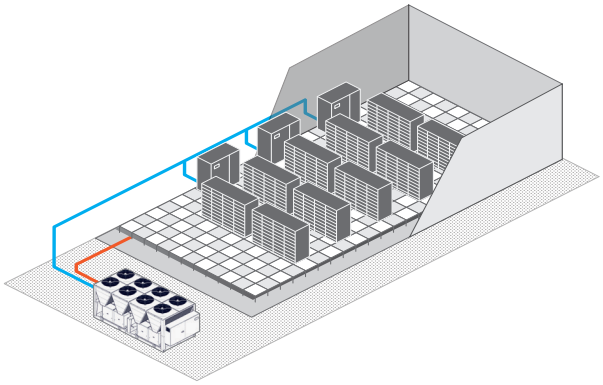


AERMEC DATA CENTRE SOLUTIONS

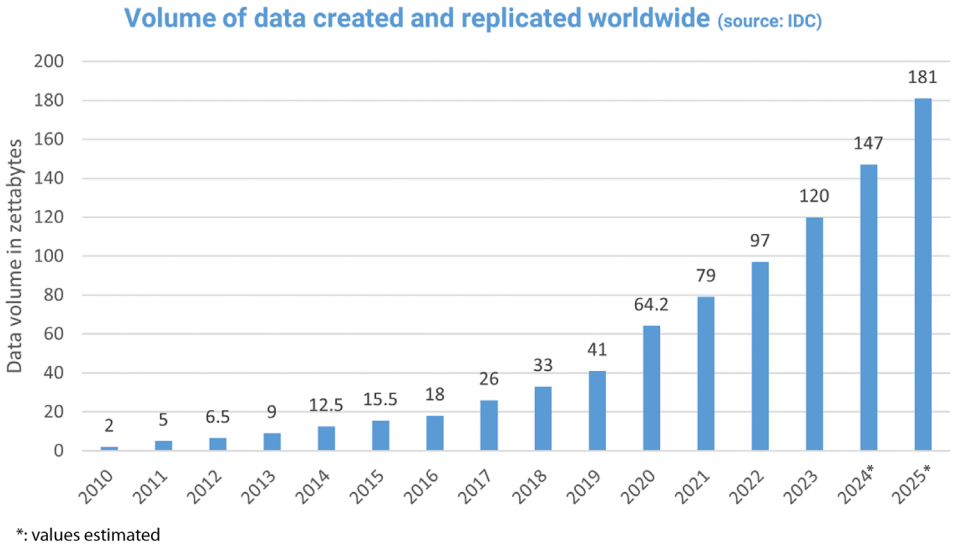
The complete range of Aermec solutions for data centres

Solutions with excellent energy efficiency designed to ensure strict temperature and humidity control in data centres.

GLOBAL DATA CENTRE IP TRAFFIC WILL TRIPLE WITHIN 5 YEARS

The global IP traffic of data centers is constantly increasing. The total amount of data created, acquired, copied and consumed globally is expected to quick increase, reaching over 180 zettabytes in 2025.

In 2020, the amount of data created and replicated reached a new peak, due to the increased demand during the COVID-19 pandemic. The growth was higher than previously expected, as more people worked and learned from home and used "home entertainment" options more often. All these aspects created the need for a rapid mobilization of cloud computing to cope with the increase in data and pushed all the organizations towards digital transformations.



*: values estimated

The huge demand for data recorded by all countries around the world during the pandemic has increased the strategic importance of digital technology and data centers even further. All these factors together lead to forecast that the demand for data centers will increase with a CAGR of 7.5% in the period 2024-2032, with a significant growth of data centers air conditioning systems.

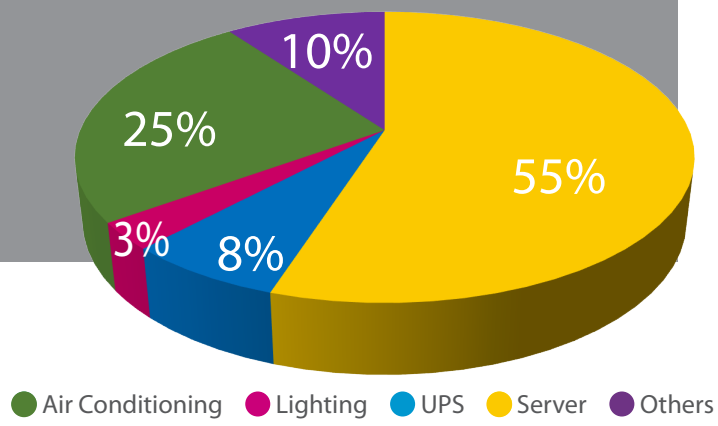
A HIGH ENERGY CONSUMPTION APPLICATION

Data centres represent a high-density building typology, with a consequently very high power density. A data centre requires an average of 10-15 times more energy than a standard office building, at times reaching 40 times. In addition, the field of "Information and Communication Technology (ICT)" is one of the main causes of growth in energy consumptions in Europe. The density of the servers is in fact growing rapidly, and as a consequence so is the power demand of the air conditioning systems dedicated to them.

