

APPLICATION BROCHURE IT

Close control units

Versatile complete systems

***Reliable, efficient, and sustainable
solutions for computer centers***





PROMISE

Close control units are much more than just words for us; they are also a promise. A promise, which we can keep due to our long-lasting expertise. All units of the DENCO product series are bywords for cooling accurate to the degree, exact control of humidity and absolutely reliable, space-saving and at the same time energy-efficient air conditioning solutions.

Stable close-control air conditioning control under every condition

We set standards in heat exchange

Our promise: perfect fit, reliable and sustainable solutions as a sign of the times. With highly efficient air conditioning equipment supplemented with powerful air filter systems, we cover a comprehensive spectrum that has grown into the largest portfolio in the world.

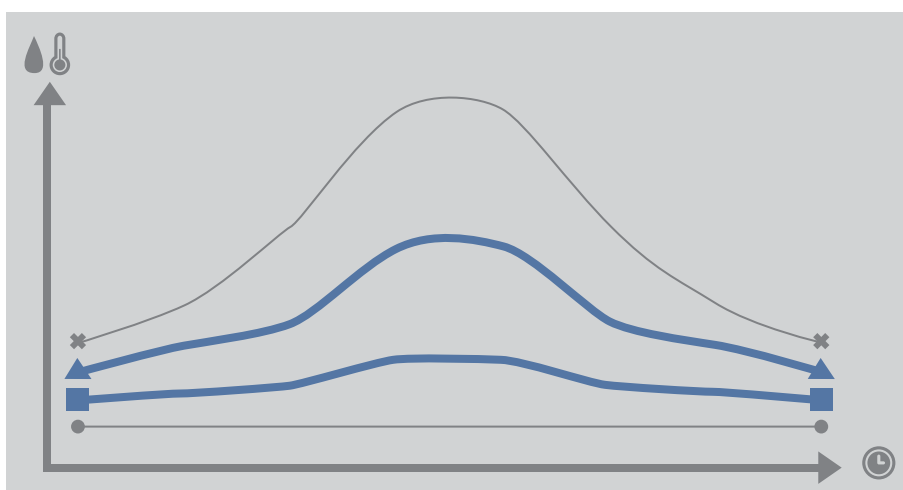


Excellent organized in the high-tech association

The back-up of the future: climate control of computer centers

We deliver first-class innovative solutions for sensitive requirements, such as particularly demanded by information technology. A reliable computer center cooling systems demands a great deal of attention, since it is associated with considerable challenges: constant operational reliability, dynamic room conditions and a reduction of the operating costs are the most important parameters for efficient and reliable air conditioning of small to large computer centers. This is where we invest our expertise, in touch with state-of-the-art technology and with an exceptionally keen awareness of innovations and influential trends. For this reason we are members of the high-tech association BITKOM e.V. and are orient our work on the recommendations of the US professional association ASHRAE (American Society of Heating, Refrigeration and Air-Conditioning Engineers).

The chart demonstrates that independent of the outdoor air conditions, we ensure the comfort zone of your IT with our reliable cooling systems.



Energy consumption:

▲ Compression refrigeration:
Higher operating costs,
but lower investment costs

■ Adiabatic cooling:
Higher investment costs,
but lower operating costs

Thermal conditions:

- ✕ Ambient temperature
- Computer center temperature



DIVERSE HOLISTIC SOLUTIONS

Intelligent complete systems for every computer center

Commercial computer centers, all kinds of companies, and especially telecommunication systems depend on the maximum availability of information technology. Perfect data back-up, a redundant energy supply and fail-safe hardware are a matter of course – and reliable, precise and efficient hardware cooling is a must. With regard to cooling, humidifying and cleaning ambient air, as experts for heat exchangers we can make a decisive contribution to the efficiency of buildings and their functional rooms. The combination of customized climate and air treatment technology paired with reliability and minimum energy consumption over the entire life cycle of a unit pays off in cash, systems operational reliability, and productivity.



FIRST RATE EFFICIENCY

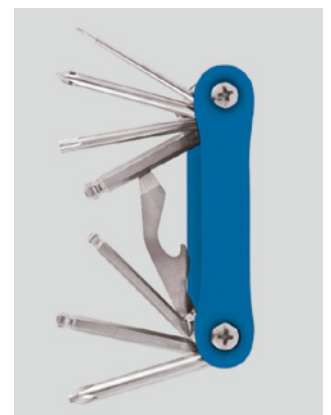
Our promise for your computer center: the reliable reduction of so-called Power Usage Effectiveness (PUE). The PUE formula determines the efficiency of energy consumption within a computer center. Efficient precision air conditioning is a major factor for the successful reduction of PUE. Our systems achieve a pro-rated PUE (pPUE) of up to 1.05.

