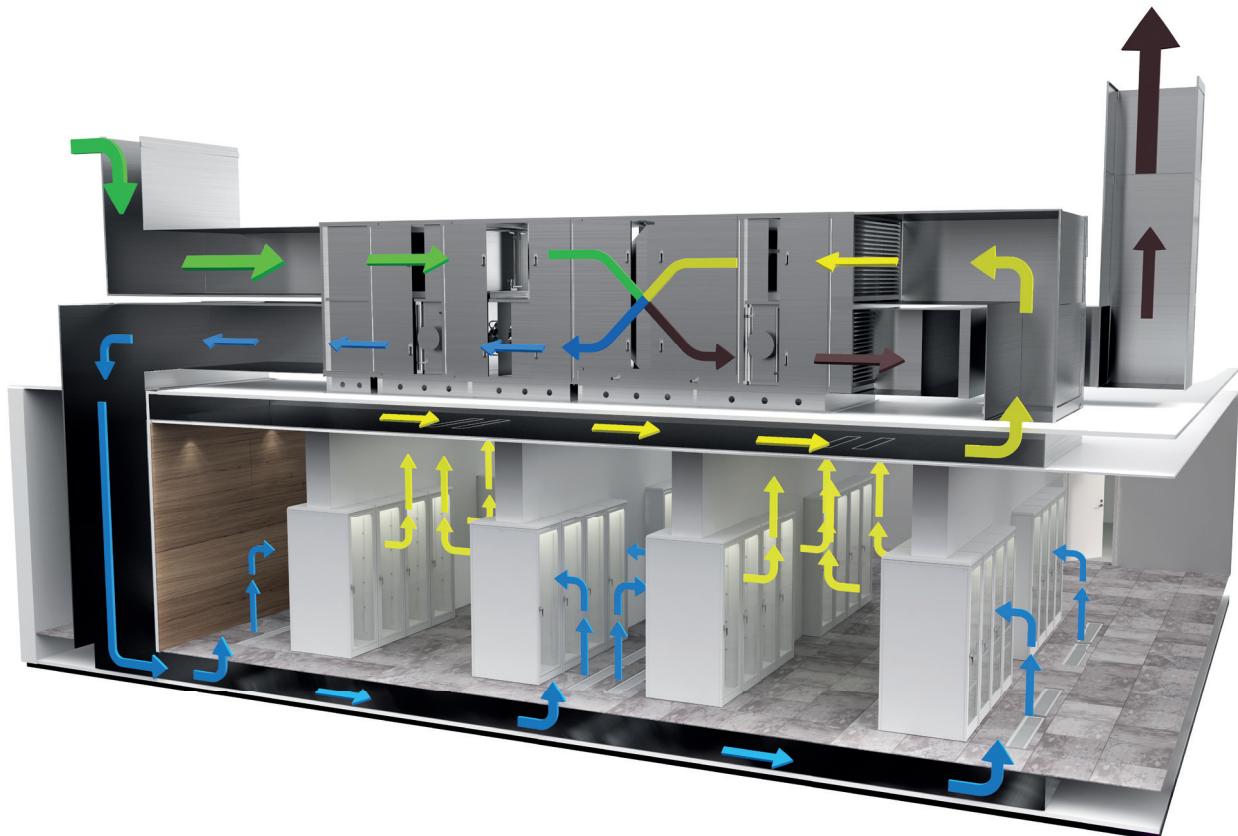
# Take advantage of favourable outside conditions: Indirect Free-Cooling Units

Free-cooling is a highly efficient method that uses outdoor air to cool the data centre, thus considerably reducing total energy consumption. Considering ASHRAE's regulations for IT equipment, it is possible to free cool during 97-99 % of the time in most of the European countries. Even in really hot countries, free-cooling air handling units can be used in combination with DX, evaporative or

chilled water cooling to reduce the total energy consumption for cooling. If it is allowed to supply air temperature at 26-27 °C for some hours of the year, which is still within ASHRAE A1 recommended temperatures, it is possible to avoid any mechanically supported cooling and use free-cooling and adiabatic support alone.

Systemair and Menerga offer various solutions for direct and indirect free-cooling systems:

- Systemair Indirect Free-Cooling units IFC (25-300 kW)
- Systemair Direct Free-Cooling units DFC (40 - 300 kW)
- Menerga Indirect Free-Cooling units (11 - 230 kW)
- Menerga Compact Cooling units for data centres (10 - 50 kW)



# Low mechanical PUE and minimal OPEX: Systemair's Indirect Free-Cooling units

Systemair IFC Data Centre units (25 kW - 300 kW) enable an energy-efficient cooling of IT equipment in data centre facilities. Most of the year, the units work with outdoor air only to cool by using a high-efficiency air-to-air heat exchanger. When the outdoor temperature rises, an adiabatic humidifier will start to help maintain the supply air temperature. The adiabatic humidifier has a water recovery solution to ensure a low WUE and will operate with tap water quality (no need for reverse osmosis).

If the design outdoor temperature is very high, a plug-and-play DX package can be integrated inside the unit for further mechanical support.

