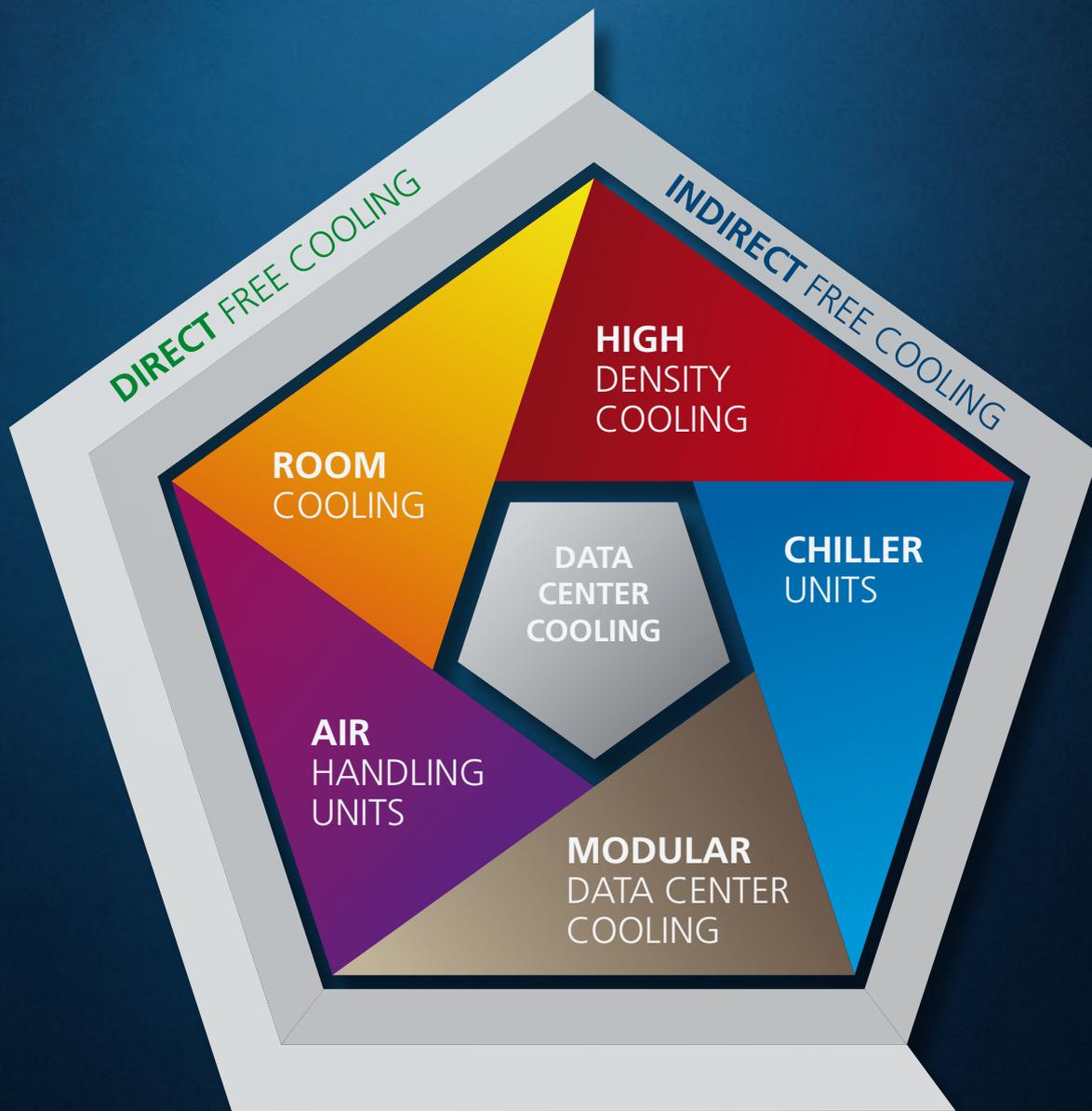


STULZ



IT Cooling Solutions

The Whole Range of
Data Center Cooling Solutions



The Whole Range of Data Center Cooling Solutions from a Single Source

For more than 40 years, sensitive information and communication technology has been cooled by air-conditioning systems made by STULZ – everywhere in the world. Our formula for success is both simple and sophisticated: we are engineers with a vision and business people who know a lot about technology.

STULZ products and services are the result of many thousands of projects. This wealth of experience, our power of innovation, and our know-how enable us to offer our customers the whole spectrum of our Data Center Cooling products and services at the highest quality level.

Around the globe, our entire range of products and services complies with international standards.

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STULZ Data Center Cooling Selection

– Overview

STULZ products and solutions feature optimum quality and reliability for data centers of all sizes and with the most diverse requirements. Choose the perfect solution for your individual requirements from different designs and dimensions – precisely

configured, proven, tested, superbly reliable, and, above all, with exceptional energy efficiency. Find out more and choose precision air-conditioning technology from STULZ.

STULZ Data Center Solutions			DX	CW	Dual	Free Cooling		
						Indirect Free Cooling	Direct Free Cooling	Adiabatic Cooling
Room Cooling	CyberAir 3		●	●	●	●	●	
	MiniSpace EC		●	●			●	
	CompactPlus		●				●	
High Density Cooling	CyberRow		●	●		●		
Modular Data Center Cooling	CyberCon		●	●		●	●	●
Air Handling Units	CyberHandler		●	●	●	●	●	●

STULZ Data Center Solutions				Free Cooling	Air-Cooled	Water-Cooled	Indoor Installation	Outdoor Installation
Chiller Cooling	Outdoor Units	CyberCool 2		•	•			•
	Indoor Chiller	CyberCool CSI		•	•	•	•	

STULZ Humidification				Direct Room Humidification	Duct Installation
Adiabatic Humidifiers		CyberSonic		•	•
		UltraSonic BNB		•	
		UltraSonic ENS			•
Isothermal Humidifier		SupraSteam		•	•



FREE COOLING SYSTEMS



When it comes to reducing energy consumption and costs in data centers, Free Cooling offers the largest potential for energy savings – in particular in cold and moderate climate zones. Recently, technological progress has significantly increased this potential.

High Energy Efficiency with STULZ Free Cooling

With our Direct and Indirect Free Cooling solutions, we are international leaders in the field. The innovative STULZ-developed indirect DYNAMIC FREE COOLING (page 11) is a showcase example of this: it is the first system worldwide with automatic efficiency optimization, and it operates up to 60% more economically than pure compressor cooling systems.

STULZ Free Cooling Labeling



Indirect Free Cooling

With Indirect Free Cooling, a system with a water/glycol mixture is used to cool the data center. Unlike with Direct Free Cooling, no outside air enters the data center with this cooling method. Air-conditioning systems with Indirect Free Cooling can be configured flexibly to suit requirements and are extremely efficient.



Indirect Dynamic Free Cooling

To further improve the efficiency of Indirect Free Cooling, STULZ has developed a dynamic control system for use with its own units. This system controls the mode in accordance with the current heat load in the data center and so considerably increases the number of operating hours in Free Cooling mode compared with other Indirect Free Cooling systems. Moreover, STULZ Indirect Dynamic Free Cooling has another operating mode – Extended Free Cooling – which further lengthens the time of Free Cooling mode and drastically reduces operating costs. The dynamic control cuts energy-intensive compressor cooling to a minimum.



Direct Free Cooling

With Direct Free Cooling, filtered outside air is used to keep the data center cool. This brings huge potential savings of up to 90%, but brings challenges as well. With this cooling method, a large volume of outside air enters the rooms, so that extended temperature and humidity tolerances must be permitted. If the outside temperature rises above the supply air set point, either an integrated DX system with compressors or a separate chiller assumes the task of cooling the data center.



Adiabatic Cooling

In Adiabatic Cooling, water evaporates. The heat required for evaporation is drawn from the room air, so aiding cooling. There are two types of Adiabatic Cooling.

Direct Adiabatic

In a suitable temperature range, the outside air is cooled in Free Cooling mode by an adiabatic pad applied before the DX coil, thereby dramatically reducing the number of compressor operating hours. Energy efficiency is greatly increased.

Indirect Adiabatic

An adiabatic spray applied to an air-to-air heat exchanger decreases the outside air temperature that flows through one circuit. The cooled outside air absorbs the heat of the return air that flows in another circuit creating cool supply air and increasing energy efficiency. Outside air does not mix with return or supply air.

Indirect Free Cooling

In cool weather, Indirect Free Cooling extracts cooling capacity from the outside air. Unlike with Direct Free Cooling, no outside air enters the data center with this cooling method.

Traditional Indirect Free Cooling combines Free Cooling and compressor cooling in three stages (Free Cooling, Mixed mode, DX mode).



Compatibility



ROOM COOLING
HIGH DENSITY COOLING
CHILLER COOLING
MODULAR DATA CENTER COOLING
AIR HANDLING UNITS

Benefits Indirect Free Cooling vs. Direct Free Cooling

- Indirect Free Cooling does not depend on the quality of the outside air (no dust, no pollen, and no problems with excessively dry or moist air)
- Longer maintenance intervals
- Fewer filter changes
- Building security



Traditional Indirect Free Cooling

Comprised of a dry cooler with a constant-speed fan, pumps, and CRACs consisting of both a DX and glycol cooling coil.

Operating Mode	Outside Temperature
Free Cooling	Cooling capacity extracted from outside air; compressor off
Mixed mode	Free Cooling is joined by compressor cooling
DX mode	The unit works in compressor mode

Indirect Dynamic Free Cooling

The modern control electronics developed exclusively for STULZ CyberAir with Indirect Free Cooling select the most energy-saving mode. In contrast to traditional Indirect Free Cooling, the Indirect Free Cooling solution by STULZ features the additional Extended Free Cooling mode. Using variable-speed pumps and a dry cooler with a variable-speed fan, Free Cooling mode is extended, further reducing operating costs.



STULZ Indirect Dynamic Free Cooling controls the mode in accordance with the current heat load in the data center – which is frequently below this set value. In this way, the actual heat load can be dissipated with a smaller temperature difference between the chilled water and the room air.

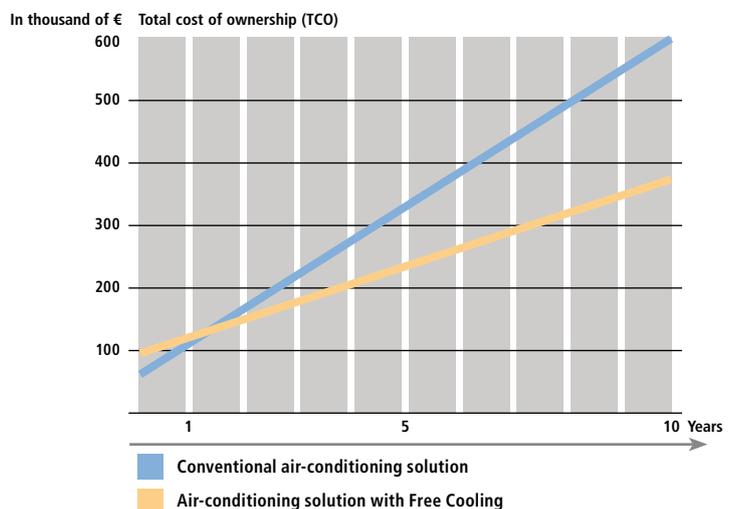
Indirect Dynamic Free Cooling exploits this fact and works dynamically, i.e. without a fixed starting value, which means that it can considerably increase the number of operating hours using Free Cooling.