The air conditioning of a server room represents a significant portion of the total energy consumption of the data centre, representing 25% of the total energy usage of the entire data centre.

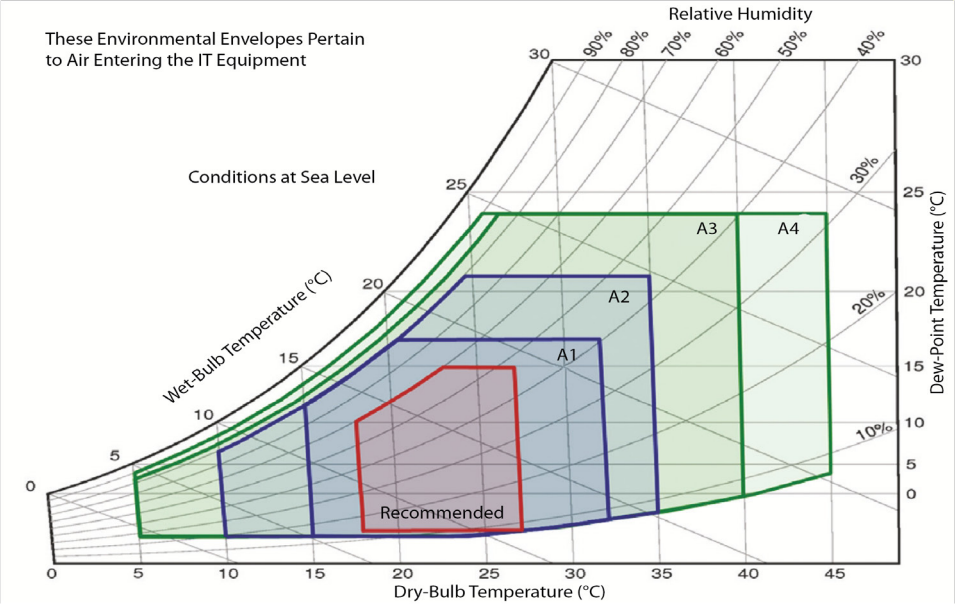
It is thus of paramount importance that the air conditioning system applied within data centres achieves the highest efficiencies and lowest energy consumptions. In fact an optimised data centre air conditioning solution represents a significant cost saving and powerful contribution to global carbon footprint reductions.

Distribution of energy consumptions in a data centre



DATA CENTRE COOLING REQUIREMENTS

Data centre cooling systems represent a significant portion of a facility's capital expenditure and use a substantial amount of energy. ASHRAE (American Society of Heating, Refrigerating, and Air-conditioning Engineers) publishes periodically specific guidelines for temperature and humidity control within data centres.
The last Edition of the Thermal Guidelines for Data Processing Environments defines a recommended operating window and four allowable ranges, designated A1 through A4.
The new allowable ranges (A3 and A4) are intended to remove obstacles to new data centre cooling strategies such as free cooling systems. Free-cooling takes advantage of a facility's local climate by using outside air to cool IT equipment either directly or via a cooling medium, avoiding the use of mechanical refrigeration whenever possible.



ENERGY EFFICIENCY & PUE LEVELS: A MARKET SURVEY

PUE (Power Usage Effectiveness) is a measure of how efficiently a computer data centre uses energy. Specifically, it measures how much energy is used by the computing equipment (in contrast to cooling and other overheads). It is defined as the ratio of the total amount of energy used by a data centre facility to the energy delivered to the computing equipment. The closer to a PUE of 1,0 the more efficient the data centre.
From an independent market research conducted in 2023 it is estimated that the PUE of the new datacenters have a PUE value between 1.20 and 1.40.