Systemair's Indirect Free-Cooling will ensure a low mechanical PUE and minimal OPEX, and also features an optional energy recovery module to obtain a good ERE value.

## KEY BENEFITS:

- Innovative cooling ensures low OPEX
- Efficient air filtration
- Extremely low WUE
- Ultra-efficient free-cooling with no outside air in the data centre
- Single-stage adiabatic cooling with water recovery
- Energy-efficient EC fans to reduce power consumption
- Integrated controls and sensors for easy operation
- Factory-tested systems
- Tier 3 ready: ATS and UPS for controls as option
- Modular design for many installation configurations
- Optional energy recovery module



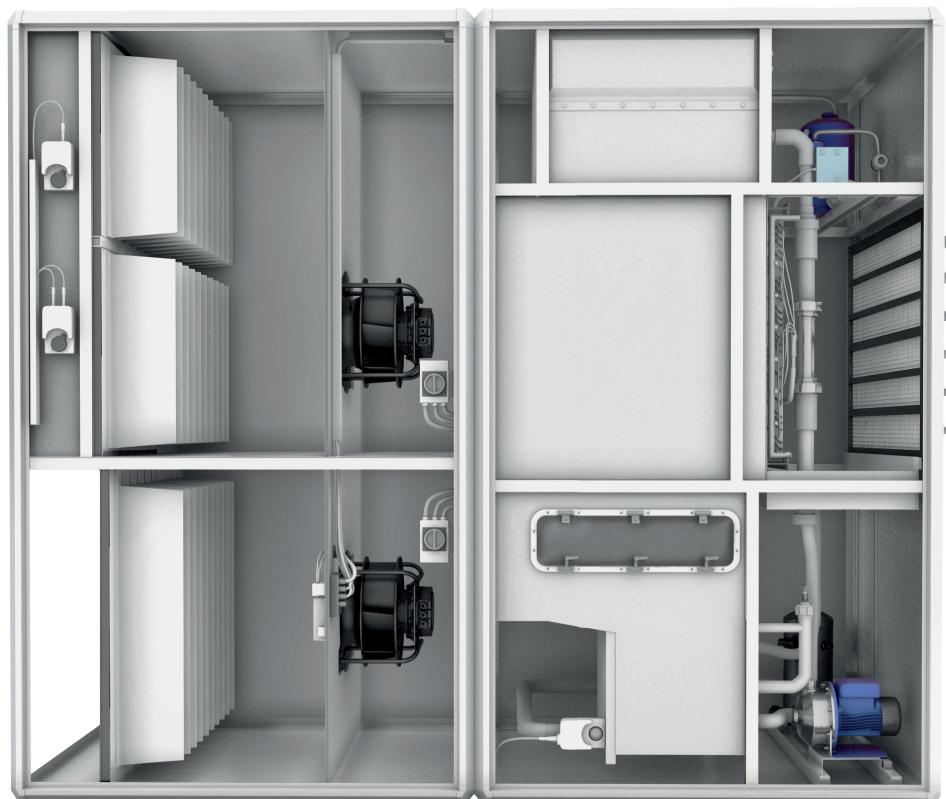
Systemair's Geniox data centre units are specially designed for cooling data centre facilities. Our range of indirect or direct free-cooling units is designed for both outdoor and indoor installation. All units are modular and easy to install and maintain. The units are always delivered with controls, and every unit is commissioned in our factory to ensure functionality.



# Indirect free-cooling concepts: Finely tuned for data centres

Thanks to the combination of indirect free-cooling, indirect adiabatic evaporative cooling and the integrated output-regulated compressor refrigeration system, each of which supports the effectiveness of the others, Menerga Adcoolair allows heat dissipation in recirculation mode for data centres and other rooms with high thermal loads. Minimal space requirements, low air pressure losses within

the unit and very little energy consumption are only the main advantages of this highly flexible solution. The use of energy-efficient EC fan motors, in combination with a demand-oriented flow rate control system, additionally contributes to the reduction of operational costs.



## KEY BENEFITS:

- Use of polypropylene, which is microbiologically harmless and non-corroding for heat recovery systems
- Highly efficient solutions also for large data centres > 1 MW with a pPUE of 1.07
- Use of the waste heat of the building heating system
- Integrated condensation protection, with infinitely variable control
- Water-saving mode by primary use of indirect, dry cooling and DX cooling
- Integrated data logger with trend display, directly at the device or via cloud

# Independent of external influences: Compact Indirect Free-Cooling systems

Menerga Adcoolair with a compact recirculation cooler with heat recovery for capacity ranges from 10 to 50 kW operates with indirect evaporative cooling. This evaporative cooling concept is an energy-efficient and environmentally friendly solution that is ideal for installation as an upgrade for already existing data centres. Within the cooling system, the humidified air flow that extracts the required heat is additionally precooled by the circulation water of the evaporative cooling system. This enables achieving supply air temperatures below the wet-bulb temperature of the outdoor air – which is not possible with conventional evaporative cooling systems. This pure recirculation-air mode assures that external influences – such as pronounced temperature and humidity fluctuations, or pollution in the outdoor air – have no negative influence on the room air quality and conditions within the server room.