Benefits of Indirect Dynamic Free Cooling

In addition to features of traditional Indirect Free Cooling, STULZ Indirect Dynamic Free Cooling has the following benefits:

- The world's first system with automatic efficiency optimization
- Controls the operating mode in accordance with the current heat load in the data center, without a fixed starting value
- Up to 60 % energy savings
- The efficiency of the compressor is increased in Mixed mode
- Networking of all active components: All AC including standby units, control valves, compressors, EC fans, pumps, and dry coolers

The higher capital investment in a STULZ GE unit with Indirect Dynamic Free Cooling compared with a conventional air-conditioning system is offset after just a few years.



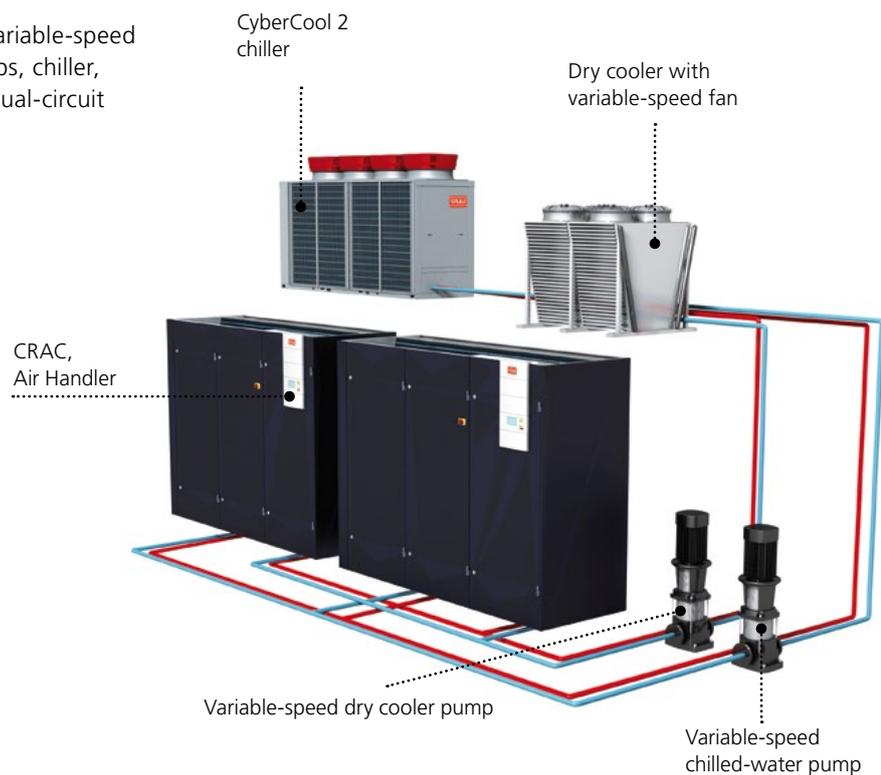
Indirect Dynamic Free Cooling

Thanks to the following components, STULZ can provide systems with the additional Extended Free Cooling mode.



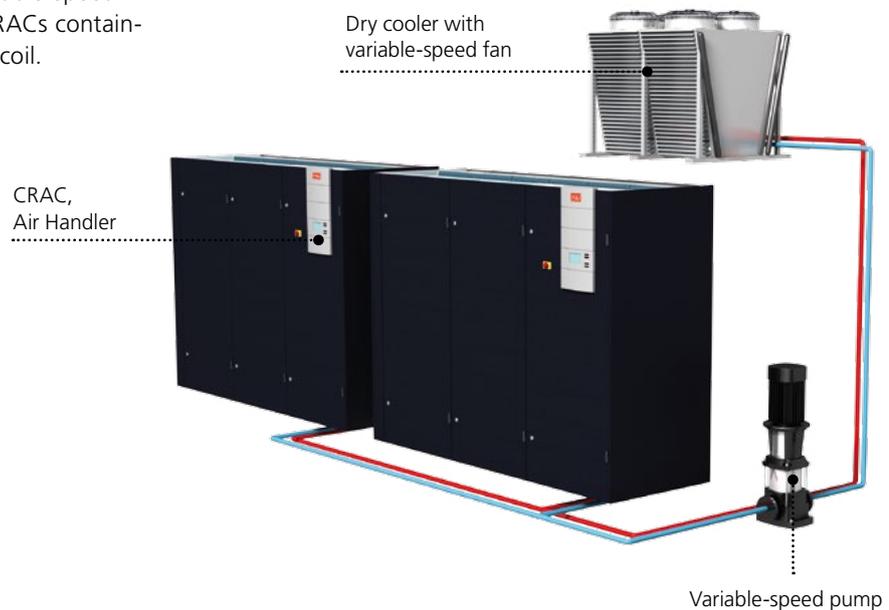
Free Cooling with Dual Chilled-Water Coils (CW2)

Comprised of a dry cooler with a variable-speed fan, variable-speed dry cooler pumps, chiller, variable-speed chiller pumps, and dual-circuit chilled-water CRAHs.



Indirect Free Cooling with GE/GES Units

Comprised of a dry cooler with variable-speed fans, variable-speed pumps, and CRACs containing both a DX and a glycol cooling coil.



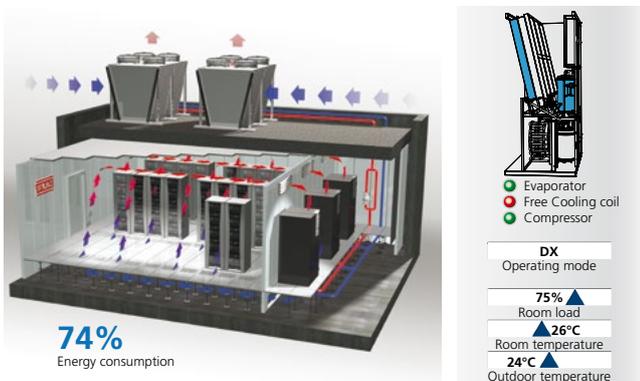
Up to 60% More Economical with STULZ Indirect Dynamic Free Cooling

The electronically controlled GE cooling system combining compressor cooling and Free Cooling in four stages. Here we present an example showing the four operating modes and the required energy for air-conditioning at 75% capacity and a room temperature of 26°C in the data center. Thanks to the scalability of the Indirect Dynamic Free Cooling, this example can be applied to data centers of almost any size.

DX (Compressor Cooling)

As shown in this example, when outside temperature rises above 24°C, the Indirect Dynamic Free Cooling system automatically selects energy-intensive DX mode. But even in this mode, savings are achieved through the use of modern

components. Allowing higher room temperatures can boost this savings effect even further, as the compressor is activated later on.

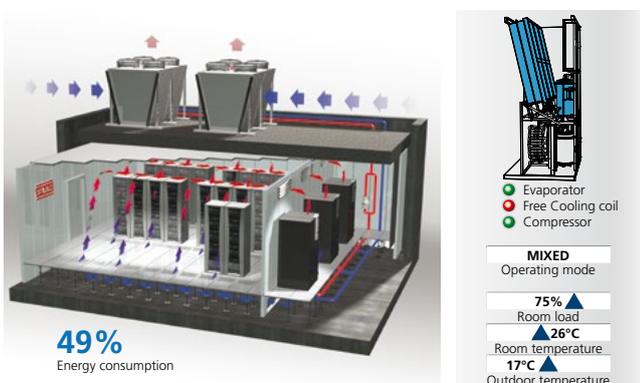


Compressor	Fan	CRAC
On	Set point	CW: Off/DX: Max.
Standby unit	Pumps	Dry Cooler fans
Off	Min.	Variable

MIXED (Compressor and Free Cooling)

When the outside temperature lies between 16°C and 23°C, the system activates Mixed mode. In other words, compressor cooling is joined by Free Cooling. The higher the permitted

room temperature, the higher the number of operating hours using energy-efficient Mixed mode.

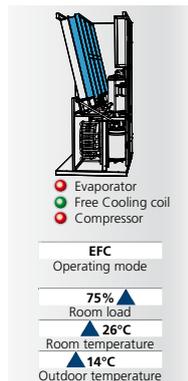
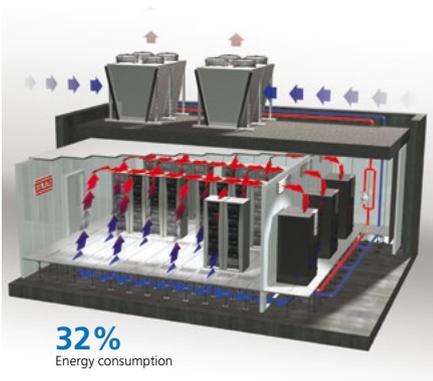


Compressor	Fan	CRAC
Variable	Set point	CW: Variable/ DX: Staged
Standby unit	Pumps	Dry Cooler fans
On	Max.	Max.

Up to 60% More Economical with STULZ Indirect Dynamic Free Cooling

EFC (Extended Free Cooling)

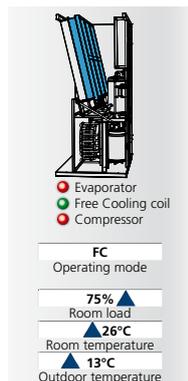
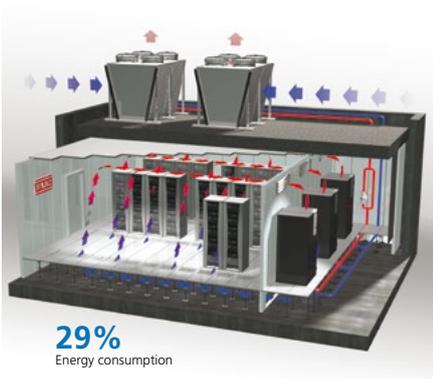
When outside temperatures lie between 14°C and 15°C, Extended Free Cooling is activated, and the compressor is switched off completely! The air flow increases in EFC mode, so that Free Cooling can also be used at higher temperatures.



Compressor	Fan	CRAC
Off	Max.	CW: Max./DX: Off
Standby unit	Pumps	Dry Cooler fans
On	Max.	Max.

FC (Free Cooling)

When outside temperatures are below 13°C, pure, cost-efficient Free Cooling mode is possible. There is no need for the additional use of a compressor.



Compressor	Fan	CRAC
Off	Set point	CW: Variable/DX: Off
Standby unit	Pumps	Dry Cooler fans
On	Variable	Variable

Direct Free Cooling

Direct Free Cooling exploits the potential of outside temperatures in moderate zones, so that the data center can be cooled with outside air. With this method of cooling, a high proportion of the outside air directly enters the room and is conditioned by filtration and humidifying systems.

Direct Free Cooling is suitable for applications with wider temperature and humidity tolerances. It can therefore be used in most countries of the world with maximum energy efficiency.

STULZ has carried out numerous projects worldwide with Direct Free Cooling and is familiar with the requirements of different countries and continents. In order to be able to always offer just the right solution, STULZ has developed scalable air-conditioning systems that precisely conform to the typical parameters of each country.