PUE
Power Usage Effectiveness

Current market average PUE = 1,80

PUE referring to the new datacenters ≤ 1,40

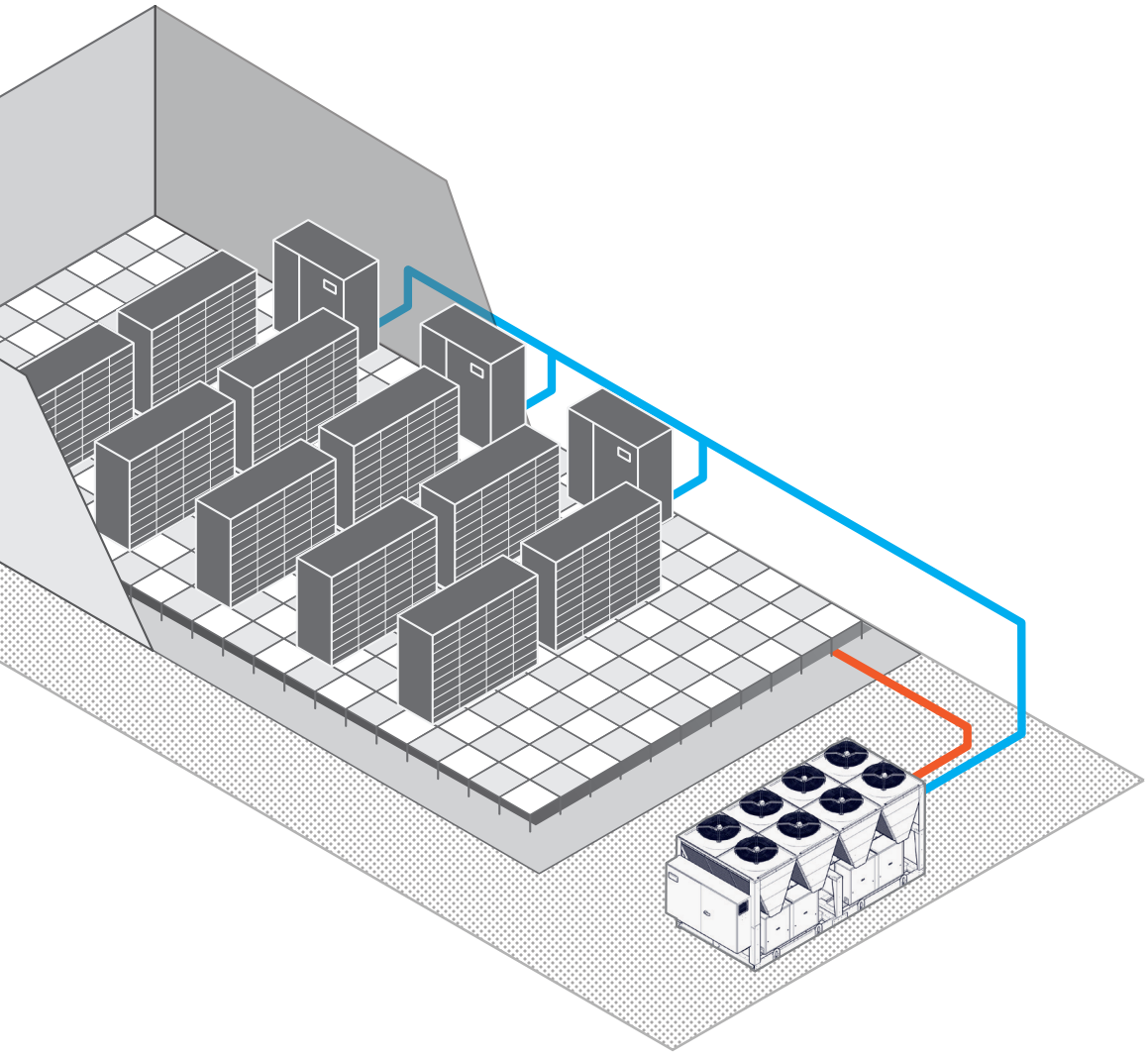
AERMEC: TECHNOLOGY YOU CAN TRUST

Aermec, founded in 1961, counts amongst Europe's longest established Air Conditioning suppliers. A true pioneer, with over 60 years of innovative customer focused solutions, Aermec is present on all continents worldwide and with Subsidiaries and Affiliates in France, Germany, Italy, the Netherlands, Poland, North America and South America, Spain and the UK.

The Aermec Group of companies includes a total of 8 centres of excellence spanning the full air conditioning portfolio, with a turnover in excess of €500m and over 1800 employees. A total of 8 Group manufacturing locations create the advanced product solutions Aermec offers its clientele.

Aermec is well established in the data centre market, with a multiple year experience and prestigious projects aimed at reducing the overall cost of ownership of modern data centres. This process is achieved by applying state-of-the-art product solutions with a strong focus on integrated design and sophisticated analyses of individual data centre customer requirements, with the aim of achieving a personalised and optimised solution for each and every individual installation site.

Product quality is an Aermec hallmark. Premium components are utilised throughout, each unit exiting the Aermec factories undergoes meticulous testing processes, and numerous certifications including Eurovent, MCS, cUL and AHRI testify to Aermec's attention to detail.



Aermec's 2MW testing facilities

2MW TESTING FACILITIES

Aermec's advanced labs extend to 2MW cooling capacity per single unit in what is probably Europe's largest test facility, which will offer Eurovent certification. Specific labs within Aermec also cater for extreme temperature testing, ventilation and heat exchange measurements, noise level verification and vibration testing.
Aermec furthermore utilizes a simulated data centre installation including both a data hall simulator and an ambient air simulator recreating typical ambient temperature and humidity conditions.

AERMEC & DATA CENTRES

Aermec's experience in data centre cooling technologies spans many years and countless individual projects in more than 17 nations.
Aermec's expert professional project approach, combined with system efficiency and reliability, renders Aermec a natural choice in data centre applications.