## Compact cooling units for data centres

### Evaporative cooling with outdoor air pre-cooler

The outdoor air pre-cooler is switched on to cover peak loads. It reduces the temperature of the incoming outdoor air and thereby increases the cooling potential of the evaporative cooling. The heated circulation water is sprayed through a second nozzle system into the heat exchanger, which contributes to the evaporative cooling.



Menerga's compact recirculation cooler was awarded 3rd place at the German Data Centre Award 2018 in the category Data Centre Air Conditioning and Cooling.

## KEY BENEFITS:

- Compact design with small unit footprints
- Year-round temperature of  $22\text{ }^{\circ}\text{C} \pm 1\text{ K}$  (for a maximum ambient wet-bulb temperature of  $24\text{ }^{\circ}\text{C}$ )
- 100 % air recirculation mode
- No DX unit required
- Climate-neutral cooling technology
- Simplified maintenance by use of water as refrigerant
- Not affected by the F-gas regulation
- Integrated controls
- Capacity ranges from 10 - 50 kW
- Indoor and outdoor installation

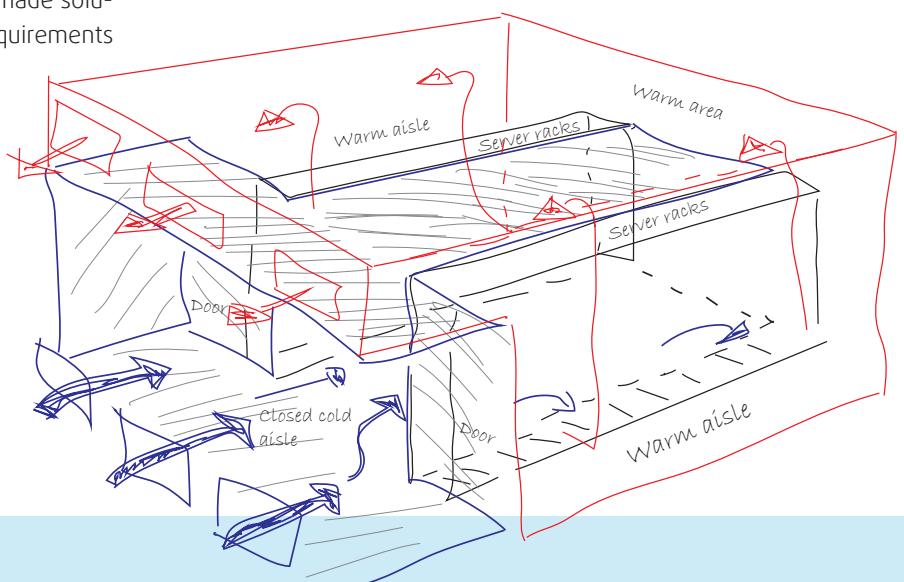
# High flexibility: Indirect Free-Cooling Systems for modular data centres

Modern technologies are constantly changing and it is necessary to provide solutions that offer a greater degree of flexibility to meet such demands. Modular data centres, for example which use container solutions, are ideal for these ever-changing times.

Such modular data centres are completely scalable and the solution can be implemented quickly compared to conventional data centres. The components and periphery are built in factories in advance of any orders so the construction time required onsite is minimal. In total the design and construction of any modular data centre can be achieved in 4 to 6 months.

Menerga provides energy efficient cooling solutions for such modular data centres. We provide tailor-made solutions dependent on the data centre project requirements you have.

The compact design of the Menerga Adcoolair with its integrated control and regulation system is the ideal air handling solution for modular data centres. Thanks to the combination of indirect free-cooling, adiabatic cooling and the integrated refrigeration system, each increasing the efficiency of the others, the Adcoolair allows heat dissipation in recirculation mode for data centres needing minimal space and having minimal air pressure drops and low energy consumption. The use of energy-efficient EC fans and the demand-oriented flow rate control system are combined to effectively reduce operating costs.



## KEY BENEFITS:

- Compact design from 10 to 50 kW, as well as capacity ranges up to 250 kW and higher
- High flexibility for cooling solutions
- Efficient and reliable cooling through the use of adiabatic cooling
- Excellent pPUE Cooling values
- No contamination of the process air flow with dust or corrosive pollutants
- Moisture content of the process air remains unaffected
- Indoor and outdoor installation possible
- Integrated control and regulation system compatible with all conventional building management systems
- Optional: The unit without integrated refrigeration system is not subject to F-Gas regulation

# A low carbon footprint for your data centre: With Direct Free-Cooling units

Systemair's Direct Free-Cooling units are built with the most efficient components available. This results in minimum operating costs and a low carbon footprint. The units range from 40 to 300 kW cooling capacity, and use outdoor air in combination with adiabatic cooling to obtain a low OPEX.