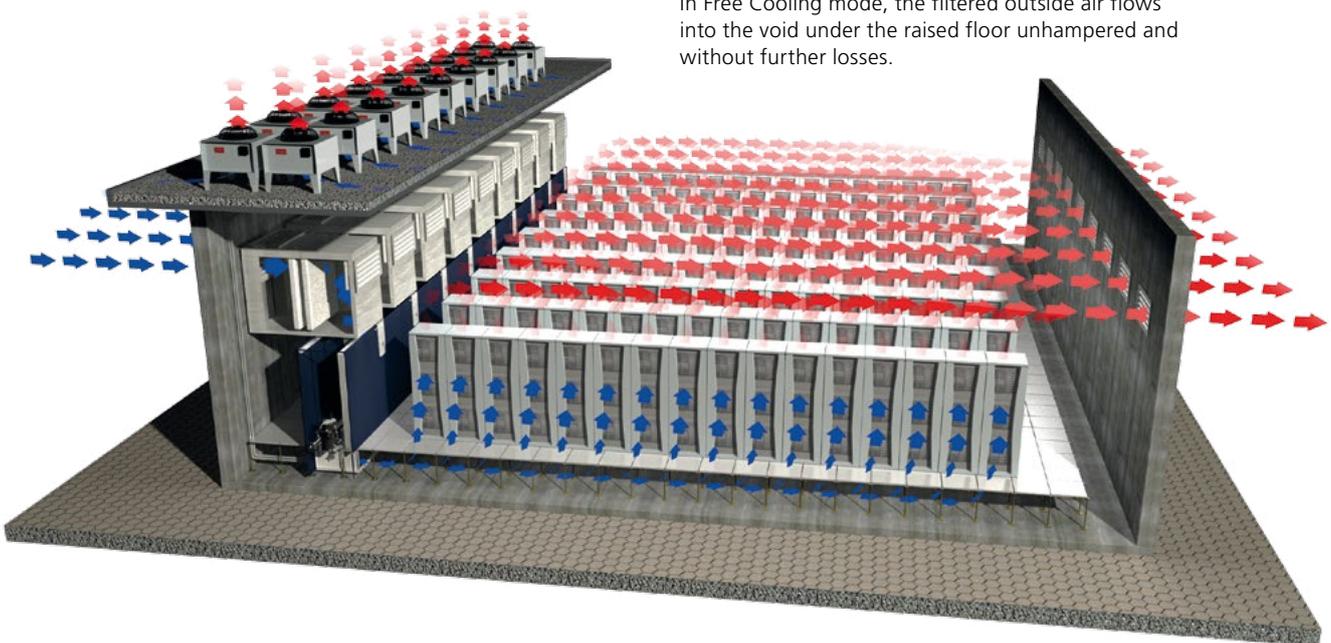


Compatibility



ROOM COOLING
HIGH DENSITY COOLING
CHILLER COOLING
MODULAR DATA CENTER COOLING
AIR HANDLING UNITS

In Free Cooling mode, the filtered outside air flows into the void under the raised floor unhampered and without further losses.



Benefits

- High energy efficiency through the direct use of Free Cooling
- Excellent system scalability („Build as you grow!“), no hydraulics (pipework, pumps, fittings)
- Lower capital investment than with conventional Indirect Free Cooling systems
- Fold-away heat exchanger in the CyberAir AMD for additional energy efficiency
- Drastically lower energy consumption than all conventional systems

Save up to 90 % on Costs per Year – with Direct Free Cooling

Energy-saving potential thanks to outside air percentage and number of hours per year of temperatures up to and including 18°C/27°C (according to ASHRAE TC9.9 – 2011)

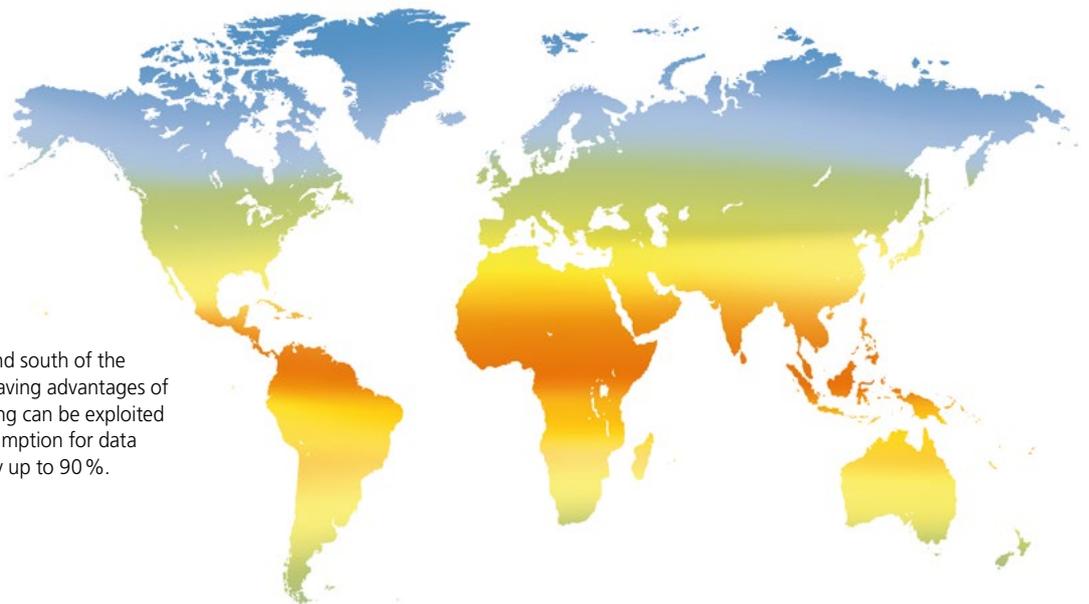
	Hamburg	London	Moscow	Canberra	Madrid	Istanbul	New York	Beijing	Johannesburg	Paris	Sao Paulo
Annual no. of hours below 18°C ¹	7,760	7,010	7,529	6,492	5,637	5,444	5,577	5,341	5,667	6,708	3,219
Percentage ²	87%	80%	86%	74%	64%	62%	64%	61%	65%	77%	37%
Annual no. of hours below 27°C ¹	8,720	8,727	8,728	8,399	7,817	8,198	8,114	7,865	8,637	8,593	8,312
Percentage ²	99.5%	99.6%	99.6%	96%	89%	94%	93%	90%	99%	98%	95%

¹Hours per year of temperatures up to and including 18°C/27°C

²Percentage of hours with temperatures up to and including 18°C/27°C over the year



Moderate Climate



In moderate climates north and south of the equatorial zone, the energy-saving advantages of Direct and Indirect Free Cooling can be exploited to the fullest. Electricity consumption for data center air-conditioning falls by up to 90 %.



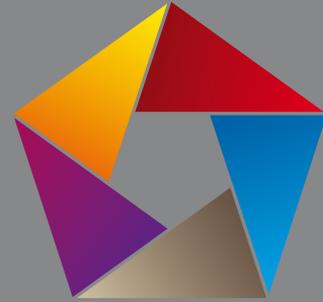
It pays to have energy efficiency with STULZ air-conditioning systems:

The air-conditioning of a Hamburg data center with a surface area of 800 m² and a heat load of 1 MW costs only €34,000 a year with Direct Free Cooling, as opposed to €296,000 a year with compressor cooling only. This equates to savings of €262,000 a year.

Source: STULZ comparison of system costs, basis for calculation 13 ct/kWh



PRECISION COOLING



STULZ Data Center Cooling Products

From traditional Room, High Density, and Chiller Cooling to Modular Data Center and Air Handling Units, STULZ offers a complete range of cooling products that provide optimum solutions for every situation – down to the appropriate humidification products.

CyberAir 3

Stand-Alone Precision Air-Conditioning System for High-End Applications

The CyberAir 3 closed-circuit air-conditioning system from STULZ controls the conditions in the data center with the utmost precision, maximum reliability, and energy efficiency.

Designed for reliable, continuous operation over many years, the STULZ CyberAir 3 is accurate to the nearest degree, quiet, and exceptionally economical. It keeps your IT available at all times.



Cooling Systems: A, AS, G, GS, GE, GES, CW, CW2, ACW, GCW
For more information, please see pages 46–49.

CyberAir 3

Stand-Alone Precision Air-Conditioning System for High-End Applications

CyberAir 3 AC units in standard door sizes are available as energy- or space-saving versions. The seven available sizes range from 950 to 3,350 mm in width. The largest two sizes have a depth of 980 mm.



Features

- Up to 90% more economical thanks to STULZ Indirect Dynamic Free Cooling and Direct Free Cooling automatic air-conditioning
- EC fan: Quiet-running, long life, maintenance-friendly
- Compressor with EC technology and state-of-the-art electronically controlled expansion valves
- Infinite compressor control for cooling capacity with maximum efficiency
- Thanks to the high-efficiency rear panel (optional), the depth of the units increases and the surface area of the heat exchanger is used even more efficiently
- Fold-away heat exchanger in the CyberAir AMD for additional energy efficiency
- Filter control management
- All parts requiring maintenance can be accessed from the front
- Seven cooling systems in both upflow and downflow format, seven sizes, standard and low-energy versions
- Compact dimensions
- C7000 controller for controlling and monitoring the air-conditioning system

CyberAir 3 CWE/CWU

Two Modules, One Aim: Efficient Use of Space and Energy

A CyberAir CWE/CWU unit consists of an EC fan and a heat exchanger module. This design principle results in low pressure losses and increases energy efficiency considerably.

The CyberAir CWE/CWU Version Provides:

- Energy-optimized heat exchanger design for high water and return-air temperatures
- Large heat exchanger surfaces
- Easy transport thanks to standard door size
- Very service-friendly (front access)
- Flexible installation in data centers



Installation Options for CyberAir 3 CWE/CWU



CWU Version:

Fan unit installed under raised floor (power input of fans is up to 35 % less than when installed on the raised floor)



CWE Version:

Fan unit installed on raised floor when height of raised floor is insufficient

Technical Data

CyberAir 3	DX and Dual Fluid	DX and Dual Fluid with EC Compressor	GE	GES with EC Compressor	CW/CW 2	CWE/CWU	
Cooling capacity	kW	18 ~ 102	20 ~ 82	18 ~ 102	21 ~ 82	28 ~ 214	45.0 ~ 252.2
Volumetric air flow	m³/h	5,900 ~ 24,500	5,000 ~ 20,000	5,900 ~ 24,500	5,000 ~ 20,000	7,000 ~ 39,000	10,000 ~ 50,000

CyberAir 3	DX with Direct Free Cooling	CW with Direct Free Cooling	
Cooling capacity	kW	75 ~ 108	107 ~ 150
Volumetric air flow	m³/h	25,000 ~ 35,000	24,000 ~ 35,000



CyberAir 3 AMD

Direct Free Cooling for Large to Medium-Sized Data Centers

To achieve the most efficient Direct Free Cooling in large to medium-sized data centers, STULZ has developed the CyberAir AMD. These units are provided with an external damper system that controls return air, outside air, and supply air to reach the most efficient operation. To prevent pressure losses in Free Cooling mode and additionally increase energy efficiency, STULZ has developed the CyberAir AMD unit with fold-away heat exchanger. In Direct Free Cooling mode, the heat exchanger moves to the side, enabling the conditioned outside air to flow unimpeded and without losses into the cavity under the raised floor.

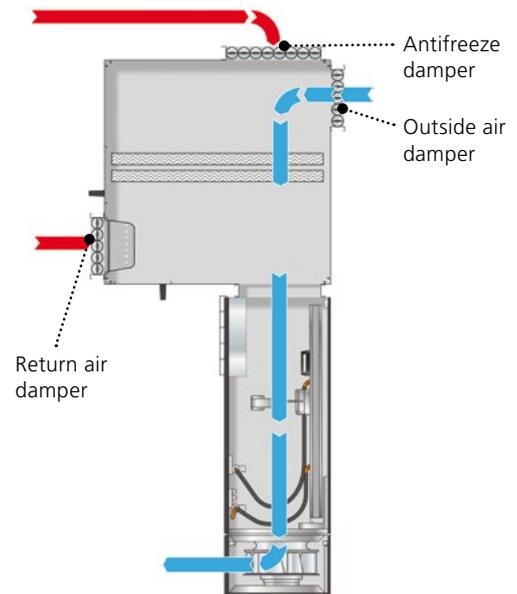
STULZ Mixing and Filtration Box

The CyberAir AMD can be fitted with the STULZ mixing and filtration box. These STULZ units are perfectly adapted to each other for optimized operation. Thanks to the size of the STULZ mixing and filtration box, pressure losses are reduced and energy efficiency increases. The box contains special filters that remove unwanted particles from the incoming air, ensuring that clean filtered air flows into the data center and through the sensitive servers.

