Product Range

Product Range

- CyberAir 3
- CyberAir DFC²
- MiniSpace
- MiniSpace EC
- Compact Plus DX
- Compact Plus CW
- CyberRow

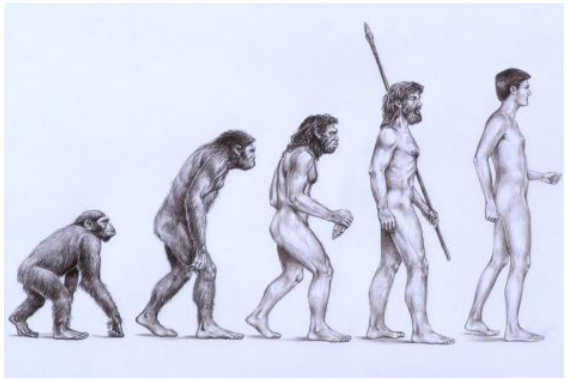
- CyberCool
- CyberCool Datachiller
- CyberCool XT
- Telecom-Line
- Humidification systems

CyberAir 3

Maximum efficiency in data centre air conditioning

Stulz Precision Air Conditioning units –

State-of-the-art at all times

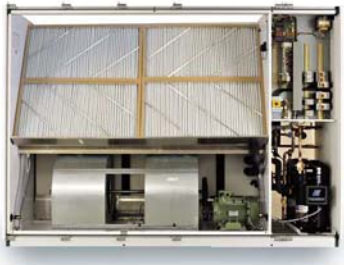


1999

Modular Line

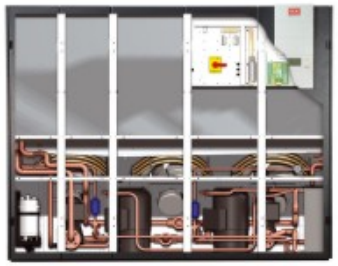
2001

Compact Line



2004

CyberAir



2007

CyberAir 2

ENERGY EFFICIENCY made in Germany

Stulz Precision Air Conditioning units –

State-of-the-art at all times

Stulz Precision Air Conditioning units – State-of-the-art at all times

1999	2001	2004	2007	2011
Modular Line	Compact Line	CyberAir	CyberAir 2	CyberAir 3
				
MRD 922 A:	**CCD 902 A:**	**ASD 1052 A:**	**ASD 1062 A:**	**ASD 1072 A:**
Qo tot = 95,4 kW	Qo tot = 95,6 kW	Qo tot = 104,3 kW	Qo tot = 103,7 kW	Qo tot = 102,4 kW
Qo net, s = 72,4 kW	Qo net, s = 77,0 kW	Qo net, s = 82,8 kW	Qo net, s = 82,2 kW	Qo net, s = 83,5 kW
P comp = 24,4 kW	P comp = 23,8 kW	P comp = 23,0 kW	P comp = 22,6 kW	P comp = 22,2 kW
P fan = 9,6 kW	P fan = 9,4 kW	P fan = 5,9 kW	P fan = 5,9 kW	P fan = 4,5 kW
Footprint = 3,69m²	Footprint = 2,45m²	Footprint = 2,27m²	Footprint = 2,27m²	Footprint = 2,27m²
EER = 2,81	EER = 2,88	EER = 3,61	EER = 3,64	EER = 3,84
	+3%	**+25%**	**+1%**	**+5%**

+37%

Parameters:

Standard airflow, Return air: 24°C/50%, condensing temperature: 45°C

Stulz Precision Air Conditioning units – State-of-the-art at all times

1999

Modular Line

2001

Compact Line

2004

CyberAir

2007

CyberAir 2

2011

CyberAir 3

- **Enhancement of the EER value up to 37% (aircooled units)**
- **Reduction of the footprint up to 35%**
- **Reduction of the fan power consumption up to 30%**
- **Reduction of compressor power consumption up to 9%**
- **Increase of the net sensible cooling capacity up to 15%**

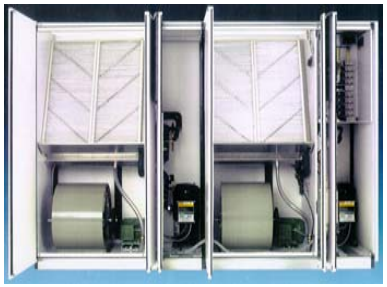
Plus:

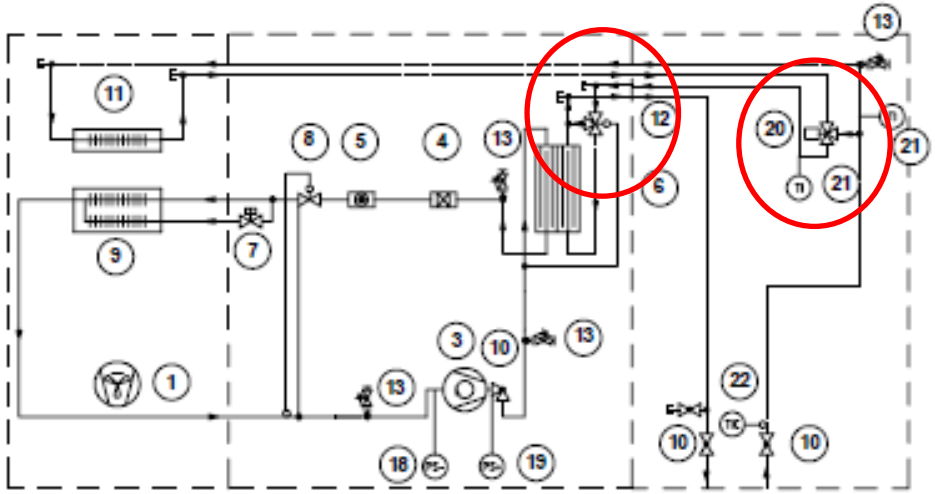
- **Introduction of the EC-fan technology in a standard product as the first supplier worldwide**
- **„Trend-setter“ in terms of indirect free-cooling solutions**

Stulz Precision Air Conditioning units – State-of-the-art at all times

„Indirect“ Free-cooling:

1999 - Modular Line „GE1“





3-way-free cooling-valve

3-way-condensing pressure control valve

Disadvantages:

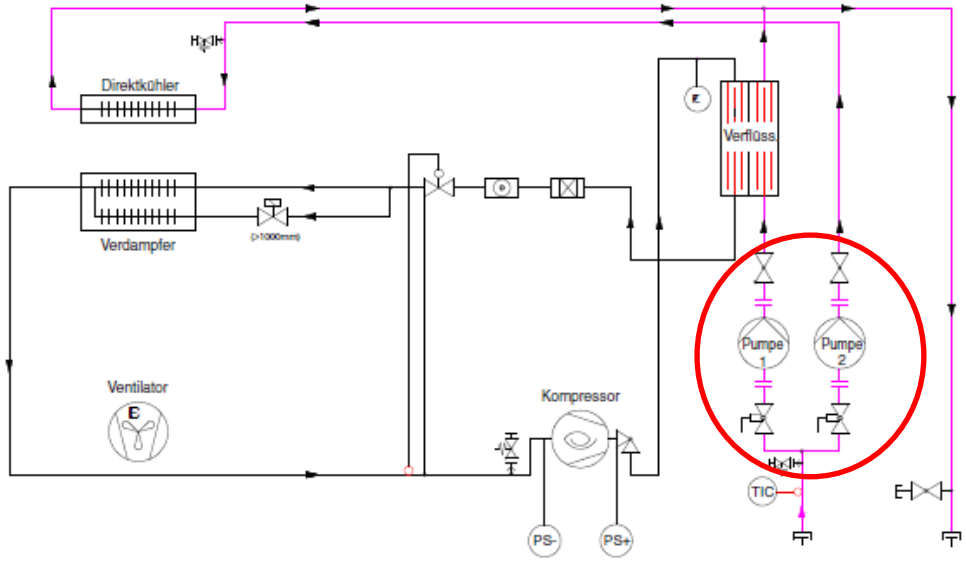
- **Increased space requirements of the components**
- **Transportation of an unnecessary high water quantity**
- **High water side pressure drop**

Still today the standard free-cooling solution of some competitors !!

Stulz Precision Air Conditioning units – State-of-the-art at all times

„Indirect“ Free-cooling:

2004 - CyberAir „GE2“



2 pumps, speed-controlled

1x free-cooling-coil

1x condenser

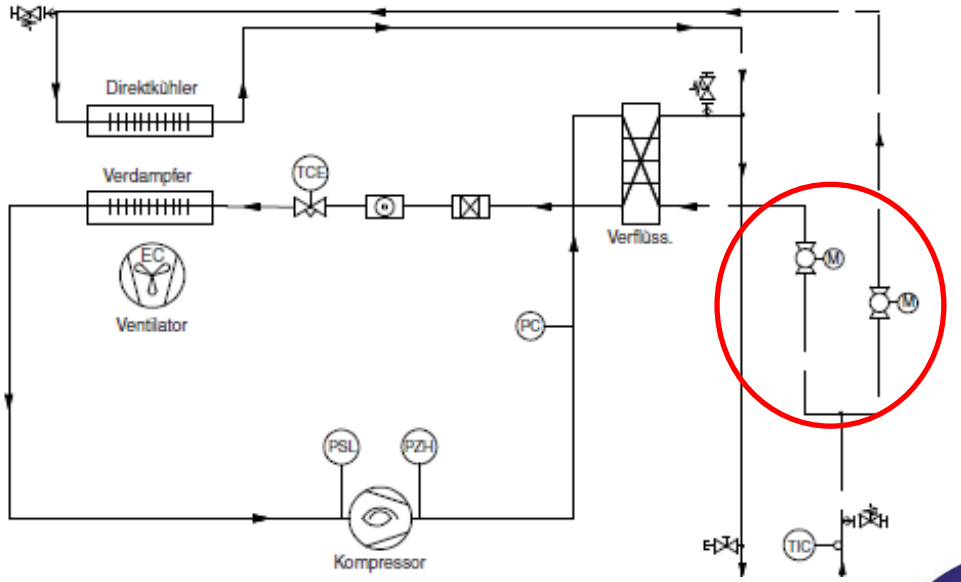
Disadvantages:

- **Limitation of the available external pump head**
- **Constrictions if several units are installed**

Stulz Precision Air Conditioning units – State-of-the-art at all times

„Indirect“ Free-cooling:

2007 – CyberAir 2 „GE“ (DFC)



2-way-valves in parallel (2x)

1x free-cooling-coil

1x condenser

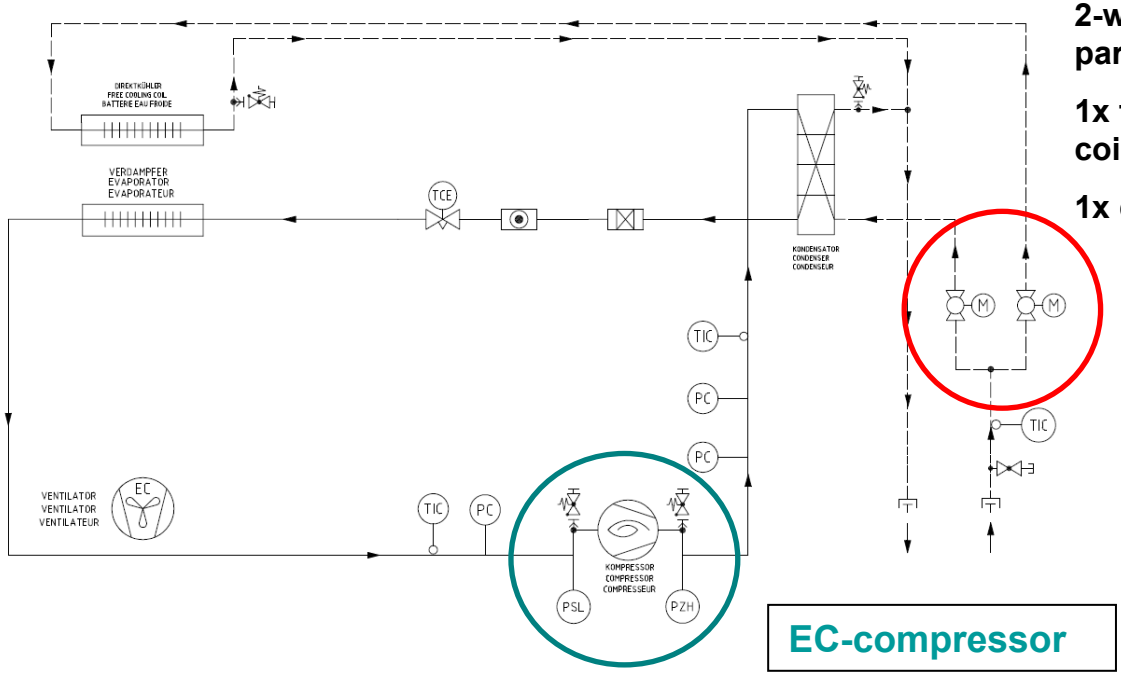
Limitation:

- **compressor on/off operation in part load and in MIX-mode**

Stulz Precision Air Conditioning units – State-of-the-art at all times

„Indirect“ Free-cooling:

2011 – CyberAir 3 „GES“



2-way-valves in parallel (2x)

1x free-cooling-coil

1x condenser

Advantages:

- ***Increasing of the EER, especially in part load operation and MIX-mode***
- ***more precise control due to speed controlled compressor***

Stulz Precision Air Conditioning units – State-of-the-art at all times

„Indirect“ Free-cooling:

Comparison of the yearly energy costs of different free-cooling solutions based on a data-centre with a heat load of 200kW located in Hamburg, Germany.

Parameters:

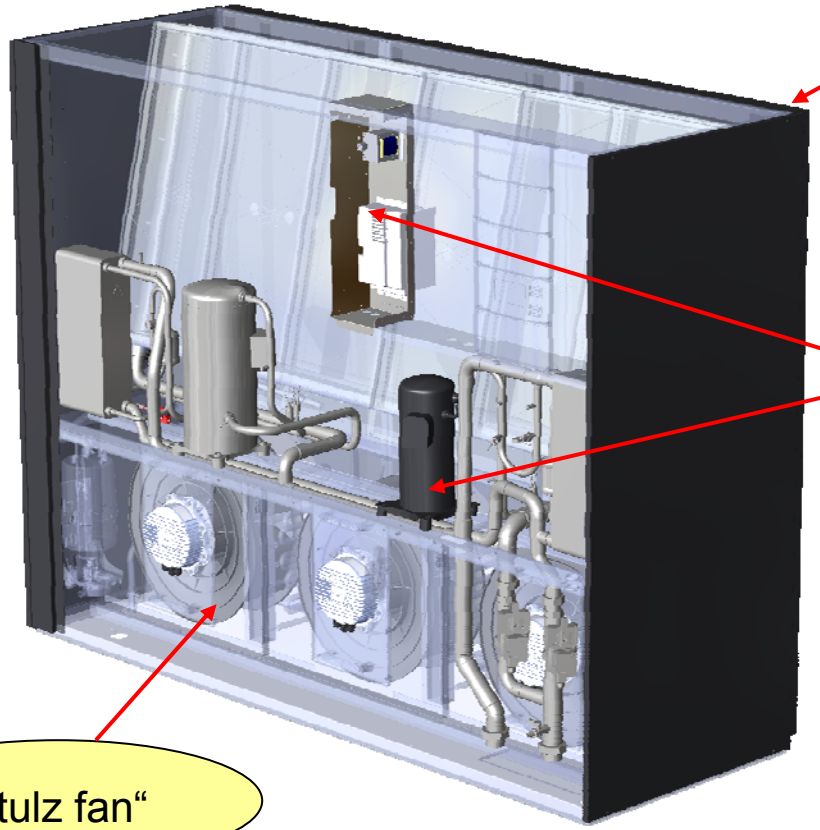
Return air: 26°C / 40%

Max. ambient temp.: 35°C

Energy costs: 0,13 Euro / kWh

	Modular Line GE1	CyberAir 1 GE2	CyberAir 2/3 GE (DFC)	CyberAir 3 GES
Chosen units	MRD 461 GE1	ALD 521 GE2	ALD 512 GE	ALD 522 GES
Unit number	5 + 1	4 + 1	4 + 1	4 + 1
Starting temp. FC	4°C (FC)	5°C (FC)	7°C (EFC)	7°C (EFC)
Energy consumpt.	515.000 kWh/a	384.000 kWh/a	318.000 kWh/a	Available from October
Operating costs	66.950,-- Euro/a	49.840,-- Euro/a	41.340,-- Euro/a	

CyberAir 3 – What´s new ?



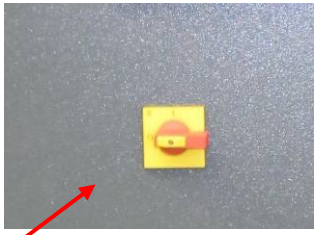
„High efficiency“ rear panel (Option)

EC-compressor incl. control and filter

(seperate unit series)

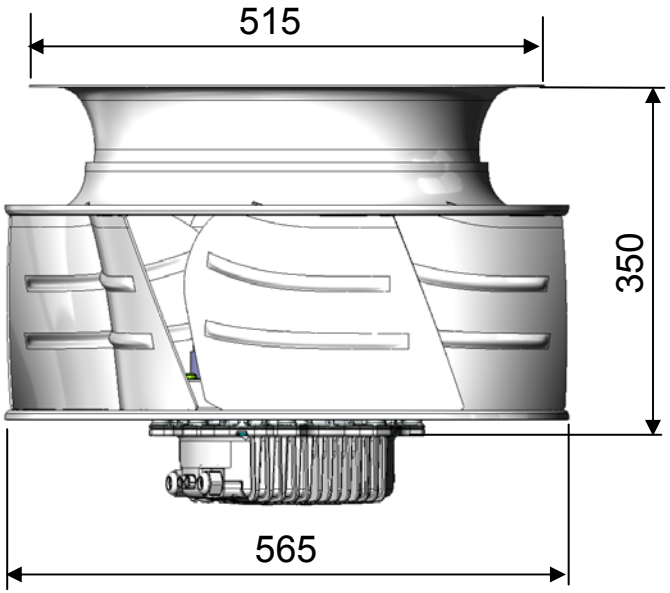
„Stulz fan“

Main switch usable from outside (Standard)



CyberAir 3 – The reinvention of the (EC)-wheel

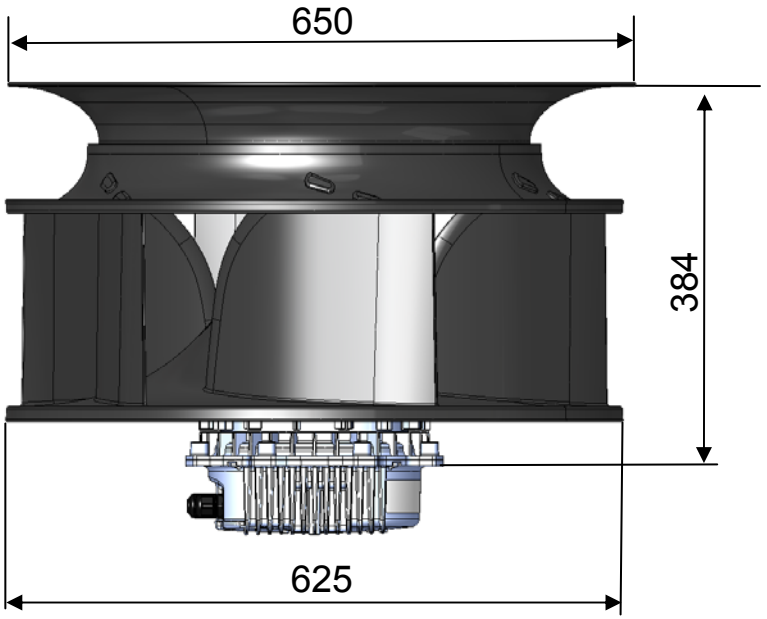
CyberAir 2



R3G 560

wheel: aluminium
nozzle: aluminium

CyberAir 3



R3G 595

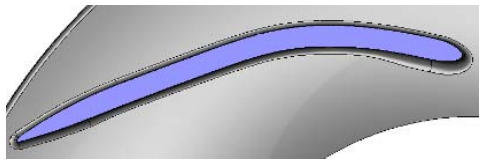
wheel: fibreglass-reinforced composite
nozzle: synthetic material

CyberAir 3 – The reinvention of the (EC)-wheel

- The new 3D fan was developed by Stulz and EBMPapst exclusively for use in Stulz precision air conditioning systems.

<u>Advantages / Innovations:</u>

- Fully developed 3D blades made from fibreglass-reinforced composite
- Enlarged fan blade surface.
- Optimized „air transportartion“ for a reduced fan power consumption and reduced noise level.



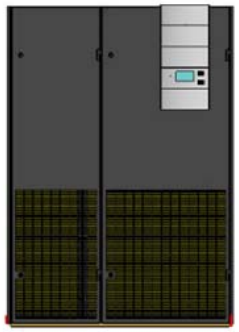
CyberAir 3 – Unit sizes and dimensions

Unit size 1:

950 x 890 x 1980mm

Number of fans: 1

All unit types

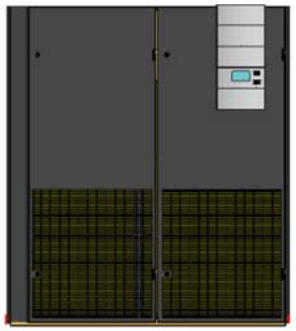


Unit size 2:

1400 x 890 x 1980mm

Number of fans: 1

All unit types

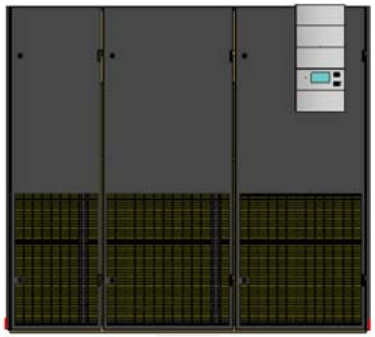


Unit size 3:

1750 x 890 x 1980mm

Number of fans: 2

All unit types



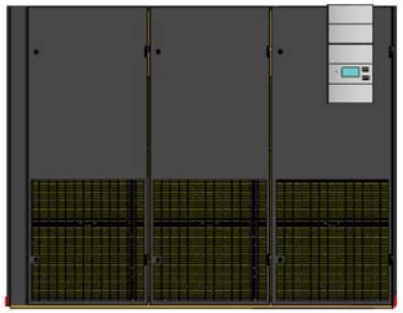
Unit size 4:

2200 x 890 x 1980mm

Number of fans: 2

All unit types

CyberAir 3 – Unit sizes and dimensions



Unit size 5:

2550 x 890 x 1980mm

Number of fans: 3

All unit types

NEW

Unit size 7:

3110 x 980 x 1980mm

Number of fans: 4

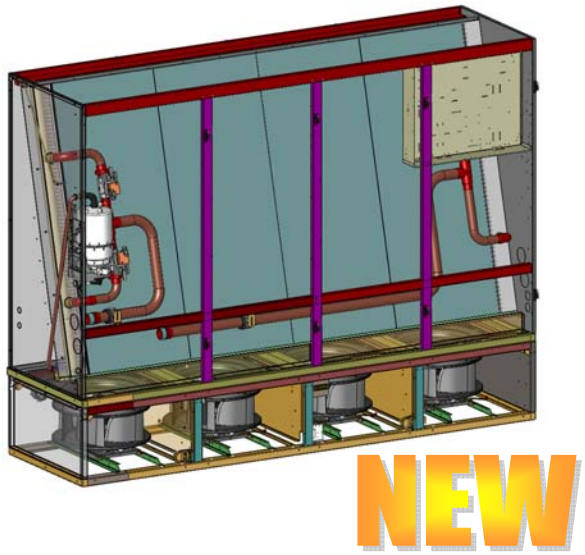
CW; CWE/CWU; CW2; CWE2/CWU2 only

Unit size 8 „Giant“:

3350 x 980 x 2495mm

Number of fans: 4

CWE/CWU; CWE2/CWU2 only



NEW

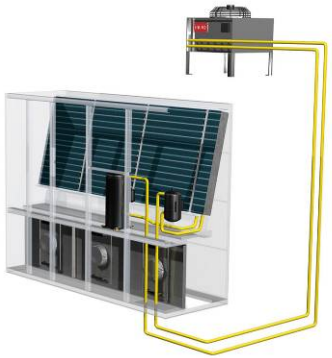
CyberAir 3 - The approved once more improved

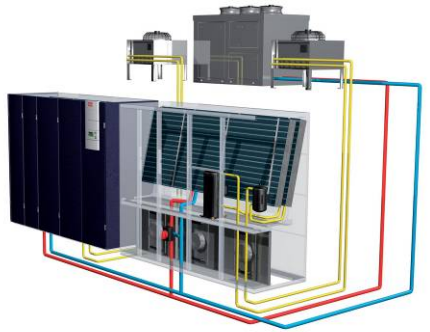
CyberAir 3 still offers:

- Highest cooling capacities with the smallest footprint
- EC-fan technology
- Infinitely variable air flow / Standby-Management
- 3 different types of refrigerant (R407C, R410A, R134a)
- High optionality
- Stand-alone intelligence per unit by C7000
- Connection to BMS-systems of all established manufacturers
- Communication via internet-protocols HTTP/SNMP; SMS or email alarm messages via GSM modem

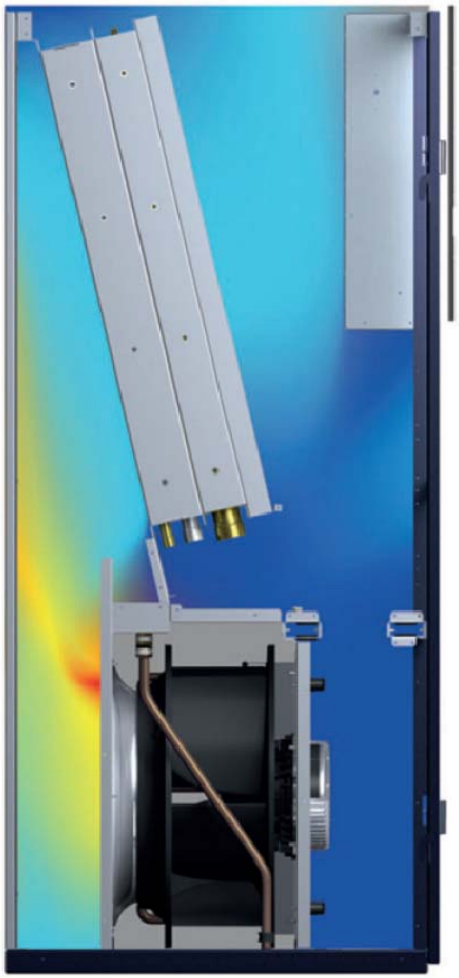
CyberAir 3

Unit series ASD/U … A/G/ACW/GCW



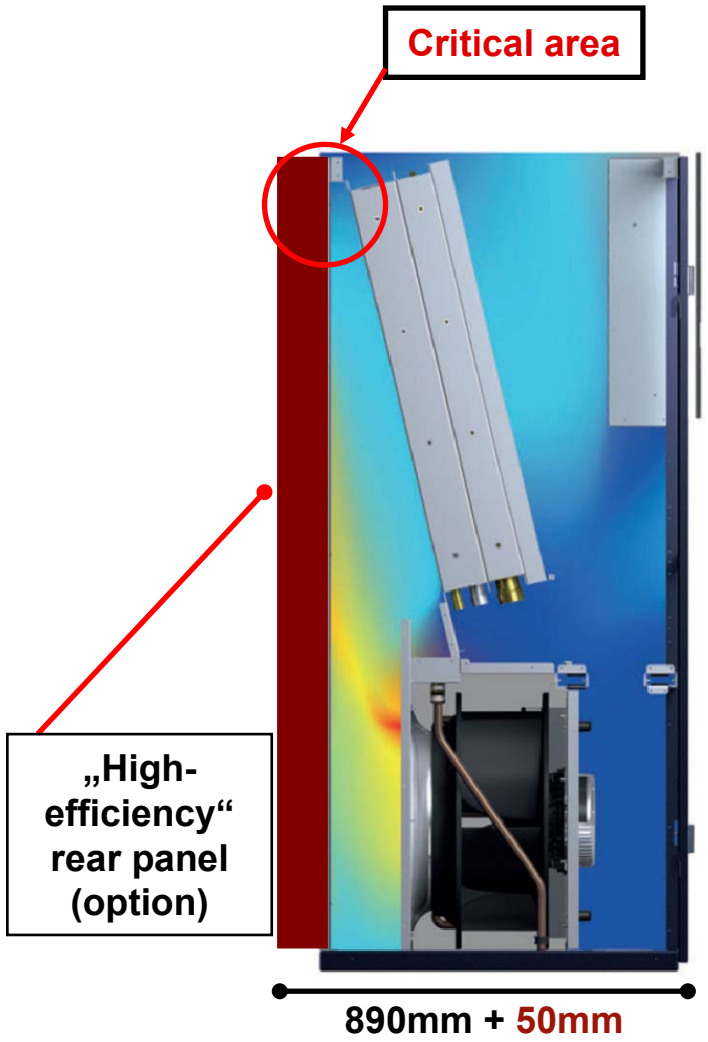


CyberAir 3 DX – The approved once more improved



- **Revision and improvement of the internal unit lay-out => reduction of the unit internal airside pressure drop and better admission of the fan nozzle with air**
  - **Reduction of the fan power consumption up to 30% (depending on the unit size)**
  - **Increase of the net sensible cooling capacity**
  - **Reduction of the sound pressure level up to 2 dB(A)**
- **Use of new steam humidifiers (option) for a precise humidification independent of the water conductivity**

CyberAir 3 DX – The approved once more improved



Option „High-efficiency“ rear panel:

(Downflow DX only)

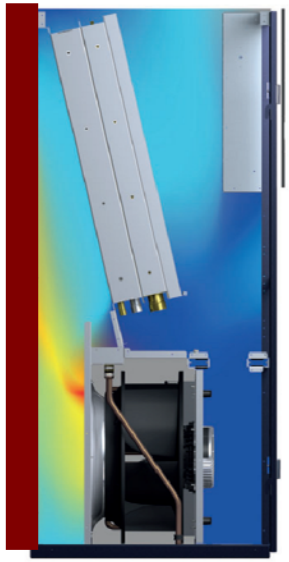
- **Optimisation of the suction area of the fan between heat exchanger and fan nozzle**
  => Better and more even refrigerant and air distribution through the evaporator
  => Reduction of the airside pressure drop
  => further reduction of the fan power cons. by 5% to 12% (depending on unit size)

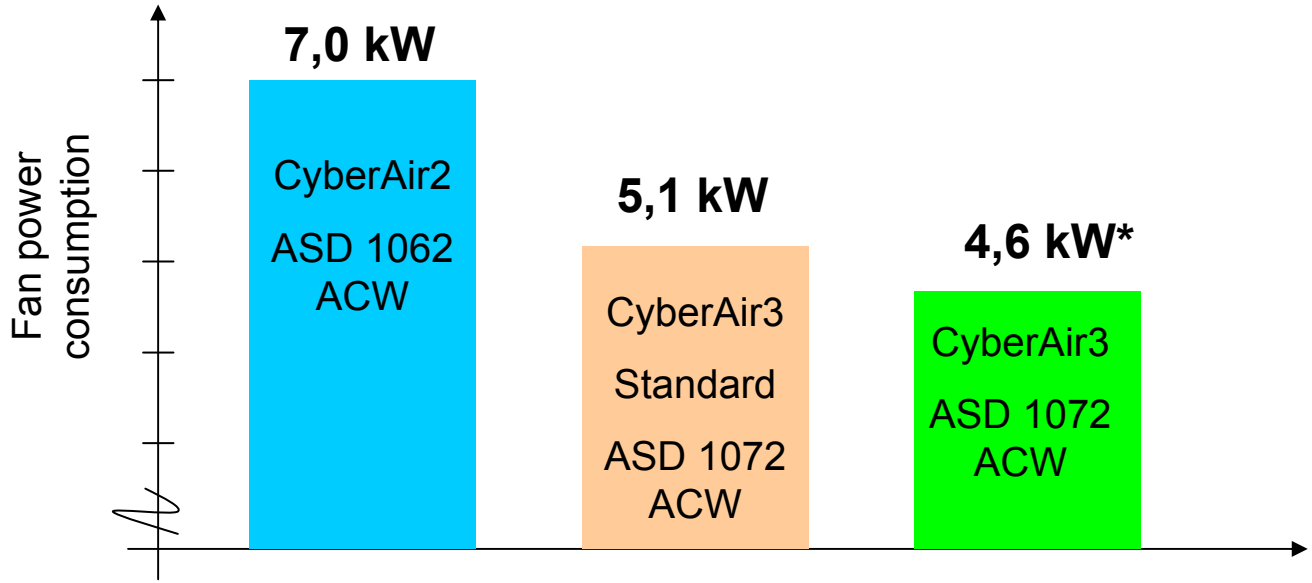
- **Fast and easy dismantling of the panel if necessary**