Rooftop units



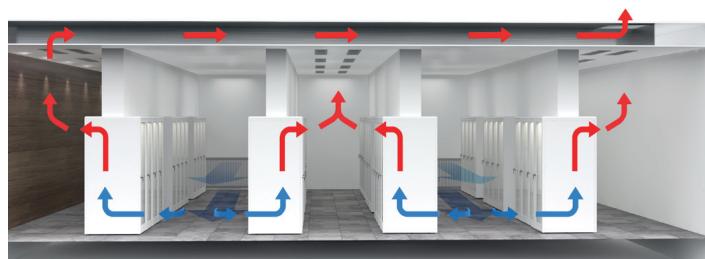
Stacked units for perimeter installation.



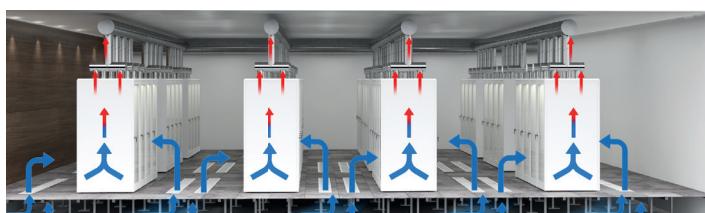
Stacked unit for multi-story buildings mounted alongside the wall.

## KEY BENEFITS:

- Innovative cooling ensures low OPEX
- Energy-efficient EC fans to reduce power consumption
- Efficient air filtration
- Integrated controls and sensors for easy operation
- Factory-tested
- Tier 3 ready: ATS and UPS for controls as option
- Compact sizes for small spaces
- Wide range of installation solutions
- High flexibility and fast installation thanks to modular construction
- Solutions for extreme low outdoor air temperatures



Wall-supply cold-corridor containment.



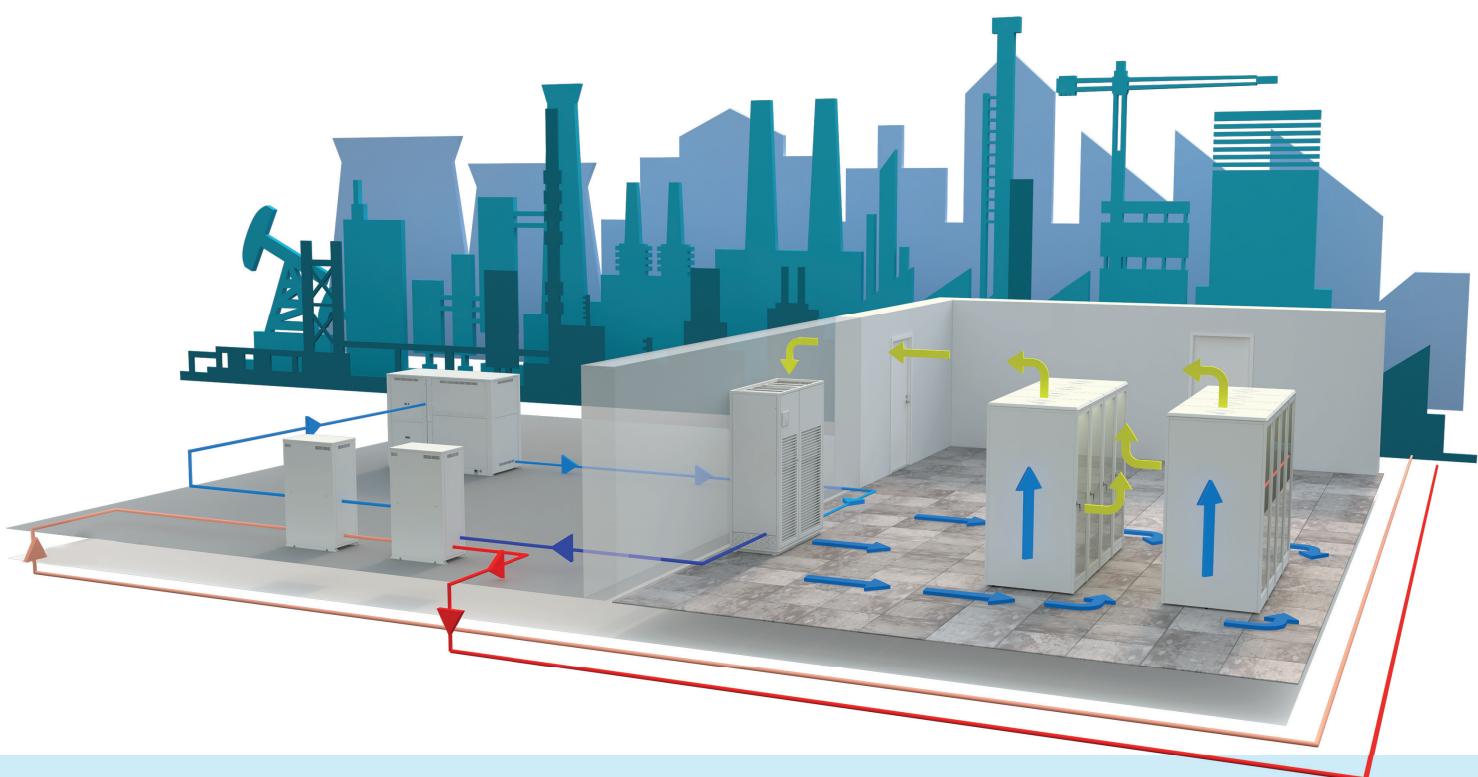
Floor supply and ducted return.