Free Cooling Mode

(STULZ CyberAir AMD unit with mixing and filtration box)

The damper system consists of an outside air, return air and antifreeze damper. A further air damper, which conveys the exhaust air to the outside, is installed in the data center that is to be air-conditioned.



Operating Mode	Outside Temperature	Operation
Free Cooling	Outside temperature between supply air set point and antifreeze temperature	Outside air damper opens. Outside air flows through the filter directly into the unit, then into the data center; compressor off. The return air and outside air dampers open if the outside temperature drops or thermal load is reduced. They mix return air with outside air and so maintain the supply air temperature; compressor off.
	Outside temperature below antifreeze temperature	To prevent the filters from icing up, the antifreeze damper opens and warm return air from the data center mixes with cold outside air before entering the filter. The supply air temperature is regulated by the opening angle of the outside air and return air dampers; compressor off.
Mixed mode	Outside temperature above supply air set point	Compressor is switched on for support, to exploit Free Cooling mode to the fullest; outside air damper open; compressor running in partial-load mode.
DX mode	Outside temperature out of Free Cooling and Mixed mode range	The unit works in compressor mode; outside air damper closed.

FreeCool Plenum for CyberAir 3

Direct Free Cooling for Medium to Small-Sized Data Centers

To enable Direct Free Cooling to be used in small and medium-sized data centers as well, the CyberAir 3 units can be equipped with FreeCool Plenum. The compact Free Cooling box with an integrated filter for the outside air can be retrofitted and has been specially developed for use in data centers.

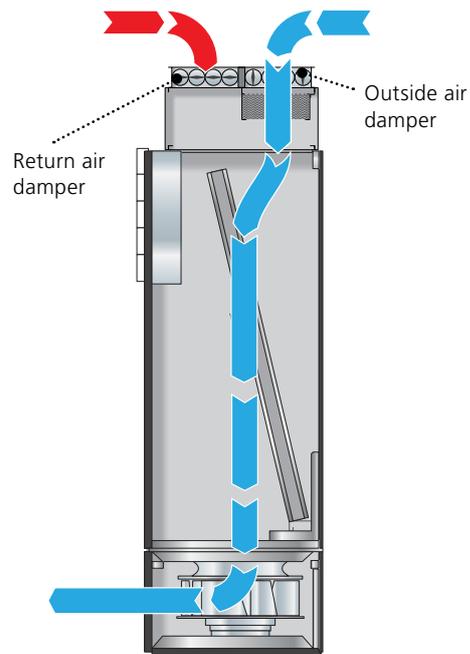


FreeCool Plenum (FCP) is available for all CyberAir 3 sizes.

Free Cooling Mode

(CyberAir 3 downflow unit with FreeCool Plenum)

FreeCool Plenum features a damper for outside air and a damper for return air. An exhaust air damper, which conveys the exhaust air to the outside, is installed in the room that is to be air-conditioned. The filtered outside air flows through the CyberAir 3 unit into the cavity under the raised floor.



Operating Mode	Outside Temperature	Operation
Free Cooling	Outside temperature between supply air set point and antifreeze temperature	Outside air damper opens. Outside air flows through the filter directly into the unit, then into the data center; compressor off. The return air and outside air dampers open if the outside temperature drops or thermal load is reduced. They mix return air with outside air and so maintain the supply air temperature; compressor off.
Extended Free Cooling	Outside temperature above supply air set point	The cooling capacity is kept constant by increasing the air flow. Outside air damper open; compressor off.
Mixed mode	Outside temperature continuously increasing	If the fan reaches maximum speed and Extended Free Cooling is no longer sufficient, the compressor is switched on for support; outside air damper open; compressor runs in partial-load mode.
DX mode	Outside temperature out of Free Cooling and Mixed mode range	The unit works in compressor mode; outside air damper closed.

Compact Plus

Direct-Expansion Air-Conditioning for Data Centers

For minimal investment, the Compact Plus precision air-conditioning system ensures the availability of your sensitive technology in large rooms with a heat load from 18 up to 104 kilowatts.

The Compact Plus units offer excellent performance and operational reliability for little money. This electronically controlled system uses cooling compressors and works on the direct evaporator principle (Direct Expansion - DX). The system is available as a single- or dual-circuit system.

Easy installation, simple maintenance from the front, and compact design make our Compact Plus units a superior air-conditioning controller in equipment rooms. The system can be extended to include up to twenty AC units of different sizes.



Features

- AC fans with direct drive
- Easy installation
- Maintenance-friendly
- High-efficiency zigzag filter and low pressure drop
- Filter class G4, refrigerant R407C
- Options:
 - Refrigerant R134a, filter class M5
 - Suitable for connection to all common BMS systems
 - Communication via Internet protocols (HTTP/SNMP), text message or e-mail
 - C7000 controller for controlling and monitoring the air-conditioning system

Technical Data

Compact Plus DX	Single and Dual Circuit
Cooling capacity kW	18 ~ 104
Volumetric air flow m³/h	6,000 ~ 24,000



MiniSpace EC

Reliability for Small and Medium-Sized IT Rooms

If you need precise, reliable, and cost-effective air-conditioning solutions for small to medium-sized server and technology rooms, the MiniSpace EC series provides a microprocessor-controlled solution.

These units require very little floor space, and their compact size means they can be installed in existing server rooms with no problem.

The MiniSpace units are also available with AC fans.



Cooling Systems: A, G, CW
For more information, please see pages 46–47.

Features

- Maximum cooling performance with minimum floor space
- Units as downflow and upflow versions
- Simple installation and maintenance through doors on the front
- Continuously adjustable EC fan*
 - High levels of fan motor efficiency up to 92 %, reaping obvious savings in running costs
 - Quiet-running, long life, maintenance-free
 - Flexibility for changed air conduction
- Continuous recording of measured values
- Air filtering with filter class EU 4
- C7000 controller for controlling and monitoring the air-conditioning system
- Options:
 - Humidifier/heating
 - R134a high-temperature refrigerant

* For MiniSpace EC only

Technical Data

MiniSpace	AC Fans	EC Fans
Cooling capacity kW	5 ~ 28	6.5 ~ 31.5
Volumetric air flow m³/h	2,000 ~ 7,000	2,500 ~ 7,500



Technical data subject to change without notice.

For more information please use the QR code or visit our web site: www.stulz.com

MiniSpace Eco-Cool

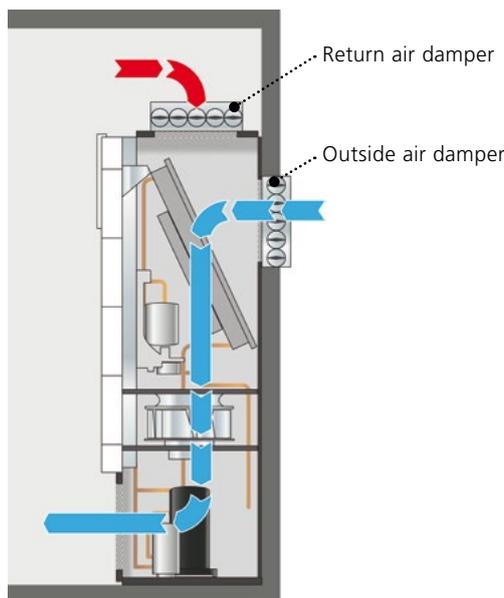
Direct Free Cooling for Small and Medium-Sized IT Rooms

The Eco-Cool function enables the use of Direct Free Cooling in small IT rooms thanks to air dampers integrated in the MiniSpace unit.

This unit features preinstalled outside air and return air dampers, thus offering more installation flexibility. An exhaust air damper, which conveys the exhaust air to the outside, is installed in the room that is to be air-conditioned.

Free Cooling Mode (MiniSpace Eco-Cool downflow unit)

Outside air flows into the unit through filters that remove unwanted particles.



MiniSpace Eco-Cool is available in downflow versions.

Operating Mode	Outside Temperature	Operation
Free Cooling	Outside temperature between supply air set point and antifreeze temperature	Outside air damper opens. Outside air flows through the filter directly into the unit, then into the data center; compressor off. The return air and outside air dampers open if the outside temperature drops or thermal load is reduced. They mix return air with outside air and so maintain the supply air temperature; compressor off.
Extended Free Cooling	Outside temperature above supply air set point	The cooling capacity is kept constant by increasing the air flow. Outside air damper open; compressor off.
Mixed mode	Outside temperature continuously increasing	If the fan reaches maximum speed and Extended Free Cooling is no longer sufficient, the compressor is switched on for support; outside air damper open; compressor runs in partial-load mode.
DX mode	Outside temperature out of Free Cooling and Mixed mode range	The unit works in compressor mode; outside air damper closed.

CyberRow

High Density Solution

CyberRow is the innovative air-conditioning system in which the air distribution takes a whole new direction – horizontal! The individual units are carefully integrated in the rows of server racks, greatly improving air distribution and taking cooling directly to the heat load.



Cooling Systems: AS, GS, GES, CW
For more information, please see pages 46–48.

Features

- Independent of rack manufacturer
- Targeted cooling of high-density racks
- Up to five variable-speed EC fans, which can be controlled independently of each other for optimum adaptation to different return air and supply air temperatures
- Infinitely adjustable EC compressor for precise cooling capacity, and no increase in start-up current due to inverter technology
- For data centers with and without raised floors
- Three different widths for flexibility
- Front and rear service access
- C7000 controller for controlling and monitoring the air-conditioning system



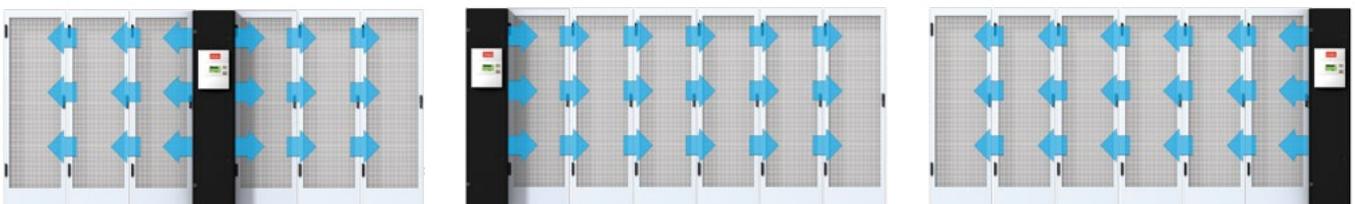
CyberRow Sizes:

Size 1: 1,950 x 300 x 1,200 (H x W x D)

Size 2: 1,950 x 400 x 1,175 (H x W x D)

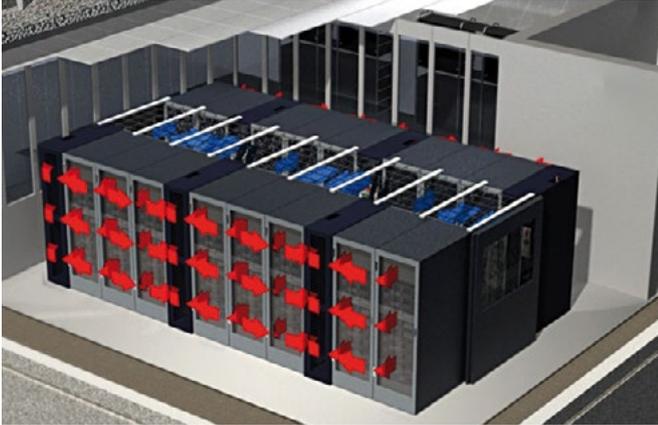
Size 3: 1,950 x 600 x 1,175 (H x W x D)

Depending on the unit size, a CyberRow can supply cold air to as many as six server cabinets.