CyberAir 3 DX – The approved once more improved

Potential savings (example):

- **New 3D EC-fan**
- **„High-efficiency“ rear panel**
- **Improvement of the internal unit lay-out**





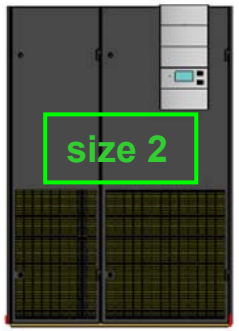
***: incl. „High-efficiency-rear panel**

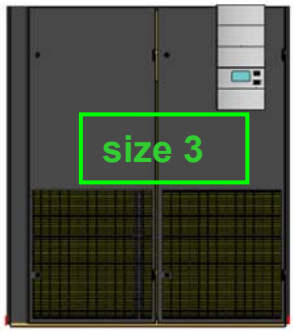
CyberAir 3 DX – The approved once more improved

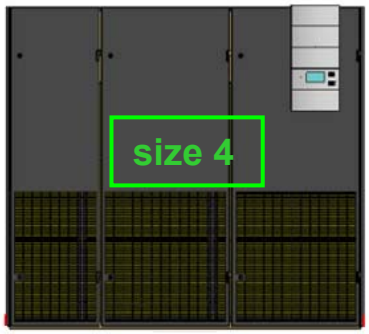
Additional innovations/improvements CyberAir 3 DX:

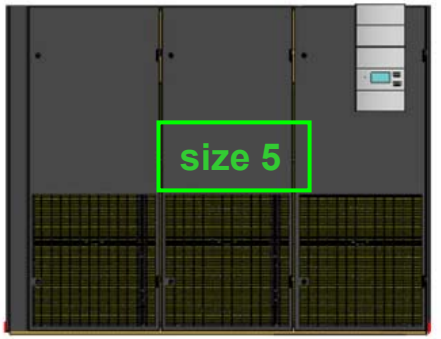
- Extension of the choosable return air temperature to 40°C
- Units filled with refrigerant R134a can be calculated with condensing temperatures higher than 60°C
- Use of state-of-the-art pipework bending machines

CyberAir 3 DX – Cooling capacities and unit names









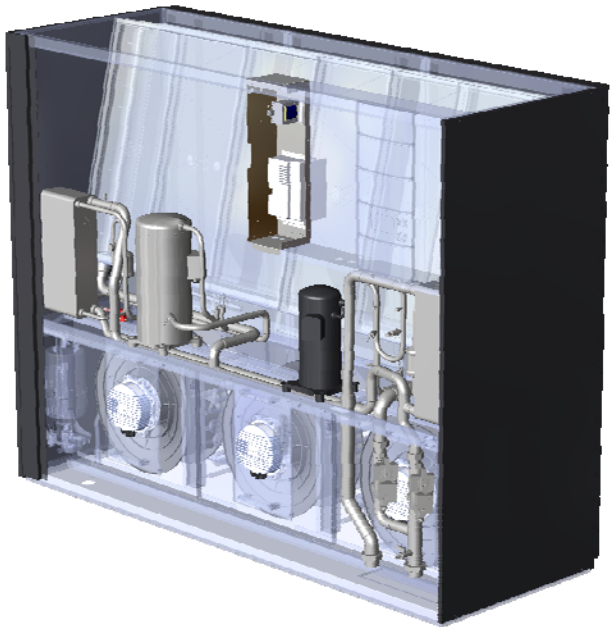
191 221 251 281	321 371 391	421 461 541	412 462 522	562 622 712	812 872 1072

ASD/U xxx A,G,ACW,GCW ; 1 circuit

ASD/U xxx A,G,ACW,GCW ; 2 circuits

CyberAir 3

Unit series ASD/U
… GE / GES



CyberAir 3 GE / GES

Two different models:

„Classic“ GE (DFC):

- Field-tested and approved system
- Fully developed system
- Possible with all available refrigerants
- By far the most energy efficient indirect free-cooling system available

CyberAir 3 „GES“:

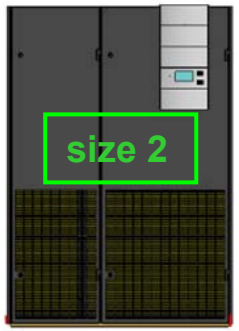
„S“ = „speed controlled compressor“

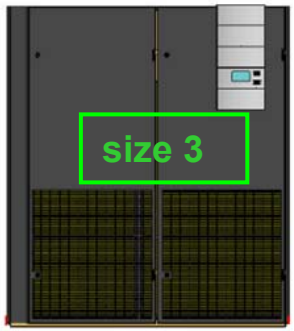
- Improvement of an already very good system:
  => Higher EER in part load operation
  => Higher EER in MIX-mode
  => Better control quality

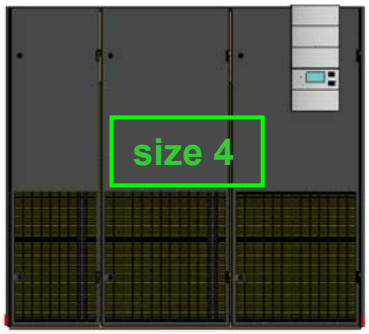
CyberAir 3 GE / GES

Technical details available from October

CyberAir 3 GE / GES – Cooling capacities and unit names







size 1	size 2		size 3		size 4			size 5	
191	191	191	321	321	421	412	412	562	562
221	221	221	371	371	461	462	462	622	622
251	251	251	391	391	541	522	522	712	712
281	281	281						812	812
								872	
								1072	

ASD/U xxx GE ; 1 circuit

ALD/U xxx GE ; 1 circuit

ALD/U xxx GES ; 1 circuits

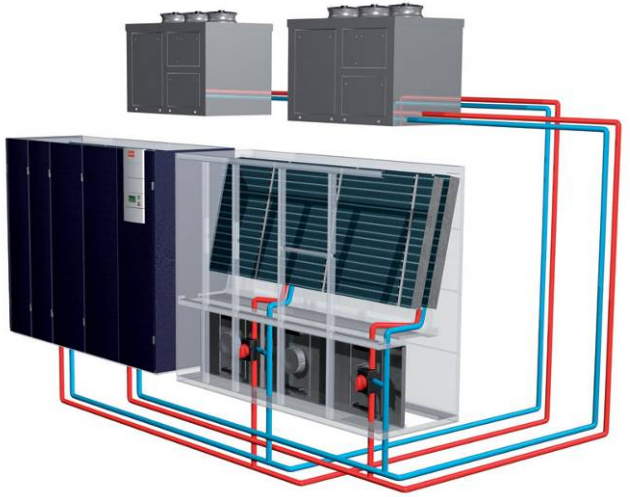
ALD/U xxx GE ; 2 circuits

ALD/U xxx GES ; 2 circuits

CyberAir 3

Unit series ASD/U …

CW / CW2



CyberAir 3 CW / CW2 – The approved once more improved

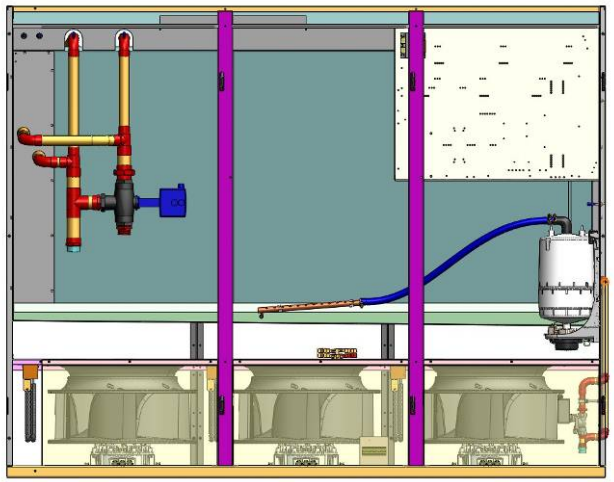
- Integration of the new 3D-EC fan in the existing CW-unit range
- CW2: both water circuits integrated in one heat exchanger with end-to-end fins – increased coil surface for a higher cooling capacity and better SHR values
- Optimised number of fans
- Enhanced pipework run in the CW2 units for a lower total water side pressure drop
- Improvement of the steam lance position
- CW2: Adding of unit size 7 (ASD 1170 CW2)

CyberAir 3 CW / CW2 – Integration of the new EC-fan

Example 1: ASD 1510 CW (CA2) vs. ASD 1550 CW (CA3)

Airflow [m³/h]	ASD 1510 CW (CA2) Fan power consumption	Δ	ASD 1550 CW (CA3) Fan power consumption
29.000	7,2 kW	-13%	6,3 kW
24.500	4,4 kW	-14%	3,8 kW
19.000	2,1 kW	-14%	1,8 kW

ESP = 20Pa

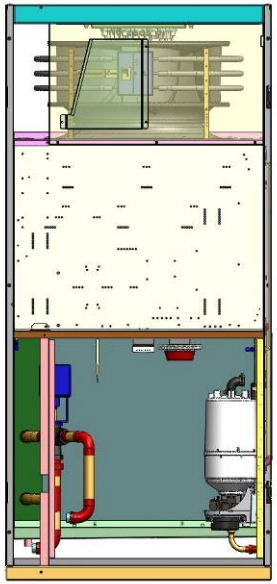


CyberAir 3 CW / CW2 – Integration of the new EC-fan

Example 2: ASU 410 CW (CA2) vs. ASU 420 CW (CA3)

Airflow [m³/h]	ASU 410 CW (CA2) Fan power consumption	Δ	ASU 420 CW (CA3) Fan power consumption
8.500	1,8 kW	-11%	1,6 kW
6.000	0,7 kW	-14%	0,6 kW

ESP = 50Pa

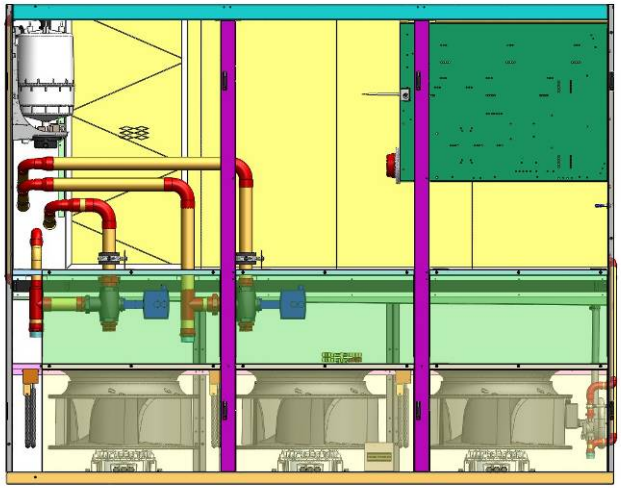


CyberAir 3 CW / CW2 – Integration of the new EC-fan

Example 3a: ASD 1200 CW2 (CA2) vs. ASD 1070 CW2 (CA3)

Airflow [m³/h]	ASD 1200 CW2 (CA2) Fan power consumption	Δ	ASD 1070 CW2 (CA3) Fan power consumption
28.000	8,4 kW	-22%	6,6 kW
24.000	5,4 kW	-22%	4,2 kW
15.000	1,4 kW	-22%	1,1 kW

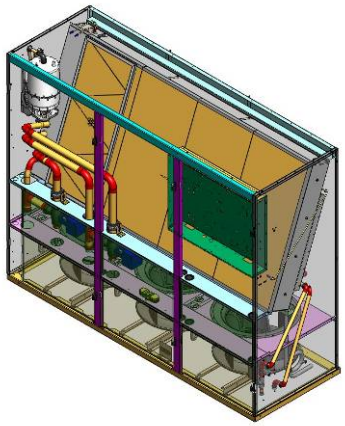
ESP = 20Pa



CyberAir 3 CW / CW2 – Optimised coil surface

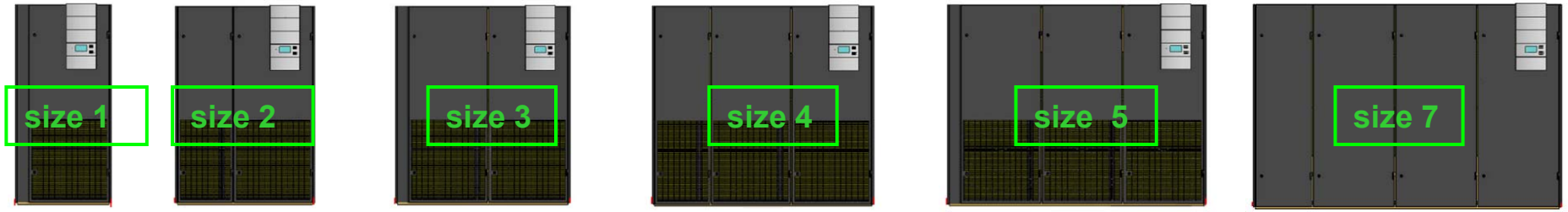
Example 3b: ASD 1200 CW2 (CA2) vs. ASD 1070 CW2 (CA3)

Parameters	ASD 1200 CW2 (CA2) Total capacity / sensible capacity	Δ	ASD 1070 CW2 (CA3) Total capacity / sensible capacity
Return air: 24°C/50% Water: 7/12°C	103,0 kW / 89,3 kW	+ 5%	107,6 kW / 93,4 kW
Return air: 26°C/40% Water: 10/15°C	87,1 kW / 87,1 kW	+ 5%	91,2 kW / 91,2 kW
Return air: 32°C/30% Water: 14/20°C (with option HT-coil)	98,1 kW / 98,1 kW	+ 6%	103,9 kW / 103,9 kW



Air flow: 26.000m³/h

CyberAir 3 CW / CW2 – Cooling capacity and unit names



size 1	size 2	size 3	size 4	size 5	size 7
320 420	550 650	800 950	1000 1180	1250 1550	1800 2100
270	510	670	810	1070	1170

ASD/U xxx CW

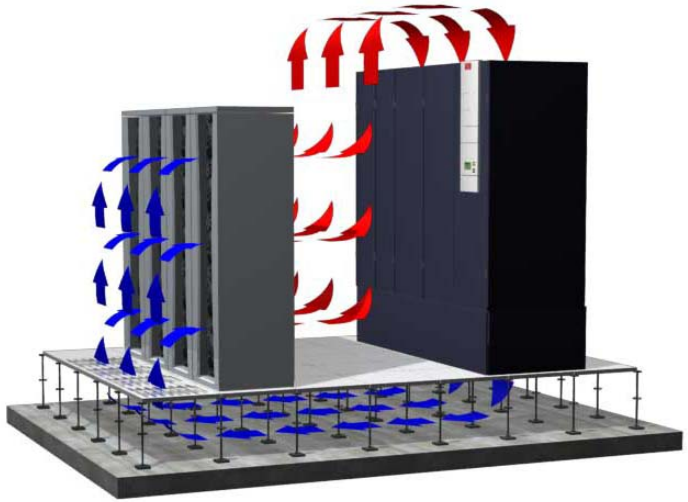
ASD/U xxx CW2

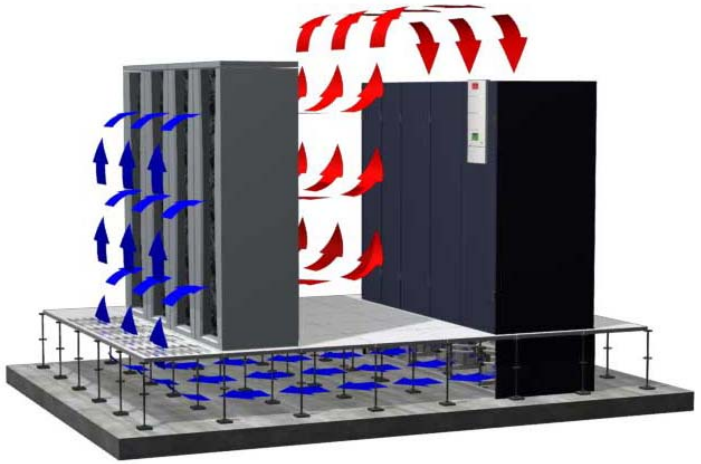
ASD xxx CW

ASD xxx CW2

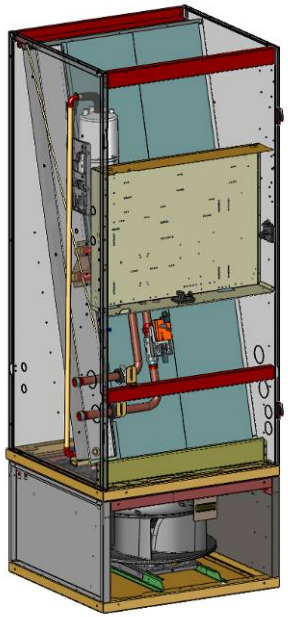
CyberAir 3

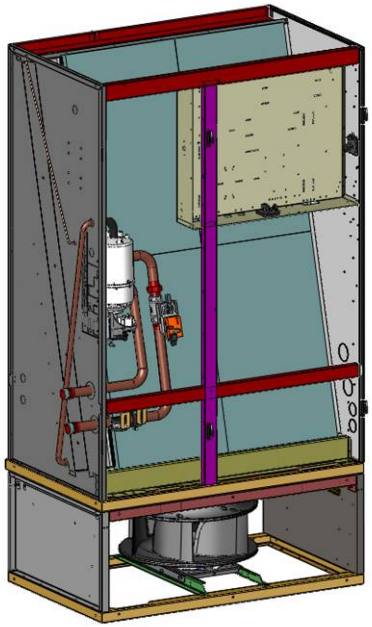
Unit series ASD …
CWE/CWU

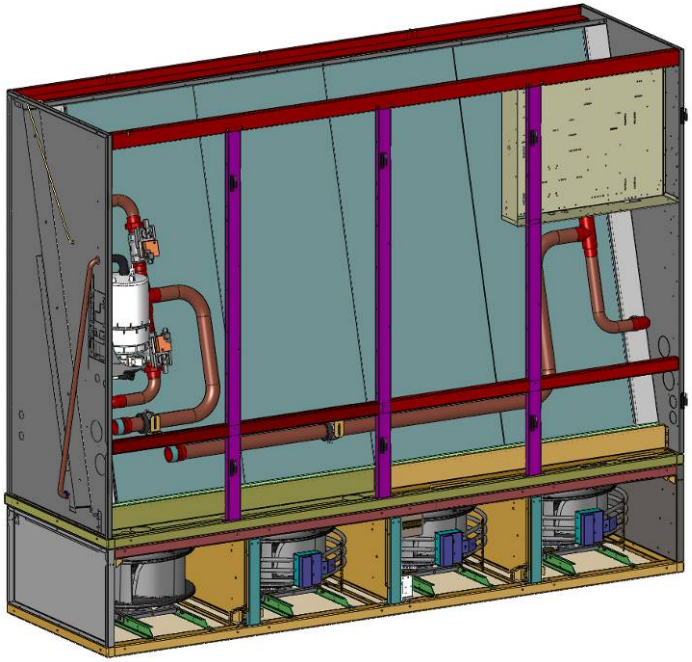




CyberAir 3 CWE/CWU – What´s new ?







- **Completion of the unit series: Introduction of the unit sizes 1-3 and 8 „Giant“**
- **Integration of the new EC-fan in unit size 4 and 5**
- **„Re-Design“ of unit size 7 including integration of the new EC-fan**

CyberAir 3 CWE/CWU – Cooling capacity and unit names

Unit size 1:

950 x 890 x 2495mm

Number of fans: 1

ASD 390 CWE/CWU

Unit size 2:

1400 x 890 x 2495mm

Number of fans: 1

ASD 600 CWE/CWU

Unit size 3:

1750 x 890 x 2495mm

Number of fans: 2

ASD 1050 CWE/CWU

Unit size 4:

2200 x 890 x 2495mm

Number of fans: 2

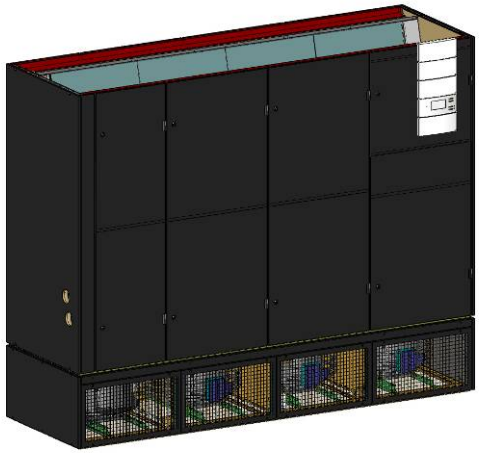
ASD 1350 CWE/CWU

Unit size 5:

2550 x 890 x 2495mm

Number of fans: 3

ASD 1700 CWE/CWU



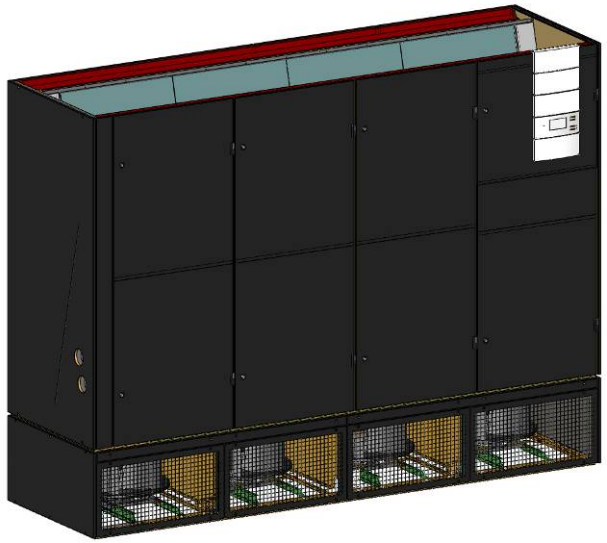
Unit size 7:

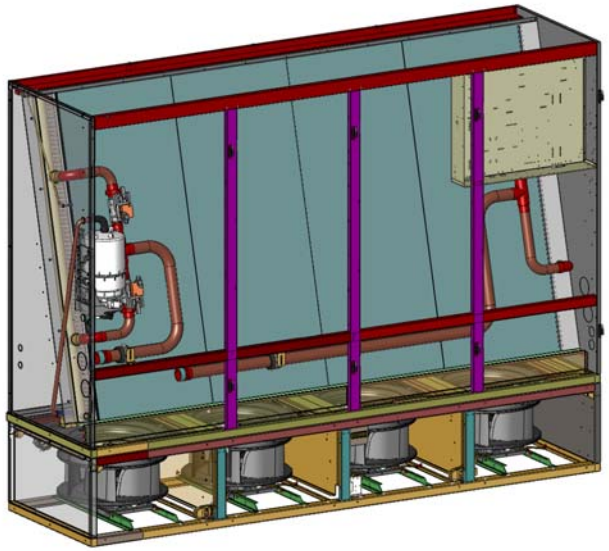
3110 x 980 x 2495mm

Number of fans: 4

ASD 2050 CWE/CWU

CyberAir 3 CWE / CWU – Unit size 8 „Giant“



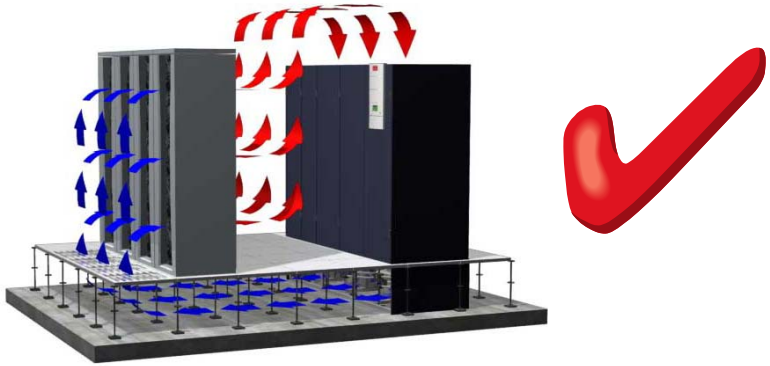


- **Unit name: ASD 2400 CWE/CWU „Giant“**
- **Dimensions: 3350 x 980 x 2495 mm**
- **Number of fans: 4**
- **Maximum airflow: 52.400 m³/h (at 20Pa ESP)**
- **Total cooling capacity: 246kW (24°C/50% und 7/12°C (50.000m³h))**

CyberAir 3 CWE / CWU –

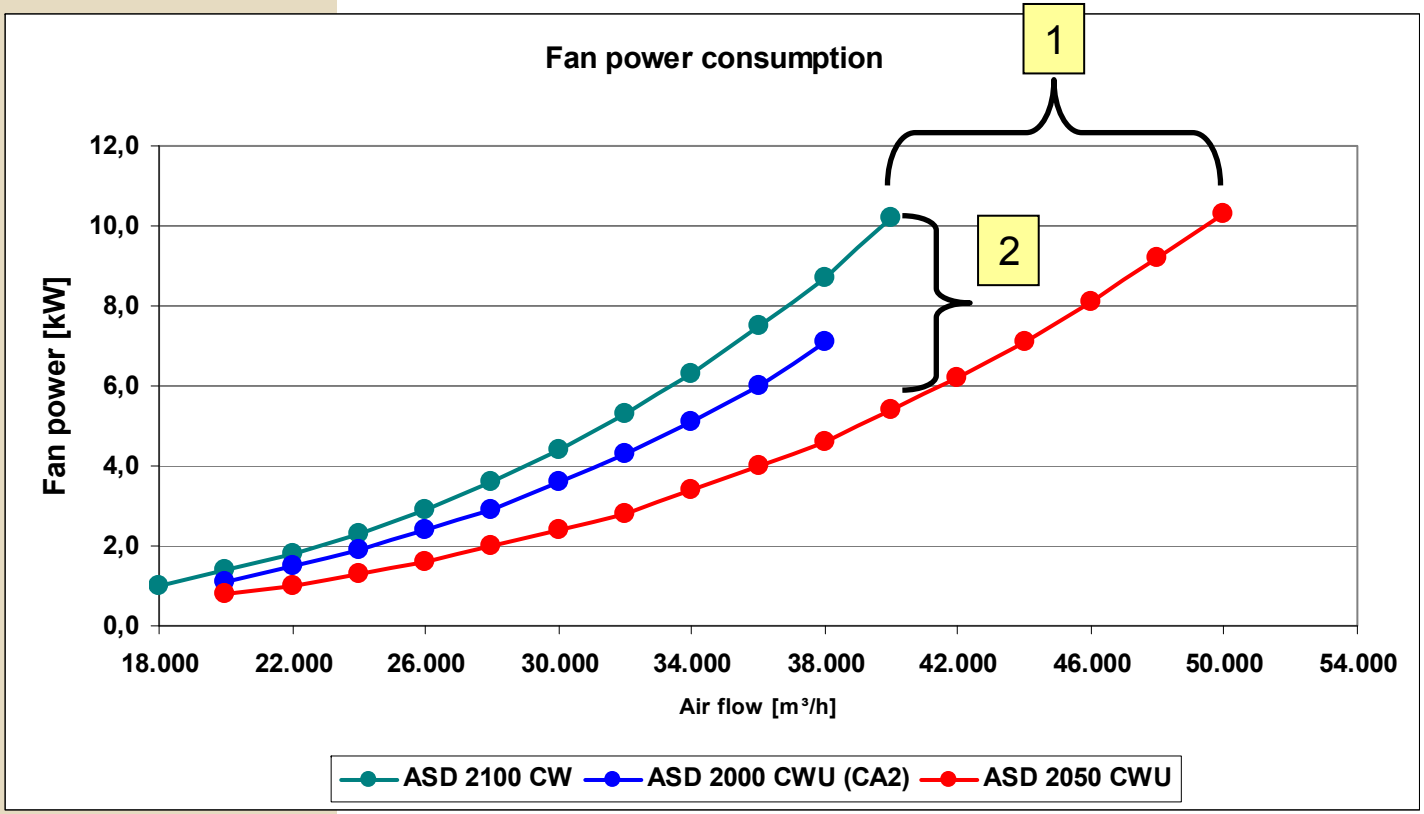
Why CWU – fan section under the raised floor ?