Aermec's main manufacturing facilities near Verona, Italy

EXPERT SUPPORT AT ALL TIMES

Aermec offers a focused technical support during all stages within the project, accompanying its customers in strategic data centre decisions and providing a full portfolio of services at every stage, including:

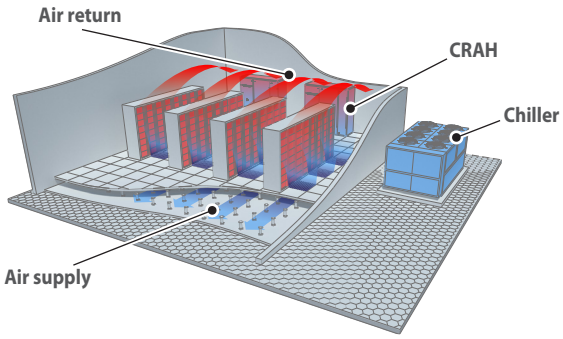
- System energy efficiency analysis using innovative energy simulation softwares; Aermec allows customers to evaluate the overall system efficiency in order to obtain the lowest possible PUE.
- Accurate real operation condition witness tests in Aermec's advanced testing laboratories, allowing customers to validate the performance of the units prior to start-up.
- Safety in time: evolved devices supplied with the system allow 24/7 control and supervision of the systems, even remotely, ensuring maximum reliability and peace of mind.
- Aermec service personnel are available at all times for fast and efficient troubleshooting and on-site interventions.

DATA CENTRE DESIGN SOLUTIONS

According to the specific data centre characteristics, the geographical and thus ambient conditions in which the data centre is located, and the individual target requirements of the User, differing data centre cooling typologies can be applied.

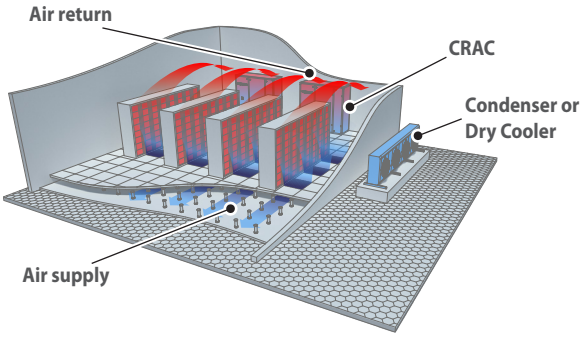
CHILLED WATER SYSTEMS

Precision Air Conditioners featuring one or more chilled water coils (CRAH), operating in combination with one or more external water chillers. The water chiller can be in standard or free-cooling configuration.
In alternative to the CRAH units, which are generally positioned peripherally to the server rack, In-Rack conditioners can be utilised, which supply air conditioning within the server racks themselves.
Also fan wall units can be placed inside, feeded by one or more water chillers.



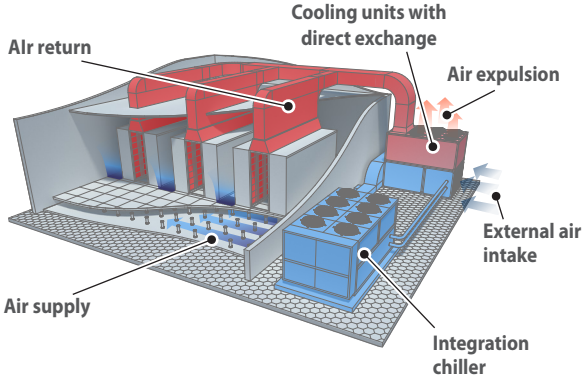
DIRECT EXPANSION SYSTEMS

Precision Air Conditioners featuring one or more direct expansion circuits (CRAC), either in air-cooled configuration with external condensers or in water-cooled configuration with external dry coolers.
In alternative to the CRAC units, which are generally positioned peripherally to the server rack, In-Rack conditioners can be utilised, which supply air conditioning within the server racks themselves.



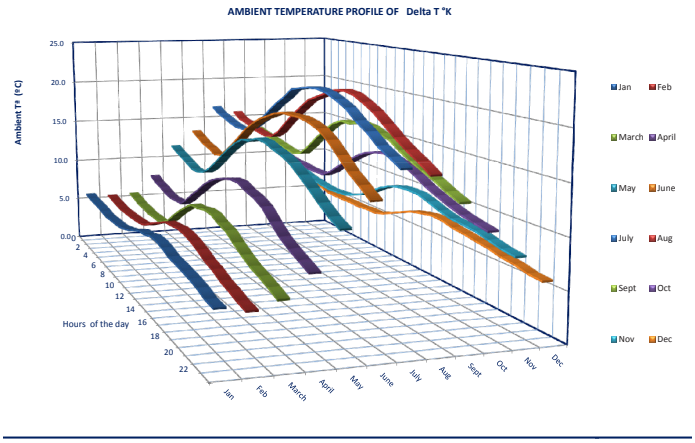
DIRECT COOLING SYSTEMS

Air Handling Units featuring a cooling circuit which introduces cold air directly into the data centre and expels hot air to ambient. Fresh air is mechanically distributed into the data centre via ducting. Direct cooling systems are integrated with filters and may feature additional forms of adiabatic cooling or dehumidification.