# High efficiency: Chillers, DX condensers and cooling

The hydronic system, using water as exchange fluid, provides perfect cooling with high efficiency.

The system is flexible and can be tailored to any type of building to meet the demands of small, medium and large data centres.

Systemair offers a wide range of chillers and heat pumps that are Eurovent certified and comply with ErP Directives to ensure that you have the most efficient product for your data centre.



## OUR RANGE OF HYDRONIC COOLING SYSTEMS:

- Air cooled chillers and heat pumps from 5 to 1,700 kW cooling power
- Water cooled chillers, heat pumps and condensing units from 20 to 1,600 kW cooling power
- Free-cooling modules from 100 to 550 kW cooling power
- Condensing units from 20 to 700 kW cooling power
- Roof top units from 15 to 110 kW cooling power

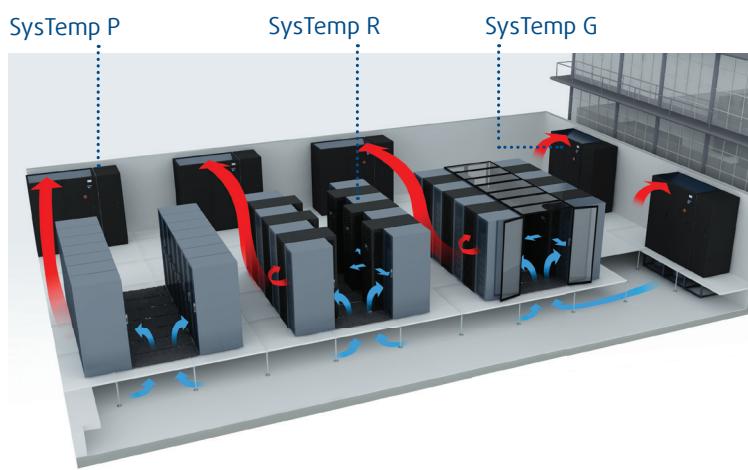
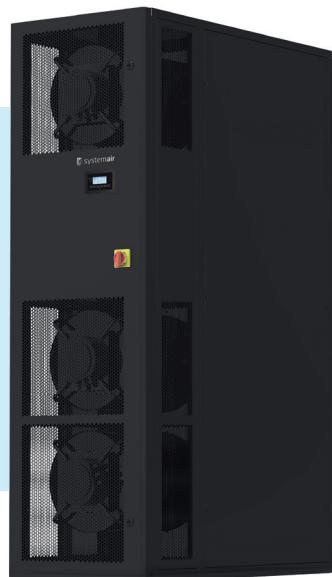
# A wide cooling range from 7 to 170 kW: SysTemp close control cooling systems

Systemair offers a comprehensive range of close control air conditioning units, designed to meet the requirements of environmentally sustainable development. The units of the Systemair close control air conditioning range have been optimised for use in new generation data centres, offering the highest guarantee of flexibility, efficiency and reliability.

The SysTemp range, for DX, chilled water, free-cooling or dual circuit system, can be installed as in-row, perimeters in room installation or outside data room installation.

## KEY BENEFITS:

- Ease of use
- Flexibility of use
- Energy efficiency
- Service reliability
- Technical innovation



P series – suitable for various types of special applications, such as metrology laboratories, TV production studios or ideally for various industrial sectors such as optics, electronics, electromedical equipment, etc..

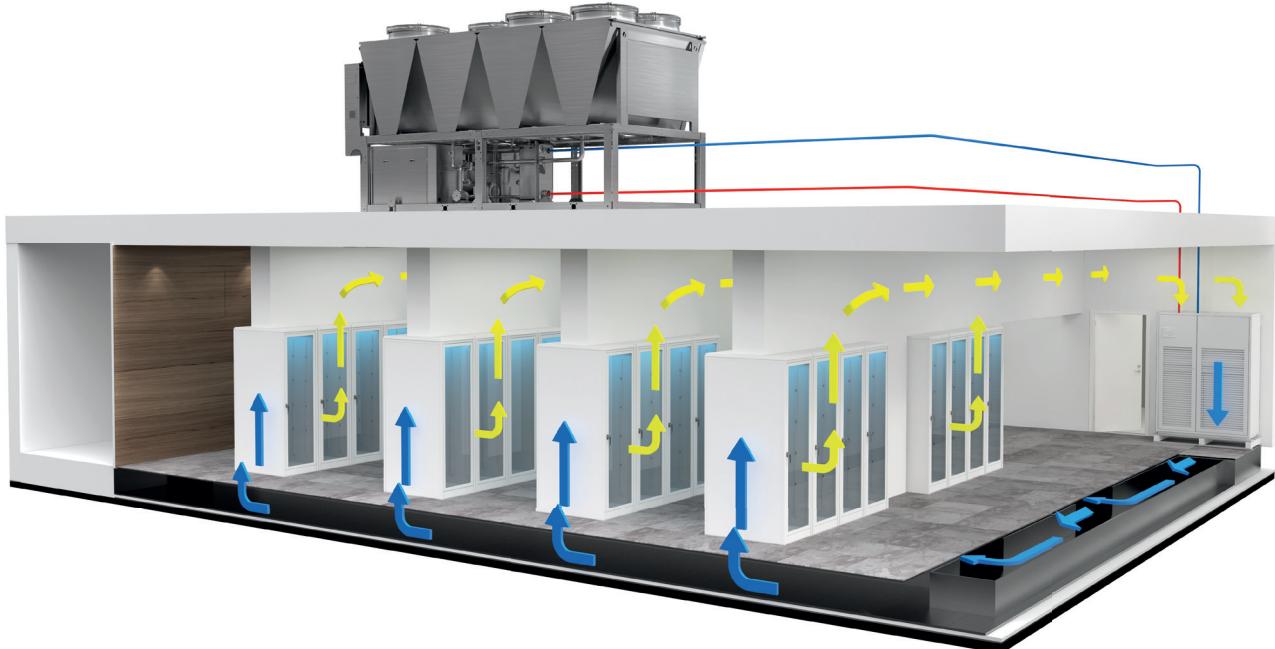
R series – built and sized in such a way that they can be installed alongside data center racks in air conditioning systems for large data centers.