- Significantly lower fan power consumption
- Increase of the coil surface – higher airflow possible and therefore higher cooling capacity at the same footprint
- Higher net sensible cooling capacity
- Larger filter surface – therefore reduction of the unit internal airside pressure drop and further increase of the net sensible cooling capacity
- More flexibility for pipework connections



CyberAir 3 CWE / CWU – Comparison of fan power consumption

Example 1: Unit size 7



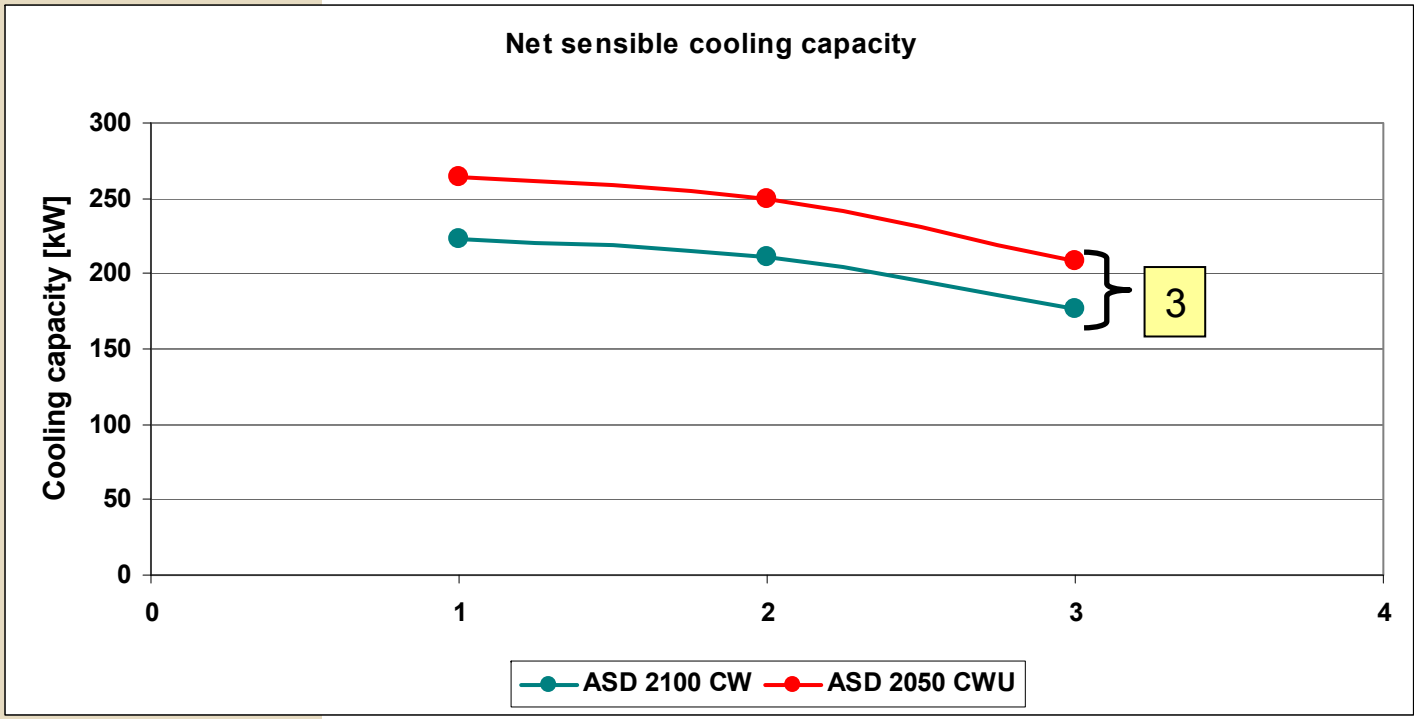
ESP = 20Pa

1 25% higher airflow

2 Reduction of the fan power consumption by 47%

CyberAir 3 CWE / CWU – Comparison of cooling capacity

Example 1: Unit size 7



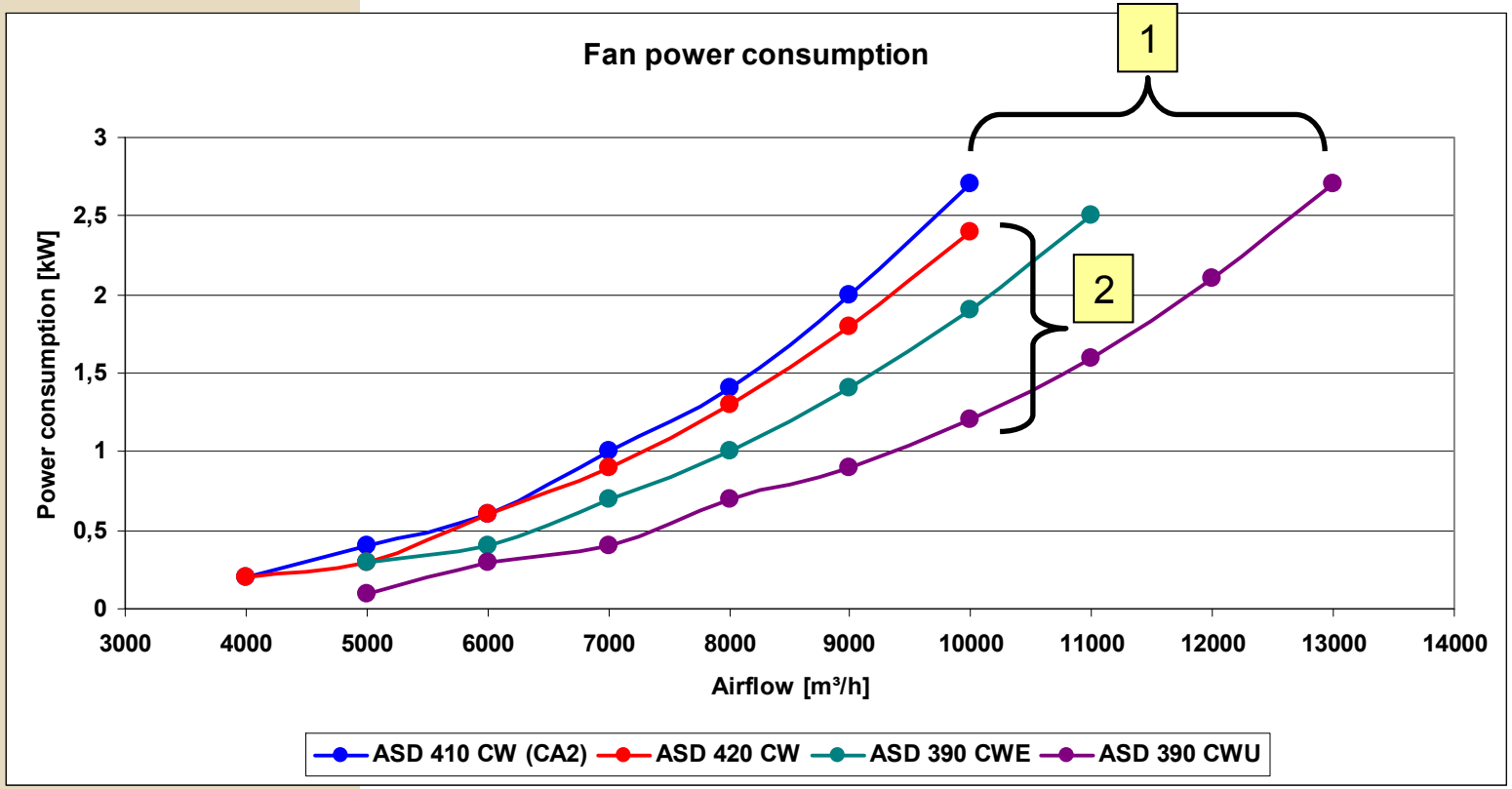
Based on: max. airflow
Return air: 33°C/30% (HT)

3 Increase of the net sensible cooling capacity up to 19%

Watertemp.: 1 – 8/14°C, 2 – 10/15°C, 3 – 12/18°C (0% Glycol)

CyberAir 3 CWE / CWU – Comparison of fan power consumption

Example 2: Unit size 1



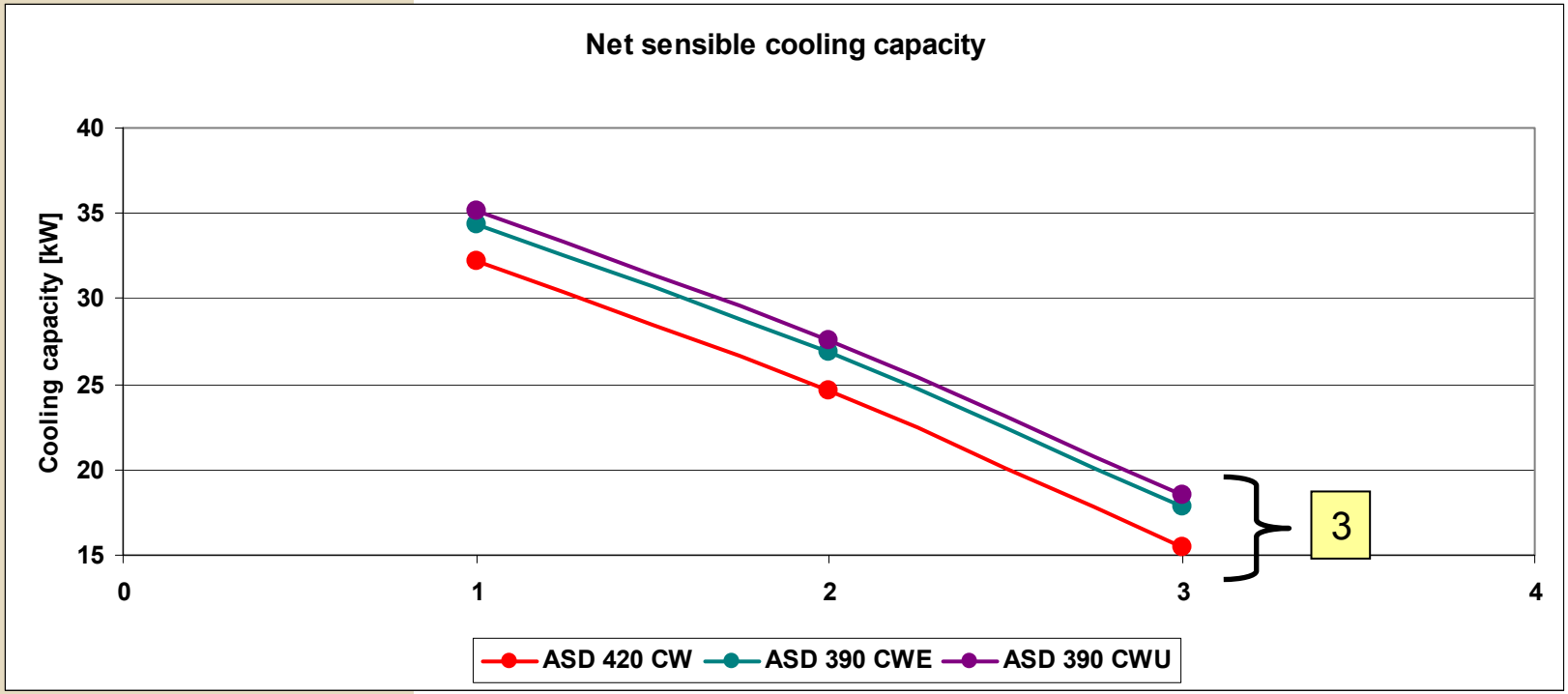
ESP = 20Pa

1 30% higher airflow

2 Reduction of fan power consumption by 50%

CyberAir 3 CWE / CWU – Comparison of cooling capacity

Example 2: Unit size 1



Based on: max. airflow
Return air: 24°C/50%

3 Increase of the net sensible cooling capacity up to 19%

Watertemp.: 1 – 7/12°C, 2 – 10/15°C, 3 – 12/18°C (0% Glycol)

CyberAir 3 – Options

- Electrical reheat, max. 27kW, up to three steps, „on/off“ or proportional controlled
- Hotgas re-heat / Warm water reheat
- Steam humidifier, max. 15 kg/h, proportional controlled
- Different filtration qualities
- Floorstands in different heights
- Flexible duct connections / unit bases with or without grilles / dampers / etc.
- Duct connection with bag filters or sound attenuators
- Double skin panels
- Hotgas-Bypass or suction control valve
- Fire detector and/or smoke detection system
- Volt-free contacts
- C7000 Advanced or C7000 Display, furthermore all well-known connections to BMS-systems

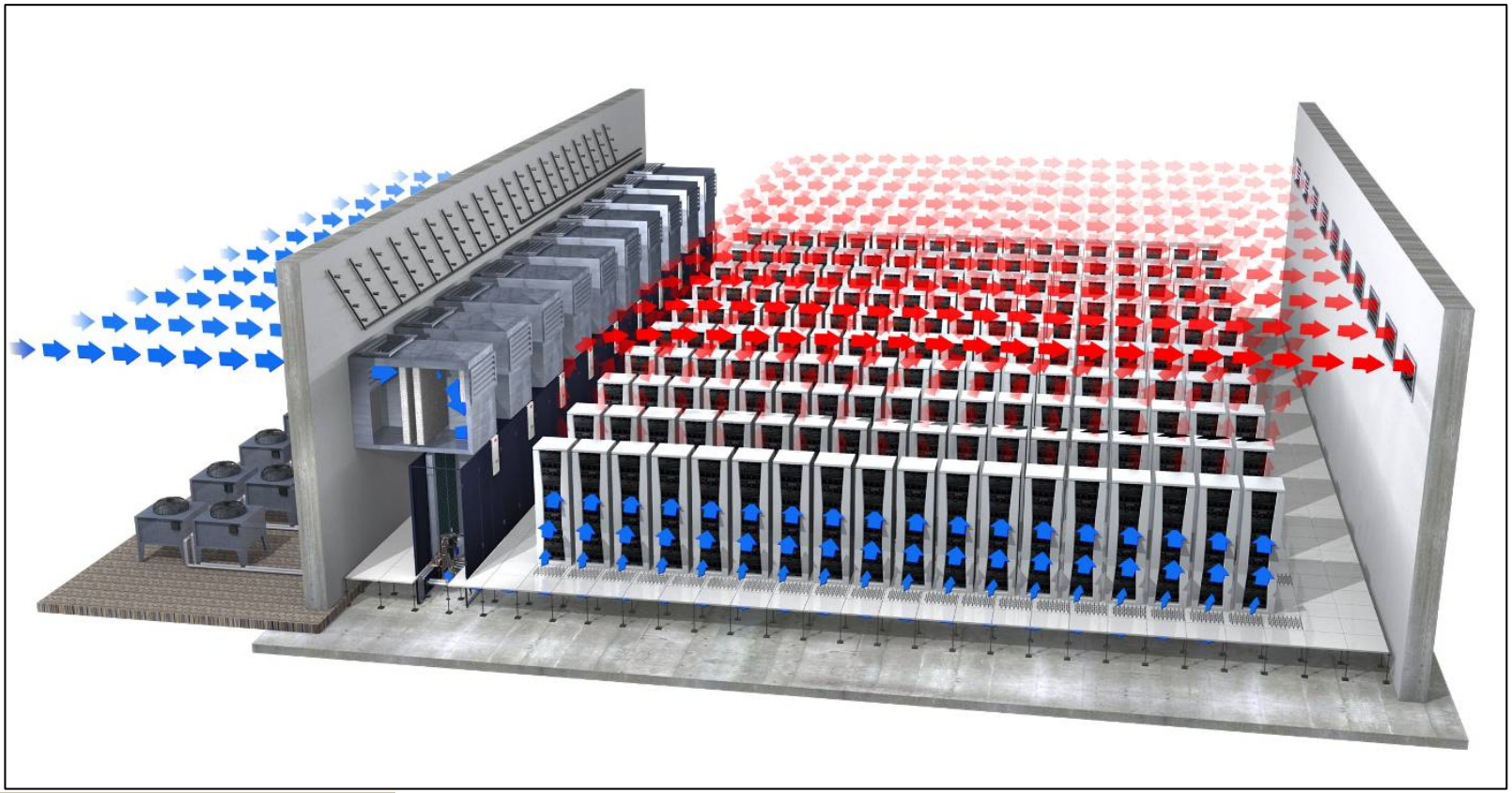
DFC²

Direct Free-Cooling for Data centres

Energy efficient, reliable and available around the world

New requirements allow new ideas and conceptions in data-centre air-conditioning !

DIRECT FREE-COOLING

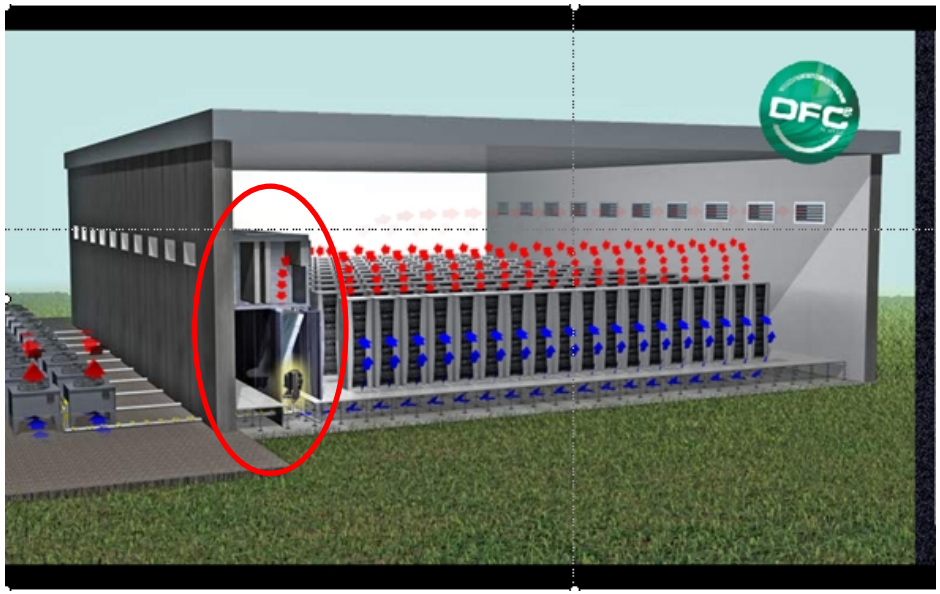


Possible working modes in dependence of the ambient temperature:

(Example Aircooled version)

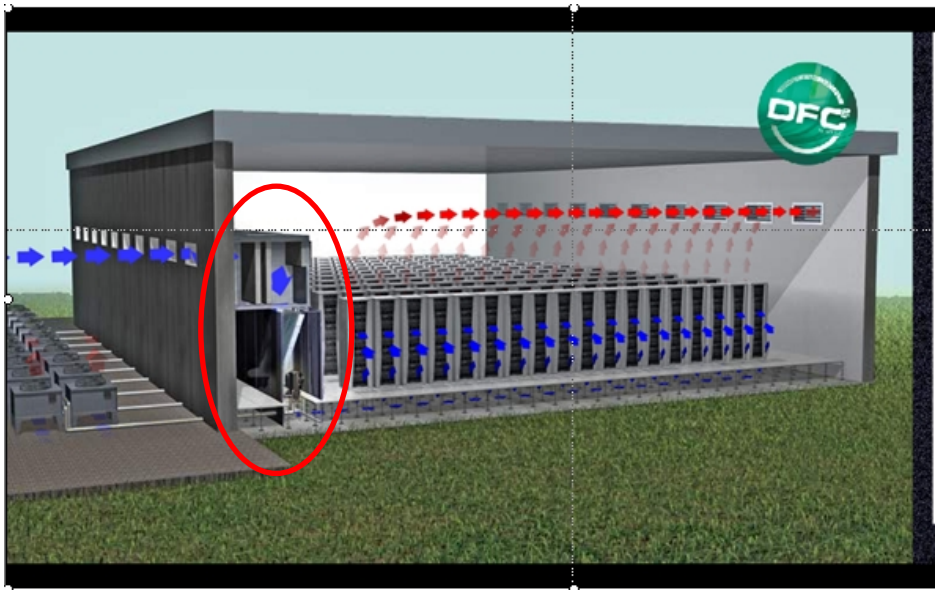
1. 25°C and higher:

air circulation plus DX-operation



2. 19°C – 24°C:

100% air change plus DX-operation

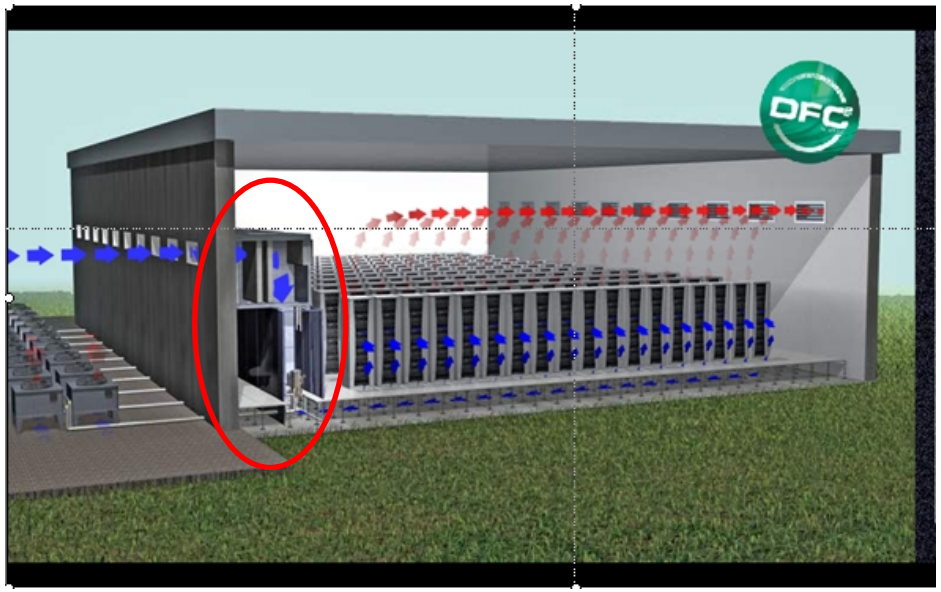


Possible working modes in dependence of the ambient temperature:

(Example Aircooled version)

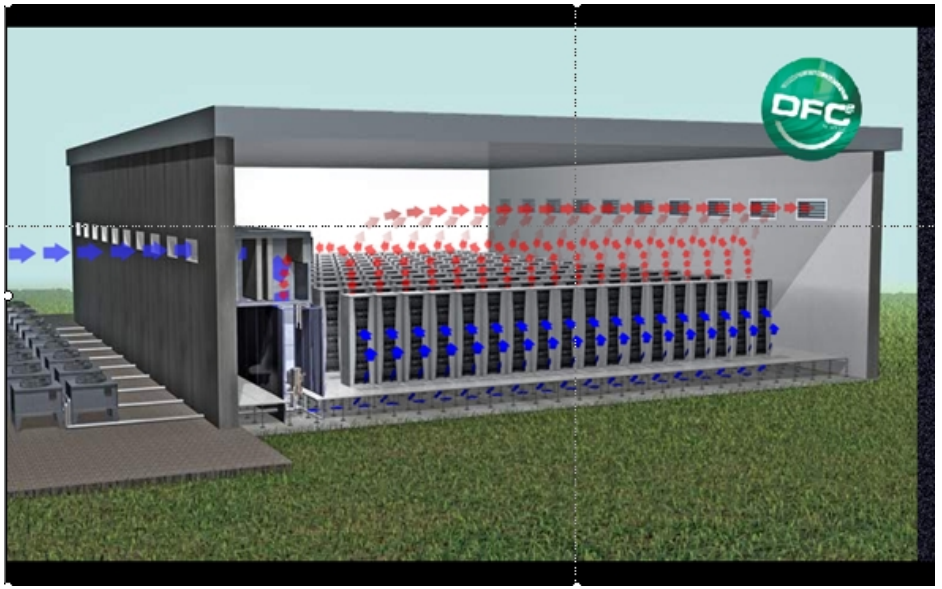
3. 18°C:

100% air change



4. 0°C – 17°C:

Mix-mode with air circulation

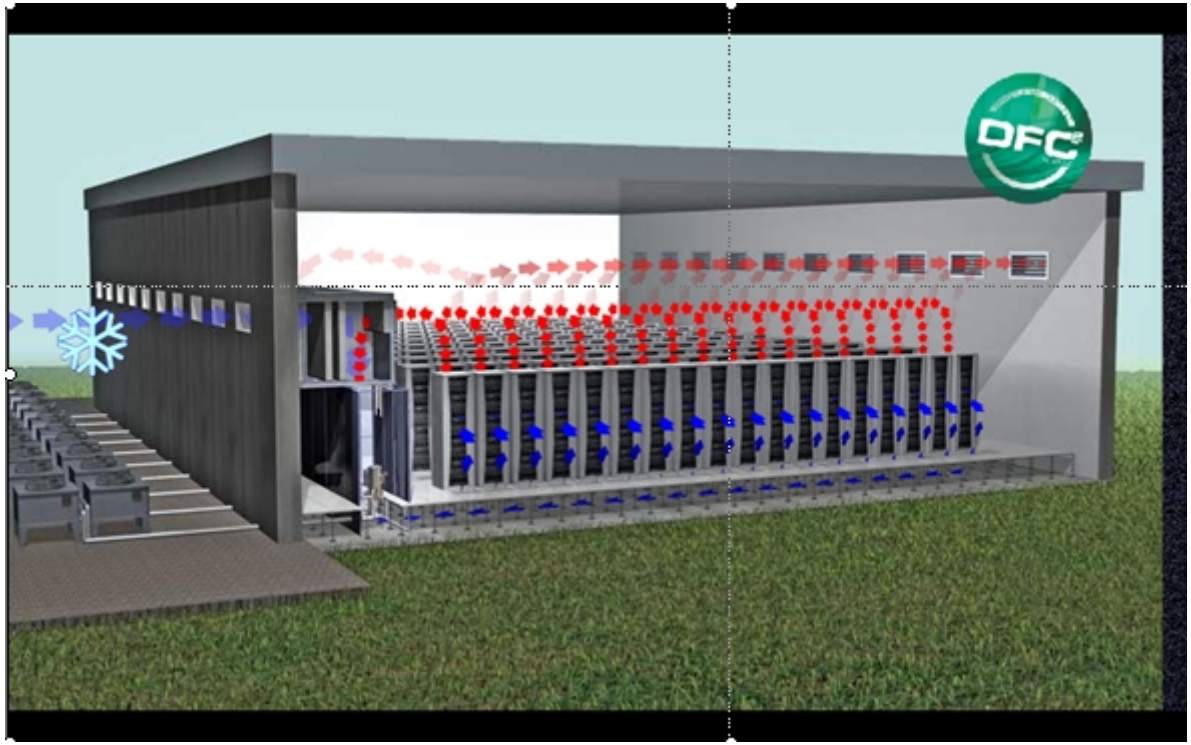


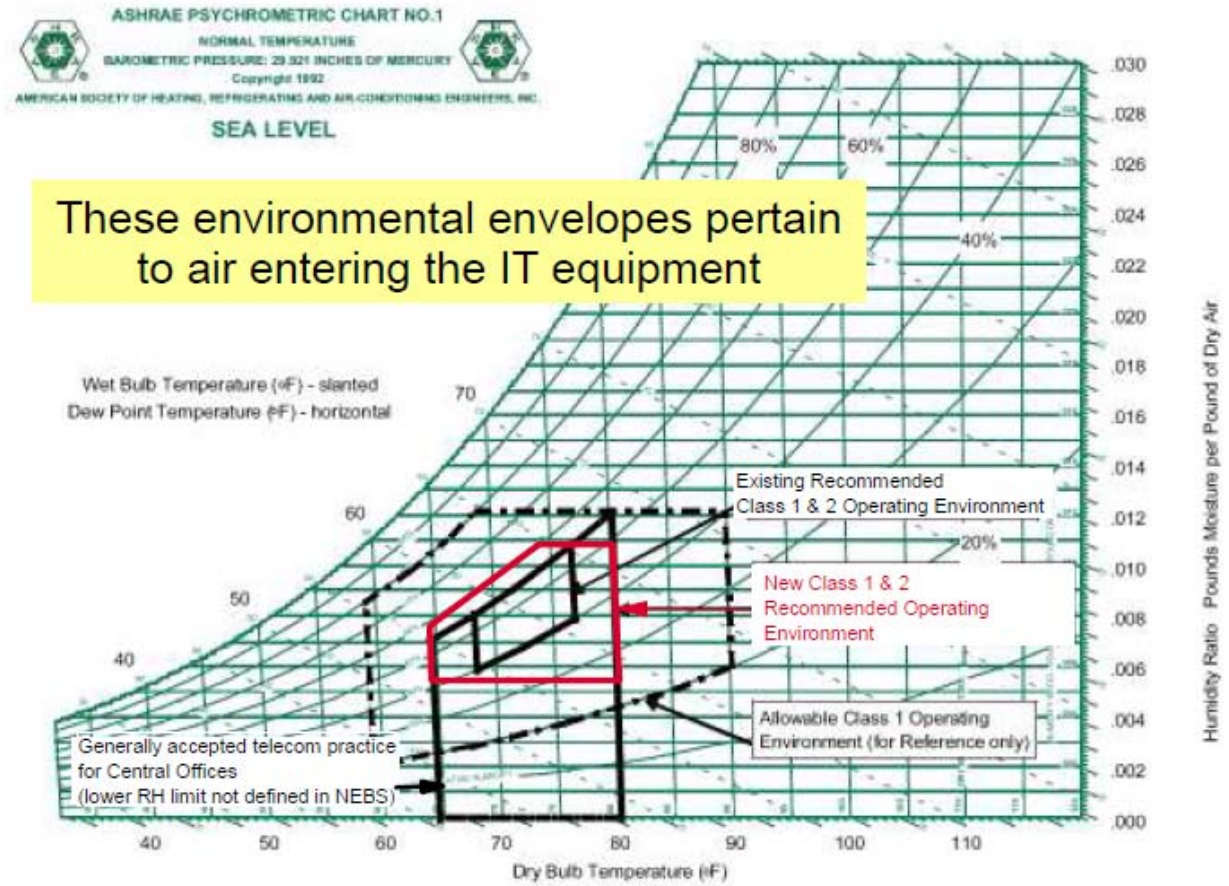
Possible working modes in dependence of the ambient temperature:

(Example Aircooled version)

5. -1°C and lower:

Mix-mode with air circulation and defrost of air filters





The „2008 ASHRAE Environmental Guidelines for Datacom Equipment“ (TC 9.9 – 2008) allow server air intake temperatures from

18°C up to 27°C !

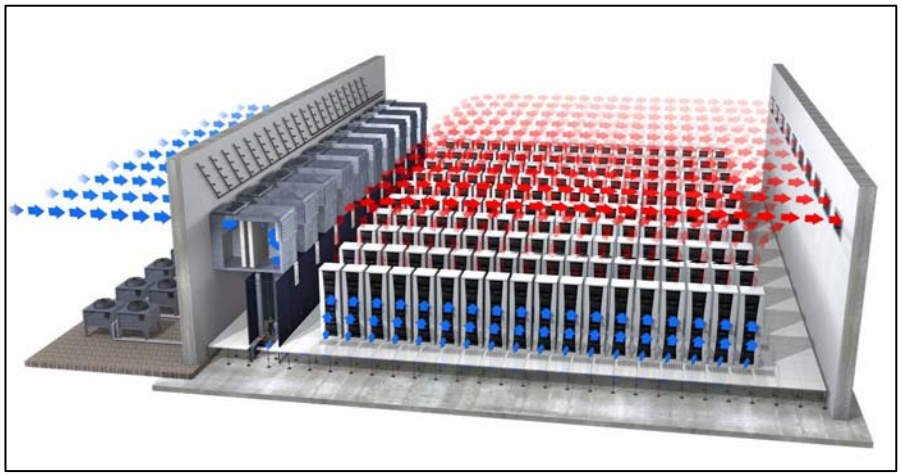
	Hamburg	London	Moscow	Canberra	Changchun	Madrid	Istanbul	New York	Johannesburg
Annual no. of hours below 18°C(1)	8.247	8.014	7.805	7.786	6.610	6.338	6.224	5.997	4.833
Percentage(2)	95%	91%	89%	89%	75%	72%	71%	68%	55%
Annual no. of hours below 25°C(1)	8.738	8.724	8.696	8.754	8.318	8.033	8.442	7.866	7.815
Percentage(2)	99,7%	99,6%	99,2%	99,9%	95%	92%	96%	90%	89%

(1): Hours per year of temperatures up to and including 18°C (25°C) = **SUPPLY AIR SETPOINT**

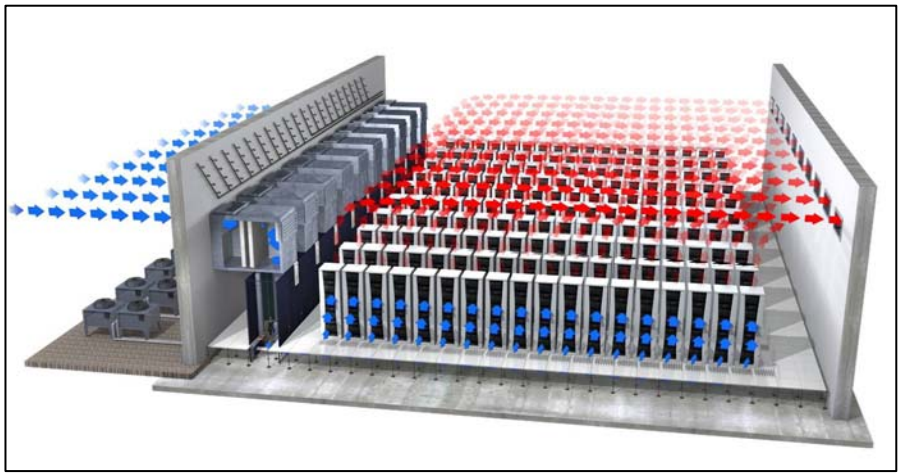
(2): Percentage of hours with temp. up to and including 18°C (25°C) over the year

Advantages of DFC²:

- High energy efficiency because of direct free-cooling – no losses due to additional heat exchangers
- Easy scalability of the system „Build as you grow!“ – no hydraulic calculation (pipework, pumps, valves, etc) needed from day one for the overall completion (DX-version only)
- Lower investment costs compared to indirect free-cooling systems
- Lower energy consumption in comparison to all other traditional systems