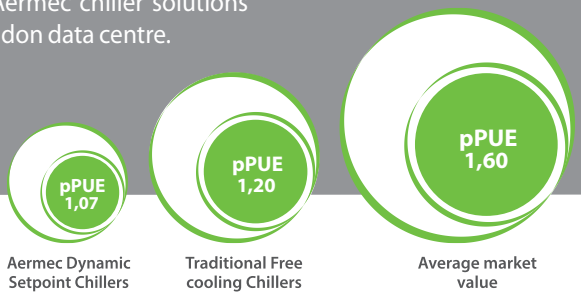
DESIGN YOUR OPTIMIZED DATA CENTRE

An optimized data centre starts with a clear vision as to overall project objectives; Aermec's energy simulation softwares support the process by evaluating the performances of different data centre solutions.
In these simulations are taken into account variable loads and all year round operation, evaluating climate profiles and cooling loads; the load demand profile is defined by the specific server requirements, including primary circuit pumping.
These energy analyses calculate the efficiencies of each individual main component and the resulting efficiency of the whole system, taking into account all the factors involved: installation site design, required cooling load, climatic profile, potential renewable energy sources integrations, the available space, the noise performances required, redundancy, maintenance needs and more beyond.
AERMEC energy simulation softwares (ACES and NRGCalc) are able to cross compare the performance of multiple chillers, PAC system, AHU and server control devices, primary and secondary pumping equipment, system lay-out, etc., in order to find the best specific solution available for the customer.
The instantaneous efficiencies of each proposed system are calculated using complex algorithms which account for both differing loads and water and ambient temperatures, maximizing efficiency and chiller cycling whilst accounting for the total Precision Air Conditioner (PAC) load needs at specific ambient temperatures and load levels. All factors causing possible efficiency losses are accounted for, including chiller switching sequences, pump input powers and PAC operation.



ACHIEVING THE LOWEST pPUE

Aermec data centre systems are capable of achieving market leading pPUE levels, offering significant reductions in carbon footprints and energy consumptions. More specifically Aermec chiller solutions applying Dynamic Setpoint can achieve a pPUE down to 1,07 in a London data centre.
Traditional free cooling chillers by contrast generally achieve pPUE = 1,20, with the market average being 1,60.



THE AERMEC DATA CENTRE SOLUTIONS


NSM_I


NSM et NSM HWT


TBA / TBG


NRV


NRB


NSG


NRG

WATER CHILLERS

Aermec water chillers offer a wide range of cooling capacities to meet the needs of small, medium and large data centres. Free-cooling technology exploits the favourable environmental conditions to supply chilled water without the use of mechanical cooling, maximizing efficiencies and energy savings.

NSM_I (285 - 1342kW)
Chillers with inverter screw compressors with shell & tube heat exchangers
Water produced up -8°C to +15°C - Outdoor air temperature up -10°C to +50°C
Standard and free-cooling configurations

NSM (302 - 2100kW)
Chillers with screw compressors with shell & tube heat exchangers
Water produced up -8°C to +18°C - Outdoor air temperature up -20°C to +50°C
Standards, free cooling and glycol free configurations

NSM_HWT (306 - 1600kW)
Chillers with screw compressors with shell & tube heat exchangers
Water produced up -5°C to +30°C - Outdoor air temperature up -20°C to +50°C
Free cooling and glycol free configurations

TBA-TBG (200 - 1404kW)
Chillers with Turbocor compressors featuring magnetic levitation
Shell & tube heat exchangers
Water produced up 5°C to +18°C - Outdoor air temperature up -10°C to +42°C
Standard and free-cooling configurations

NRV (108kW)
Modular Chiller with scroll compressors and microchannel batteries
Plate heat exchangers
Water produced up 4°C to +15°C - Outdoor air temperature up -10°C to +46°C
Standard and free cooling configurations

NRB (217 - 1049kW)
Chillers with scroll compressors with plate heat exchangers
Water produced up -10°C to + 18°C - Outdoor air temperature up -20° C to +50°C
Standards, free cooling and glycol free configurations

NSG (227 - 1580kW)
Chillers with screw compressors with HFO R1234ze
Inverter screw compressor as a special option on request
Shell & tube heat exchangers
Water produced up +4°C to + 23°C - Outdoor air temperature up +10° C a +48°C
Configurations standard
Outdoor air temperature up -20° C to +50°C
Standard and free-cooling configurations

NRG (226 – 718 kW)
Chillers with scroll compressors, plate or S&T heat exchangers, R32 low GWP refrigerant fluid.
Standard, free cooling and glycole free configurations

REMOTE CONDENSERS AND DRY COOLERS

Aermec Precision Air Conditioners find their ideal external cooling source when combined with the extensive range of Aermec remote condensers (for air-cooled solutions) and dry coolers (for direct expansion water-cooled solutions). Horizontal and compact V-coil configurations are available, with a multitude of options and accessories for all individual needs. The dry cooler range with compact V-coil configuration can be equipped also with the adiabatic cooling system. In the Hybrid Dry Coolers , the adiabatic cooling process, which allow to cool down the air temperature through the water evaporation, so that the free cooling operation mode is extended with significant energy savings. The highly robust design is ideal for year-round data centre operation.

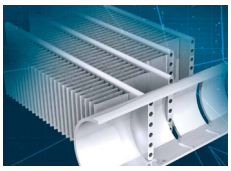
TECHNOLOGY, COMPONENTS AND ADVANCED CONSTRUCTION DETAILS

Double screw stepless and inverter compressors with high SEER and SEPR values and extended operating limits (up to 30°C chilled water outlet)

Optimized Shell&Tubes evaporators for reliable and efficient operation

Shell&Tubes spray evaporator: -50% refrigerant charge

Turbocor centrifugal compressors: max efficiency, low working and starting currents, low noise



Micro-channel coils allow up to 30% reduction in refrigerant charge compared and up to 20% weight to Cu/Al coils

R134a, R513A, R1234ze, R515B refrigerants available also for low GWP requirements

Inverter fans available for higher efficiency seasonal performances

Integrated hydronic kits with various configurations and pumps available: single or double, high or low head, with inverter on demand, and with independent power supply on request.