We face the future and challenges of IT cooling with comprehensive and sustainable performance portfolios that permit higher power density, dynamic operating states, and synchronous growth processes. With our efficient close-control climate concepts, we have no trouble satisfying all requirements from ambient conditions to minimum operating costs, and offer you an optimal price/performance ratio:

- Indirect free cooling in combination with adiabatic humidification
- Direct free cooling
- Compression cooling
- Cold-water based systems

Convince yourself of the three categories of our diverse product range:

- Innovative Air2Air solutions
- Interior systems
- Outdoor facilities



Intelligent and customized product solutions for your individual requirements.



TECHNOLOGICAL PROGRESS

We contribute to global stability with a high degree of innovation and efficiency. The results of our intensive development work are ecological and economic system solutions that promise future-oriented close-control air conditioning of computer centers.

We secure and conserve resources – in the long-term.

Information and communication technology shows us the future, opens new possibilities, but also requires a considerable share of our electricity. In numbers: the computer centers in Germany alone require annually more than ten terawatt hours of electricity, which corresponds to the power of two nuclear power plants. And the numbers are on the rise. For this reason, we are increasingly focusing on the topic of "Green IT", with the objective of protecting the environment and promoting the environmentally sound use of communication and information technology.

With an exceptional sense of responsibility for our environment and the future, our special attention is directed towards the development of an innovative and sustainable product range that guarantees low CO₂, a high level of energy efficiency, and low operating costs.

CAIRplus®:

Close-control air conditioning by direct free cooling – with CAIRplus we offer a well-proven technology for climate control of computer centers using outdoor air, which ensures considerable energy savings.

Adia-DENCO®:

Indirect adiabatic cooling lowers the energy and operating costs by up to 70% – The innovative Adia-DENCO works according to the principle of indirect free cooling in combination with adiabatic humidification for removing heat. Therefore it features an extremely low energy consumption.

Production Wurzen:



Europe's largest production factory for air-handling units



Our innovative Air2Air systems conform to all requirements of Green IT.



CAIRplus is Eurovent certified

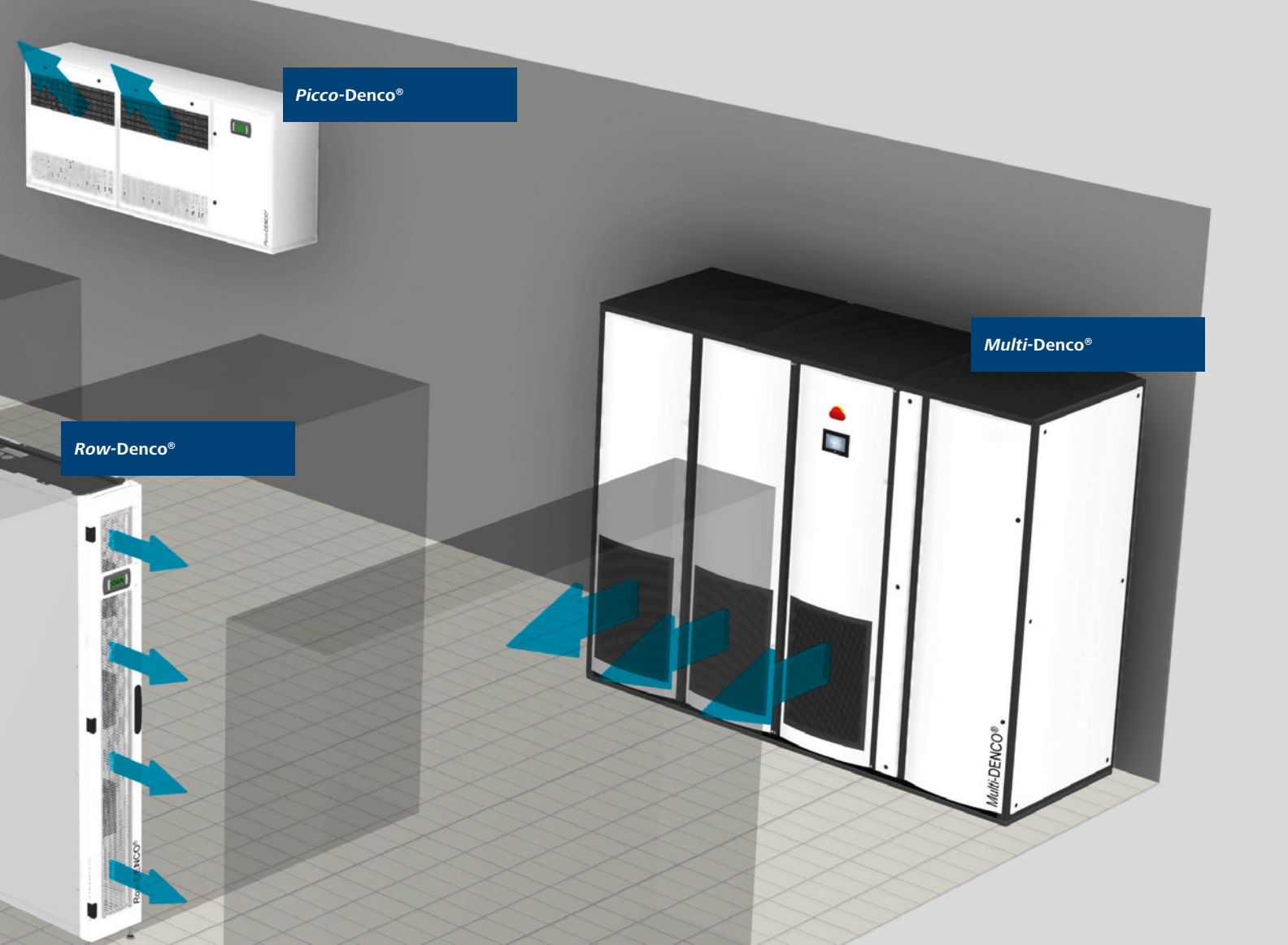
Maximum capacity with highest claim to sustainability: for a production area of 25,000 m², more than 300 staff in three shifts on 22 assembly lines produce over 7,000 CAIRplus units per year. The output: unique quality in the sign of "Green IT".