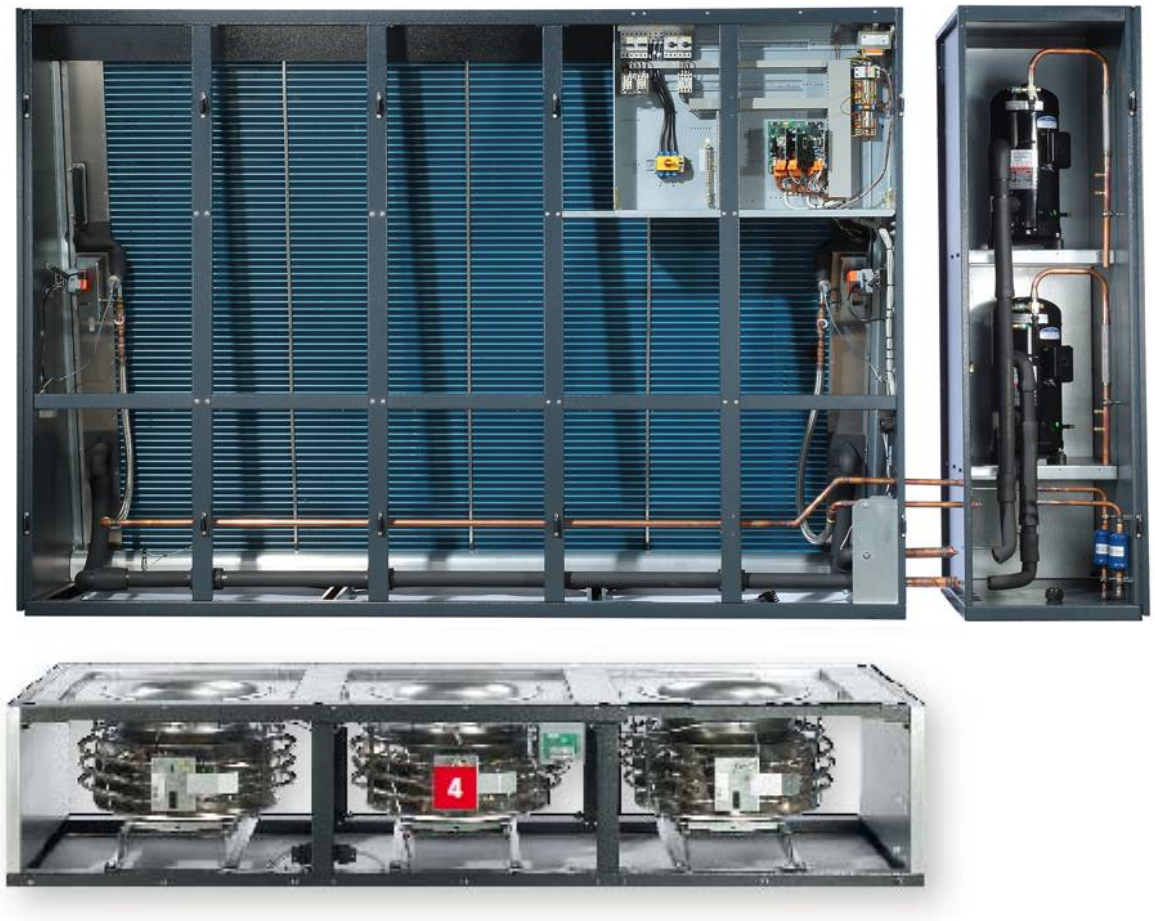
General conditions:



- Decontrol of room humidity – range e.g. 20-80%
- Considerations of dust loading (e.g. proximity to highways, harvest, city centres)
- Acceptance of possible environmental effects like smoke, gas, etc.
- Acceptance of lower building safety
- Open options in constructural matters
- Ductwork as short as possible
- Air intake has to be prevented from direct sun solarisation

Product range DFC²

Aircooled („AU“) version



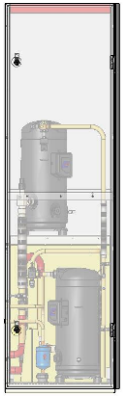
Product range DFC²

Unit layout (aircooled version):

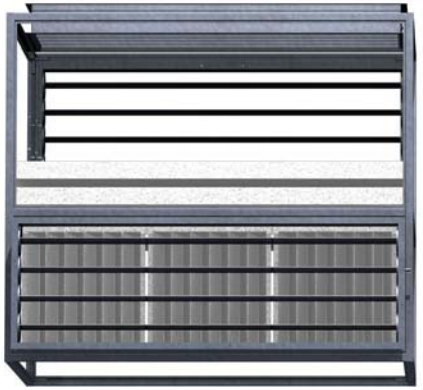
Complete unit consists of altogether 4 parts:

1. **Evaporator module**

2. **Compressor module**



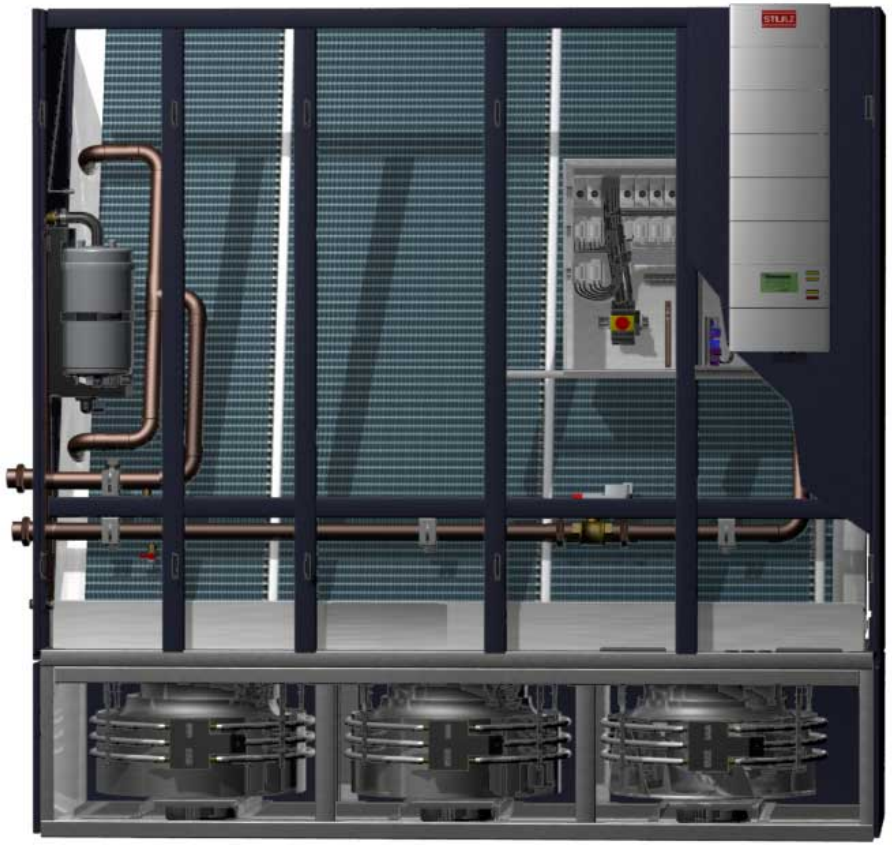
3. **Fan section (for installation under the raised floor)**



4. **Mixing box (on top of evaporator module)**

Product range DFC²

CW-version („CWU“)



Product range DFC²

Unit layout (CW version):

Complete unit consists of altogether 3 parts:

1. **CW-coil module**

2. **Fan section (for installation under the raised floor)**

3. **Mixing box (on top of evaporator module)**

Product range DFC²

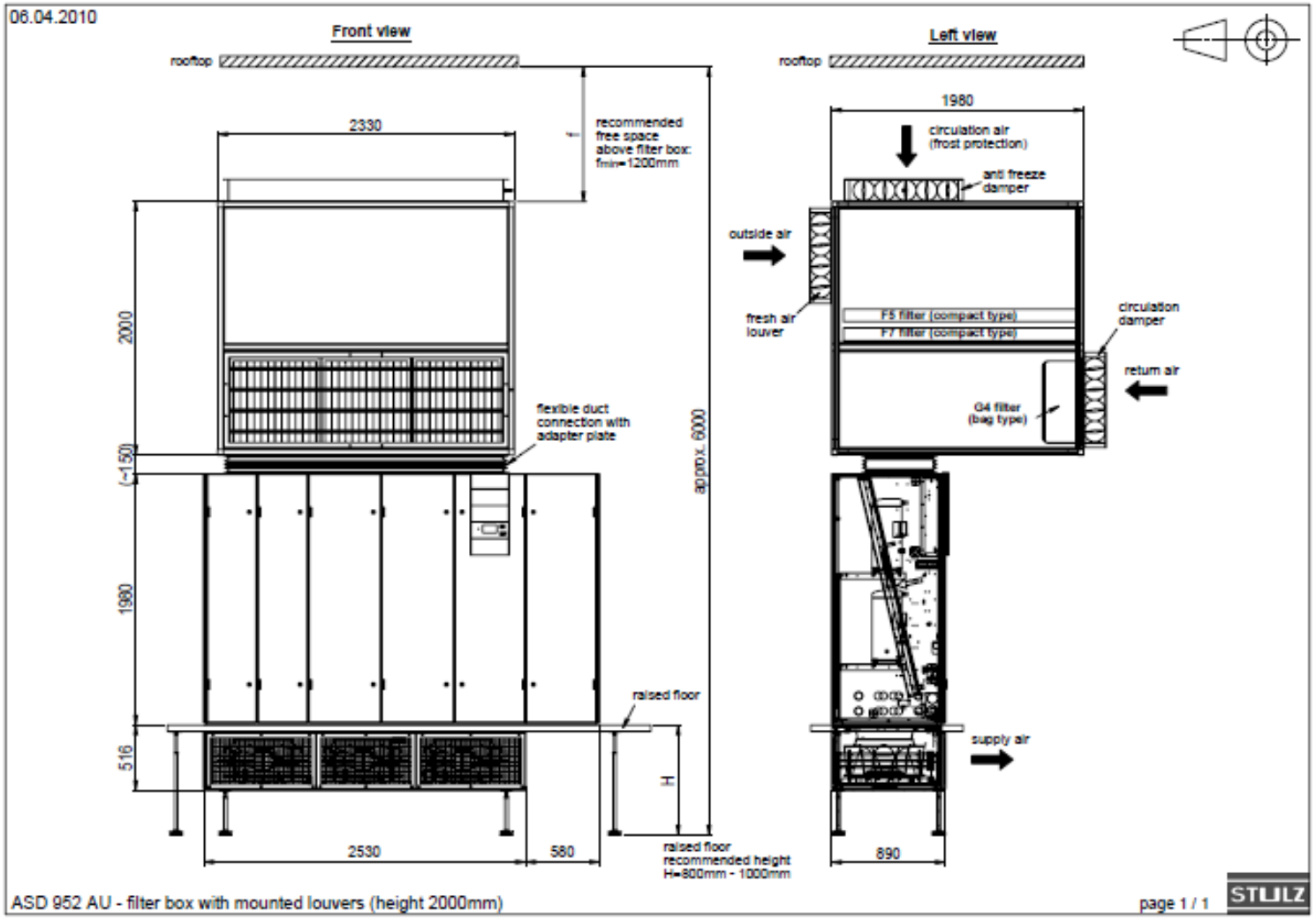
Highlights unit layout:

1. **Considerable energy saving due to installation of fan section under the raised floor**

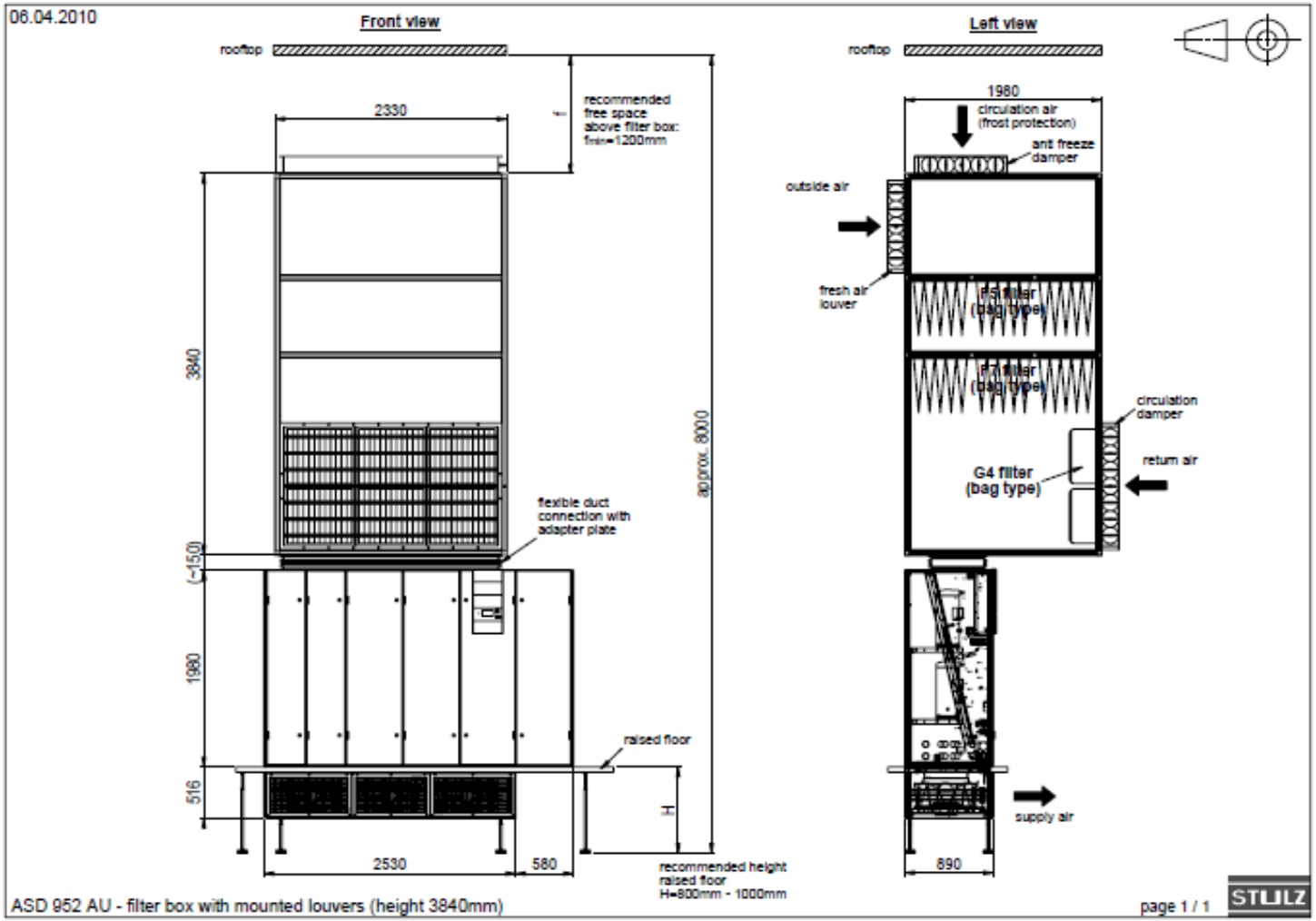
2. **Considerable energy saving in mix-mode and compressor mode due to large evaporator surface and possibility of low condensing pressure**

3. **Large coil size in CWU - units, SHR of 1 earlier achievable**

Product range DFC²



Product range DFC²



Product range DFC²

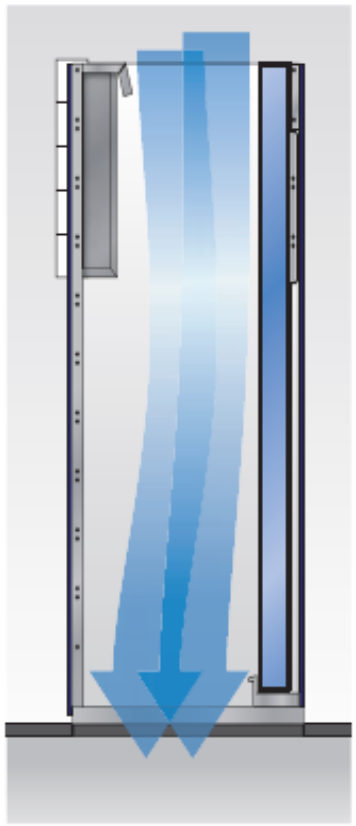
DX-units („AU“):

	AS(M)D 742 AU	AS(M)D 822 AU	AS(M)D 882 AU	AS(M)D 952 AU	AS(M)D 1002 AU	AS(M)D 1102 AU
Airflow [m³/h]	25.000	25.000	33.000	33.000	39.000	39.000
Unit dimensions [mm]	2710 x 890 x 2495		3110 x 890 x 2495		3460 x 890 x 2495	
Cooling capacity [kW]	75,3	82,2	89,0	95,4	101,9	110,9
Compressor power [kW]	14,4	16,4	16,4	18,6	18,6	22,4
Number of fans	2	2	3	3	3	3
Noise level and fan power	Depending on filter box, cooling mode and unit type					

Product range DFC²

Special feature „Movable heat exchanger“ (unit type „AMD“):

DX-mode: Airflow through heat exchanger

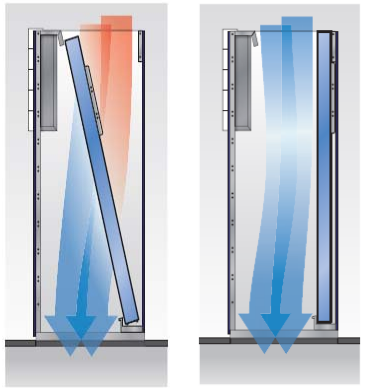


Free-cooling: heat exchanger is folded to the back side of the unit

Product range DFC²

Special feature „Movable heat exchanger“ (unit type „AMD“):

- **Reduction of airside pressure drop in Free-cooling mode**
- **Reduction of fan power consumption !!**



Example 1:

- ASD 882 AU vs. AMD 882 AU
- Airflow: 33.000 m³/h
- Reduction PD: 123Pa
- Reduction fan power: 1,3 kW
- Free-cooling time: 80% a year (7.000 hours)
- Savings: 1.200,- €/year (0,13 €/kWh)

Example 2:

- ASD 1102 AU vs. AMD 1102 AU
- Airflow: 39.000 m³/h
- Reduction PD: 153Pa
- Reduction fan power: 2,3 kW
- Free-cooling time: 80% a year (7.000 hours)
- Savings: 2.100,- €/year (0,13 €/kWh)

Product range DFC²

CW-units:

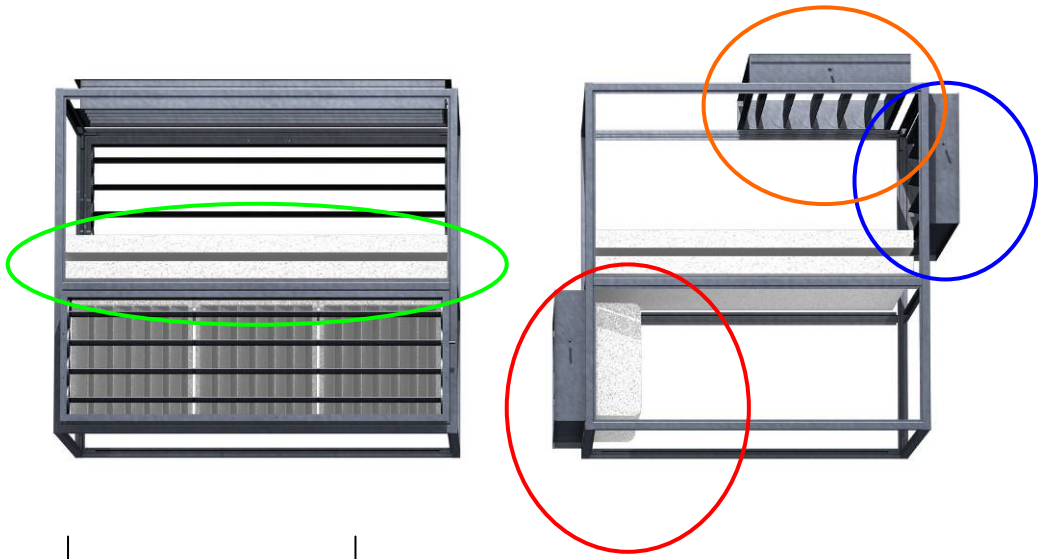
	 AS(M)D 1300 CWU	 AS(M)D 1600 CWU	 AS(M)D 2000 CWU
Airflow range [m³/h]	12.000 – 26.500	22.000 – 38.500	20.000 – 39.000
Unit dimensions [mm]	2150 x 890 x 2495	2550 x 890 x 2495	2900 x 890 x 2495
Cooling capacity, noise level, fan power consumption	Depending on water temperatures, return air conditions, size of mixing box and working mode		

Product range DFC²

Mixing box:

3 different sizes (heights)

per unit size



	Size 1	Size 2	Size 3
Height	**1950mm**	**3000mm**	**3900mm**
Depth	**1980mm + 2x 100mm**		
Width	**Unit width – 220mm**		
Filter type	**Zig-zag**	**Bag type**	**Bag type**

Return air louver + G4-filter

Fresh air louver

„Filter anti-frost“ louver

F5 pre-filter / F7 main filter

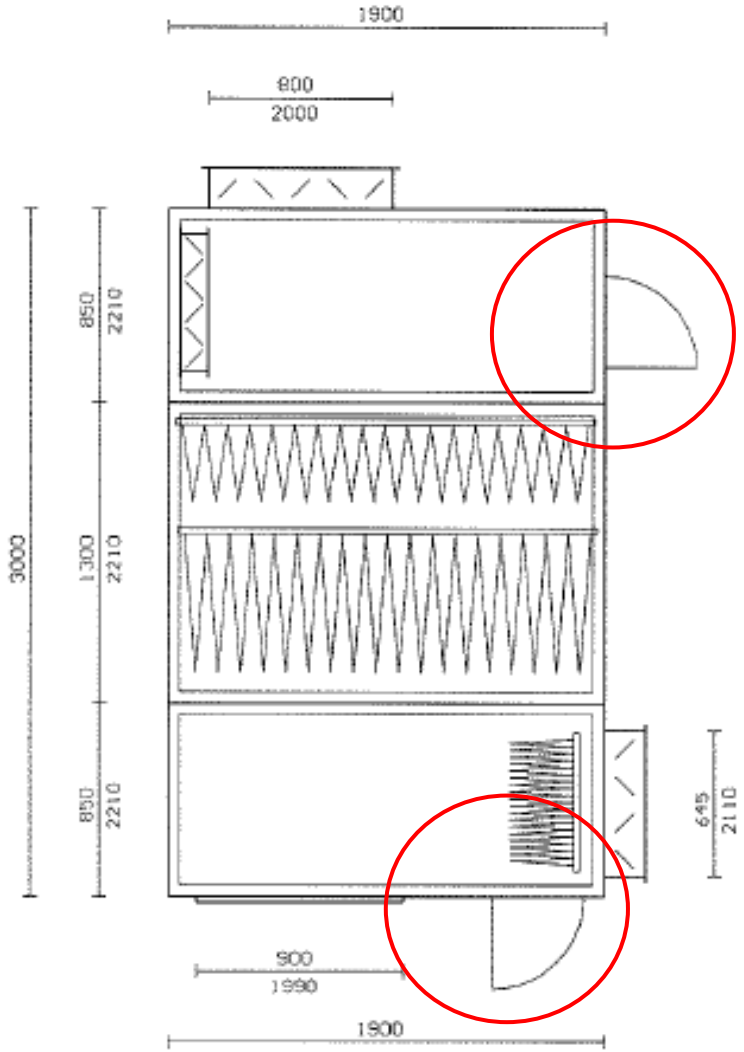
Product range DFC²

Option Mixing box:

All boxes in all sizes have got panels to be opened for filter changes.

For the connection of the unit and the mixing box a flexible connection is mandatory.

Due to the size and weight a seperate fixing of the mixing box at the wall is mandatory.



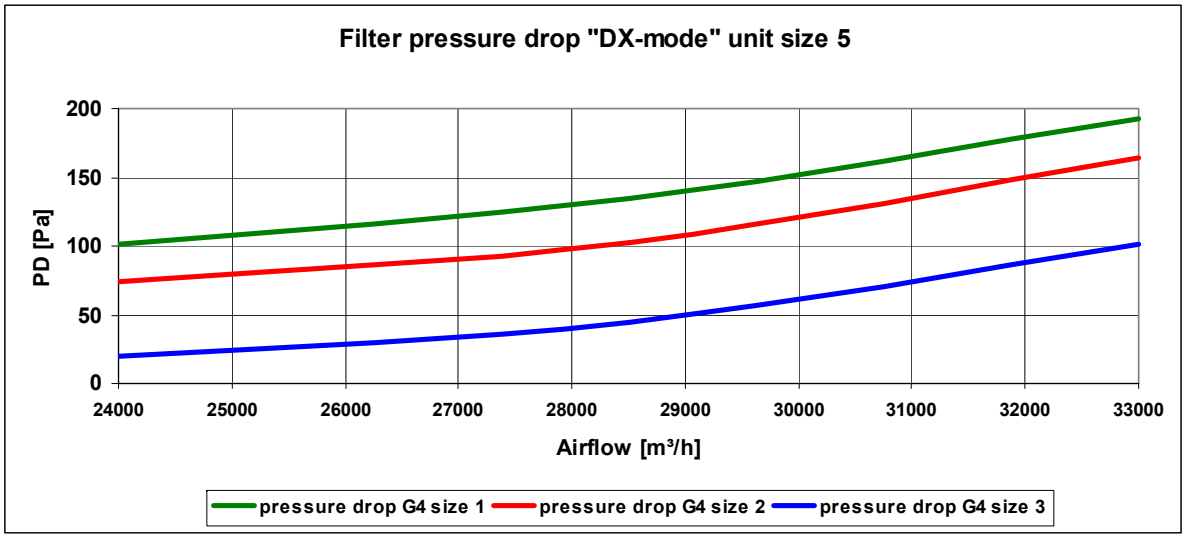
Product range DFC²

Mixing box – pressure drop comparison:

- Depending on height
- Depending on filter type

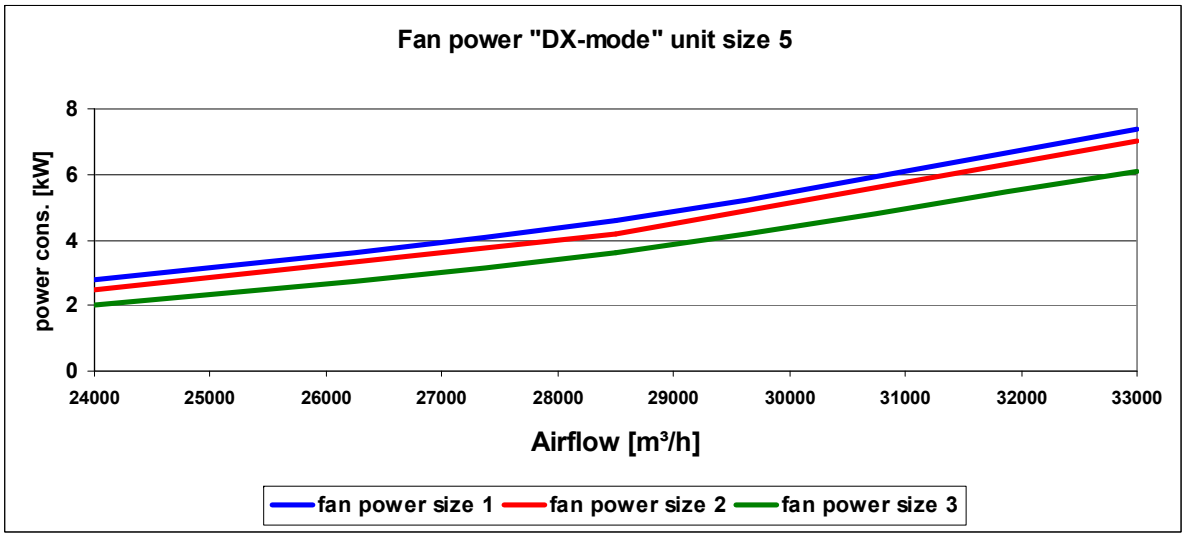
=> Direct influence on fan power consumption

Product range DFC²



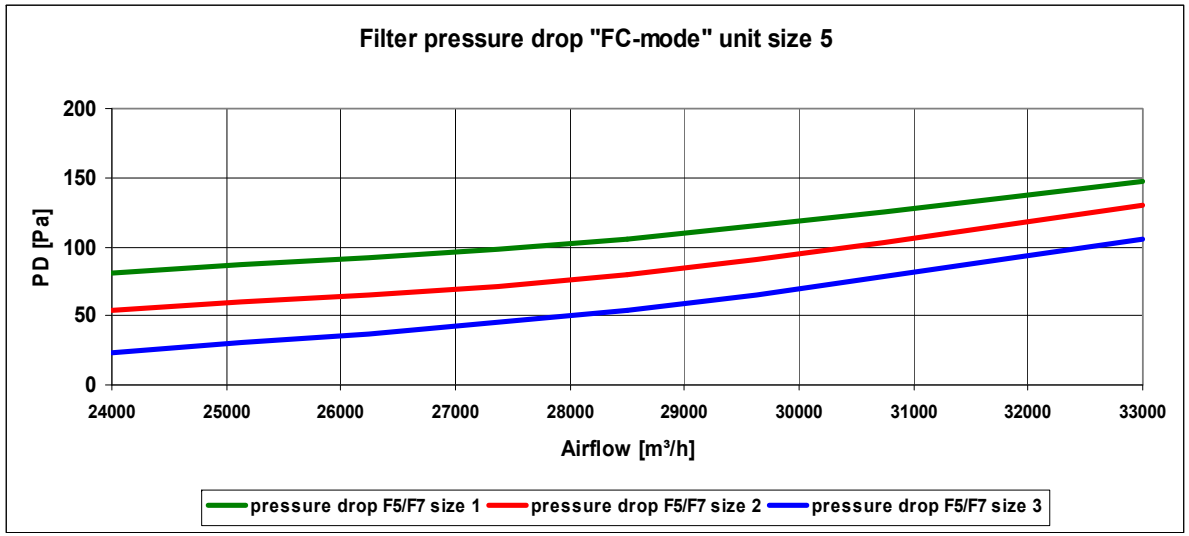
Comparison pressure drop:

Reduction of approx. 90Pa



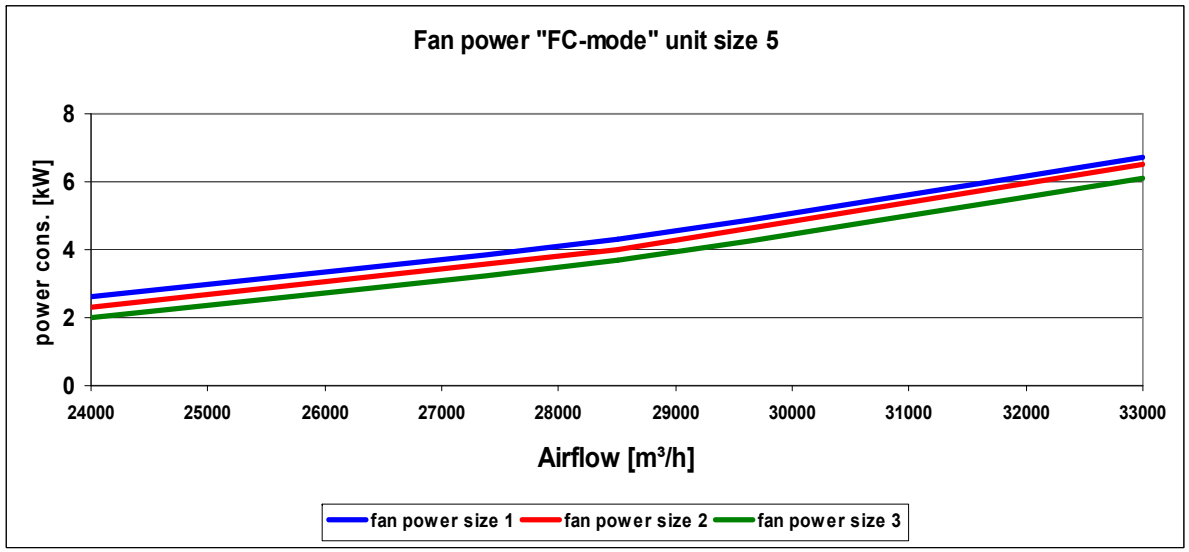
Reduction of approx. 1,3 kW at 33.000 m³/h

Product range DFC²



Comparison pressure drop:

Reduction of approx. 50Pa



Reduction of approx. 0,7 kW at 33.000 m³/h

Standard unit configuration and options

Standard unit configuration:

- C7000 IOC
- Refrigerant R407C (DX version)
- Rotalock valves compressor (DX)
- Anaconda (flexible) connection discharge line (DX)
- 2-port-CW-valve (CW version)

Available options:

- C7000 advanced terminal
- Electrical reheat, up to three steps
- Smoke detector
- BMS contacts
- Double skin panels
- Main switch through door
- Connection to BMS systems
- Etc.

An external humidification system (like Ultrasonic) is highly recommended.