Electronic expansion valves

FAST RESART: Restoration of 100% power operation in a short time in the event of a power failure.

OTHER DETAILS:

- Differential pressure probe able to report the water flow value to BMS System
- All units are subjected to drying of the hydraulic circuit with nitrogen at the end of the line test
- Digital outputs reporting the status of the main components and the main operation settings

For specific compatibility, refer to the technical documentation or contact the Head-quoters.

PRECISION AIR CONDITIONERS

Aermec's wide range of Precision Air Conditioners cater for the differing data room conditioning needs. Efficient and flexible product solutions can be applied within numerous differing configurations. A wide range of options and accessories allows perfect alignment according to the needs of individual installations, providing complete and optimised control of the temperature, humidity and indoor air quality within data centres.

AIR-COOLED DIRECT EXPANSION CONFIGURATIONS

Cooling range 7 – 183kW
Down-flow and Up-flow versions
DC inverter compressors, EC fans, electronic expansion valves

WATER-COOLED DIRECT EXPANSION CONFIGURATIONS

Cooling range 7 – 183kW
Down-flow and Up-flow versions
DC inverter compressors, EC fans, electronic expansion valves

CHILLED WATER CONFIGURATIONS

Cooling range 10 – 200kW
Down-flow and Up-flow versions
EC fans

IN - RACK UNITS

Aermec's In-Rack Precision Air Conditioners are positioned within the data hall. In contrast with CRAC and CRAH units, which are generally positioned in peripheral areas within the data hall, In-Rack units are positioned within the server racks themselves, providing a highly effective "localised" cooling right where it is needed. Both direct expansion and chilled water (20 – 40kW) solutions are offered.

AERWALL UNITS

Air Handling Unit featuring a free cooling chiller working in high water temperature configuration. The return hot air from the data centre is cooled to the suitable supply temperature and the fresh air is distributed into the data centre via ducting. Aerwall high temperature cooling system enhances the overall Data Centre efficiency.

1) STRUCTURE: aluminum sections with external and internal rounded edges, in order to prevent the accumulation of dust and dirt, aluminum section support structure, nylon angular reinforced in fiberglass, aluminum profiles connections with thermal break cut

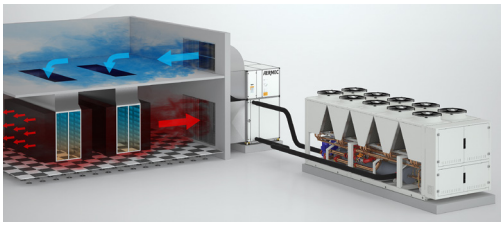
2) PANELS: effective thickness 50 mm, best materials used (galvanized sheet steel, painted galvanized steel, 3105 aluminum alloy, stainless steel), insulation available with injected polyurethane and mineral wool), fixed using special locking profiles embedded into the frame with greater sealing

3) AIR FILTER: class G4 filter as standard, with guides and closures in galvanized steel, easy to replace

4) HEAT EXCHANGER SYSTEMS: Optimized chilled water coil made with copper pipes and aluminum fins, 3-way modulating valve provided, with 0-10V signal control from the unit's control in order to modulate the delivered cooling capacity with extreme precision; the coils are available in different number of rows and different circuit design in order to match the load according to the ambient and water temperature

5) VENTILATING SECTION: EC plug-fan type centrifugal fans with blades facing backwards, for low noise and electrical absorption, integrated controller with overheating, over-voltage and phase control protection. Air flow, pressure and rpm controls available, oversized motors to increase available static pressure s option.

Classified characteristic:		EN1886 Classification	Values
Casing strength (max. relative defl ection)	mm/m	D1	D1 (the best), D3 (the worst)
Casing strength (max. relative defl ection)	l/s m^2	-400 Pa / +700 Pa	L1 (the best), L3 (the worst)
		L1	
Filter bypass leakage (max. leakage rate)	%	F9	G1 (the worst), F9 (the best)
Thermal transmittance	W/m^{2}K	T2	T1 (the best), T5 (the worst)
Thermal bridging factor	-	TB2	TB1 (the best), TB5 (the worst)