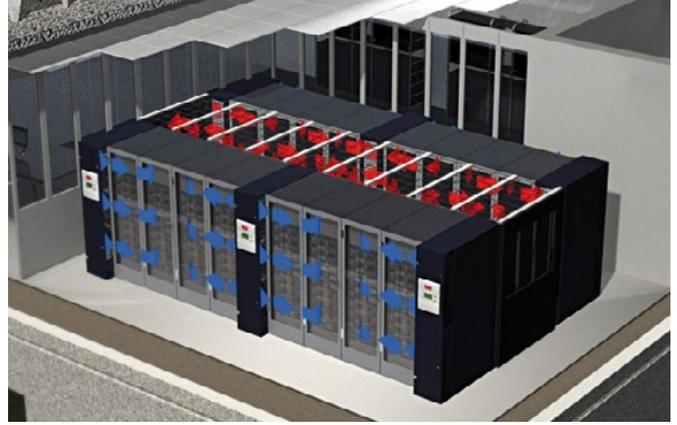


CyberRow

Intelligent Air Flow Control – for More Efficiency in Rack Cooling

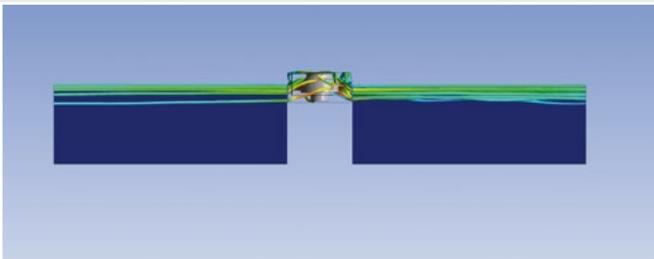


CyberRow units with frontal air outlets are used for cold-aisle containment. The units are positioned in a staggered arrangement to provide an optimum air supply to the server racks across from them.

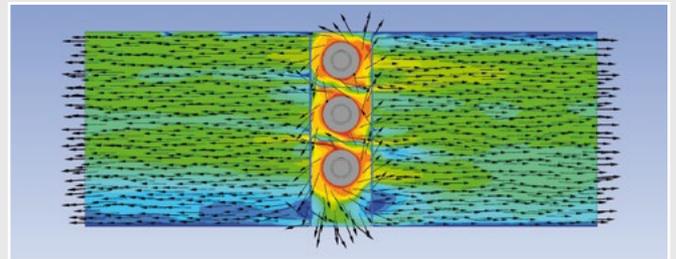


CyberRow units with lateral air conduction are used for hot-aisle containment.

Thanks to its horizontal dual-direction air outlet, CyberRow creates uniform, close-contact air flow directly in front of the racks. Air baffles in the unit ensure that the cold air sticks directly to the server racks and no turbulence arises.



This CFD visualization shows how the cold air flows directly in front of the server racks.



The red areas – around the EC fans – show that the fans emit the cold air at a very high speed at the outlets. However, this is only the case as long as the air is in the housing. The partitions installed between the EC fans channel the air flow, and the air baffles at the outlet ensure uniform distribution across the entire height of the racks.

Technical Data

CyberRow		DX			GE		CW		
Model		CRS 211 AS	CRS 251 AS/GS	CRS 361 AS/GS	CRS 251 GES	CRS 361 GES	CRS 210 CW	CRS 320 CW	CRS 560 CW
Height	mm	1,950	1,950	1,950	1,950	1,950	1,950	1,950	1,950
Depth	mm	1,200	1,175	1,175	1,175	1,175	1,200	1,175	1,175
Width	mm	300	400	600	400	600	300	400	600
Cooling capacity	kW	22.2	25.3	37.5	25.3	37.5	22.7	33.3	58.2
Volumetric air flow	m ³ /h	4,600	5,400	8,000	5,400	8,000	5,000	6,400	11,200



Technical data subject to change without notice.

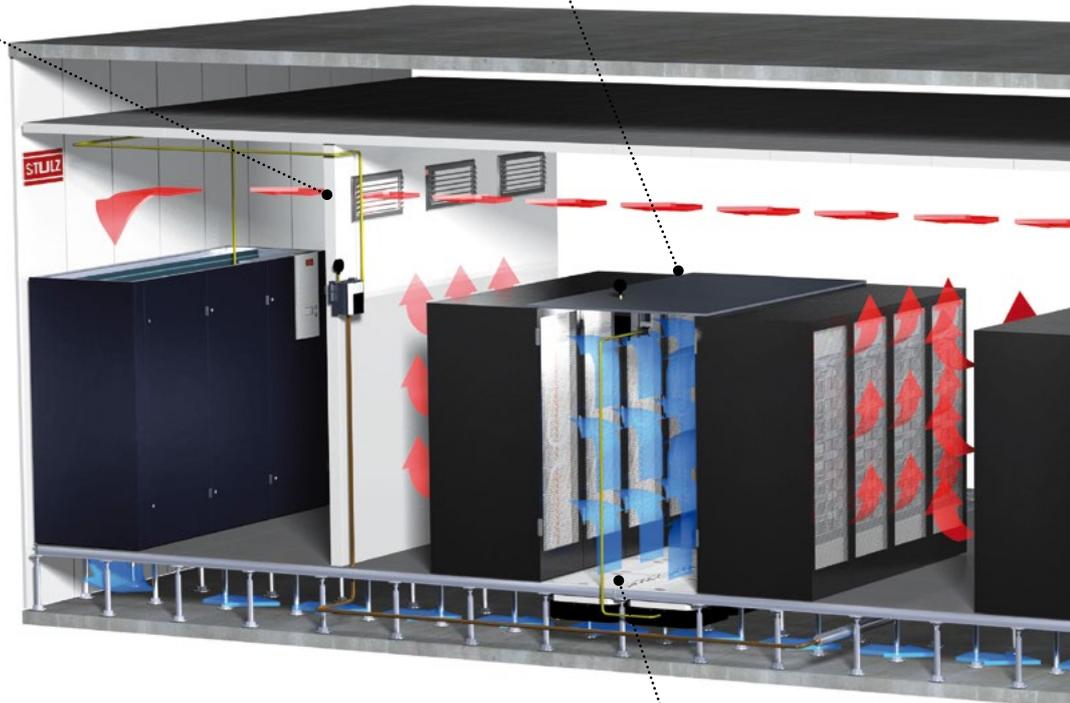
For more information please use the QR code or visit our web site: www.stulz.com

High Density Products

Air Flow Management for Data Centers with Closed-Circuit Air-Conditioning

For optimal server performance, we recommend also using the STULZ differential pressure control to drive the closed-circuit air-conditioning unit.

Sensor for differential pressure control housing (Pressure Transmitter Module – PTM)



AirModulator
with louvered
dampers

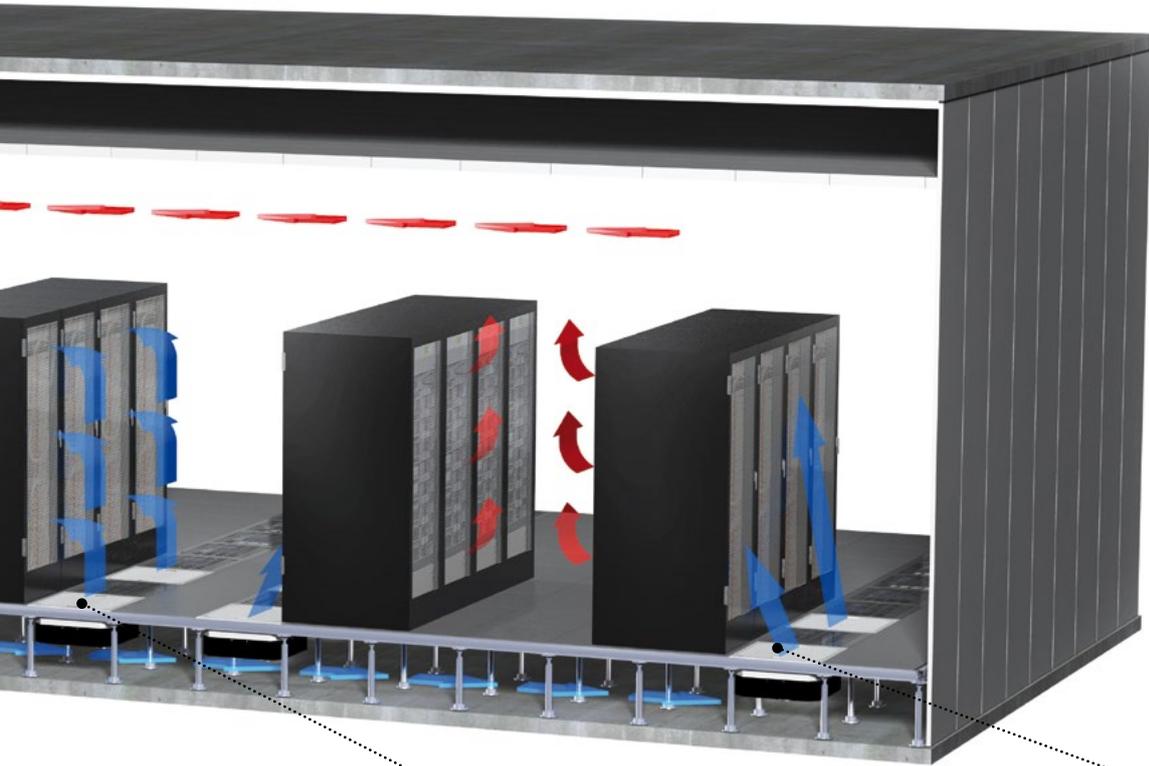


Air flow system solutions from the STULZ AirBooster series are installed directly in front of the server rack in the raised floor. Integrated sensors ensure that cold air requirements are automatically determined and exactly the right air flow rate is provided based on the required temperature.

All elements of STULZ air flow solutions utilize the same air conduction system, from the air conditioners to the racks, and are controlled exactly in line with cooling requirements.

High Density Products

Air Flow Management for Data Centers with Closed-Circuit Air-Conditioning



AirBooster
with infinitely
variable EC fan
speed control



AirBooster Pro
with adjustable air
transfer grille and
variable-speed EC
fan control



Technical Data

Fan	EC
Maximum air flow	m ³ /h 2,650
Distributed load	kg/m ² 1,000
Dimensions (W x H x D)	mm 600 x 210 x 600



CyberCon

Cooling for Containerized Data Centers

The STULZ CyberCon outdoor modular container system is designed for conditioning the air in a prefabricated data center. This modular cooling solution is ideal for rapid deployment and reduced construction time.



CyberCon can be mounted on top of a containerized computer room.