DENCO®: *PERFECT FORM INSIDE*

Elegant solutions for any claim

Our CRAC – Computer Room Air Conditioning units of the DENCO product series specify the most modern state of technology for close-control air conditioning in a computer center. Many years of expertise justify the unique product line with absolutely precise cooling solutions, exact observance of air humidity and absolutely reliability, space-saving and simultaneously energy-efficient air conditioning. The DENCO close-control units do justice to the highest requirements in computer centers and telecommunication installations, and provide a valuable contribution to reliable operation and continuous availability of indispensable information technology.



The Denco product series offers highest precision for various application scenarios and individual requirements: from *Ultra-Denco* for use in computer centers with high IT power to our *Multi-Denco*, a diversified product for many usages, up to the *Row-Denco*, which is required for racks with high power density as well as our compact *Picco-Denco*, which convince where space is at a premium and small rooms require high-quality performance.

Innovative features of your individual Denco® equipment:

- EC fans
- Inverter-compressor technology
- Upflow/Downflow
- DX/chilled water option with sensitive heat ratio (SHR) = 1
- Racks can be used with a waste heat of up to 30 kW

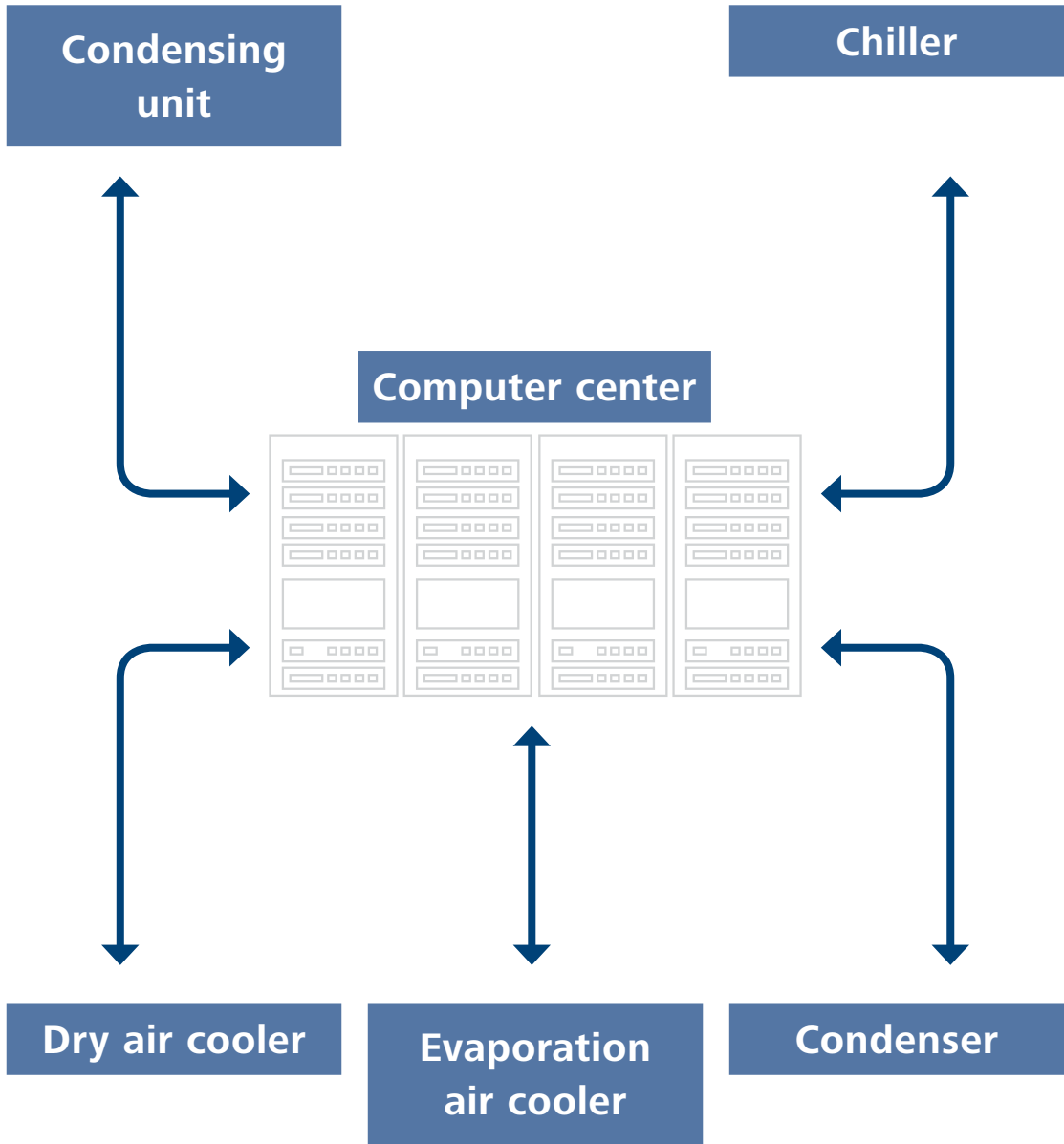
Ambient air becomes an energy source



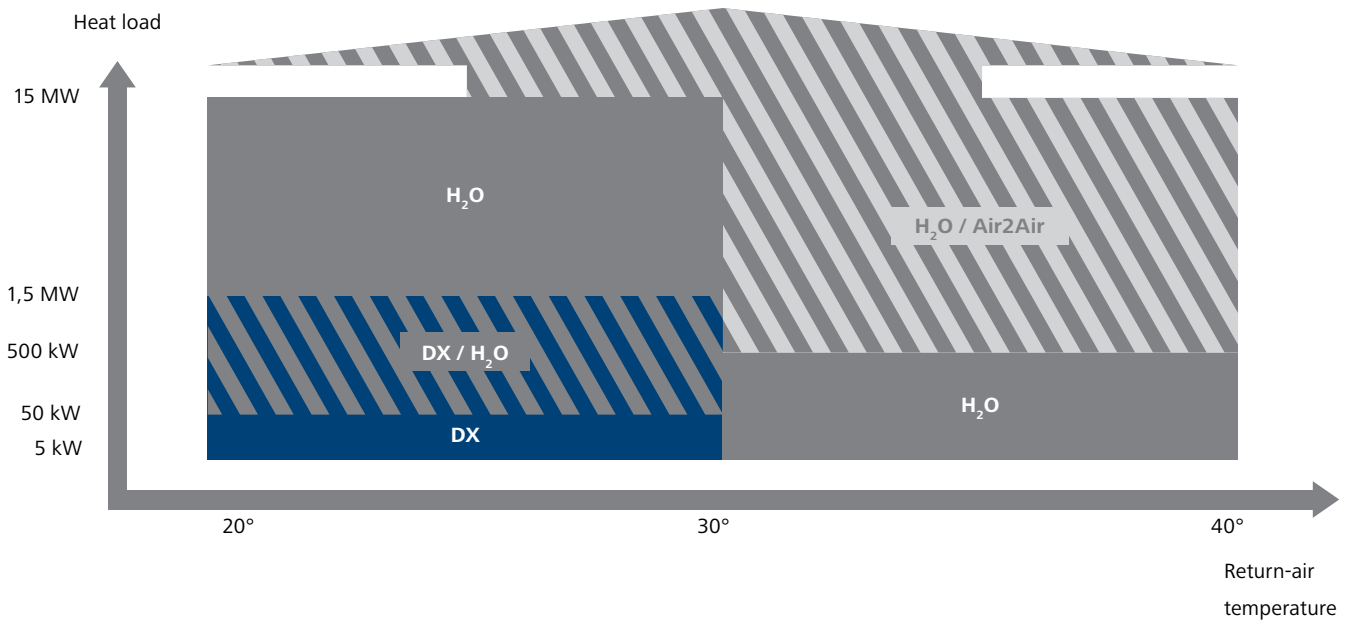
We enjoy a decade-long success story: as inventor of the elliptical pipe, we revolutionized heat transfer with air and thanks to our exceptional know-how are pioneers of outdoor-air cooled systems. Continuous research and development justify our particularly innovative experience, which has produced the world's largest product line for heat exchangers.