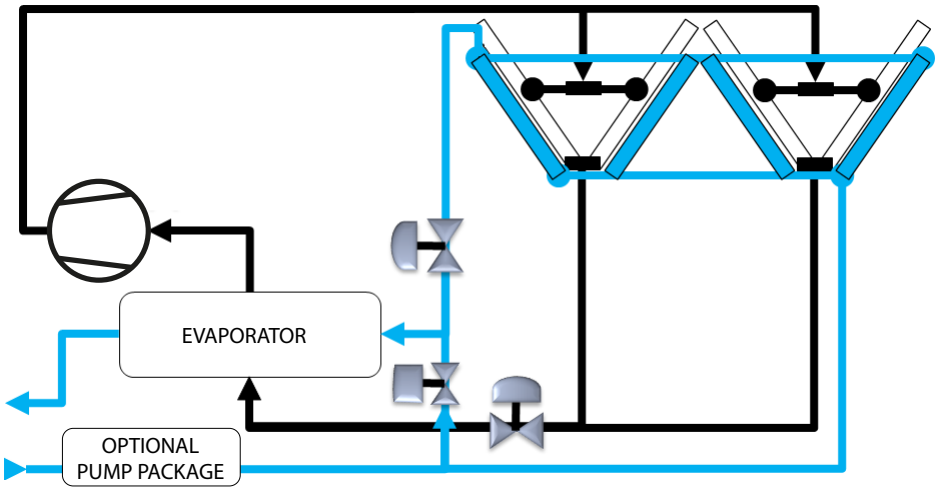


AERMEC CHILLERS ENSURE LOWEST PUE'S

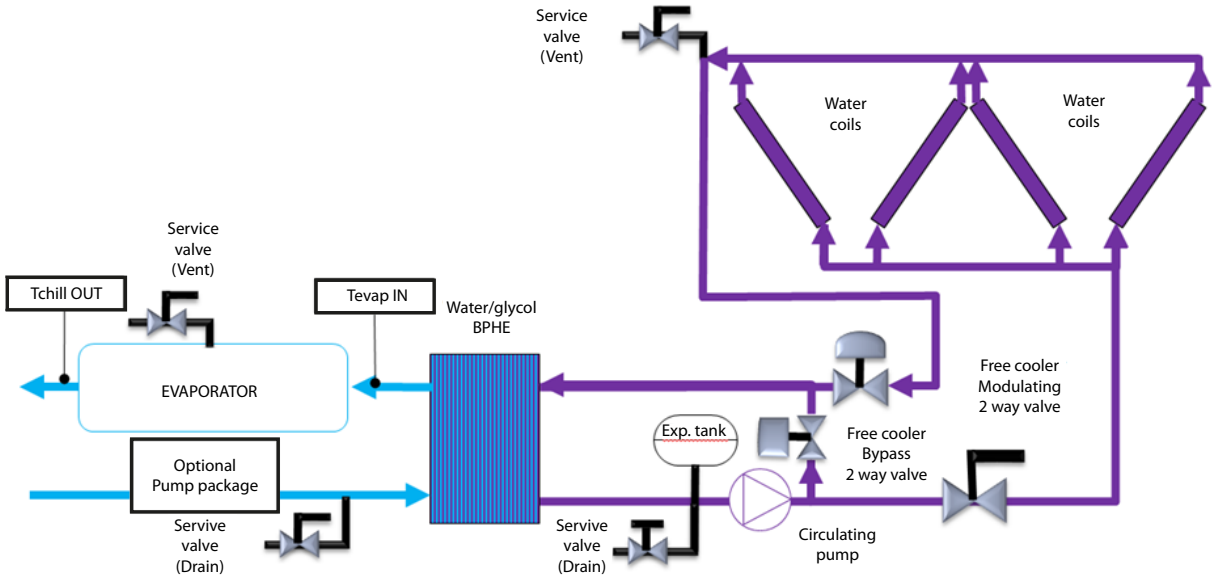
The most evolved free-cooling technologies

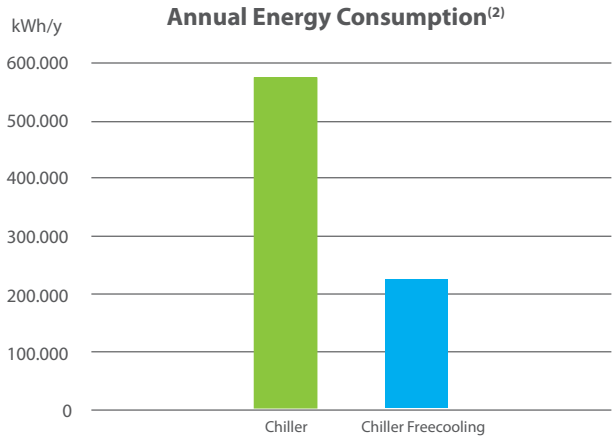
Free-cooling translates into cooling for free, the more this can be exploited the higher the energy savings.
Aermec optimises free-cooling, a concept whereby ambient air is used for cooling when the ambient temperature is lower than the data hall air (direct free-cooling) or the chilled water (indirect free-cooling).
In hydronic solutions free-cooling starts when external conditions ensure even a minimum coverage of the thermal load requirements.
Thanks to the application of modulating free-cooling to maximize the free external source, the percentage of free-cooling increases proportionally in relation to the temperature difference between the internal and external environments, thus notably reducing the contribution of mechanical cooling and maximizing overall system efficiency.
Free Cooling is even more effective with high water temperatures, ensuring maximised energy savings.
The ASHRAE standards with the new permitted operating fields make it possible to work within the Data Centre with higher temperatures, so the use of Free Cooling and different cooling technologies compared with the traditional ones becomes even more advantageous.