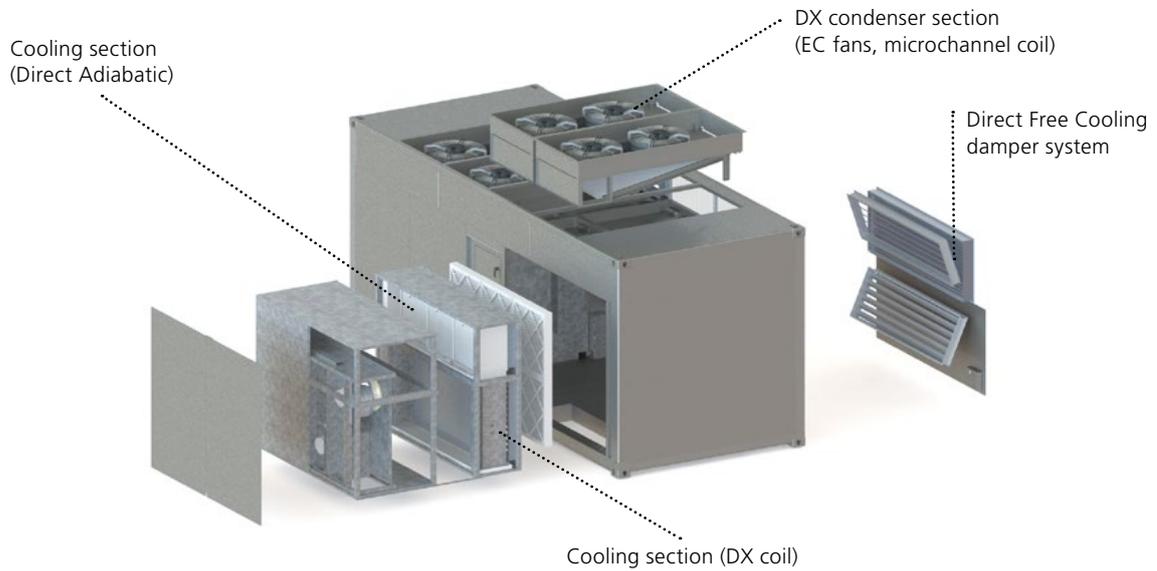
Features

- Easy to ship and install
- Reduces up-front capital costs and adapts to rapidly changing conditions
- Provides ability to scale capacity and quickly align with IT demands
- Can be installed directly on top of a containerized computer room
- No components, fans, doors, or louvers exceeding outside dimensions
- Rigid construction
- Air intake and service access on one side, allowing end-to-end and back-to-back installation
- Multiple independent circuits with interlaced coil and electronic expansion valve
- Direct Free Cooling option allows energy savings of up to 80%
- Direct Adiabatic option handles humidification and provides additional energy-efficient cooling
- Air-cooled condenser using microchannel coils
- Cabinet sizes: 20 ft

Operating Mode	Outside Temperature	Operation
Free Cooling	Outside temperature between supply air set point and antifreeze temperature	Outside air damper opens. Outside air flows through the filter directly into the unit, then into the data center; compressor off. The return air and outside air dampers open if the outside temperature drops or thermal load is reduced. They mix return air with outside air and so maintain the supply air temperature; compressor off.
Adiabatic Free Cooling	Outside temperature above supply air set point	If the outside air temperature rises above the supply air temperature set point, an Adiabatic Cooler cools the outside air, thus taking full advantage of the Free Cooling potential. Outside air damper open; compressor off.
Mixed mode	Outside temperature continuously increasing	Compressor is switched on for support, to exploit Free Cooling mode to the full; outside air damper open; compressor running in partial-load mode.
DX mode	Outside temperature out of Free Cooling and Mixed mode range	The unit works in compressor mode; outside air damper closed.

CyberCon

Cooling for Containerized Data Centers



Modular Design

Thanks to the variety of options, CyberCon units can be configured according to your specified requirements and needs.

Mechanical Cooling	Free Cooling	Adiabatic Cooling, Humidification	Heat Rejection
DX coil	Direct Free Cooling	Direct Adiabatic	Condensing unit for DX
CW coil*	Indirect air	Steam Humidifier	Exhaust module for Direct Free Cooling
No mechanical cooling	Indirect water		
	No Free Cooling		

* External chiller, cooling tower, or dry cooler required

Technical Data

CyberCon	DX	CW
Cooling capacity kW	230 ~ 480	243
Volumetric air flow m ³ /h	20,800 ~ 41,600	23,000



Technical data subject to change without notice.

For more information please use the QR code or visit our web site: www.stulz.com

CyberHandler

Air-Conditioning Unit

STULZ CyberHandler is designed with proven STULZ cooling technology for stringent demands of data centers and can be mounted on top of a building or ducted to the side of a building. This air handling system is a centralized cooling solution designed specifically to free up white space in the data center.



Features

- Frees up white space in the data center
- Designed for stringent demands of data centers
- Modular design
- Low installation costs (fewer units, mounted outdoors)
- Designed for higher return air temperature (according to ASHRAE 90.1)
- Proven STULZ Precision Cooling Technology integrated
- Direct Free Cooling is available with Adiabatic Cooling options
- Indirect Free Cooling with DX/CW or CW/CW coil configurations
- Aluminum skin provides superior corrosion protection and light weight
- Coil bypass for reduced air pressure drop during low loads
- Reduced operating costs (energy efficiency, maintenance)
- Use of Free Cooling possibilities (direct air, indirect air, adiabatic, indirect water)
- Maintenance is not conducted inside the data center (security, cleanliness, duration)
- Units are mounted outside, lower risks in case of leakages
- Extensive range of capacities available
- EC fans
- Designed for operation 365 days a year

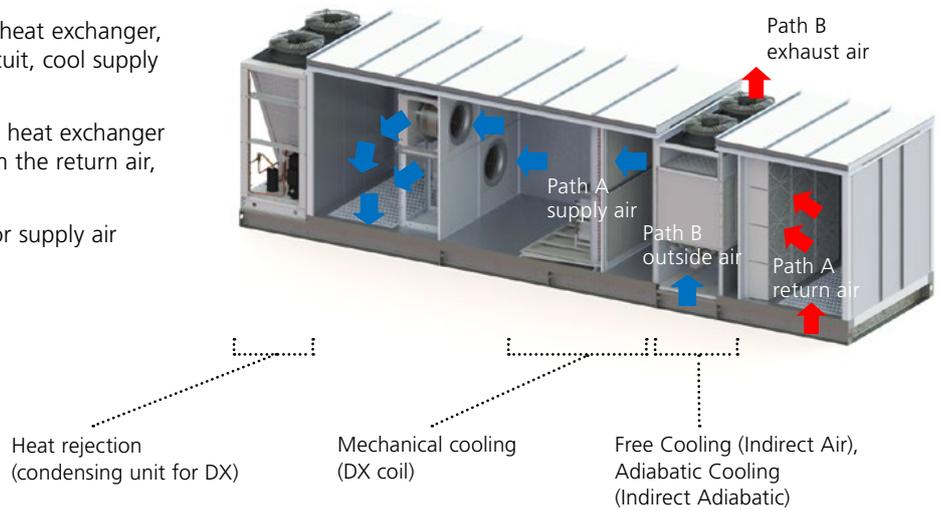
Operating Mode	Outside Temperature	Direct Free Cooling Operation
Free Cooling	Outside temperature between supply air set point and antifreeze temperature	Outside air damper opens. Outside air flows through the filter directly into the unit, then into the data center; compressor off. The return air and outside air dampers open if the outside temperature drops or thermal load is reduced. They mix return air with outside air and so maintain the supply air temperature; compressor off.
Adiabatic Cooling	Outside temperature above supply air set point	If the outside air temperature rises above the supply air temperature set point, an Adiabatic Cooler cools the outside air, thus taking full advantage of the Free Cooling potential. Outside air damper open; compressor off.
Mixed mode	Outside temperature continuously increasing	Compressor is switched on for support, to exploit Free Cooling mode to the fullest; outside air damper open; compressor running in partial-load mode.
DX mode	Outside temperature out of Free Cooling and Mixed mode range	The unit works in compressor mode; outside air damper closed.

CyberHandler

Air-Conditioning Unit

Free Cooling Indirect Air

- Path A: Return air flows through the heat exchanger, heat is transferred to the external circuit, cool supply air is created
- Path B: Outside air flows through the heat exchanger in counterflow, absorbs the heat from the return air, and is exhausted via EC axial fans
- Outside air is not mixed with return or supply air



Modular Design

Thanks to the variety of options, CyberHandler units can be configured according to your specified requirements and needs.

Mechanical Cooling	Free Cooling	Adiabatic Cooling, Humidification	Heat Rejection
DX coil	Direct Free Cooling	Direct Adiabatic	Condensing unit for DX
CW coil*	Indirect air	Indirect Adiabatic	Exhaust module for Direct Free Cooling
	Indirect water		
No mechanical cooling	No Free Cooling	Steam humidifier	Fluid cooler for CW

* External chiller, cooling tower, or dry cooler required

Technical Data

CyberHandler		DX	CW
Cooling capacity	kW	49 ~ 351	56.5 ~ 527
Volumetric air flow	m ³ /h	4,500 ~ 32,000	4,500 ~ 42,000



CyberCool 2

High-End Chiller for Data Centers

CyberCool 2 chillers have been developed especially for use in data centers to set new standards for all requirements for efficiency and reliability.

These units, which were designed and produced in Hamburg, boast a cooling capacity from 50 to as much as 1,400 kW and are available as an air-cooled version. Thanks to the diverse range of available options and the intelligent control technology, the new CyberCool 2 is one of the most cost-effective chillers.

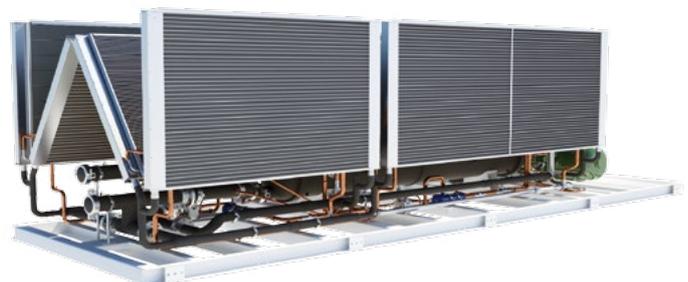


Features for CyberCool 2

- Energy-efficient and noise-optimized system operation
- Floating switchover to Mixed/Free Cooling mode reduces compressor run time
- Suitable for a broad range of applications (outside temperature -45 to +55°C)
- Exclusive use of industry-specific, commonly available system components for optimal spare-part availability and fail-safe operation
- Fans with large surface areas
- Easy installation and machine connection
- Large coil surfaces
- Full aluminum microchannel coil
- Operational and system concept designed for maintaining functionality with interchangeable components (one spare part for two refrigerant circuits)
- Encapsulated compressor chamber for reduced noise
- Compact machine design
- Compressed gas pipes of stainless steel for screw compressors
- Airflow-optimized condenser modules
- Sturdy base frame made of welded U-profile steel
- C7000 controller for controlling and monitoring the chiller

CyberCool 2 with Screw Compressor

- Cooling capacity approx. 320 to 1,400 kW
- Refrigerant R134a
- Constant-speed and variable-speed screw compressors always combined with evaporator dry expansion (DX)
- Available in one- and two-circuit chiller designs



CyberCool 2

High-End Chiller for Data Centers

CyberCool 2 with Scroll Compressor

- Cooling capacity approx. 50 to 611 kW
- Evaporator as brazed-plate heat exchanger
- Refrigerant R410a
- Available in one- and two-circuit chiller designs



Options for CyberCool 2

- Control with UPS buffer
- Dual power feed with automatic or manual switchover (A and B supply)
- Compressor quick-start routine so that the machine reaches operating point again as quickly as possible after a power failure:
 - Constant-speed compressors power back to 100% cooling capacity after approx. two minutes.
 - Variable-speed compressors start up again with no delay when power returns after an outage. As the compressors are influenced by system operation as a whole, the time until the required cooling capacity is reached varies depending on the number of compressors installed and the specific circumstances of the project.
- Separate electrical-load outputs to supply external consumers
- Internal chiller bypass switch to prevent forced flow through of unnecessary thermodynamic parts
- Fan diffuser attachment for reduced energy and noise
- Glycol and nonglycol versions
- Soft-start option for constant-speed compressors avoids current spikes when the compressors are started
- Fold-away fans allow efficiency-preserving coil cleaning
- Corrosion protection (e-coating, epoxy coating)
- Extendible roof for effective maintenance

Technical Data

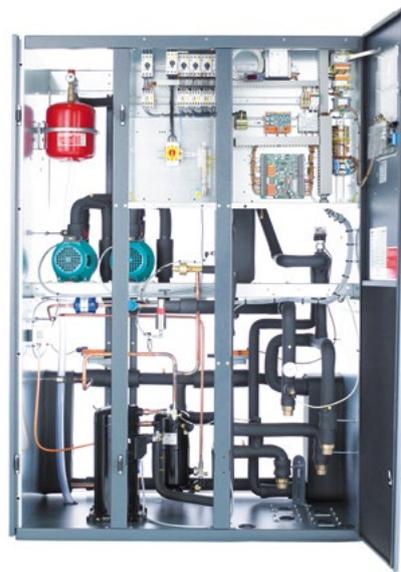
CyberCool 2	Screw Compressor	Scroll Compressor
Cooling capacity, total kW	320 ~ 1,400	50 ~ 611
Volumetric water flow	70.0 ~ 211.4	16.5 ~ 106.0



CyberCool CSI

Indoor Data Chiller

A compact chilled-water generator for direct water cooling with a cooling capacity up to 100 kilowatts. Three different systems (A, G, GE) to ensure a supply of chilled water that precisely suits demand. Complete, autonomous, and highly available.