MiniSpace

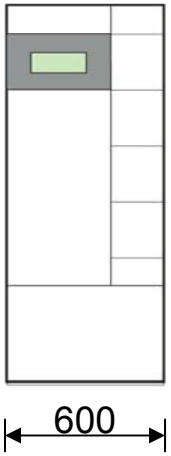
...for cooling small computer and server rooms

MiniSpace - Product Line

- Cooling capacities from 4kW to 20kW
- 2 unit sizes
- 3 cooling systems: A, G and CW
- All cooling systems available in downflow and upflow
- All cooling systems available in all unit sizes
- Microprocessor C1002 / C7000

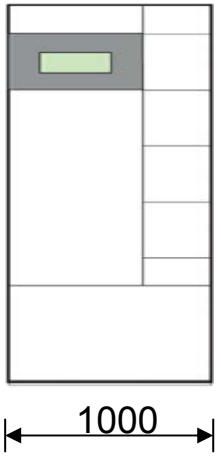
All cooling capacities at a glance

Size1



4,9	6,8	8,9	12,4
11,7			

Size 2



17,8	22,6
28,1	

A,G; 1 circuit | CW | Values in kW at 24°C/50% ; CW: Water: 7°C/12°C

MiniSpace - Highlights

- High sensible heat ratio
- Energy efficient operation
- front access
- EU4 filtration
- Connection to BMS systems possible
- Indoor condenser available

MiniSpace EC

...the next new...

for cooling small computer and server rooms

MiniSpace EC – the new generation

MiniSpace EC offers:

- Latest EC-fan technology
- 2 unit sizes
- 3 cooling systems: A, G and CW
- Standard refrigerant R407C and high temperature refrigerant R134a choosable
- All cooling systems in downflow and upflow
- All cooling systems in all unit sizes
- Stand-alone intelligence per unit by C7000

MiniSpace EC – the next generation

Unit names and cooling capacities:

Unit size 1: 600x600mm

CCD/U 51 A/G

CCD/U 71 A/G

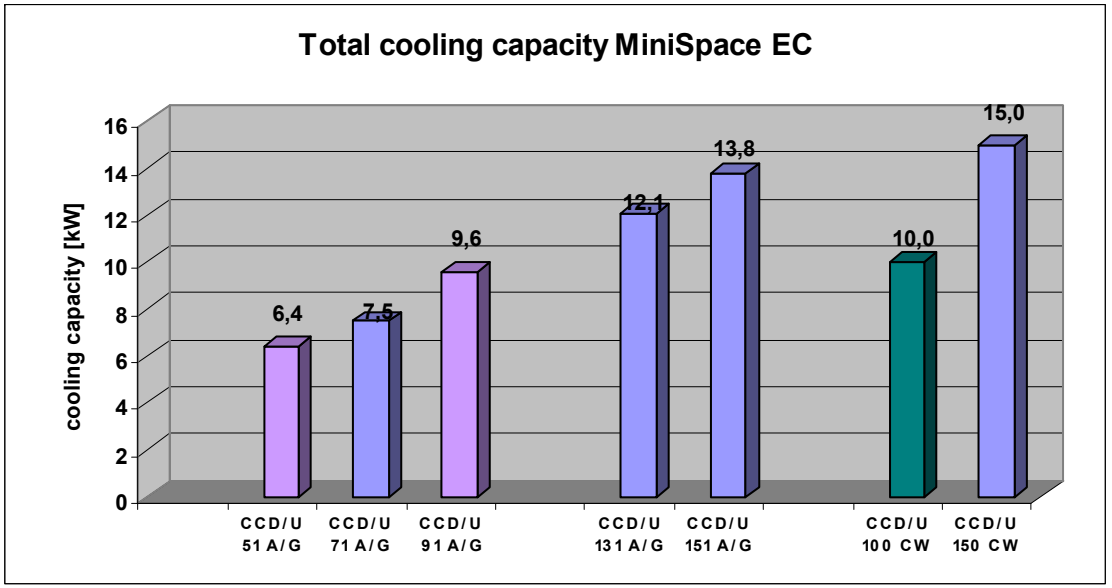
CCD/U 91 A/G

CCD/U 131 A/G

CCD/U 151 A/G

CCD/U 100 CW

CCD/U 150 CW



Values in kW at 24°C/50% ; CW: Water: 7°C/12°C

MiniSpace EC – the next generation

Unit names and cooling capacities:

Unit 2: 1.000x850mm

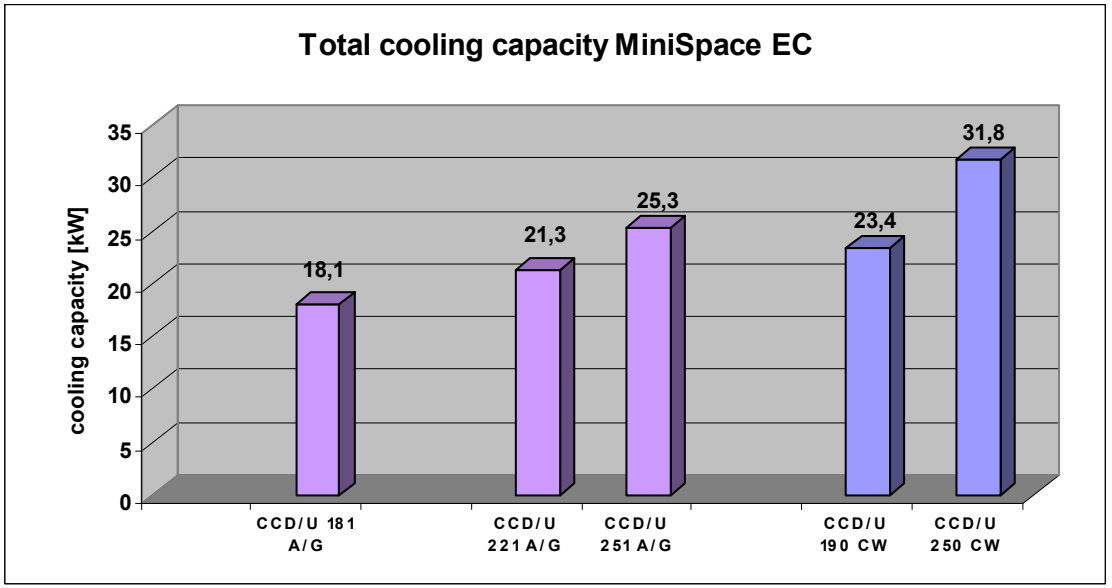
CCD/U 181 A/G

CCD/U 221 A/G

CCD/U 251 A/G

CCD/U 190 CW

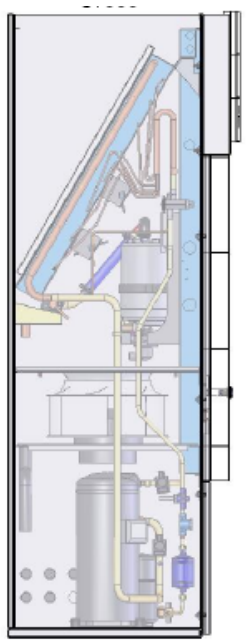
CCD/U 250 CW



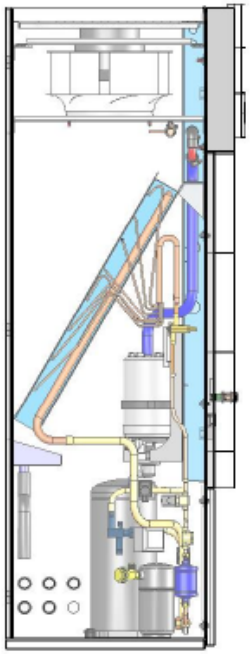
Values in kW at 24°C/50% ; CW: Water: 7°C/12°C

MiniSpace EC – the new generation

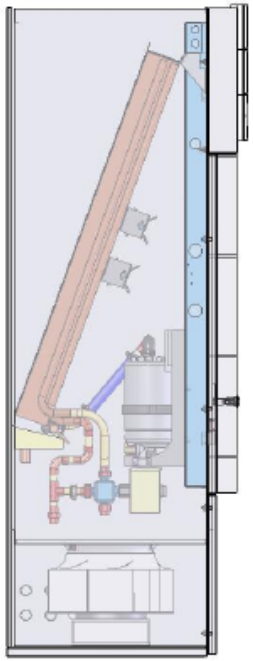
Design unit size 1 (600x600mm)



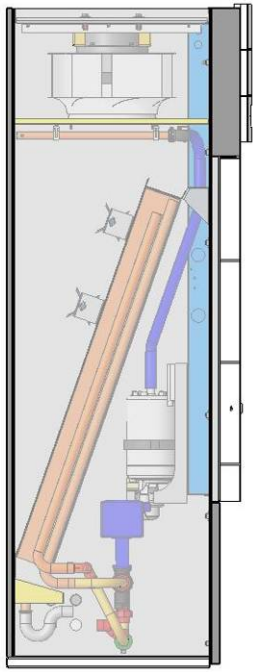
Downflow DX



Upflow DX



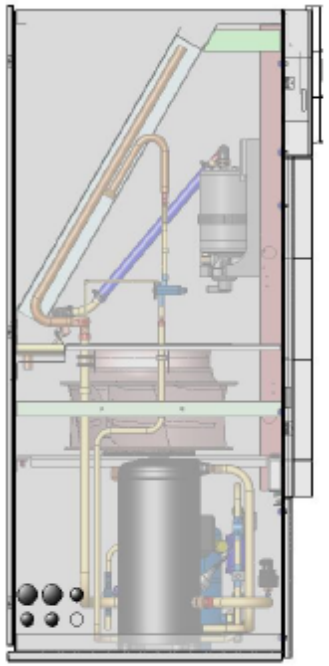
Downflow CW



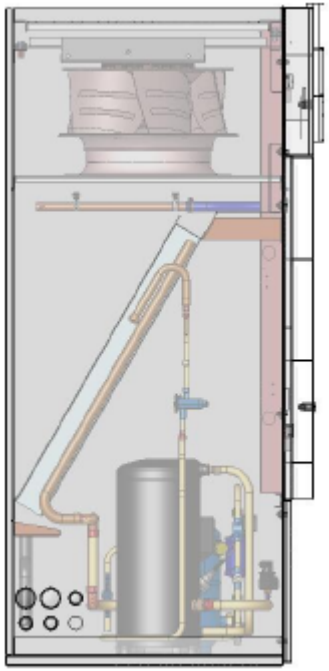
Upflow CW

MiniSpace EC – the new generation

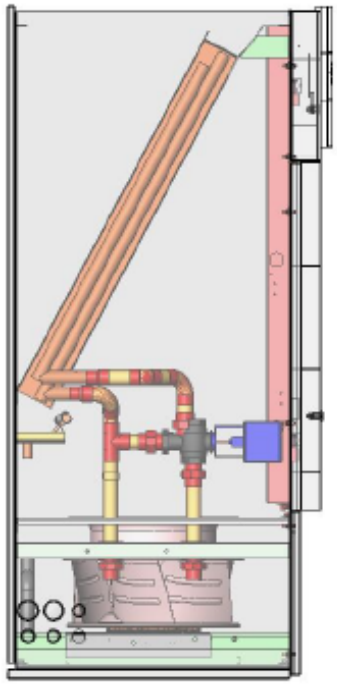
Design unit size 2 (1.000x850mm)



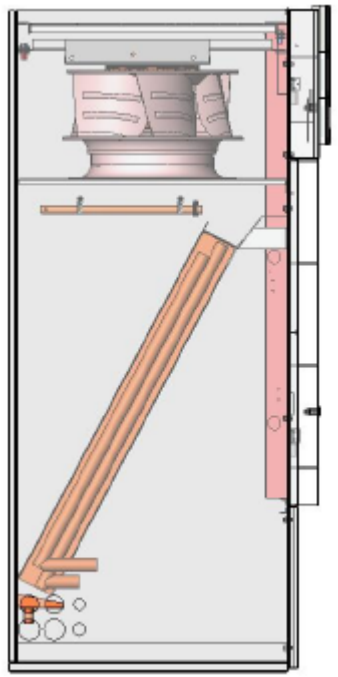
Downflow DX



Upflow DX



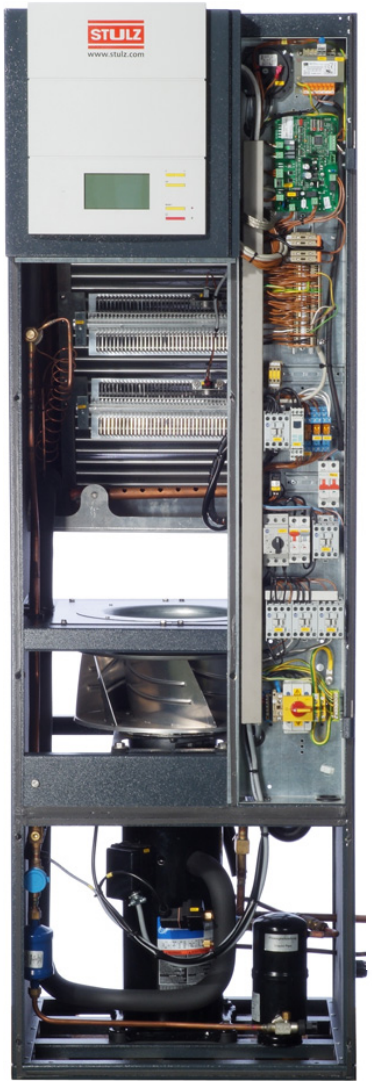
Downflow CW



Upflow CW

MiniSpace EC – Highlights

- High sensible heat ratio due to enlarged coil surface
- Energy efficient operation because of EC-fan technology
- Infinitely variable air volume
- Reduction of internal airside pressure drop due to enlarged filter- and coil surface
- Maintanance front access
- CW-Standby-Management
- Connection to BMS-systems of well-established manufacturers
- Homogenous load of all 3 phases because of new 3-phase electrical reheat



Compact Plus DX

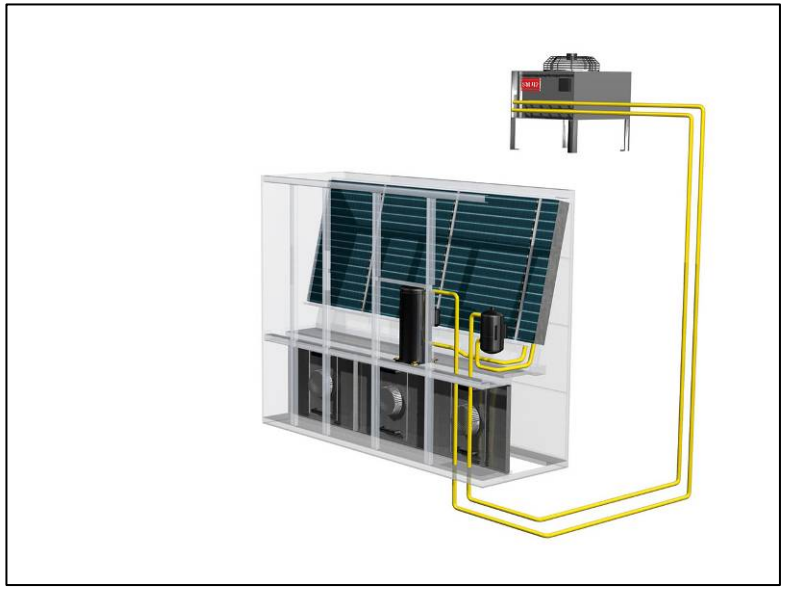
Close Control Air Conditioning for High-end Applications

Compact Plus DX:

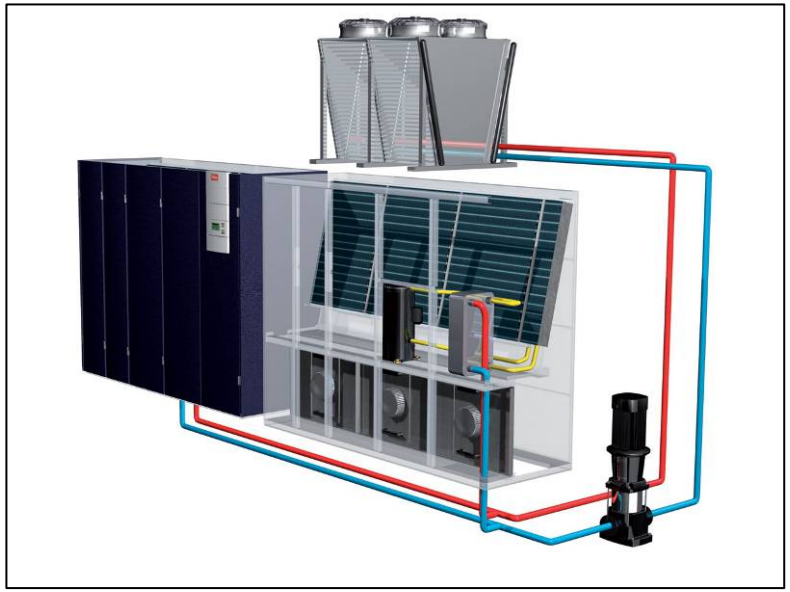
Close Control Air Conditioning for High-end applications

- **Compact Plus DX combines high performance with compact size and established technology**
- **AC-fan technology with direct drive**
- **Adjustable airflow through transformer**
- **Multiple options**
- **Stand alone intelligence per unit by C7000**
- Connection to BMS systems of established suppliers
- Communication via internet protocols (HTTP/SNMP)
- SMS or email alarm messages via GSM modem

Compact Plus DX: Cooling systems



A-System (air-cooled)



G-System (glycol-cooled)

<u>Airflow direction:</u> Downlow and Upflow available in all sizes and for both cooling systems

Compact Plus DX: Types per unit size

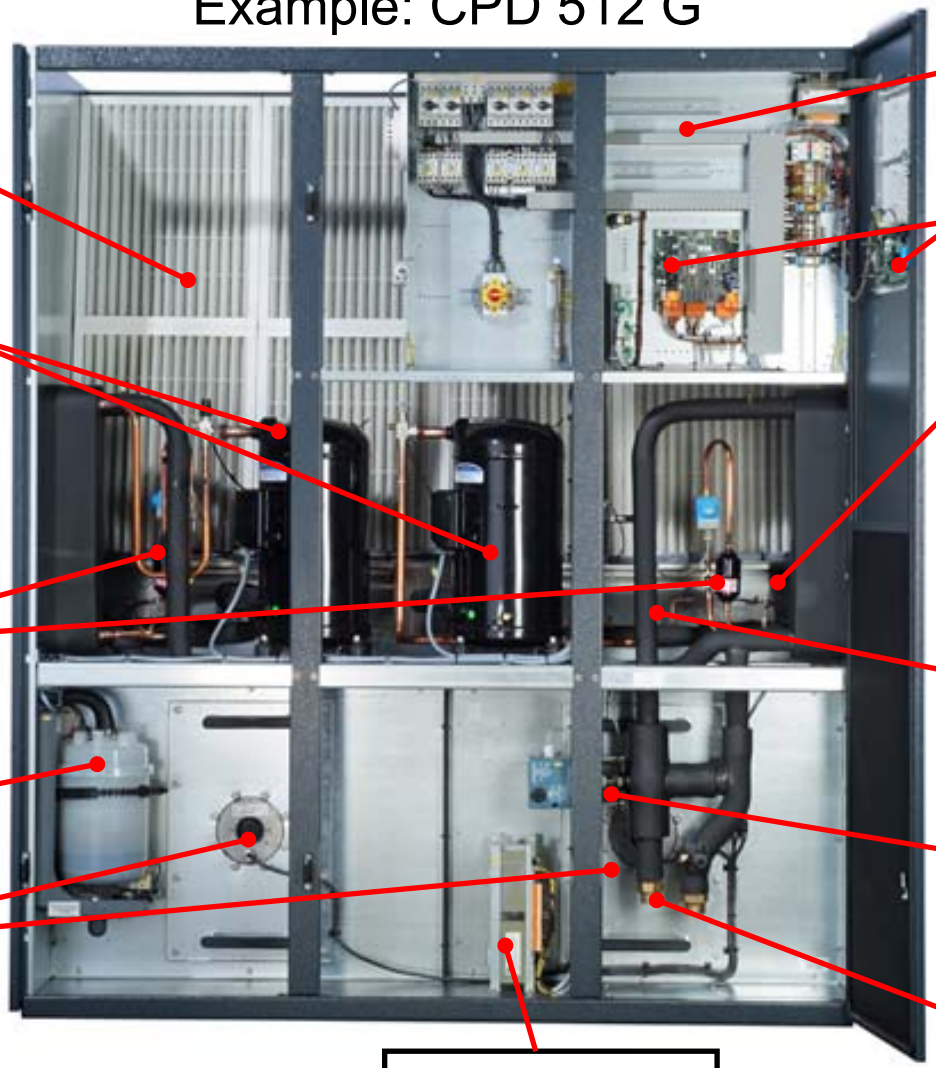
Size 1	Size 2	Size 3	Size 3	Size 4	Size 5
181	311	411	402	552	802
211	361	451	452	612	862
261	401	531	512	702	1062
291					

CPD/U xxx A,G 1 circuit

CPD/U xxx A,G 2 circuits

Front access to all maintenance relevant components

Example: CPD 512 G



Adjustable air flow according to all cooling requirements

In 6 steps adjustable fan speed by different transformer wiring connections:

200V	320V
240V	360V
280V	400V

Dehumidification (DX only):

In dehumidification mode the fan speed is automatically lowered to the next voltage step via a unit internal contactor.

Adjustable air flow according to all cooling requirements

Example:

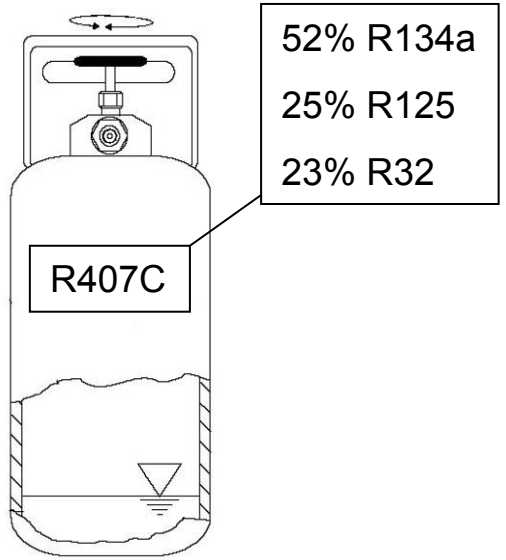
Unit size 2

200V	=	6.700m³/h @ 20Pa ESP		
240V	=	7.400m³/h @ 20Pa ESP	=	7.400m³/h @ 20Pa ESP
280V	=	8.000m³/h @ 20Pa ESP	=	7.400m³/h @ 130Pa ESP
320V	=	8.400m³/h @ 20Pa ESP	=	7.400m³/h @ 200Pa ESP
360V	=	8.700m³/h @ 20Pa ESP	=	7.400m³/h @ 260Pa ESP
400V	=	9.000m³/h @ 20Pa ESP	=	7.400m³/h @ 300Pa ESP

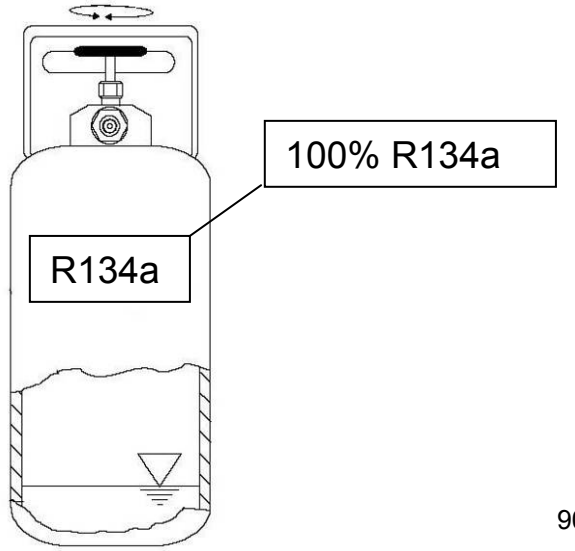
If a different airflow or ESP is selected and the transformer steps are not exactly met, the voltages will be factory elevated to the next available transformer step prior to delivery!

Two different refrigerants to meet all requirements

1. R407C for temperate climate zones
   - standard refrigerant of Compact Plus DX
   - worldwide available
   - established for many years



2. R134a for extreme ambient temperatures
   - easy calculation in Stulz-Select
   - same delivery time due to use of same compressors



Compact Plus CW

Close Control Air Conditioning for High-end Applications

ENERGY EFFICIENCY made in Germany

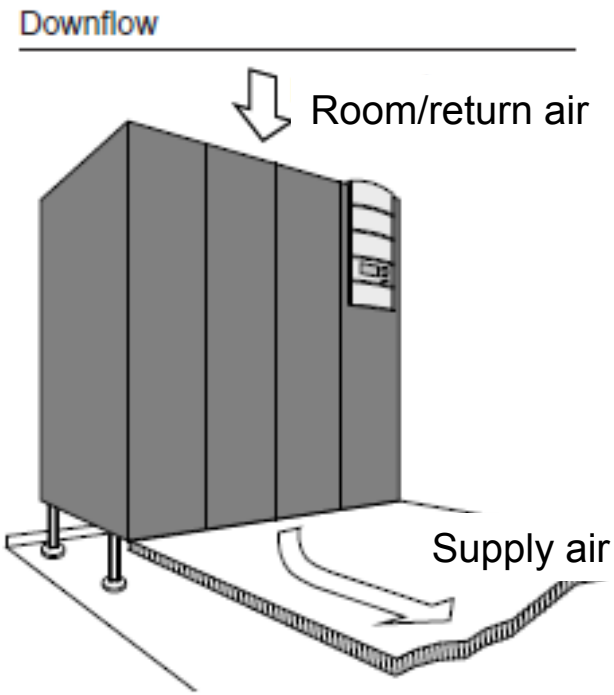
Compact Plus CW:

Close Control Air Conditioning for High-end applications

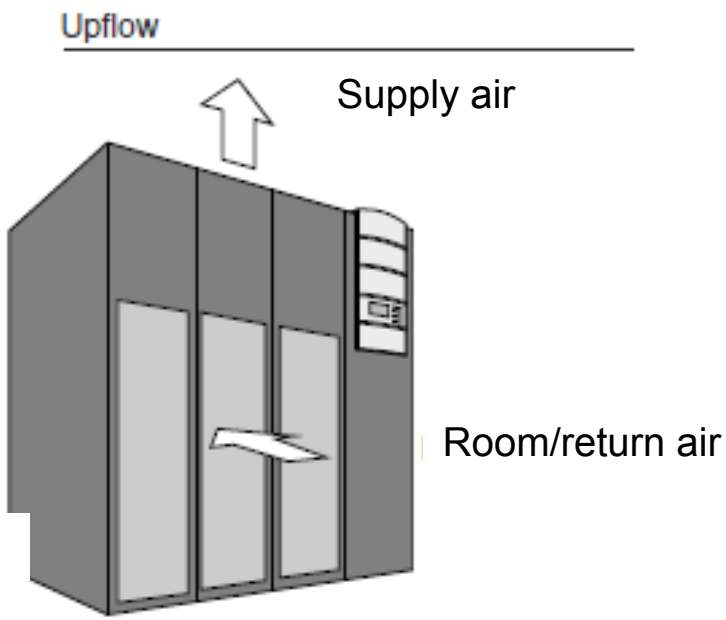
- **Compact Plus CW combines high performance with compact size and established technology**
- **AC-fan technology with direct drive**
- **Adjustable airflow through transformer**
- **Multiple options**
- **Stand alone intelligence per unit by C7000**
- Connection to BMS systems of established suppliers
- Communication via internet protocols (HTTP/SNMP)
- SMS or email alarm messages via GSM modem

Compact Plus CW:

Close Control Air Conditioning for High-end applications



Unit size 1 - 7



Unit size 1 - 5

Compact Plus CW: Unit sizes and names

Size 1: 950 x 890 x 1980mm

- CPD/U 310 CW
- CPD/U 410 CW

Size 2: 1400 x 890 x 1980mm

- CPD/U 510 CW
- CPD/U 680 CW

Size 3: 1750 x 890 x 1980mm

- CPD/U 760 CW
- CPD/U 910 CW

Size 4: 2200 x 890 x 1980mm

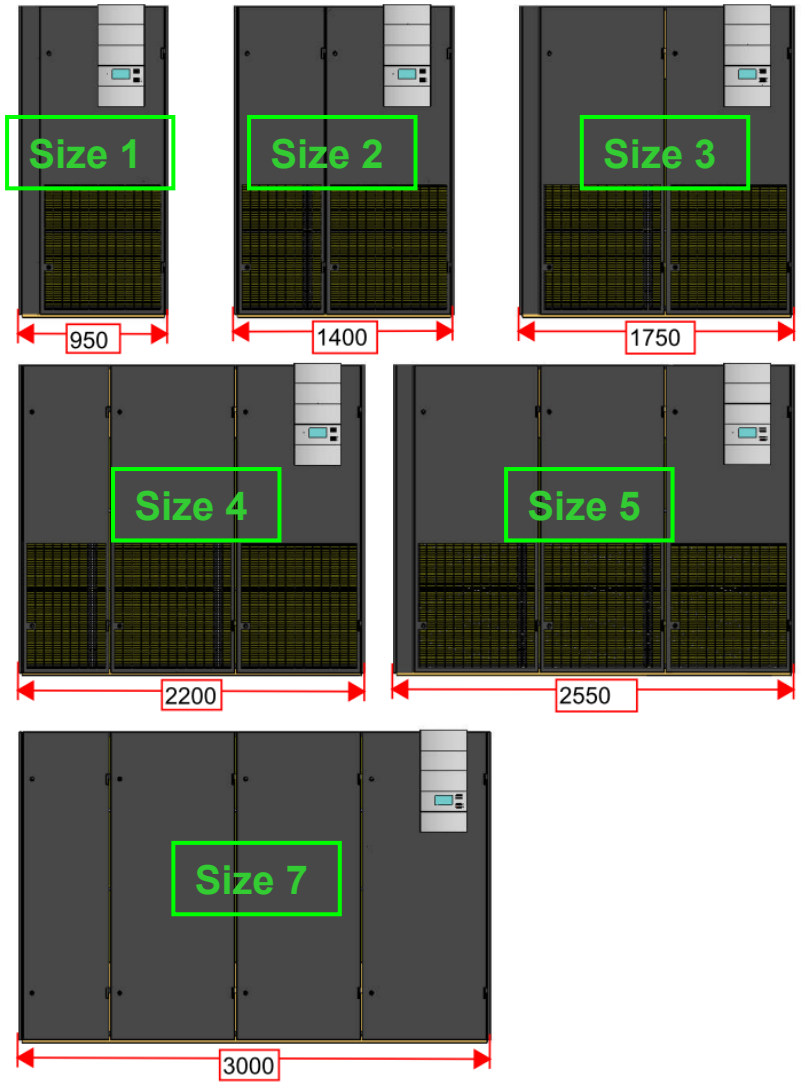
- CPD/U 1020 CW
- CPD/U 1150 CW

Size 5: 2550 x 890 x 1980mm

- CPD/U 1210 CW
- CPD/U 1510 CW

Size 7: 3000 x 890 x 1980mm

- CPD 1860 CW
- CPD 2120 CW



Compact Plus CW: Technical Data

CPD xxx CW		310	410	540	680	760	910	1020	1150	1210	1510	1860	2120
Airflow	m³/h	6.900	8.400	9.700	11.300	14.800	17.800	18.000	19.500	23.000	27.500	32.000	35.500
CW-cooling capacity (total)	kW	33,3	39,9	52,5	60,6	77,4	93,6	105,3	113,1	128,5	152,9	170,2	187,6
CW-cooling capacity (sensibel)	kW	27,8	33,6	41,7	48,3	62,3	75,2	80,5	87,2	100,5	119,7	135,9	150,5
Sound level	dBA	51,5	56,0	51,6	60,3	52,7	58,2	61,8	64,3	51,3	64,7	64,4	67,6
fan power consumption	kW	1,8	2,5	2,3	2,9	3,6	4,8	3,8	4,3	5,3	7,1	8,1	9,6

CPU xxx CW		310	410	540	680	760	910	1020	1150	1210	1510
Airflow	m³/h	6.500	8.000	9.900	10.900	15.100	17.000	18.000	19.000	23.000	26.000
CW-cooling capacity (total)	kW	29,0	35,4	50,5	56,1	72,9	83,1	94,6	100,3	122,7	138,2
CW-cooling capacity (sensibel)	kW	25,2	30,8	41,2	45,5	61,2	69,0	75,9	80,2	97,6	110,3
Sound level	dBA	51,4	55,9	56,6	61,7	54,8	58,1	63,1	64,7	57,3	66,1
fan power consumption	kW	1,8	2,5	2,5	3,0	4,1	4,9	4,2	4,6	6,1	7,3

All data refers to:

Standard unit airflow

ESP: 20Pa (D), 50Pa (U)

Return air: 24°C/50%

Water: 7/12°C, 0% Glykol

Adjustable air flow according to all cooling requirements

In 6 steps adjustable fan speed by different transformer wiring connections:

200V	320V
240V	360V
280V	400V

Adjustable air flow according to all cooling requirements

Example:

Unit size 5 - Downflow

200V	=	20.500m³/h @ 20Pa ESP	
240V	=	23.000m³/h @ 20Pa ESP	= 23.000m³/h @ 20Pa ESP
280V	=	24.900m³/h @ 20Pa ESP	= 23.000m³/h @ 120Pa ESP
320V	=	26.100m³/h @ 20Pa ESP	= 23.000m³/h @ 190Pa ESP
360V	=	26.900m³/h @ 20Pa ESP	= 23.000m³/h @ 250Pa ESP
400V	=	27.700m³/h @ 20Pa ESP	= 23.000m³/h @ 300Pa ESP

If a different airflow or ESP is selected and the transformer steps are not exactly met, the voltages will be factory elevated to the next available transformer step prior to delivery!