Free Cooling idraulic circuit

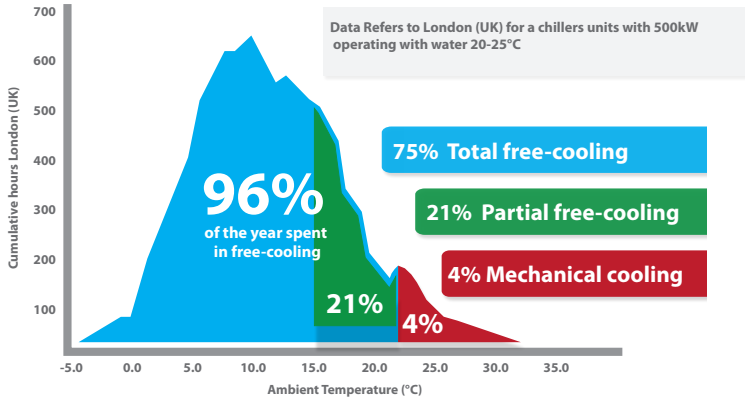


Free Cooling glycol free idraulic circuit





(1) Energy saving with the adiabatic dry cooler would be wider with higher water temperature in the cooling process.
(2) The Free Cooling chiller solution is always the most advantageous, maximising the energy savings in both relative (compared with the other solutions) and absolute terms.
(3) Energy annual consumption includes losses of load on air side due to adiabatic panels.



The percentage of hours over the year in which the load is met purely by mechanical cooling is minimal:
most of the load profile is covered by total Free Cooling.

Dynamic Set Point

DSP DYNAMIC SET POINT

The Free Cooling chiller solution can be optimised with the innovative dynamic set-point (DSP), that provides a further 10% reduction in consumption.
Dynamic Set Point (DSP) automatically and continuously optimises chilled water outlet temperatures as ambient and IT loads vary, ensuring the highest amount of free cooling is achieved all year round.
DSP's control algorithm affords maximum efficiency across the widest operating spectrum. By optimising the efficiency characteristics of single compressor, DSP ensures each compressor works at its peak performance (as opposed to systems where each compressor is loaded up once the full load per circuit is reached). Free-cooling is maximised by allowing chilled water outlet temperatures to rise to 30°C using uniquely developed compressors. Furthermore, specifically redesigned Precision Air Conditioner water coils cater for low load scenarios, overcoming laminar flow issues, with DSP fully exploiting the resilience designed into the system at low load conditions.
DSP noticeably reduces Carbon Footprints whilst allowing flexibility in build programs and load profiles, with a plug and play philosophy allowing modules to be added as and when client IT loads increase. DSP is rapidly proving itself to be the most energy efficient chilled water system available.

Supervision & Connectivity Solutions

Multichiller sequence controlling manages the entire system, evaluating the effective load request to achieve the best overall system efficiency, optimising free-cooling and ensuring tight temperature control. Aermec data centre solutions can furthermore be easily and fully integrated with BMS and Supervisor systems (LONWORKS, BACNET, MODBUS, etc.) to ensure an optimised and simplified system overview.

CUSTOMIZED EXECUTIONS

AERMEC has always been close to the needs of the designer and the customer and is able to provide special executions and options on request.
Our Technical Department is able to study and develop solutions that can adapt AERMEC units to severe environment conditions or special applications.

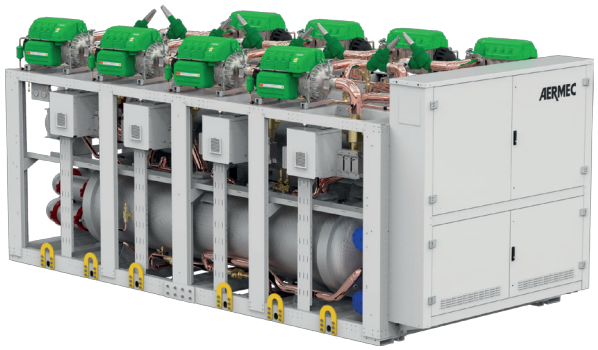
- Special option In-built UPS for minimum time to restart after power failure

Possibility to install inbuilt UPS for control board
Minimum time to restart after
Power failure reduced by: -60 seconds!

- Special option inbuilt ATS (Automatic Transfer Switch) for double power supply

Possibility to install inbuilt ATS Automatic Transfer Switch for double power supply

- Extension of the sizes of water-cooled Multi- Turbocor chillers: up to 4000 kW, 8 centrifugal compressors with double circuit, R134a, R513A, R1234ze and R515B refrigerants available, Electorinc Expansion Valves, Shell&Tubes spray evaporator



- Max efficiency, low working and starting currents, low noise, long therm technology
- Back-flow by-pass on free-cooling glycole-free units, in order to provide anti-freeze protection of the heat exchanger by means of heat recovery from the plant

- Ultracap: by means of ELDC (Electric Double Layer Capacitors) thecnology this device is able to provide safe valve shut off in case of power failure.

In order to check the availability of the special options contact AERMEC head-quarters

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Cod. DDATACENTERUY_06