Features

- Independent chilled-water supply close to consumption
- Completely autonomous system with high availability of 99.999 %
- Construction of redundant chilled-water systems
- As a compact DX chiller or an energy-saving Free Cooling chiller
- Suitable for use in areas sensitive to noise, thanks to low-noise condensers and heat exchangers
- Minimal indoor refrigerant circuit (no antifreeze + low water volume = reduced risk)
- Easy maintenance: all parts accessible from the front
- Reliable monitoring: easy integration of BMS systems or alarms via floating contacts
- Units in standard door size and compact design for easy transport and assembly
- Integrated pumps
- C7000 controller

Technical Data

CyberCool CSI		A/G/GE
Cooling capacity, total	kW	20 ~ 100
Volumetric water flow	m ³ /h	3.0 ~ 14.2



UltraSonic

Data Center Cooling Accessory – Humidification

In computer rooms, laboratories, technical rooms, GPs' surgeries, and offices – in fact, wherever humidification is a vital element of optimum air-conditioning. In all cases, with our STULZ UltraSonic® humidifying systems, STULZ provides made-to-measure humidification to ensure the best possible processes and high quality standards.

UltraSonic BNB Direct Room Humidifiers

For direct room humidification, STULZ offers units from the STULZ UltraSonic® model series BNB 1000 to BNB 8000. All major components of these units are made from stainless steel or high-grade plastic. A fan integrated in the housing distributes the cold mist, which is generated in the water bath, around the room. These units are employed, for example, in the humidification of production rooms, computer rooms, and many other areas in which optimum humidity is essential for production, storage, or the indoor climate.



Features

- STULZ UltraSonic® uses up to 93% less electricity than electrode/resistance steam humidifiers with the same output.
- Excellent control characteristics
- Energy-saving cooling effect
- Flexible actuation
- Very fine mist
- Long service life
- Rapid amortization/future-proof investment
- Hygienic humidification

UltraSonic ENS Humidifiers for Integration

Devices from the UltraSonic® ENS model series are designed for use in ventilation and air-conditioning systems. They can be installed in ventilation ducts, box-type units, and air conditioners, for example.



Technical Data

UltraSonic	ENS Humidifiers for Integration	BNB Direct Room Humidifiers	
Humidifier capacity	kg/h	1.2 ~ 18.0	1.0 ~ 8.0
Power consumption	VA	65 ~ 960	100 ~ 670
Weight without water	kg	1.5 ~ 13.0	7.1 ~ 23.0



CyberSonic

Data Center Cooling Accessory – Humidification

For servers in data centers to work safely and reliably, the room air must meet precisely defined requirements. Besides temperature, humidity is a key factor. Too much humidity can lead to condensation and corrosion; too little can result in static, loss of data, and damage to hardware.

CyberSonic keeps the specified room air conditions constant.



Features

- More than 90 % energy savings compared with conventional electrode/resistance steam humidifiers, with the same performance
- Outstanding control characteristics – full humidifier capacity is available without delay on power-up
- Distribution by infinitely adjustable EC fan
- Adiabatic cooling
 - The water droplets are nebulized so finely in the ultrasonic humidifier that they automatically pass from the liquid to the gas phase (they evaporate). The heat necessary for evaporation is drawn out of the room air, so aiding cooling.

Technical Data

CyberSonic		
Humidifier capacity	kg/h	42
Air volume flow	m ³ /h	10,000
Adiabatic cooling capacity	kW	24
Sound pressure level	dbA	<60
Weight	kg	612



SupraSteam

Data Center Cooling Accessory – Humidification

The STULZ SupraSteam® series is a technically flexible solution for industry and the home, as well as museums, exhibition rooms, and building complexes that have to be kept sterile.



Features

- Output of floating alarm or status signal
- Alphanumerical display
- Second moisture sensor can be connected as a supply air limit sensor
- Remote control
- RS485 interface
- Patented antifoaming system (AFS)
- Air duct humidification with optional steam lance
- Direct room humidification with optional top-mounted fan
- Intergrated seperation from water supply system
- Humidity control with moisture sensor (actual-value/set-point comparison)
- Proportional operation via external control signal (e.g. 0–10 V signal)
- ON/OFF operation

Technical Data

SupraSteam Electrode Steam Humidifier		
Steam output	kg/h	1.5 ~ 65.0
Power consumption	kW	1.50 ~ 48.75
Weight without water	kg	13.5 ~ 44.0



Control and Monitoring

Intelligent Control of All STULZ Precision Cooling Products

To cool IT systems efficiently and reliably, the cooling equipment and its controls have to work in a perfectly harmonized manner. This is why we at STULZ keep Research and Development of our controller under our own roof, allowing us

to constantly update the hardware and software to fulfill the highest standards in the reliability of mission-critical applications and efficiency in cooling IT systems.

C 7000 Electronic Controller: Intelligent Control for IT Cooling Systems

- Designed specifically for precision control of mission-critical environments
- Energy-efficient control concepts onboard (CW standby management, raised-floor pressure management, Indirect Dynamic Free Cooling)
- Preservation of parameters during firmware updates
- Onboard protocol Modbus RTU (customizing Modbus data point list)
- Freely configurable digital alarm inputs
- Integrated data logger
- Internal Modbus component communication bus
- Hardware periphery check after boot sequence
- The following BMS protocols are supported: BACnet IP, BACnet MS/TP, Modbus TCP, and LonWorks



Control and Monitoring

Intelligent Control of All STULZ Precision Cooling Products

WIB 8000: The All-in-One Web Interface for Precision Air-Conditioning Systems.

The WIB 8000 is user-friendly and highly functional, and it offers easy data exchange and monitoring with global adaptability.

Functions and Monitoring

- Alert information via e-mail to up to five recipients
- Ongoing retrieval of data from the controller
- Monitoring of up to 32 units via Web browser
- Ethernet port
- Bus-independent zone operation
- Easy connection to existing building management system

User-Friendly

- Works via HTTP and SNMP in parallel
- No JavaScript, no cookies
- Easy and quick configuration via Web page
- Easy to install and suitable for retrofitting (only one component to install!)





COOLING SYSTEMS

New construction or expansion of data centers poses planning and technical challenges for our customers, requiring attention to many parameters such as climate zones, area, and environmental and noise protection, as well as safety. Therefore, STULZ offers its customers individual system solutions that can be exactly customized to meet their project requirements.

Customized Data Center Cooling Systems – Configurations

Our customers can choose from seven basic configurations that enable them to reach an optimum balance of investment, operating costs, and energy efficiency. STULZ is the only manufacturer worldwide to offer such a broad range of configuration options.

STULZ Cooling Systems

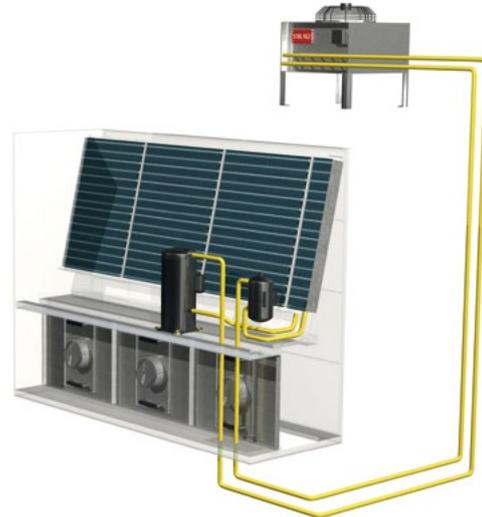
DX – Direct Expansion

A System:

Compressor Cooling System Based on the Direct Evaporator Principle (Direct Expansion – DX)

The refrigerant circuit of the AC module consists of an evaporator, an expansion valve, a scroll compressor, and an external air-cooled condenser.

The return air conveyed by the fan flows through the evaporator. As it does so, heat is removed from the air and is transferred to the refrigerant. The AC unit and the external condenser are linked by means of a closed refrigerant circuit.



AS System:

Like the A system, the AS system works according to the direct evaporator principle. And to make the system even more efficient, the AS system is exclusively available with an infinitely adjustable EC compressor.

G System:

Simple Heat Dissipation via the Water/Glycol Mixture

The G system is like the A system, except for one difference: in the G system, the heat from the DX circuit is transferred to a water/glycol mixture by a plate-type condenser integrated in the AC unit. The mixture circulates in a closed circuit and emits the heat to the outside air via an external dry cooler.

GS System:

The GS system functions in the same way as the G system. And to make this system even more efficient, the GS system is exclusively available with an infinitely adjustable EC compressor.



STULZ Cooling Systems

CW – Chilled Water

CW Systems: Liquid-Cooled Systems

CW units manage without a refrigerant circuit of their own but require separate chilled-water production. The return air conveyed by the fan flows through the direct cooling unit, which transfers heat to the water/glycol mixture. A chiller removes the heat from this water/glycol mixture. The AC unit and the chiller are connected to one another by means of a closed water/glycol circuit.

CWE/CWU Systems:

These function like the CW system. To further increase efficiency, CWE/CWU systems feature a larger filter surface and offer the option of fan installation under raised floors.