G series – constructional and operating characteristics suitable for the latest generation of data centers.

# Optimising infrastructure is part of our reliable solutions: Compact chillers for refurbishment

The wide range of models and accessories of Systemair enables optimal configuration of the air conditioning system. The minimum plan dimensions and the possibility of modulating operation for all components allow development of solutions tailored to the actual needs of the infrastructure, as well as ensure future expansion without high additional costs.

- SySmart – new generation control system optimizing unit control
- SysDrive – innovative management of cooling circuit ensuring operational safety
- SmartNet – efficiency by active distribution of workload
- Dual Power – two independent cooling sources (CW+DX or DX+CW) for critical applications
- Free-cooling – reduced OPEX and CO<sub>2</sub> emissions



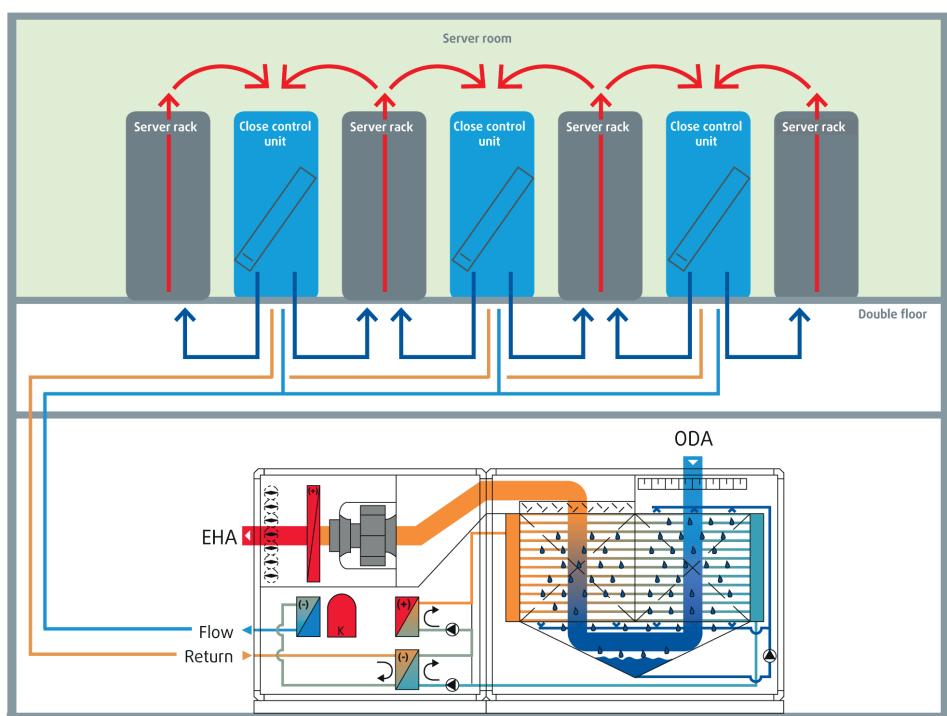
# Compact chillers: the ideal upgrade to your cooling technology

Menerga Hybritemp is a compact chilled water unit for indoor installation with free-cooling, adiabatic evaporative cooling and an integrated compressor refrigeration system. It is the ideal solution for energy upgrades of existing data centres with CRAC units or for buildings where an indoor installation of the cold water generation is necessary. Due to its compact dimensions, the unit can, next to an installation on top of a roof, easily be installed inside the building. Despite its compact design, the Hybritemp chilled water unit provides a very high cooling capacity.

This "all-in-one" cooling solution offers efficient cooling in a very compact size. The Hybritemp unit does not require any external periphery at or mounted to the exterior of the buil-

ding which is drastically reducing the overall investment costs. Additionally, the system merely needs low air volume flow rates to produce high cooling capacities. When compared to a conventional chiller, the Hybritemp chilled water unit requires just 1/10 the air volume to produce the equivalent cooling capacity. This means that you can benefit from smaller air ducts which lower the electrical power input while at the same time reduce the electrical power connection to run the whole unit.