Multiple Options for Compact Plus

- Electric reheat, up to 27kW, up to 3 steps, on/off or proportional controlled
- Hot water reheat
- Steam humidification, up to 15 kg/h, proportional controlled
- Raised floor stands
- Ducts, dampers, flexible duct connections
- Ducts with bag type filters or sound attenuators
- Double skin doors and panels
- Capacity control by hot gas bypass
- Smoke detector
- BMS contacts
- C7000 Advanced and C7000 display user interface and the complete range of C7000 connection possibilities to BMS

CyberRow

Intelligent Airflow Control – for more Efficiency in Rack Cooling

CyberRow

Intelligent Airflow Control – for more Efficiency in Rack Cooling

- An air conditioning unit to be positioned directly in the server row between the racks
- A rack independent cooling system with horizontal cold air supply
- 2 unit sizes available with infinitely variable cooling capacity
- 2 cooling systems: A and CW
- An air conditioning unit ideal for high density areas of the data centre or for medium and low density racks in data centres without raised floor

CyberRow

Intelligent Airflow Control – for more Efficiency in Rack Cooling

- 3x EC fans, independently controlled in dependence of the supply and return air temperature
- Creation of a cold air layer parallel to the air intake of the racks to achieve the most efficient air distribution
- Full maintenance access from front and back side only
- Pipework connection from either top or bottom
- RS485 connectivity to BMS

CyberRow: Unit sizes and capacities

	Aircooled (DX)		CW	
	EHMB4A	EHMC7A	EHMC2W	EHME5W
Height [mm]	1.950	1.950	1.950	1.950
Depth [mm]	1.175	1.175	1.175	1.175
Width [mm]	400	600	400	600
Airflow [m³/h]	4.800	7.700	6.400	11.200
Fan power cons. [W]	640	1.100	920	2.700
Compressor power [kW]	6,8	11,5	-	-
Return air temp. [°C]	35	35	35	35
Return air humidity [%]	30	30	30	30
Supply air temp. [°C]	21	21	21	21
Total cooling cap. [kW]	24,0	36,4	32,2	56,0
Sens. cooling cap. [kW]	24,0	36,4	30,3	54,8

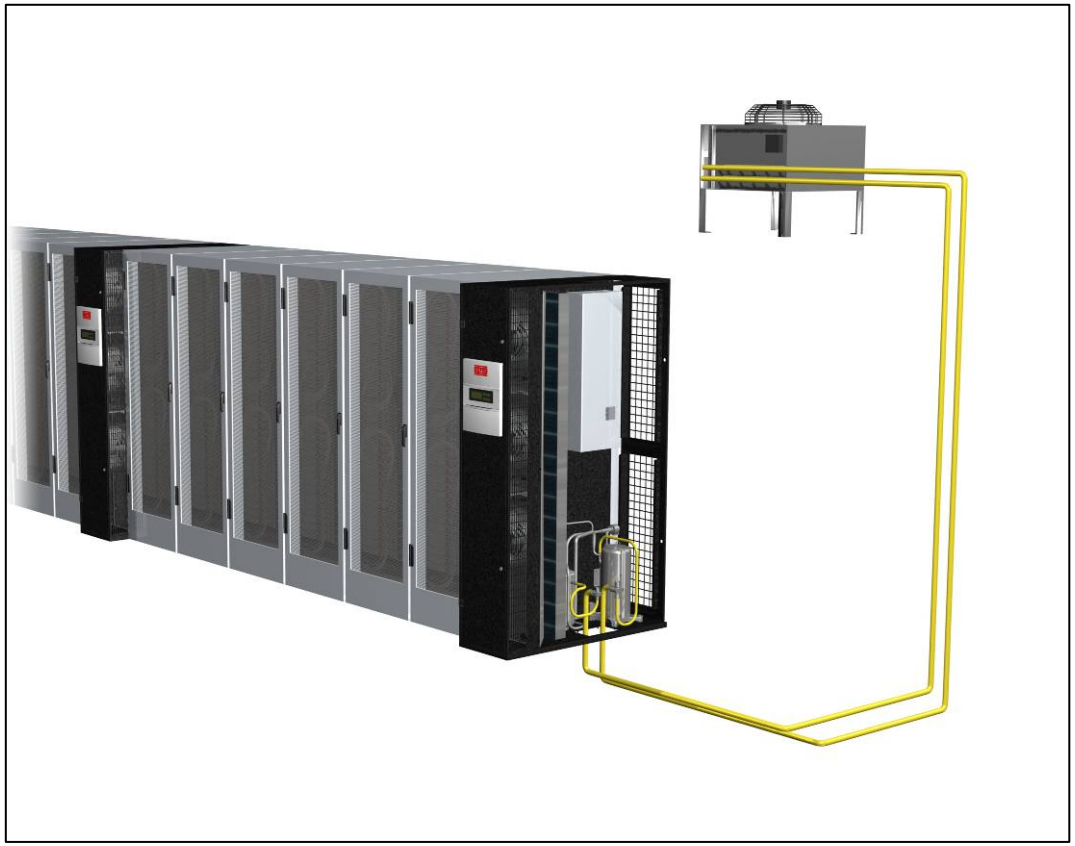
Based on:

DX: 45°C condensing temp.

CW: water 10/15°C, 0% glycol

CyberRow: Cooling systems

1. Aircooled (A) version:

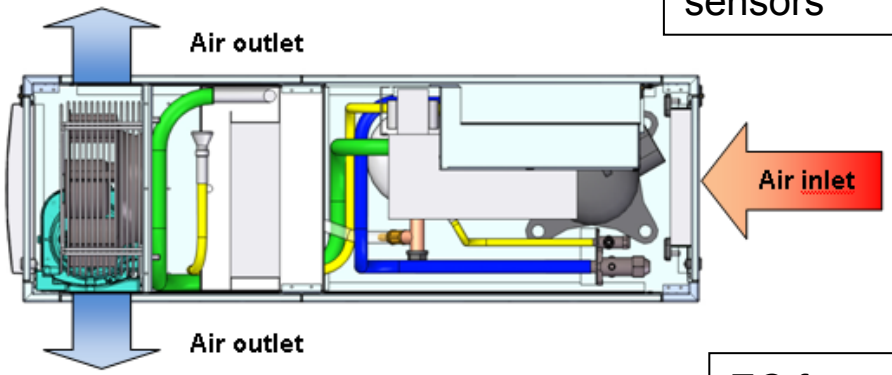


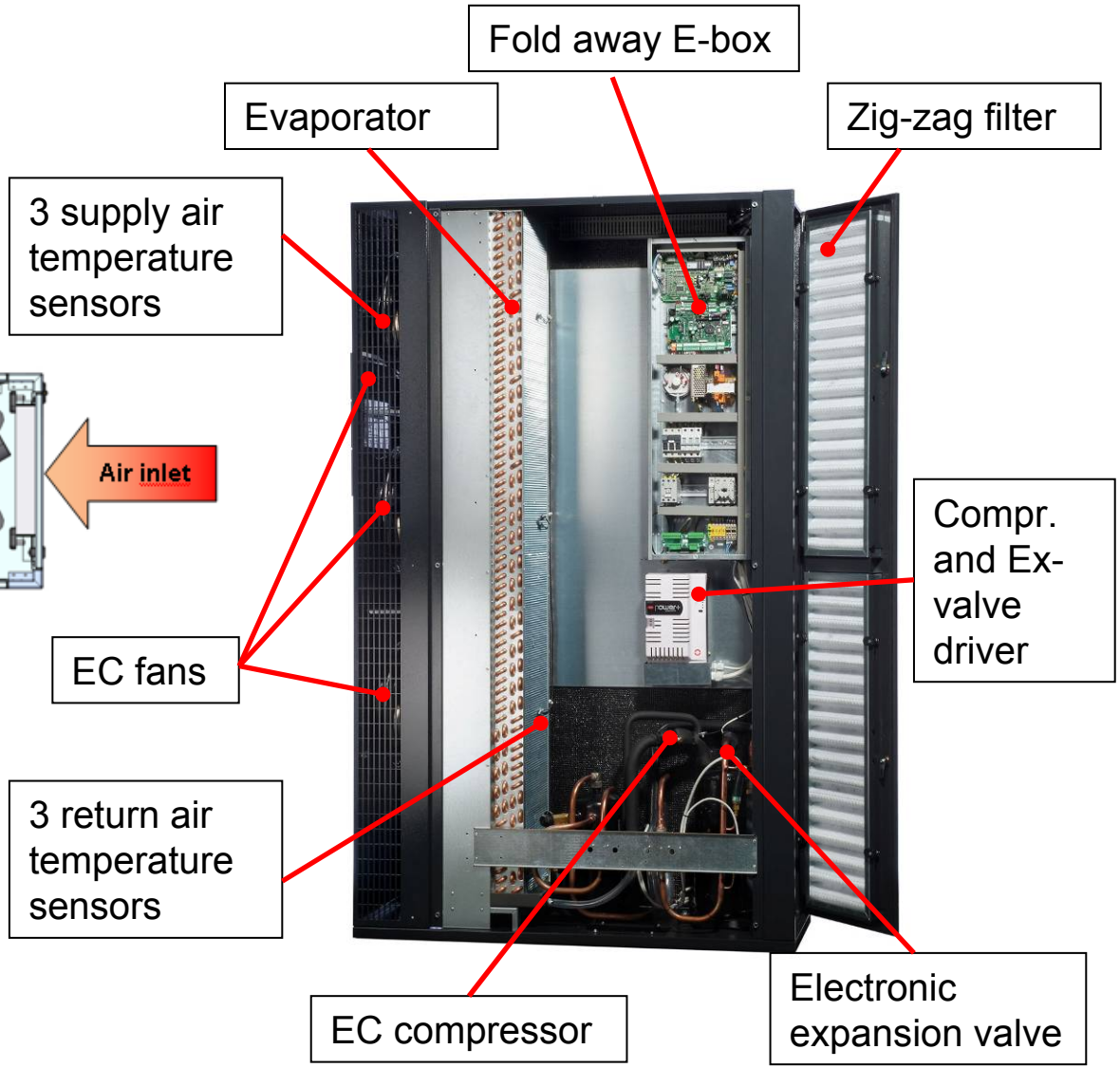
Features and components:

- **EC scroll compressor with integrated softstart**
  => Fast and stepless control of the cooling capacity between 30% and 100%
- **Electronic Expansion valve**
- **3 independently controlled radial EC fans in 3 horizontal zones (6 temperature sensors – 3 for supply air and 3 for return air)**
- **Refrigerant R410A**
- **G4 zig-zag filter**
- **C2020 controller**

CyberRow: Cooling systems and capacity

1. Aircooled (A) version:





Infinitely variable cooling capacity and highest efficiency level is achieved by the use of state-of-the-art technology and integration of all components in one control chain:

- **Stepless controlled EC scroll compressor**
  - **adjustment of cooling capacity by means of speed regulation**
  - **inrush current reduction of more than 50% due to integrated softstart**

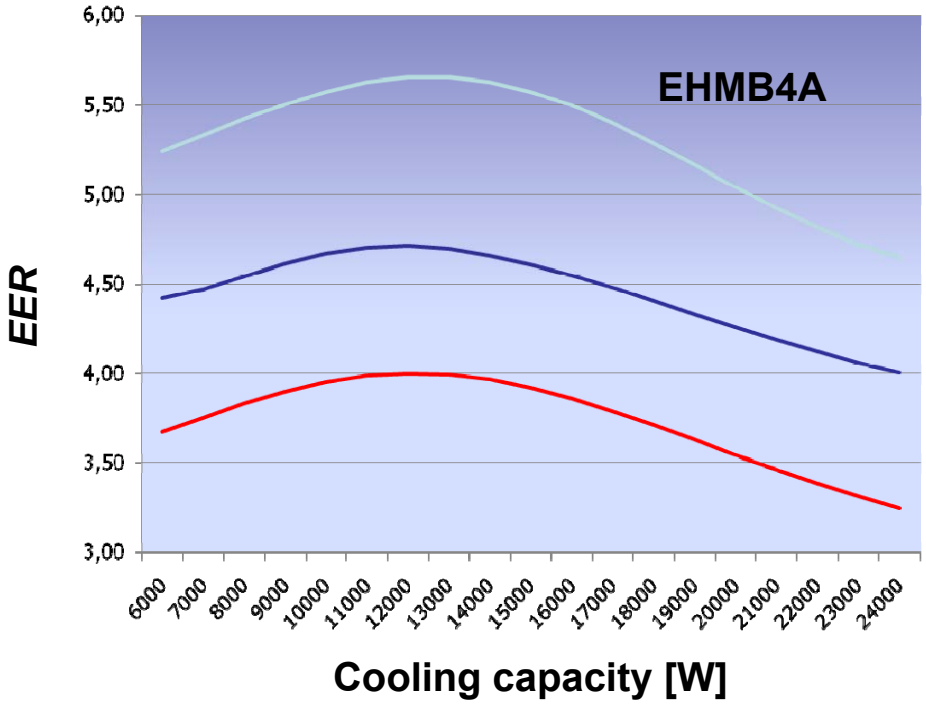
- **Electronic Expansion Valve**
  - **optimized valve opening in dependence of condensing pressure – “gliding” condensing temperature for higher COP**

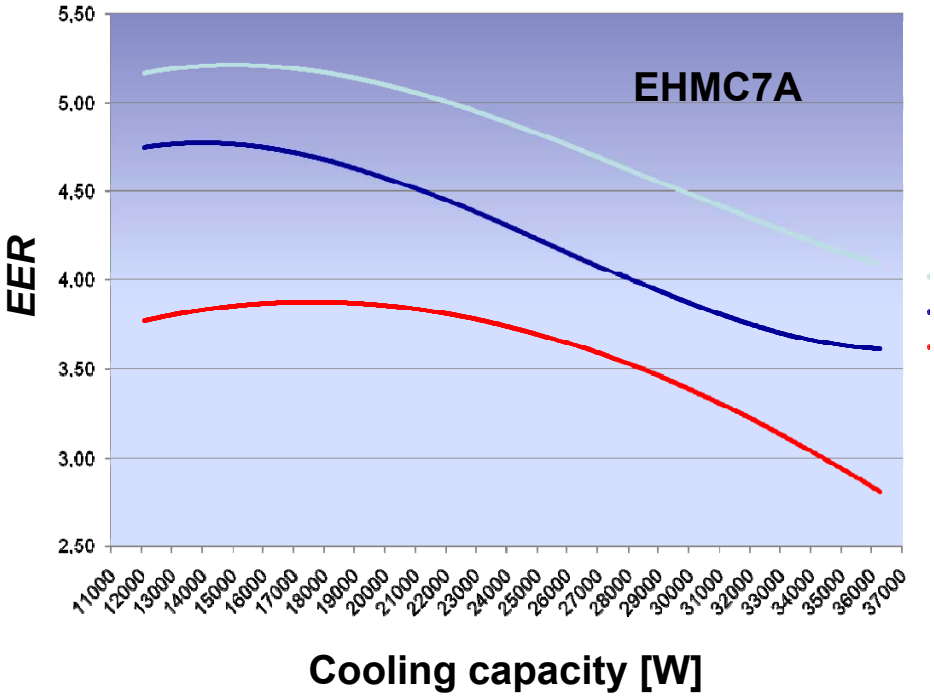
- **Combined driver for compressor and expansion valve**

Infinitely variable cooling capacity and highest efficiency level is achieved by the use of state-of-the-art technology and integration of all components in one control chain:

- **3x radial EC fans**
  - **highest efficiency in all working points**
  - **exponentially decreased power consumption in part load operation**
  - **maintenance-free**
  - **redundancy of air flow in case of one faulty fan**
  - **no inrush current**

Energy Efficiency Ratio (EER):





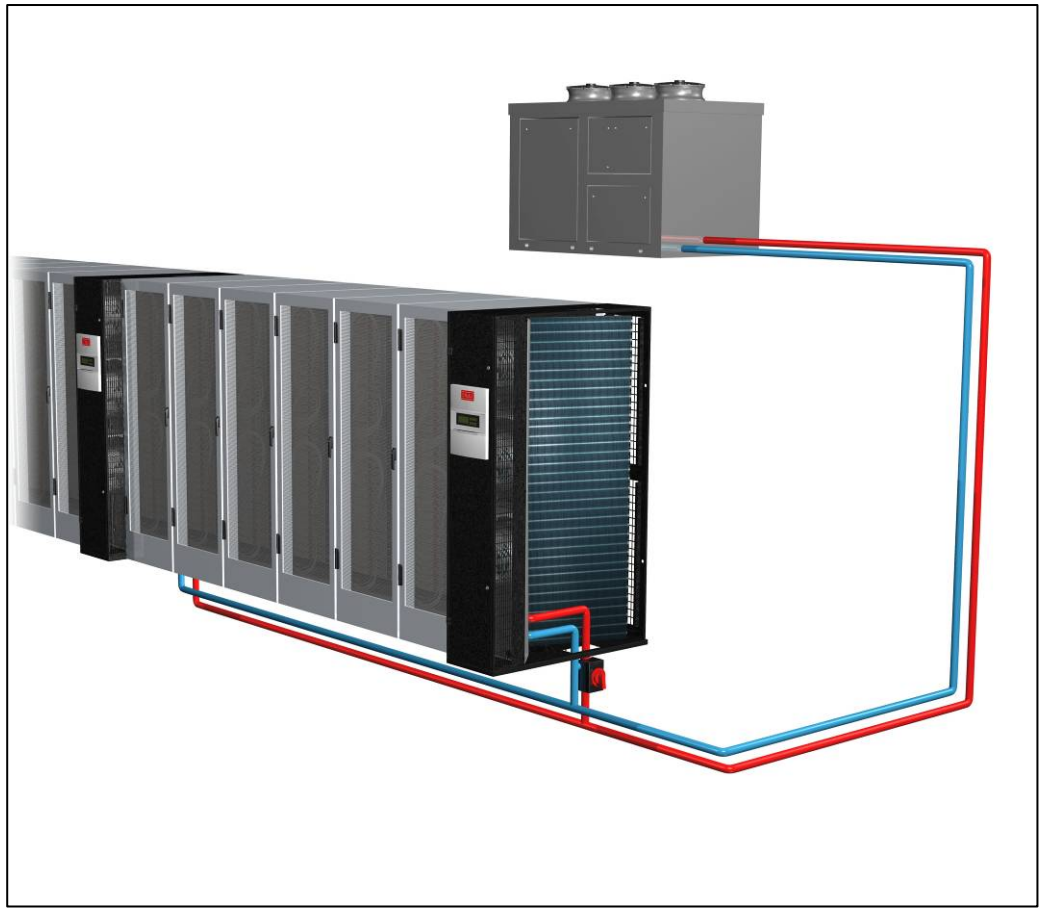
Condensing temperature

- 35°C
- 40°C
- 45°C

@ return air of 35°C / 30%

CyberRow: Cooling systems

2. CW version:

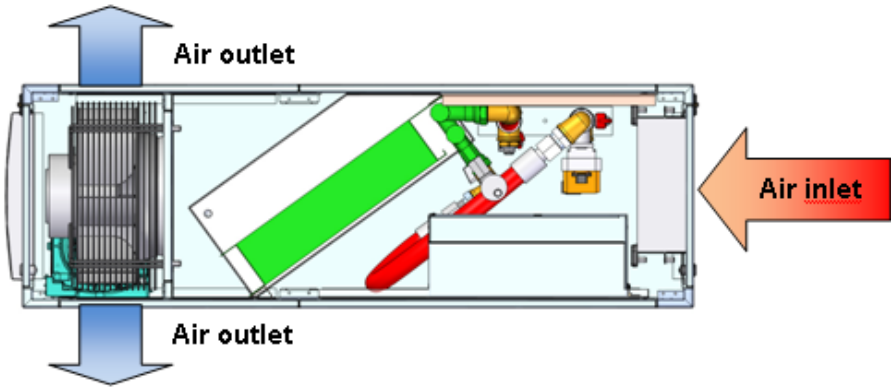


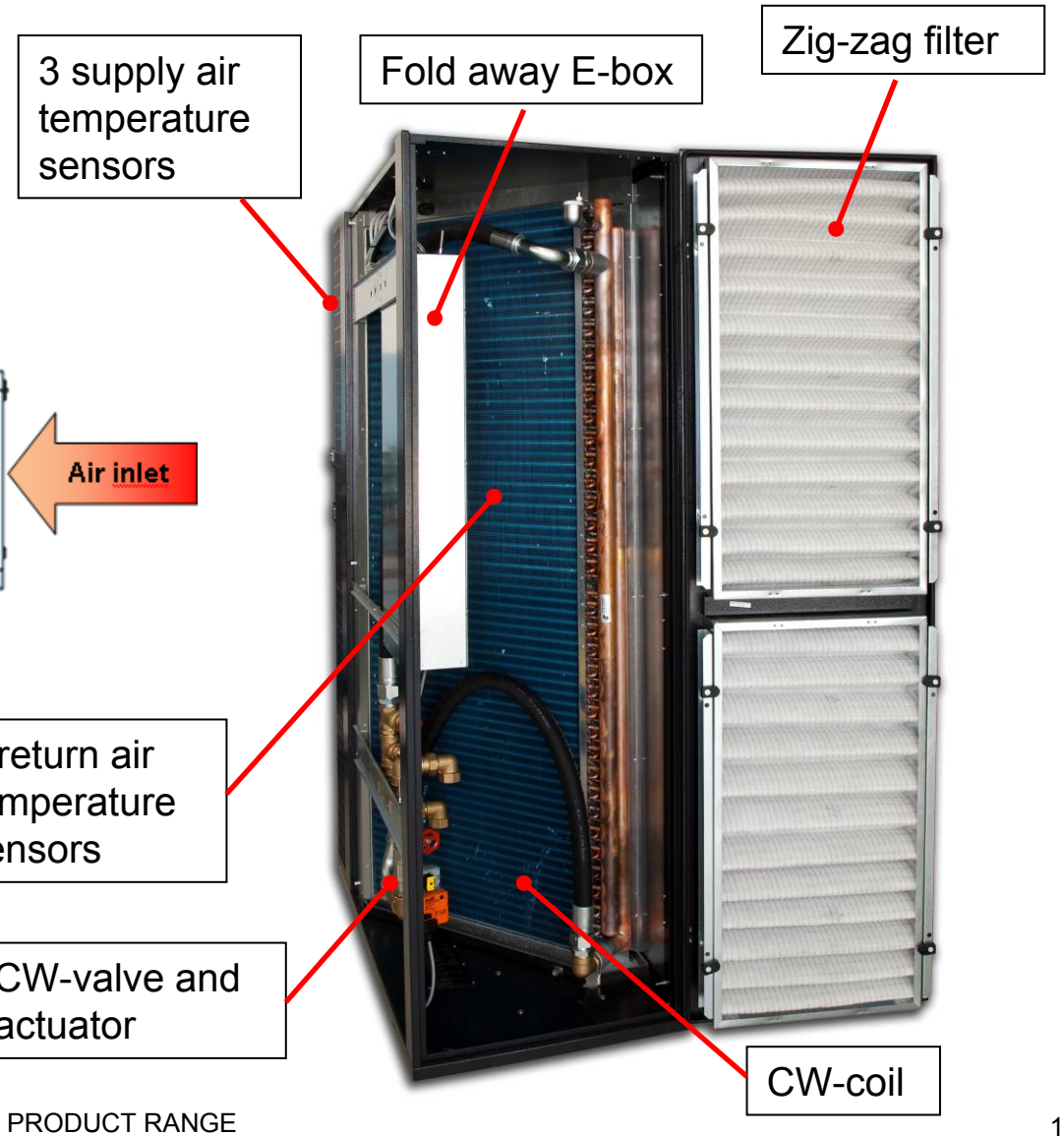
Features and components:

- 3 independently controlled radial EC fans in 3 horizontal zones (6 temperature sensors – 3 for supply air and 3 for return air)
- 2-way or 3-valve proportional controlled CW-valve
- G4 zig-zag filter
- C2020 controller

CyberRow: Cooling systems

2. CW version:



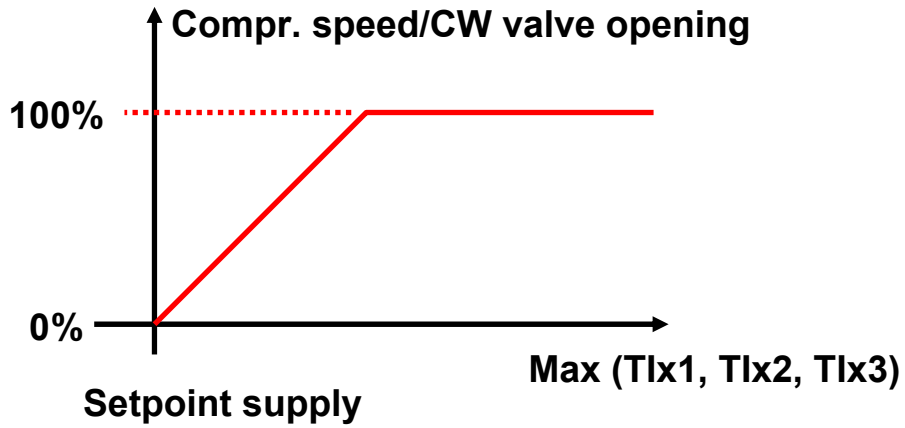


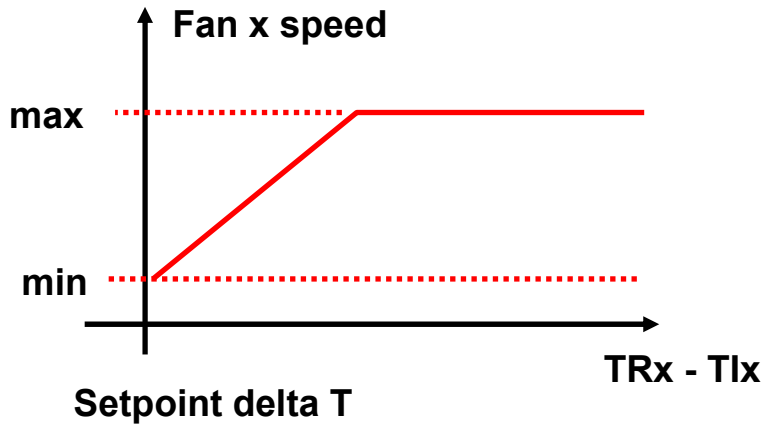
CyberRow: Control features

- **Six temperature probes for a close control of cooling in 3 independent vertical zones.**

  - 3 sensors for the supply air (TIx)
  - 3 sensors for the return air (TRx)

  => Fan speed modulation in dependence of temperature difference between return air and supply air.
  => Compressor speed regulation / Chilled water opening grade in accordance of supply air temperature.