STULZ Cooling Systems

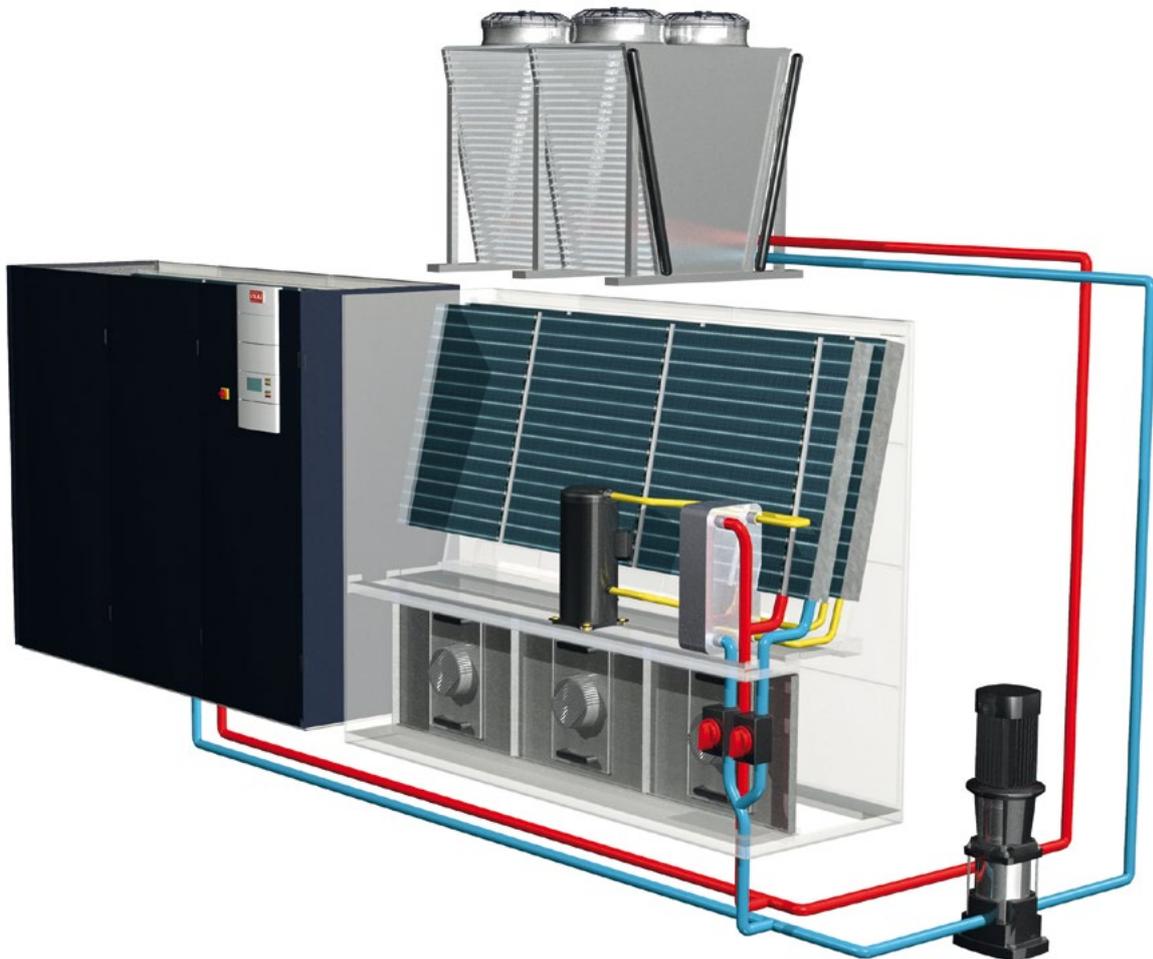
GE – with Indirect Free Cooling

GE System: Hybrid G System with Indirect Free Cooling

A hybrid cooling system that combines a G system with Indirect Free Cooling. The GE system switches to energy-saving mode as soon as the outside temperature permits. The outside air is then utilized for Indirect Free Cooling. GE systems form the basis of Indirect Dynamic Free Cooling.

GES System: Hybrid G System with Indirect Free Cooling and EC Compressor

Like the GE system, the GES system functions on the principle of Indirect Free Cooling. And to make the system even more efficient, the GES system is exclusively available with an infinitely adjustable EC compressor.



STULZ Cooling Systems

With a Secondary Independent Chilled-Water Supply

CW2 System: Liquid Cooled System with Built-In Redundancy

High-security systems often require a second independent chilled-water supply. Therefore, in the CW2 system, two redundant CW systems are integrated in one AC unit, saving valuable space in the data center.

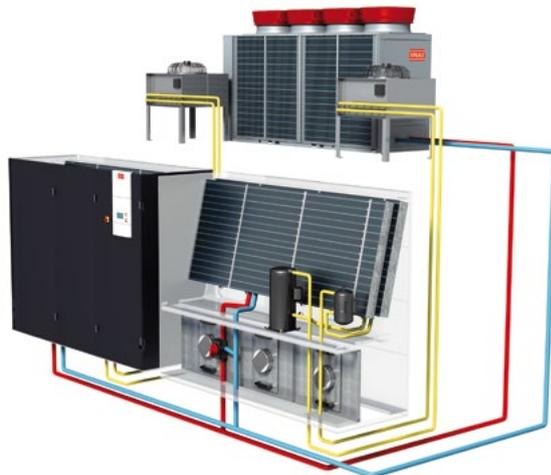
CWE2/CWU2 Systems:

These function like the CW2 system. To further increase efficiency, CWE2/CWU2 systems feature a larger filter surface and offer the option of in-floor fan installation.



ACW System: CW System with Redundant A System (Dual Fluid)

Two independent cooling systems (CW and A) in one A/C module ensure maximum failure resistance. If the main liquid-cooled system (CW) fails, the air-cooled A system ensures that air-conditioning continues without interruption.



GCW System: CW System with Redundant G System (Dual Fluid)

A similar design to the ACW cooling system, but with a liquid-cooled G system working in combination with the CW system instead of the A system.



PRODUCTION SITES

Plants

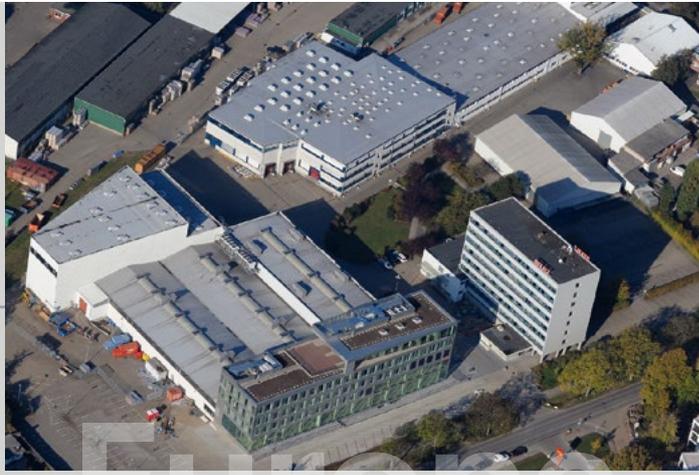
Plants

Europe, America und Asia

The humidity of the tropics and arid heat of the desert require completely different air conditioning solutions from the moderate climes of the Northern Hemisphere. In addition, the demands of Europeans and Americans differ completely from those of Indians and Chinese. Only by producing in the relevant market can you know precisely what your customers want. This is why STULZ has production sites in the world's major growth regions. All over the world, customers put their trust in product lines that answer perfectly to their requirements.

Co-operating globally, producing locally: For every region, STULZ supplies tailor-made products for individual requirements.

Germany, Hamburg



Europe

Italy, Valeggio sul Mincio



China, Shanghai



China, Hangzhou



Asia

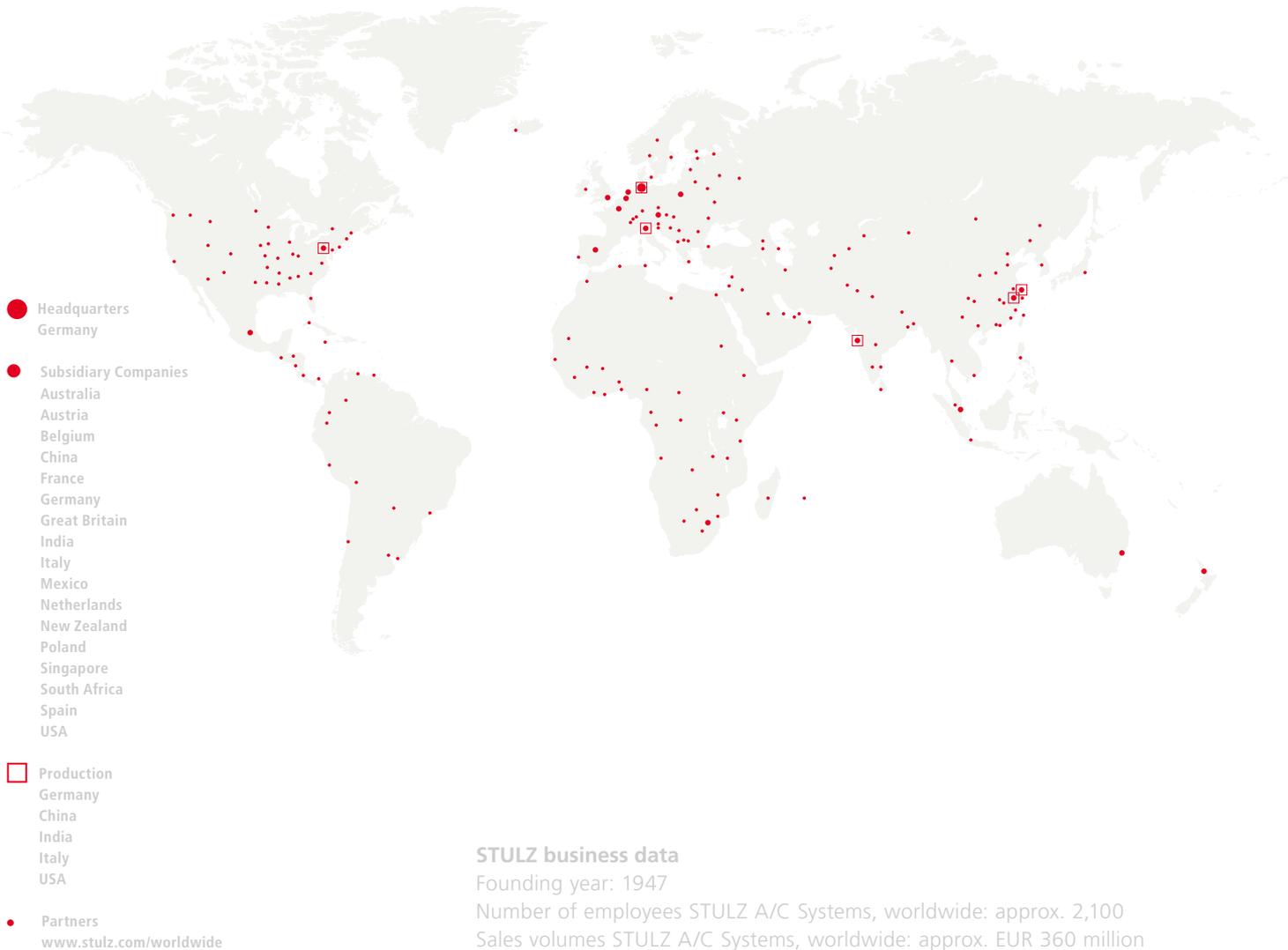
India, Mumbai



USA, Frederick, Maryland

America

STULZ Worldwide



Close to You All Over the World: with 17 Subsidiaries, 6 Production sites, and Sales and Service Partners in More than 120 Countries.

In 1971, we began specializing in the development and production of precision air-conditioning units and chillers for data centers. Customers all over the world have put their trust in our products and technical expertise. We continually invest in the latest technology and the qualified training of our employees and partners. From project planning and rollout, right up to maintenance and service, we have systems and solutions for data centers of all sizes and with the most diverse requirements – take advantage of our know-how.



German Engineering

We put a great deal of experience and innovative spirit into developing our air-conditioning systems. Engineers, specialist departments, and sales employees work closely together, and our teams are involved through all stages of the development process – right up to completion of the finished product. We brook no compromise where the efficiency of our products is concerned, and cost-effective operation is at the heart of our endeavors.

Custom-Made

Fitting to your needs, STULZ draws up a detailed quotation based on your requirements in terms of performance, availability, required space, and cost. Our specialists put together an individual air-conditioning system for you in which internal precision air-conditioning systems and external chillers are always viewed as an integrated system. And we help you to draw up service specifications and invitations to tender.

Tests with Your Own Specifications

In our modern 700 m² test center, we can conduct various tests in different climatic chambers on precision air-conditioning units. If you are interested in purchasing a STULZ product, you can book a witness test in our test center. This allows you to have the desired precision air-conditioning unit tested according to your exact specifications, creating transparency and providing you with information about the unit's performance and energy consumption.

STULZ Availability Concept

- Individual planning assistance
- Individual performance data for individual projects
- Digital documentation
- Expert implementation and start-up
- Worldwide service

For more information please visit www.stulz.com

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