Both our compressor-based as well as our compressor-free systems offer highest quality and flexibility with quiet working. Our products reflect our philosophy of sustainability: with the smallest footprint our systems conserve the environment and valuable resources, and ensure low energy consumption as well as reduced operating costs.

Outdoor solution makes the difference



Decision matrix for your optimal system



Find your perfect system!

Settle for the correct close-control air conditioning system with our flexible product combinations. The Figure shows the recommended systems which are categorized depending on server temperature and thermal load.

Water-based systems (H₂O)

- *Ultra*-DENCO + evaporative cooler
- *Multi*-DENCO + chiller + dry cooler
- *Row*-DENCO + chiller

Direct expansion system (DX)

- *Picco*-DENCO + condenser unit
- *Row*-DENCO + condenser unit
- *Multi*-DENCO + condenser unit/condenser

Air-based systems (Air2Air)

- *Adia*-DENCO
- CAIR*plus*

SERVICE ON EVERY LEVEL –

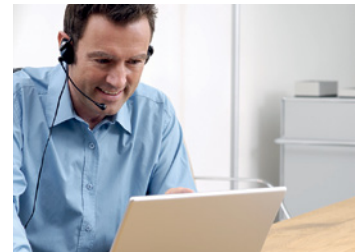
FOR YOUR INDIVIDUAL ALL-ROUND CAREFREE PACKAGE

We are there to support you at all times

Sustainability, reliability and a special proximity to our customers characterize our individual service. Rely on a world-wide market leader of innovative heat exchangers who offers you customized solutions from one source – and who is also your competent partner at all times.

The modern features of our units permit a high degree of service and comfort. For example, our products possess intelligent controllers that permit remote maintenance and thus new potential savings. And even for a necessary engagement on-site, our globally active service team will always support you during the entire product life cycle.

An all-round carefree package with four flexible stages: bronze, silver, gold and platinum adapts to you and your needs in an ideal manner. Increase the effectiveness of your computer center and optimize your operative processes across the board.



Your individual long-term dependability promise*

- **Bronze** – standard maintenance service and emergency service
- **Silver** – bronze services including assumption of repair costs, personal service and supervision
- **Gold** – silver services including service and exchange of wearing parts, i.e. air filters and toothed belts
- **Platinum** – all-round service with all types of service performance

* country-specific



Automobile manufacturers trust **Ultra-DENCO®**



Ultra-DENCO in use

For efficient air conditioning of its factory-side computer center, Daimler AG commissioned the climate manager in 2011. Our *Ultra-DENCO* range convinced the client with a unique price/performance ratio as well as a comprehensive liability including a long warranty period. The highest requirements of future server cooling withstood the test of especially comprehensive operational reliability. After a careful planning phase, Daimler AG equipped its computer center with six *Ultra-DENCO* 100 C and 100 CH systems. The installation phase took some time and was a special challenge, since the outfitting had to take place during ongoing production. However the subsequent success justified the new installation: our units now provided the 100 m² server room with climatic cabinets for the regulation the automatization, the complete robot control as well as the center of the interruption-free electrical supply.

The new unit is integrated in the building management system of Mercedes-Benz, so that malfunctions can be immediately recognized and resolved at the PC. Apart from the room, the intake or discharge temperature as well as the current temperature in the raised floor, the position of the cold water valves in the *Ultra-DENCO* cabinets can also be monitored.

Our customer relies on the performance of *Ultra-DENCO*, and instead of three necessary cooling systems has set up four climatic cabinets – two with and two without humidity control – for redundancy purposes in the server room. Even on hot high-summer days, the innovative close-control air conditioning solution has proven itself and ensured a cool “company head”.



- Initial installation
- Maintenance and servicing
- Assembly services
- Spare parts
- Customer service
- Consulting
- Refurbishing
- Training

DencoHappel is a globally operating company with great expertise in air treatment, air conditioning and filtration technology.

Our nearest consulting and service teams will be glad to discuss ideas and develop creative and effective solutions with you.