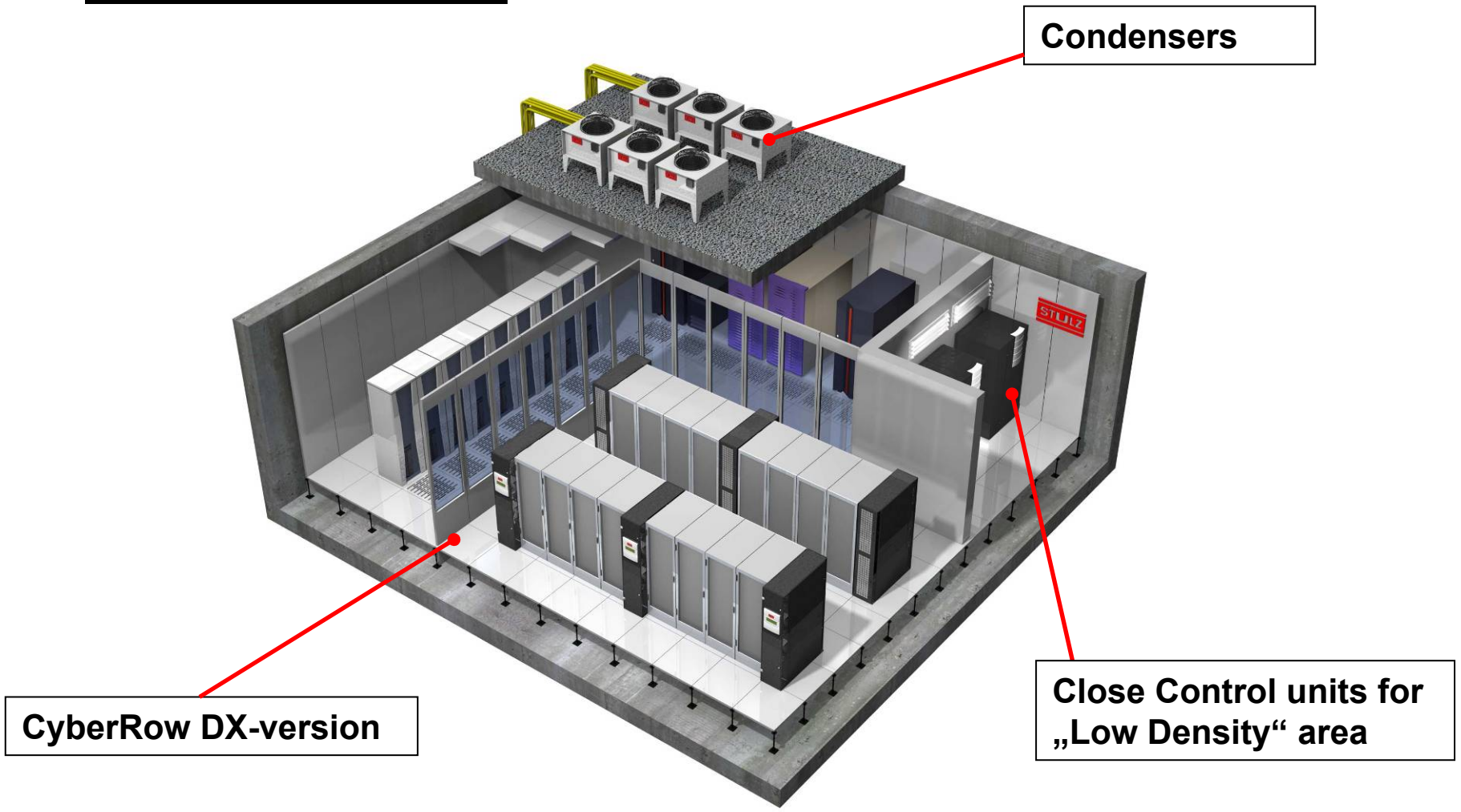




Options

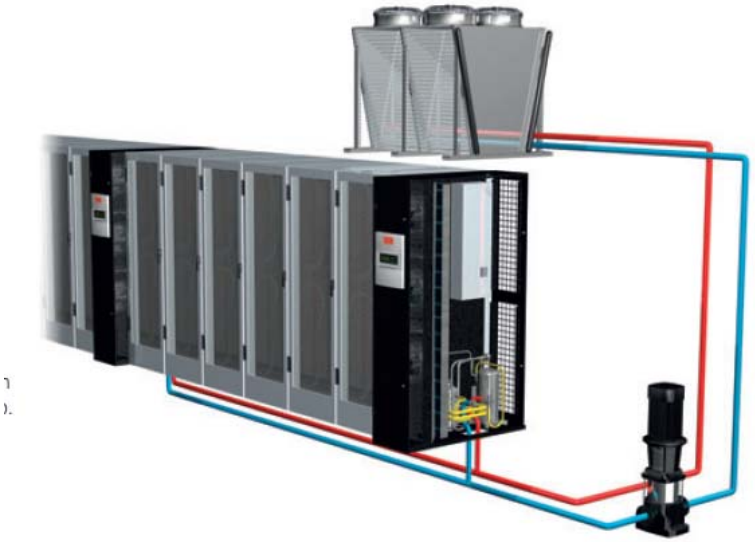
- Air outlet through the front
- Side flow only left or right
- Dual power supply (for CW)
- Water detector (currently only CW)
- EU5 Filters
- Humidifier
- Humidity sensor
- Supply air sensors, to be positioned directly at the rack air intake
- Condensate pump

Installation example:



Coming soon…

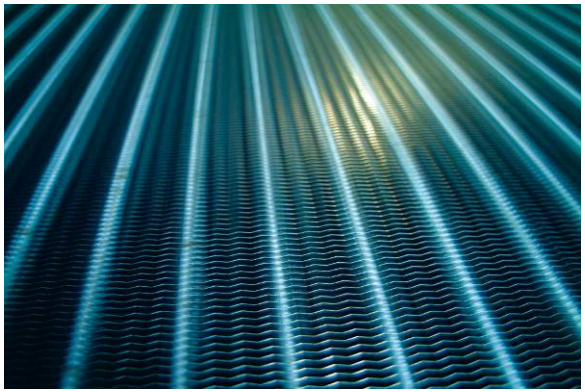
- **Glycolcooled version**
- **GE (DFC) version**



CyberCool

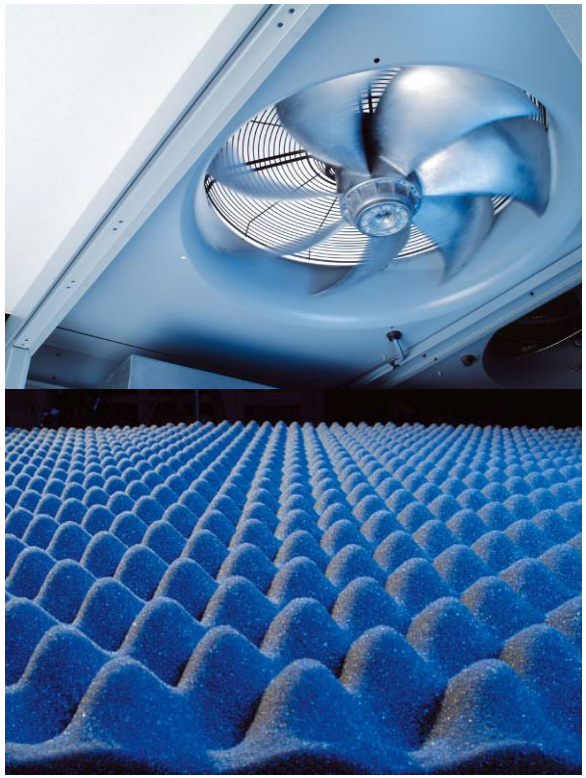
...the new generation of precision chillers

Product range



- 3 housing sizes
- 11 standard units and 9 low noise units
- Cooling capacity range from 36 to 235 kW
- Compact, fully packaged and pre-wired chillers for external installation
- Simple and rapid installation and commissioning
- External temperature from - 10 to + 40°C as standard

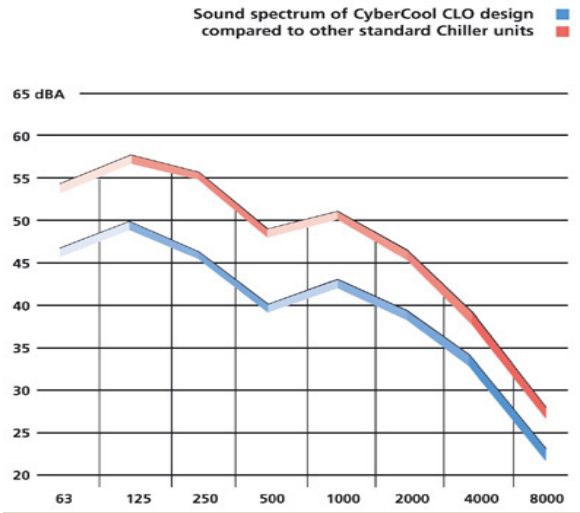
CyberCool - Dimensions

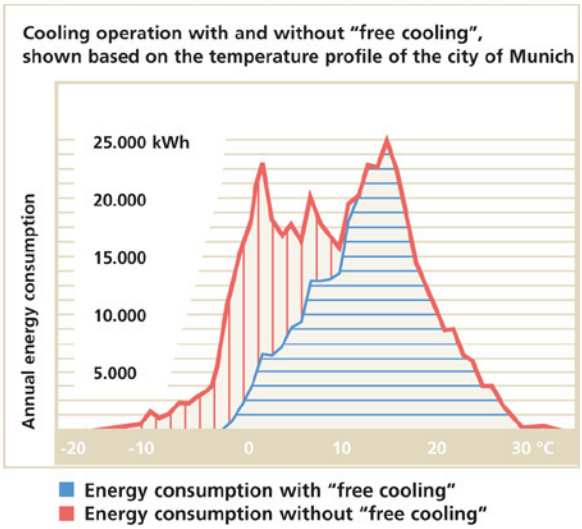


CSO 361/441/ 511/631/781 A	CSO 882/1022/ 1272/1572 A	CSO 1922/ 2352 A
		
W: 2.500 H: 1.945 D: 1.350	W: 3.000 H: 2.125 D: 1.500	W: 4.000 H: 2.125 D: 1.500

CLO 361/ 441/511 A	CLO 631/ 781 A	CLO 882/ 1022 A	CLO 1272/ 1572 A
			
W: 2.500 H: 1.945 D: 1.350	W: 2.800 H: 1.945 D: 1.350	W: 3.000 H: 2.125 D: 1.500	W: 4.000 H: 2.125 D: 1.500

High Lights





- Exceptionally low noise emission
- Low energy consumption
- Full range of options including ”Free Cooling”

High Lights

- C6000 Microprocessor control
- C6000 Connectivity

BMS supplier	Data protocol	Gateways for the STULZ C6000 controller system
STULZ, TeleCompTrol Other suppliers	SDC Modbus RTU	MIB7000
Other suppliers Other suppliers	SNMP HTTP	WIB7000

CyberCool

Indoor Data-Chiller

CyberCool Indoor Data-Chiller

Reliable chilled water supply close to the consumer

Chilled water generation even in a restricted space

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 dry cooler

Indoor CyberCool Datachiller A,G, GE – Features & Functions

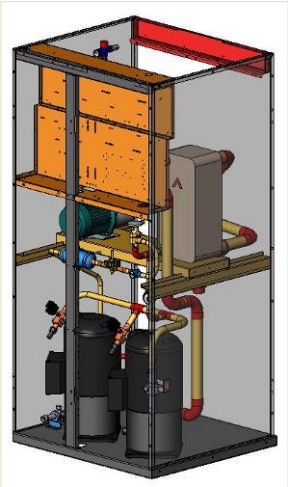
Units in standard door size design:
for easy transport and assembly

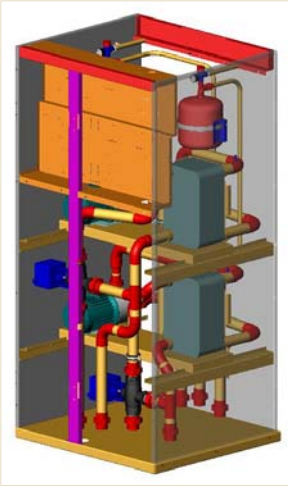
Simple to integrate: Modern design, quiet operation

Independent chilled water supply:
Completely autonomous system with high availability

Minimal indoor chilled water circuit:
(no anti-freeze + low
water volume = reduced risk)

Indoor CyberCool Datachiller A,G, GE – Features & Functions





Scroll-compressors: for reliable continuous operation

Easy maintenance: All service relevant parts front accessible

Demand-oriented control: Electronic hot-gas bypass

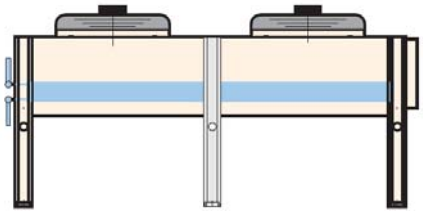
Microprocessor control: with easy integration of BMS systems

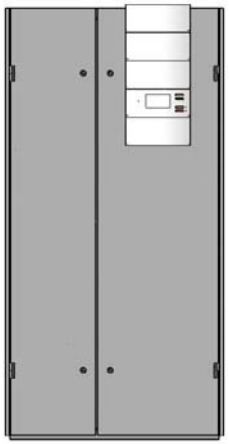
CyberCool Datachiller – Active Cooling

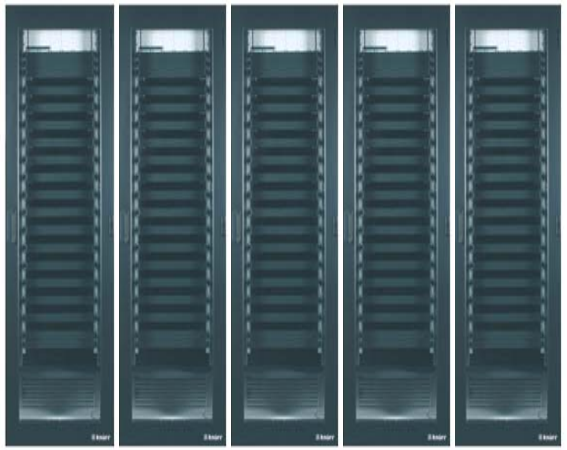
Outdoor unit
- Dry cooler -

CyberCool
Datachiller

Water-cooled
Server Rack





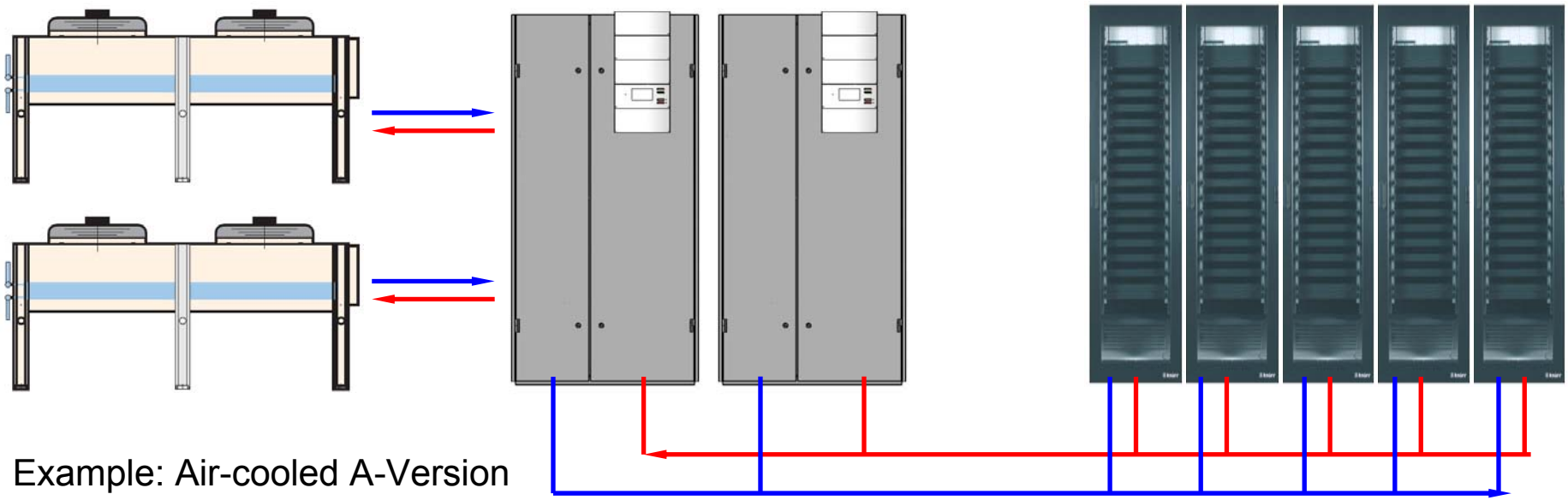


Water/Glycol 30%
39°C / 45°C

Water
12°C / 18°C

Example: water-cooled G-Version

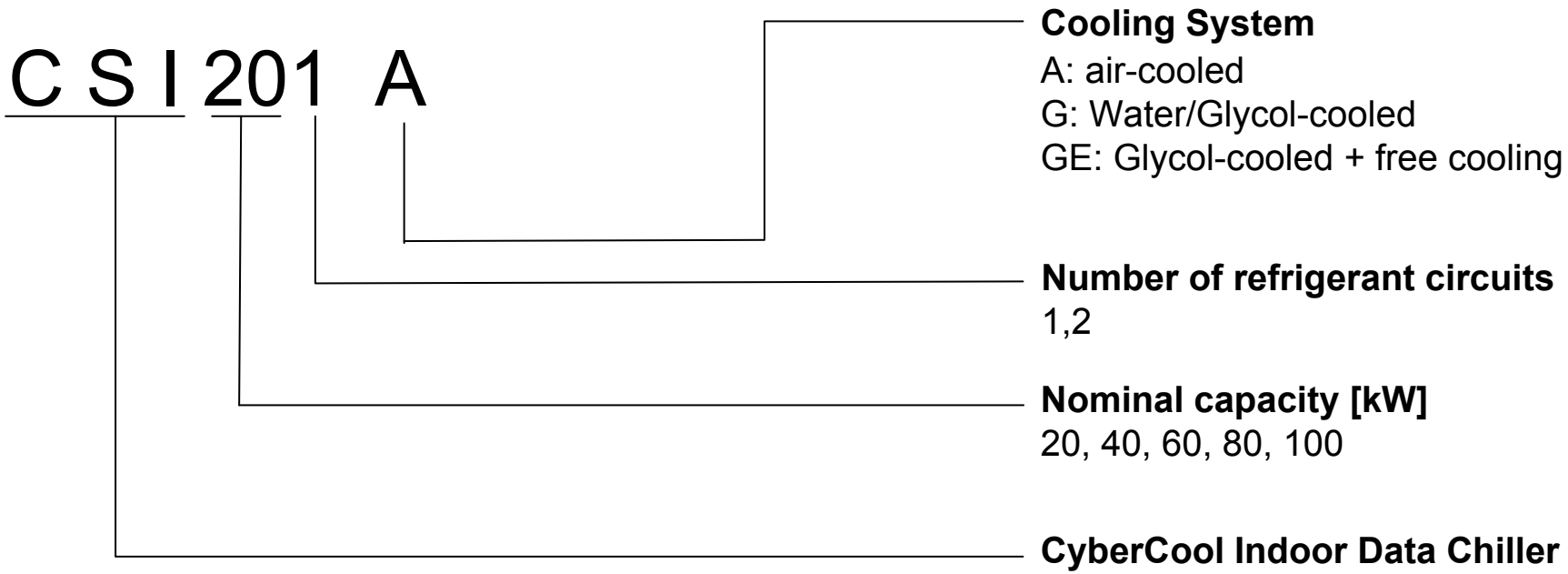
CyberCool Datachiller – redundant design



Example: Air-cooled A-Version

- 100% Redundancy
- Modular Concept
- Redundancy for all active components
- Redundancy for all passive components
- Separation of unit and standby-unit per 2-way-solenoid valve and non return valve

Type Code


C S I 201 A
Cooling System
A: air-cooled
G: Water/Glycol-cooled
GE: Glycol-cooled + free cooling
Number of refrigerant circuits
1,2
Nominal capacity [kW]
20, 40, 60, 80, 100
CyberCool Indoor Data Chiller

CSI xxx A/G

CyberCool Indoor Data-Chiller available as air- or water-cooled version

High capacity in the tightest space

Dimensions
H = 1980 mm
W = 1000 mm
D = 890 mm

CSI xxx A/G

Basic version:

- Stepless capacity control between 40-100% of nominal capacity by electronically controlled hotgas-bypass-valve
- High-pressure centrifugal pump to supply the consumer
- Controller C6000
- Thermostatic expansion valve

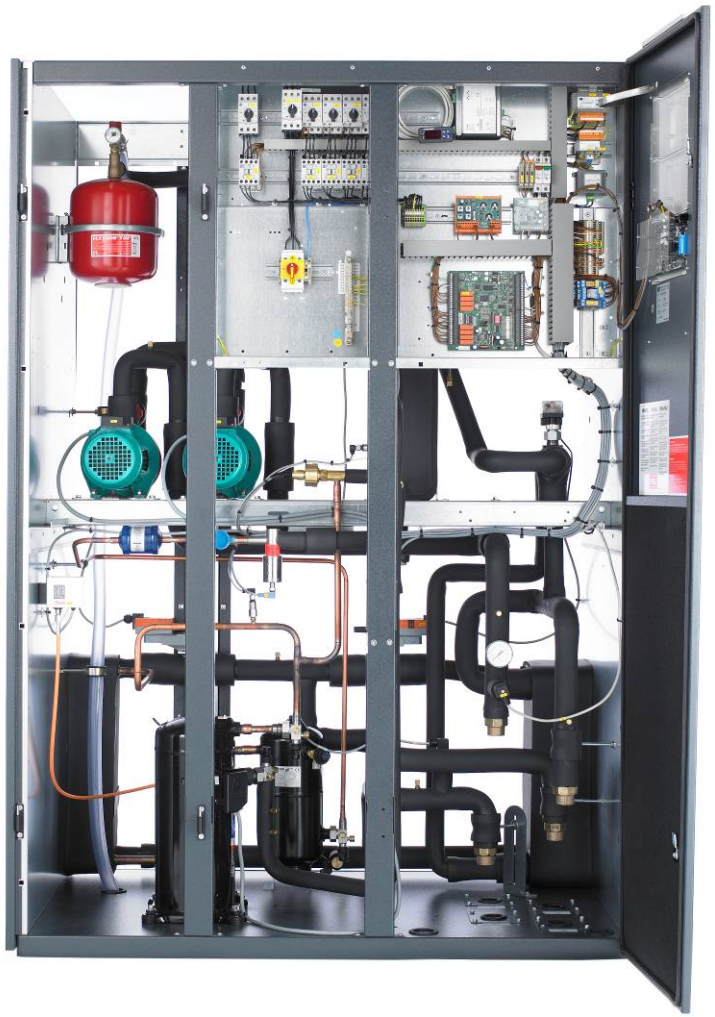
CSI xxx GE

The resource-conserving Freecooling-Indoor Data Chiller

Due to use of Free-Cooling reduced CO_2-emissions and money saving

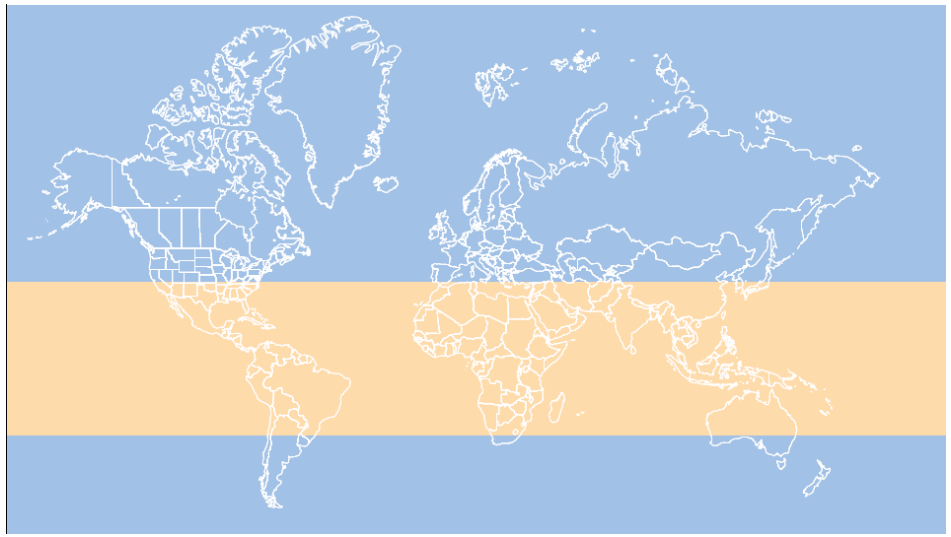
Dimensions
H = 1980 mm
W = 1400 mm
D = 890 mm

GE- Basic version



- Brazed plate heat exchanger for direct cooling
- High-pressure centrifugal pump (2 bar supply pressure)
- Condensation pressure regulation via pressure sensor (2-way G valve)
- Water volume control (2-way GE valve)
- C7000 IO controller for mode control

GE -Modes



In moderate climates north and south of the equatorial zone, the energy-saving advantages of GE systems can be exploited to the full

The C7000 control electronics chooses depending on the outside- and water temperature automatically between the operation modes:

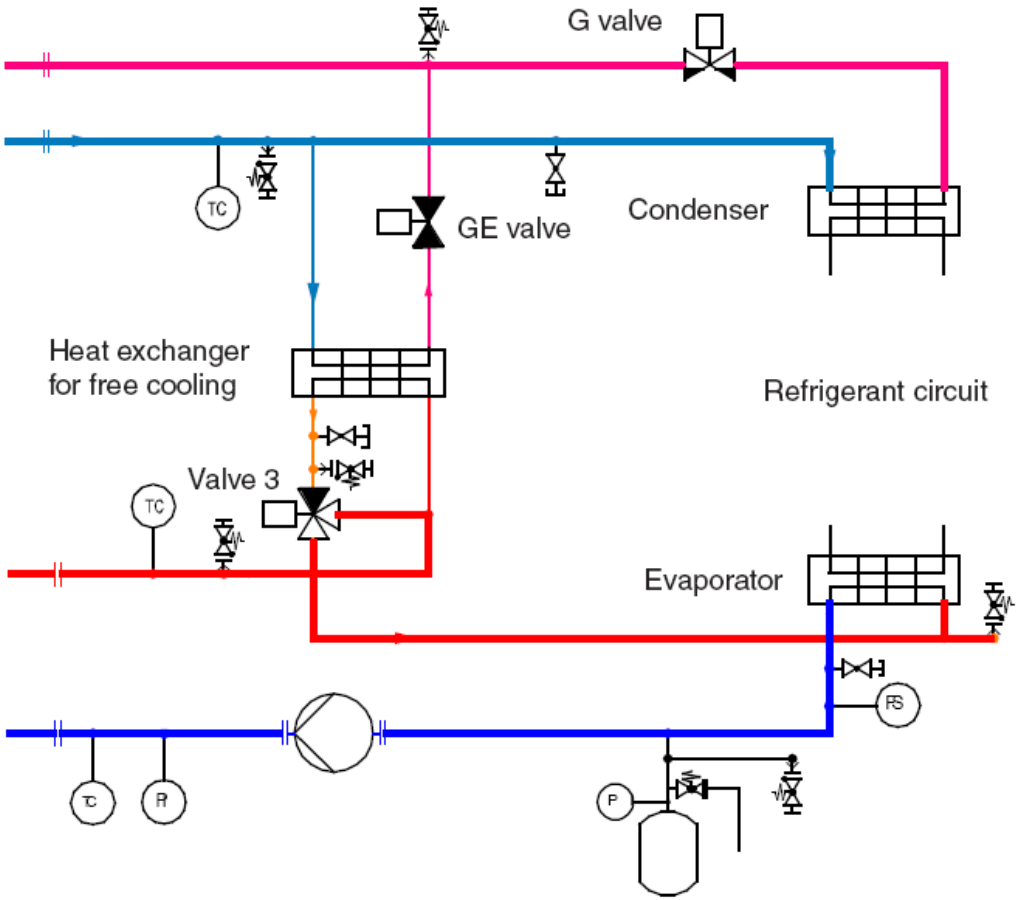
DX - Compressor cooling

MIX – Compressor and free cooling

FC – Free cooling mode

and reduces the costly compressor cooling to a minimum

GE-System / **DX-Mode**



* values depending on selected Dry-cooler

CSI1001GE

Capacity: 94,3 kW

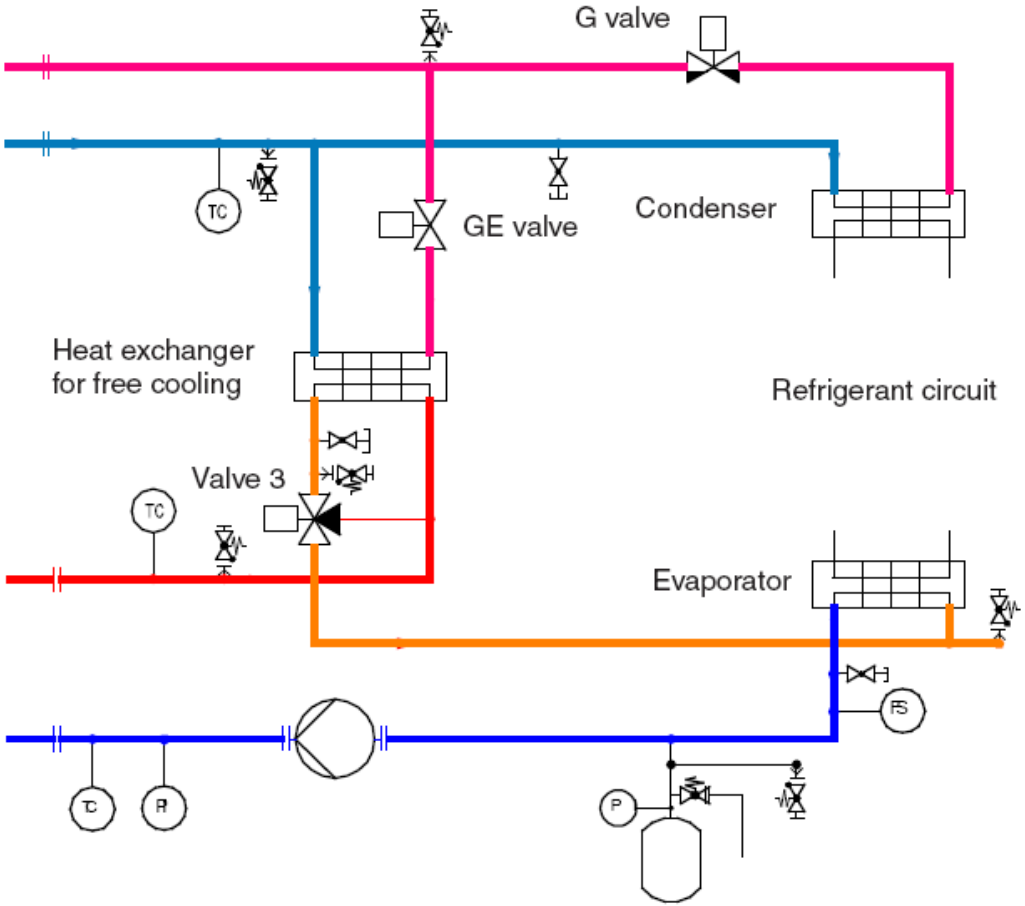
Outside temperature*
40°C - 14°C

Power consumption*
≈ 30 kW – 21 kW
Condensing temperature gliding

Chilled water:
100% Water
Return: 18°C
Supply:12°C

Cooling water:
70% Water 30% Glycol
Return: 39°C
Supply:45°C

GE-System / **MIX-Mode**



CSI1001GE

Capacity: 94,3 kW

Outside temperature*
14°C - 7°C

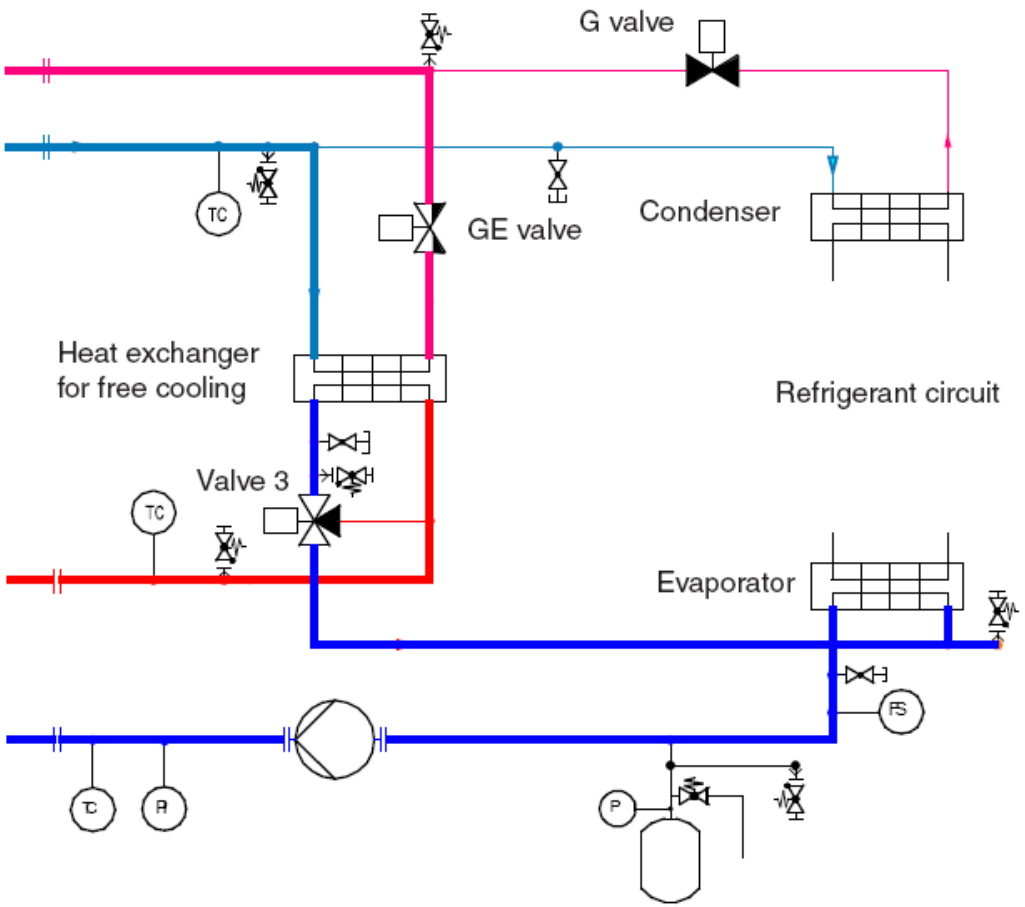
Power consumption*
≈ 21 kW – 13 kW
Condensing temperature gliding

Chilled water:
100% Water
Return: 18°C
Supply:12°C

Cooling water:
70% Water 30% Glycol
Return:10°C
Supply:15°C

* values depending on selected Dry-cooler

GE-System / **FC-Mode**



CSI1001GE

Capacity: 94,3 kW

Outside temperature*

≤ 7°C

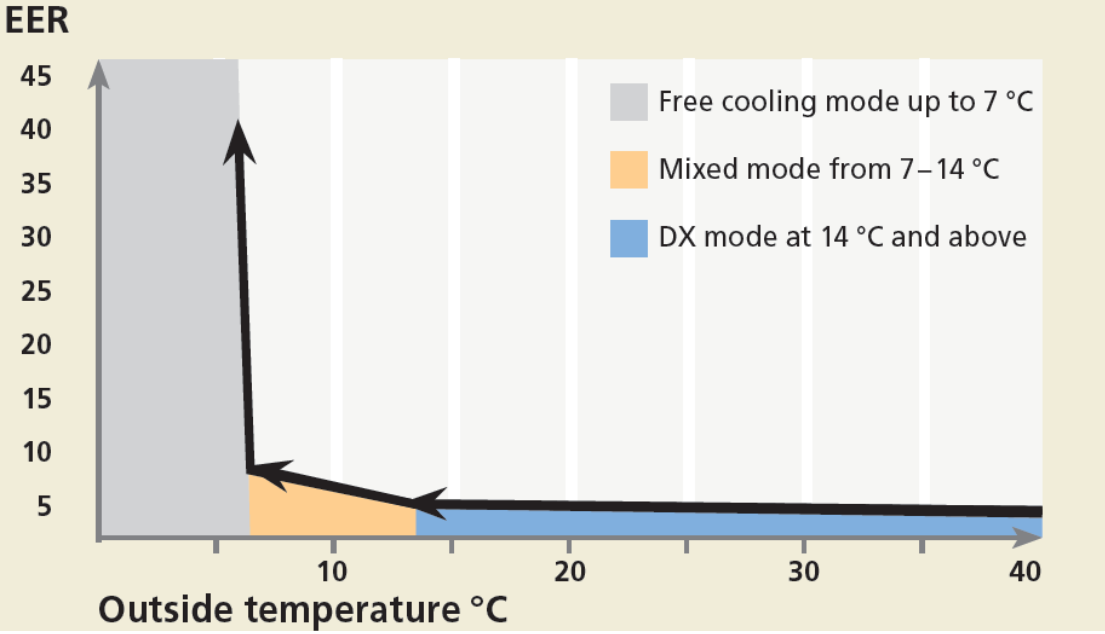
Power consumption*
2,2 kW

Chilled water:
100% Water
Return: 18°C
Supply:12°C

Cooling water:
70% Water 30% Glycol
Return:10°C
Supply:15°C

* values depending on selected Dry-cooler

Increase in EER through free cooling



Temp. [°C]	hours/ year [h/a]	frequency [%]	cumulated frequency [%]
max 29	5	0,06	100,00
28	4	0,05	99,94
27	5	0,06	99,90
26	8	0,09	99,84
25	24	0,27	99,75
24	19	0,22	99,47
23	32	0,37	99,26
22	49	0,56	98,89
21	80	0,91	98,33
20	121	1,38	97,42
19	166	1,89	96,04
18	227	2,59	94,14
17	257	2,93	91,55
16	331	3,78	88,62
15	502	5,73	84,84
14	482	5,50	79,11
13	478	5,46	73,61
12	466	5,32	68,15
11	452	5,16	62,83
10	477	5,45	57,67
9	435	4,97	52,23
8	376	4,29	47,26
7	469	5,35	42,97
6	426	4,86	37,61
5	522	5,96	32,75
4	479	5,47	26,79
3	487	5,56	21,32
2	369	4,21	15,76
1	303	3,46	11,55
0	250	2,85	8,09
-1	130	1,48	5,24
-2	65	0,74	3,76
-3	53	0,61	3,01
-4	33	0,38	2,41
-5	28	0,32	2,03
-6	38	0,43	1,71
-7	32	0,37	1,28
-8	29	0,33	0,91
-9	17	0,19	0,58
-10	19	0,22	0,39
-11	8	0,09	0,17
-12	6	0,07	0,08
-13	1	0,01	0,01
min -14	0	0,00	0,00

Considering the local temperature profile, e.g. Hamburg, “DX-operation” is only required in 1.830 hours (21%) a year!