By combining evaporative cooling together with the hybrid technology in one unit you are guaranteed optimal heat dissipation from the cooling circuit and efficient operation.



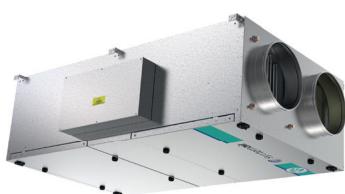
## KEY BENEFITS:

- Cooling range from 33 to 455 kW
- Very high performance with high EER and ESEER values at the same time
- Low air volumes required for heat dissipation
- Compact design thanks to an integrated re-cooling system
- No cooling system periphery on the façade or roof needed
- Integrated control and regulation system, compatible with all conventional building management systems
- Individual control of the performance parameters
- Optional: The unit without refrigeration system which uses the adiabatic model is not subject to F-Gas regulation

# Efficient ventilation and a good indoor climate: Air handling units for control rooms and offices

When looking for a low TCO in a data centre, it is also crucial to have energy-efficient ventilation and a good indoor climate in all the other areas outside the white space in a data centre.

In offices e. g. not only the mood, but also the condition of the office's air is essential. In that respect, it is important to take the technical equipment, such as computer, etc. also into account, as this often leads to a heat load. In order to prevent this and to increase the efficiency and motivation of the employees, the air handling of the office complex must be well thought-out. Moreover, an intelligent solution not only lowers the power consumption, it also has a lower connecting power.



Systemair and Menerga offer all types of air handling units from small one-piece compact units to flexible modular solutions. The Geniox family of Air Handling Units from Systemair can handle airflows from 750 to 86,000 m<sup>3</sup>/h (0.2-24 m<sup>3</sup>/s).

The flexible design, a wealth of functions and scalable size mean that we can adjust Geniox units precisely to your project needs.



# Accurate temperature and humidity control: Make-up units (MAH) for data halls

Systemair MAH data centre units are specially designed to meet several important requirements:

- Maintaining proper pressurisation of the data hall
- Maintaining the minimal ventilation rate
- Controlling the humidity level

Another important function of the unit is humidity control of indoor air.

The make-up air handling unit consists of filter, energy efficient EC fans, humidifier and dehumidification system, which allows accurate temperature and humidity control of supplied air.

All MAH units are equipped with an intelligent control system, including extended quantities of inputs and outputs and a wide range of communication protocols.

## KEY BENEFITS:

- Energy-efficient EC fans reduce power consumption
- Integrated controls and sensors for easy operation
- Factory-tested
- Tier 3 ready: ATS and UPS for controls as option



# State-of-the-art: Air distribution made for your demands

Systemair develops, produces and delivers state-of-the-art air distribution products, valves and flow rate regulators. Our components comply with the strictest interior design requirements and make data centres more energy efficient. Quality is guaranteed by our development laboratories, which are some of the most modern in Europe. There we measure air volumes, throw, Coanda

effect, sound level and temperature sequences, so we can provide our customers with accurate data. With our products you can optimize airflow and direct the air to where it has the greatest effect.

## OUR RANGE FOR AIR DISTRIBUTION IN DATA CENTRES:



Grilles for walls,  
ceiling and floor  
installations



Balancing dampers for the  
duct system



Variable airflow  
dampers for regulating  
and optimizing airflow



Floor diffusers

# Demand-responsive ventilation systems: Fans and fan-walls

Systemair has a wide range of fan wall solutions for high capacity blockchain and cryptocurrency data centres. Fan-wall range is represented with 3 sizes of vertical and horizontal fan walls with cooling capacity up to 840 kW per unit. These fan-walls can be combined with mixing chambers, filter walls, humidifiers or cooling coils. All components are supplied in modules that allow easy transportation and assembly.

Another advantage of the modular construction is its high flexibility in terms of fitting into practically every space limits.

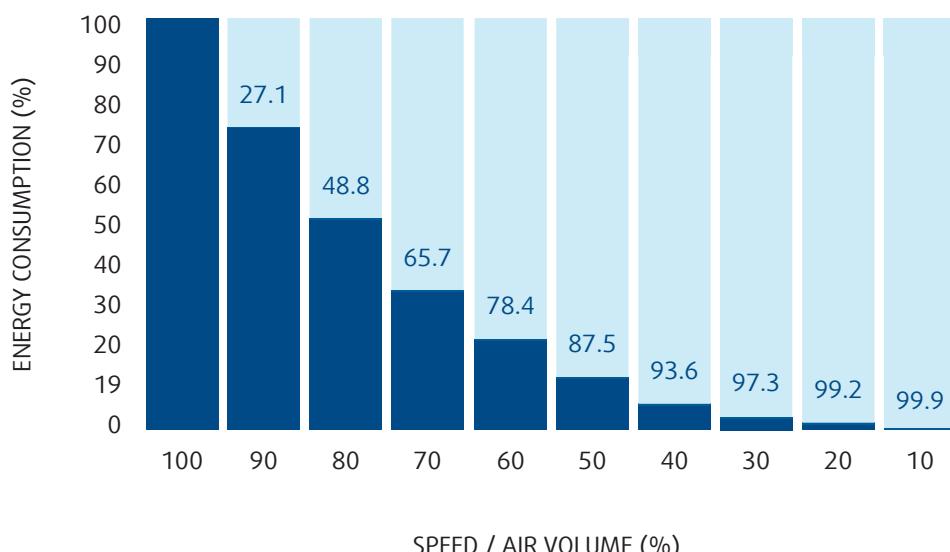
Thanks to energy-efficient EC fans, low internal pressure drops and intelligent control systems, fan-wall systems show extreme low OPEX and pPUE metrics.

## KEY BENEFITS:

- Minimal or even no footprint (Horizontal fan walls can be installed above the cold or hot corridor)
- Wide range of solutions
- Low energy consumption
- Tier 3 ready: ATS and UPS for controls as option
- Heat recovery as an option
- Factory tested
- Integrated controls and sensors for easy operation
- Solutions for extreme low outdoor air temperatures



## POWER CONSUMPTION PER LOAD



# Always on spot: Sensitive spot cooling technology for your data centre

Our spot cooling systems precisely regulate temperature and humidity for sensitive technology. In data centres and mobile phone network exchanges, their continuous operation reliability ensures the high availability of computer systems.

Systemair offers many options for spot cooling in data centres, for both chilled-water and DX cooling. Our range consists of in-row coolers, splits, cassette cooling units, and false ceiling units to give you maximum efficiency based on your needs.

## OUR RANGE FOR SPOT PRECISION COOLING:

- Cassette coolers, DX or chilled water, spot cooling up to 16 kW
- Split units for DX or chilled water, wall or floor model
- False ceiling units for DX or chilled water, 5-85 kW



Cassette cooler



Split unit



False ceiling unit

# On the safe side: Fire safety and explosion proof ventilation

During a fire, smoke and gases can spread throughout an entire data centre. It is therefore critical that buildings are constructed to prevent the spread of smoke and fire. Systemair has solutions for both extracting smoke through energy-efficient EC fans that comply with the latest fire standards, as well as with fire dampers for sealing off a building compartment or duct system.

All our products are certified and tested by independent and accredited laboratories.

## OUR RANGE OF FIRE SAFETY VENTILATION:

- Smoke extract fans F400 and F600 according to EN1366-1 for roof, wall or duct installation
- Fire dampers EI90S and EI120S according to EN1366-1



Fire safety ventilation

## ATEX CERTIFIED PRODUCTS (EXPLOSION-PROOF VENTILATION)

- Air handling units
- Fans
- Regulation and shut-off dampers
- Fire dampers, EI120S



Medium pressure axial fans



ATEX ventilation



Radial roof fans for the extract of hot smoke gases

# By your side – Systemair across the world



## **Skinnskatteberg, Sweden**

The Group headquarters, distribution centre and largest production site. Production of compact air handling units and a wide range of fans and accessories. Production of air curtains and fan heaters for Frico, a company within the Systemair Group.

## **Tillsonburg, Canada**

Production of air handling units for classroom ventilation on the North American market.

## **Tillières, France**

Production of air conditioning products.

## **Windischbuch, Germany**

Production of an extensive range of axial and roof fans, plus tunnel and garage ventilation.

## **Langenfeld, Germany**

Production of air curtains.

## **Mülheim an der Ruhr, Germany**

Production of Menerga's customized air handling units for various applications with extra high efficiencies.

## **Hässleholm, Sweden**

Production of heating products for air handling units, mobile and fixed fan heaters, plus dehumidifiers.

## **Aarhus, Denmark**

Production of large air handling units – "central units".

## **Hyderabad, India**

Production of air distribution products.

## **Greater Noida, New Delhi, India**

Production of duct, axial and box fans, air handling units and air distribution products.

## **Milan, Italy**

Production of a wide range of liquid- and air-cooled chillers and heat pumps for comfort cooling.

## **Ukmergė, Lithuania**

Production of residential units and large air handling units.

## **Kuala Lumpur, Malaysia**

Production of duct and axial fans.

## **Bratislava, Slovakia**

Production of air distribution products and fire dampers.

## **Eidsvoll, Norway**

Production of air handling units.

## **Bouctouche, Canada**

Production of air handling units for residential use in North America, plus dehumidifiers.

## **Maribor, Slovenia**

Production of high-temperature fans for smoke extract ventilation.

## **Madrid, Spain**

Production of large air handling units and box fans for markets in Southern Europe, the Middle East and North Africa.

## **Waalwijk, The Netherlands**

Production of air handling units.

## **Istanbul, Turkey**

Production of a wide range of air handling units and fan coils.

## **Lenexa, USA**

Production of duct, axial and roof fans chiefly for the North American market. Distribution centre for the USA market.

# Systemair around the globe

A way to show the customer not only our presence around the world but also give them a sense of our effective distribution network

3

Distribution Centers

50

Countries with Sales Subsidiaries



Always  
close to you!