Options

Refrigerant Circuit

Crankcase heater

Manometer

Winter-Kit (1)

Hotgas-Bypass, electronically controlled (2)

Condensation

Control of condensation pressure by 2-way or 3-way valve (3)

Air-cooled condensers in standard or low noise version (1)

Control of external Pumps (2), (3)

Mechanical

Floor stand

2nd power supply for emergency operation

(1) for A-units ; (2) for GE units (3) for G-units

Options

Chilled water circuit

Piping / Evaporator isolated
Water temperature sensor
Pressure gauge
2-way-solenoid valve
balancing valve
Non return valve
Shut-off valve
High pressure pump (3bar instead of 2 bar flow pressure)
Standby-Pump
Strainer
Venting valve

Control

C7000 Advanced Userinterface and Gateway (2)

(1) for A-units ; (2) for GE units (3) for G-units

CyberCool

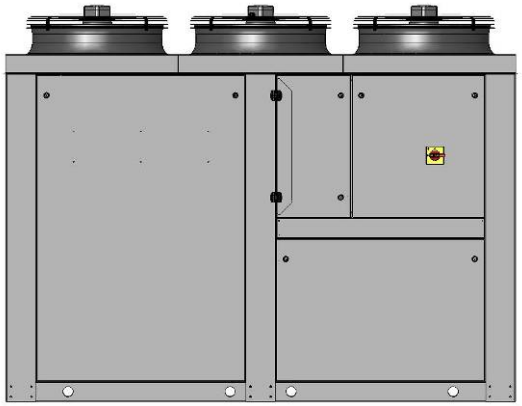
Pump&Transfer

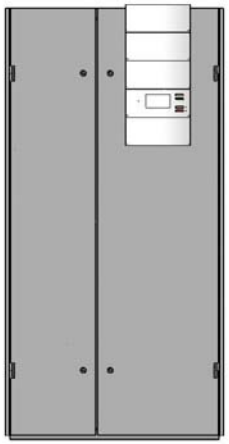
CyberCool Pump&Transfer – Passive Cooling

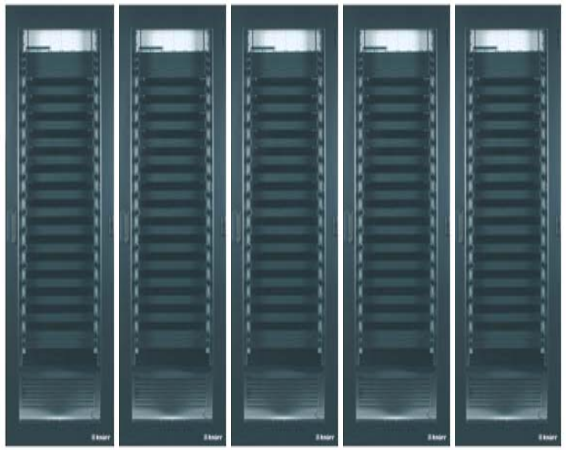
Outdoor unit
- Chiller -

CyberCool
Pump&Transfer

watercooled Rack



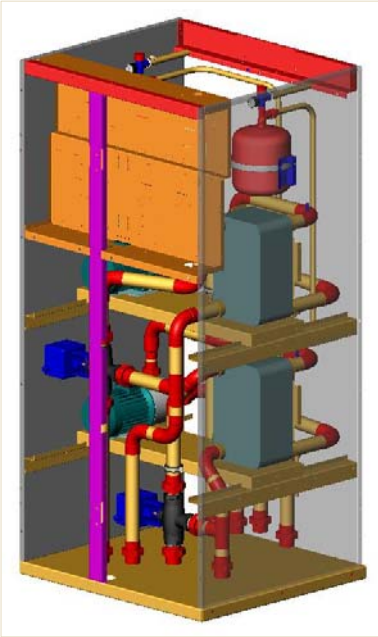




Water/Glycol 30%
7°C / 12°C

Water
12°C / 18°C

CyberCool Pump&Transfer – Technical data



	CPI 20	CPI 40	CPI 60	CPI 80	CPI 100
Cooling Capacity [kW]	20	40	60	80	100
Available head pressure [m]	24	24	22	24	25
Dimensions [mm]	Height: 1.980 Width: 1.000 Depth: 890				
Conditions	Primary circuit: Water temperature: 7°C / 12°C Secondary circuit: water temperature: 18°C / 12°C				

CyberCool

Pump Station

pump cabinet for indoor installation

Supplying air conditioning systems with up to 50 m³ cold water per hour

Pump Station CPP xx CW

Standard equipment:

- Two speed controlled centrifugal pumps
- Temperature display
- Pressure display
- Pressure transmitter for regulation
- Flow monitor
- Expansion vessel

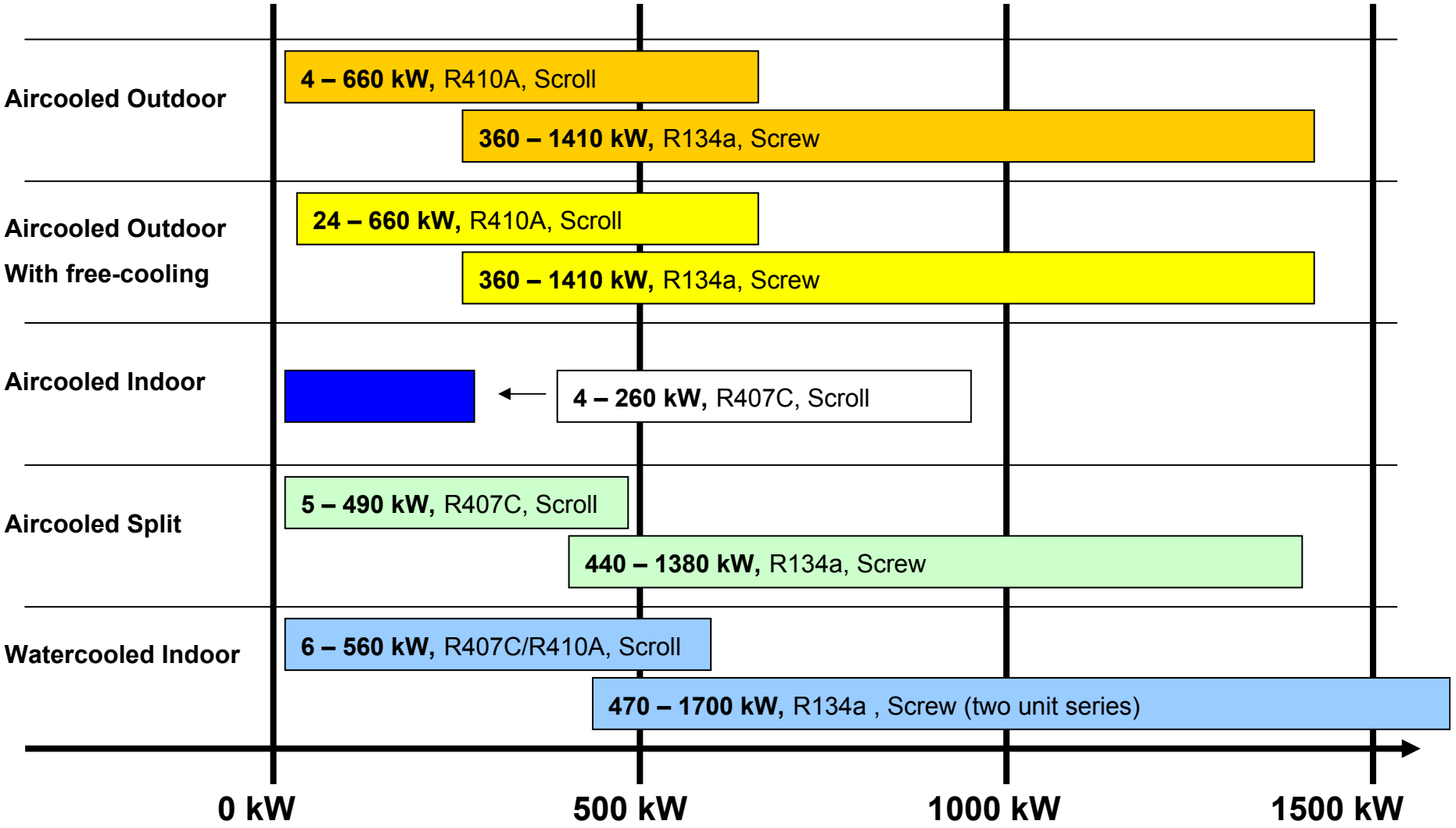
Optional extras:

- Graphical control unit C7000 Advanced
- Operating lights
- Raised floor stand

CyberCool XT

...Chillers for every application

Product range



CyberCool XT – Aircooled Outdor

- Cooling capacity from 4 kW up to 1.410 kW
- Compact, fully packages and pre-wired chillers for external installation
- Simple and rapid installation and commissioning
- 3 different unit types (CEO, CFO and CGO)
- Various sizes and noise classes – fits for every application
- Partial load operation due to multi-compressor philosophy
- Free-cooling and EC-fans available as an option in most units
- External temperature from -10°C to +45°C as standard

CyberCool XT – Aircooled Indoor

- Cooling capacity from 4 kW up to 260 kW
- Compact, fully packaged and pre-wired chillers for indoor installation
- Facility for connection to ducts
- 3 different unit types (CEI, CHI and CFI)
- Up to 150 Pa available external statical pressure
- Fan speed controller as an option
- Two different supply air directions possible

CyberCool XT – Aircooled Split

- Cooling capacity range from 5 kW up to 1.380 kW
- Compact and pre-wired aircooled split chiller for indoor installation
- To be connected to aircooled external condenser
- 3 different unit types (CHS, CFS and CGS)
- Ideal for sound-sensitive applications and resolving problems concerning space outside the building
- Partial load operation due to multi-compressor philosophy
- Different pump applications possible in most units

CyberCool XT – Watercooled Indoor

- Cooling capacity from 5 kW up to 1.700 kW
- Compact and pre-wired watercooled chillers for indoor installation
- To be connected to a dry-cooler or cooling tower
- Ideal for sound-sensitive applications and/or resolving problems concerning space outside the building
- 5 different unit types (CEI, CHI, CFI and 2x CGI)
- Pumps for user and source side available in most units
- Different noise classes available

Telecom Line

Telecom Line

- Professional A/C solutions for Shelter, BTS & switch cabinets
- Certified and economical to run
- Designed for 24/7 operation, 365 p.a.
- The STULZ's network guarantees fast, trouble-free service.

A/C‘s for Shelter

Tel-Air-2

... a/c-units for indoor installation

Wall-Air

... a/c-units for outdoor installation

Split-Air Low Noise

…the space and energysaving split-unit

Free-Air

...freecooling for existing sites

Tel-Air-2

... air conditions for indoor installation

Installation example

Tel-Air-2 units are…

- designed for installation in telecommunications containers and equipment rooms
- factory tested, filled with refrigerant and ready to start on day 1

because of the indoor installation

- protected against environmental influences and vandalism
- noise is kept to a minimum

Tel-Air Upflow

Tel-Air Downflow (TLD)

Tel-Air Displacement (TLF)
The unit pictured here is equipped with the optional blow-out diffuser.

Tel-Air-2 common features

Power supply
400V/ 3Ph+N/ 50Hz and 48VDC

5 Operating modes
DX Cooling
Free-cooling
Mix-Mode
Emergency ventilation via 48VDC
Heating (optional)

Controller
C2020 IO-Controller
Keypad (optional)

Tel-Air-2 common features

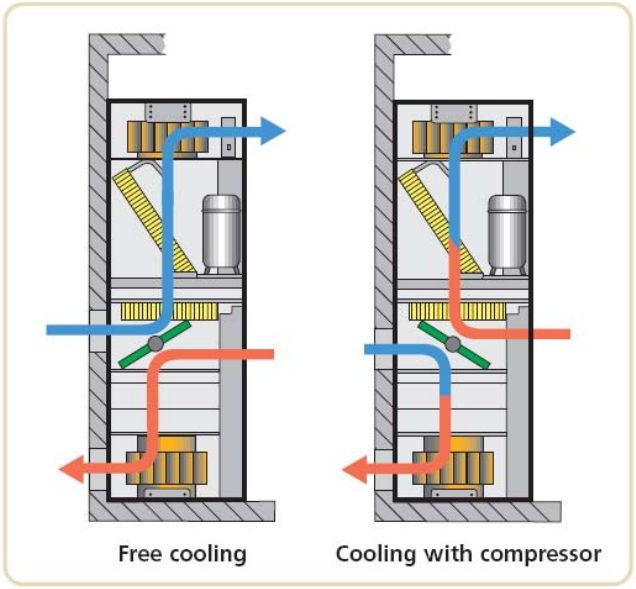
Standard

- Condenser Fan speed control
- Airflow and clogged filter signal
- In- and external temperature sensor

Options

- Humidity sensor
- Compressor soft start
- Fast plug connectors for site power supply
- Air grilles
- High temperature refrigerant R134a
- BMS-Gateways MIB and WIB7000
- CompTrol SMS
- ……

Tel-Air-2 Upflow



Tel-Air-2 Upflow

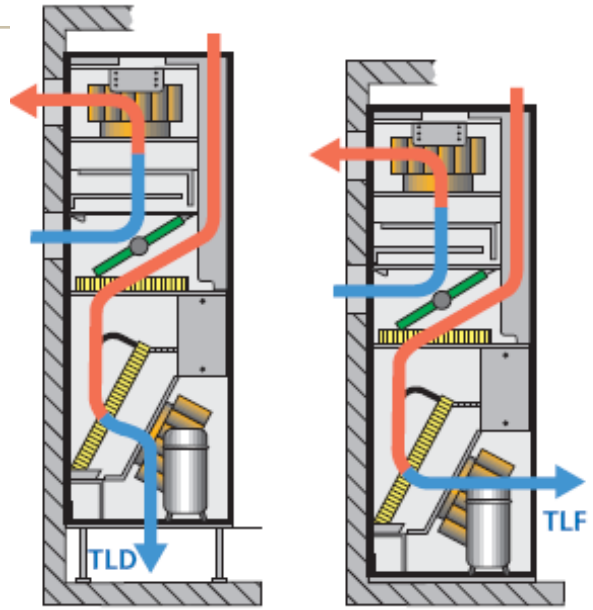
		TLU40	TLU60	TLU80	TLU90	TLUA2	TLUA4
Total cooling capacity [1]	kW	4.1[4]	5.4	7.4	8.4	10	11.3
Sensible cooling capacity [1]	kW	4.1[4]	5.4	7.4	8.4	10	11.3
Air flow	m³/h	1000	1500	2000	2200	3000	3200
Air flow with free cooling	m³/h	800	1200	1600	1800	2400	2600
Total electrical maintained heat max.[3]	kW	0	0	0	0	0	0
Sound level (interior/exterior)[1/2]	dBA	64/57	64/58	64/63	67/65	67/66	67/67
Height	mm	1990	1990	1990	1990	1990	1990
Width	mm	600	600	900	900	900	900
Depth	mm	650	650	700	700	700	700
Weight	kg	170	190	250	260	270	280
Supply voltage	V/ph/Hz	230/1/50 / 400/3+N/50					

[1] For inside temperature 25 °C / rel. humidity 40 % / outside temperature 35 °C [2] At 2 m clear distance [3] Optional [4] Total/sensible cooling capacity at 230 V 3.8/3.8 kW
Subject to change.

Tel-Air-2 Downflow and Displacement

Tel-Air Downflow (TLD)

Tel-Air Displacement (TLF)

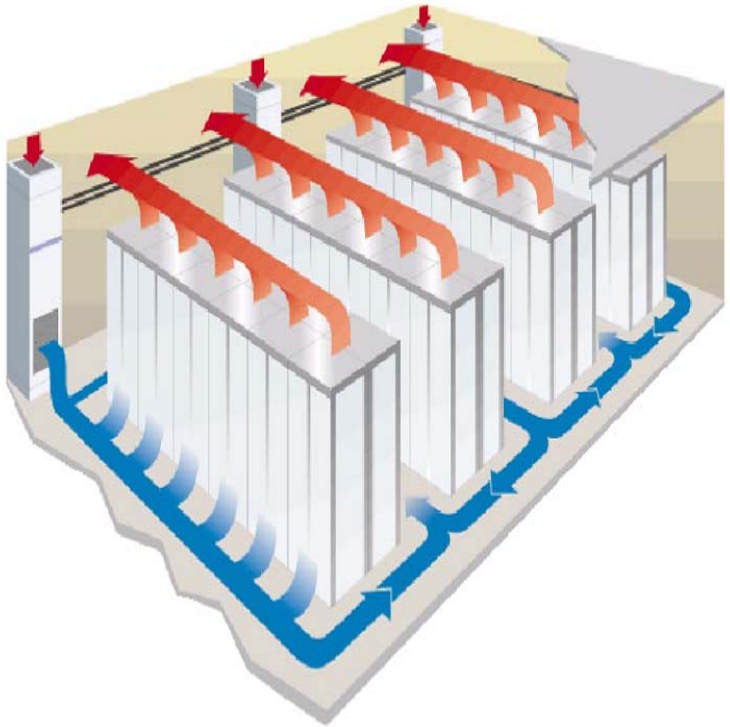


Tel-Air-2 Displacement and Downflow

		TLF/TLD40	TLF/TLD60	TLF/TLD80	TLF/TLD90	TLF/TLDA2	TLF/TLDA4
Total cooling capacity [1]	kW	4.5 [5]	6	8.3	9.2	11	12.5
Sensible cooling capacity [1]	kW	4.5 [5]	6	8.3	9.2	11	12.5
Air flow	m³/h	1000	1500	2000	2200	3000	3200
Air flow with free cooling	m³/h	800	1200	1600	1800	2400	2600
Total electrical maintained heat max.[2]	kW	0	0	0	0	0	0
Sound level (interior/exterior)[3]	dBA	64/57	64/58	64/63	67/65	67/66	67/67
Height	mm	1990	1990	1990	1990	1990	1990
Width	mm	600	600	900	900	900	900
Depth	mm	650	650	700	700	700	700
Weight	kg	170	190	250	260	270	280
Supply voltage [4]	V/Ph/Hz	230/1/50 / 400/3/50					

[1] Conditions: Inside temperature 30 °C / rel. humidity 30 % / outside temperature 35 °C [2] Optional
[3] 2 m clear distance [4] Other voltages on request [5] Total/sensible cooling capacity at 230 V 4.2/4.2 kW

Tel-Air-2 Displacement principle

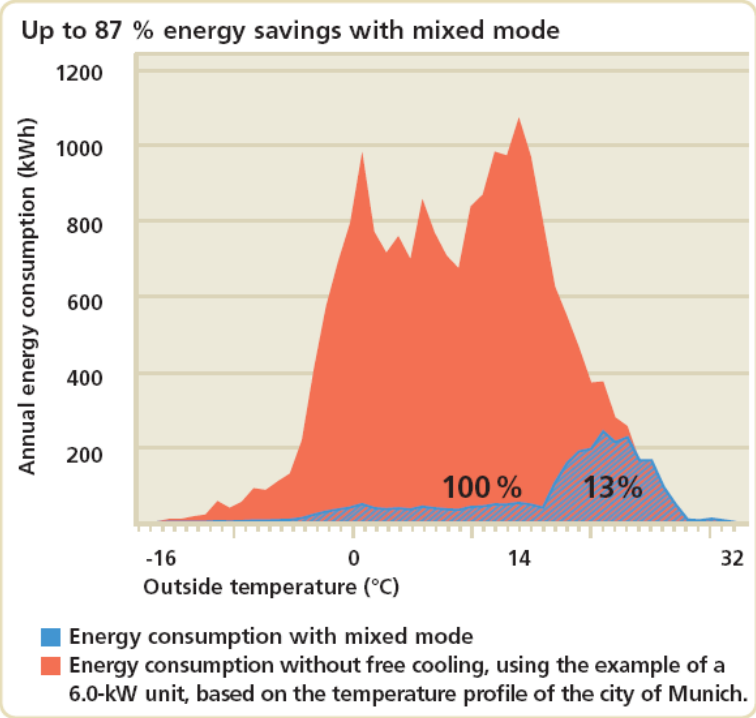


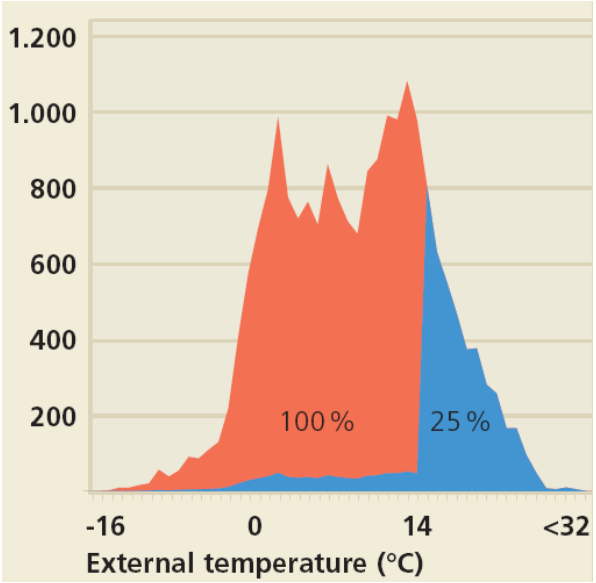
- Cool air is supplied at floor level
- No need of raised floor systems
- low velocity (1 m/s or less) prevents hot and cold air from mixing
- Displacement units draw in the air at 30°C instead of at 25°C
- Longer Freecooling time because of higher T(return)

Result: The displacement principle makes the units to work more quietly more efficiently and increase the life time of DX components

Tel-Air-2/ Mix-Mode = extended Free-cooling

If freecooling stops because the ambient temperature has exceeded a given limit, the unit switch into Mix-Mode (= simultaneous use of free- and DX- cooling). Thereby runtimes of the compressor are kept to a minimum.



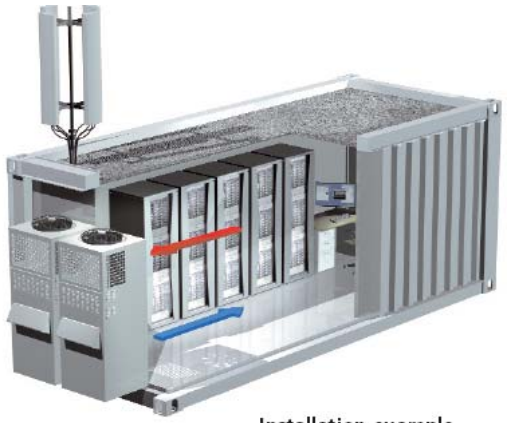


Only Free-cooling w.o. mix mode

Result: Mix Mode can cut energy costs by a further 10 %.

Wall-Air

... air conditions for outdoor installation



Installation example

Wall-Air units are…

- compact and weatherproofed A/C units
- designed for mounting on an outside wall, leaving room for communications technology when space is at a premium
- factory tested, filled with refrigerant and ready to start on day 1

Wall-Air: Versions

Wall-Air Upflow

Wall-Air Displacement

Wall-Air common features

Power supply
400V/ 3Ph+N/ 50Hz and 48VDC*

5 Operating modes
DX Cooling
Free-cooling*
Mix-Mode*
Emergency ventilation via 48VDC*
Heating (optional)

Controller*
C2020 IO-Controller
Keypad (optional)

* Only Type 1

Wall-Air common features

Standard*

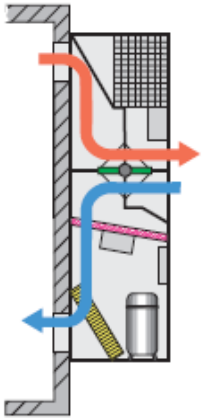
- Condenser Fan speed control
- Airflow and clogged filter signal
- In- and external temperature sensor

Options

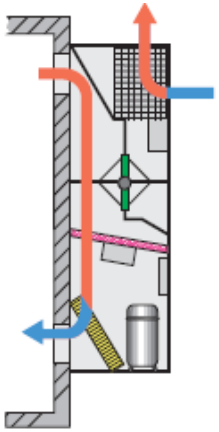
- Humidity sensor
- Compressor soft start
- Fast plug connectors for site power supply
- Air grilles
- High temperature refrigerant R134a
- BMS-Gateways MIB and WIB7000
- CompTrol SMS
- ……

* Only Type 1

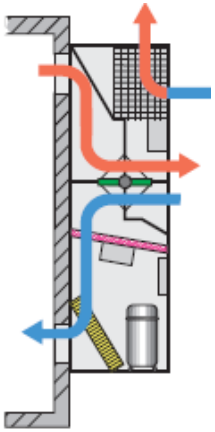
Wall-Air Displacement



Free cooling



DX-Mode



Mix-Mode

Advantages of displacement

- more quietly
- more efficiently
- longer life time of DX components

Wall-Air Displacement

		WLD40	WLD60	WLD80	WLD90	WLD A2	WLD A4
Total cooling capacity [1]	kW	4.3	6	8	10	12	14
Sensitive cooling capacity [1]	kW	4.3	6	8	10	12	14
Air flow	m³/h	1100	1400	2300	2700	3200	3600
Air flow with free cooling	m³/h	900	1100	1800	2200	2600	2900
Total electrical maintained heat max. [2]	kW	1.5	1.5	4.5	4.5	4.5	4.5
Sound level (interior/exterior)[3]	dBA	48/50	49/50	57/51	59/53	62/54	63/54
Height	mm	2090	2090	2260	2260	2260	2260
Width	mm	880	880	990	990	990	990
Depth	mm	660	660	850	850	850	850
Weight	kg	170	210	230	246	248	251
Supply voltage [4]	V/Ph/Hz			230/1/50 / 400/3/50			

[1] Conditions: Inside temperature 30 °C / rel. humidity 30 % / outside temperature 35 °C [2] Optional
[3] 2 m clear distance [4] Other voltages on request

Wall-Air Upflow

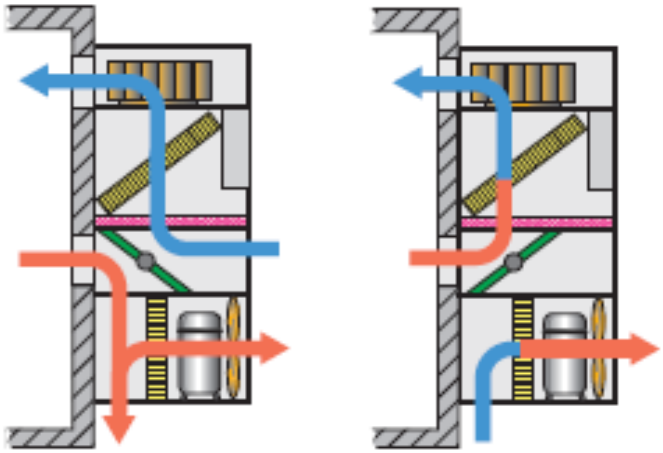
Type1:

- Power supply: 400/3+N/50 and 48VDC
- C2020 IO-Controller
- Freecooling damper, proportional controlled
- Emergency ventilation 48VDC
- Internal and external temperature sensor
- Condenser fan speed control
- Acoustic insulation

Type 2:

- Airflow and clogged filter signal
- Power supply: 400/3+N/50
- Thermostat, mechanical
- On/Off Condenser fan control
- Compressor start delay

Wall-Air Upflow



Free cooling

Cooling with compressor

Wall-Air

CVS		40	50	60	80	90	A2	A4	A7
Cooling capacity total/sensible (50 Hz)[1]	kW	3.8/3.8	5.2/5.2	6.4/5.7	8.4/7.4	9.3/8.6	11.9/11.9	14.0/14.0	16.8/14.7
Cooling capacity total/sensible (60 Hz)[1]	kW	4.1/3.9	5.9/5.9	7.2/6.1	9.3/7.9	10.9/9.4	13.2/12.3	16.2/14.7	18.4/15.5
Air flow	m³/h	1,000	1,000	1,500	2,100	2,500	2,850	2,850	3,150
Heater[3]	kW	1.5	1.5	1.5	4.5	4.5	6	6	6
Noise level (outside/inside)[1)2)]	dBA	54/63	54/63	55/63	58/69	58/66	62/71	69/71	69/71
Height	mm	1,500	1,500	1,500	1,725	1,725	1,910	1,910	1,910
Width	mm	880	880	880	960	960	1,170	1,170	1,170
Depth	mm	490	490	490	565	565	600	600	600
Weight	kg	139	143	146	175	185	230	237	240
Voltage	V/ph/Hz	400/3+N/50; 440/3+N/60; other voltages on request (also single phase)							

[1] Internal temperature 25 °C – 40 % RH – external temperature 35 °C [2] At 2 meters distance, free field [3] Optional
Technical data subject to change without notice.

Performances TÜV approved

PRÜFBERICHT
TESTREPORT
Nr./No. LK65

Prüfstelle / Testing station: TÜV Süd Industrie Service, Laboratorium für Kältetechnik

Prüfgegenstand / Test unit: Kompakt-Luftkonditionierer / Packaged Air Conditioner, CV660

Auftraggeber / Ordener: STULZ Spa, Via Torricelli 3, 37067 Valeggio Sul Mincio (VR), Italy

Auftragsumfang / Scope of the order: Prüfung in Anlehnung an EN 14511 (Juli 2004), Kalorimeter-Verfahren / Test following to EN 14511 (July 2004), Calorimeter method

Eingangsdatum des Prüfgegenstandes / Date of delivery: 04.12.2006

Prüfzeitraum / Period of testing: 04.12.06 - 08.12.06

Prüfort / Place of test: München

Prüfgrundlage / Standard of test: EN 14511

The testing results exclusively apply to the tested unit. This report includes 13 pages and shall be published in full wording. Publishing for marketing purposes shall only be allowed upon written approval by TÜV Süd Industrie Service.

Seite 13 von 13

Kühlleistung in Anlehnung an EN 15411
Cooling-capacity following EN 15411

Prüfbedingung / Test-condition	A15 / A30	
Gesamte Kühlleistung P_C / Total cooling capacity	5496	W
Wirkleistungsaufnahme / Power input	174	W
Leistungszahl (EER) / Energy efficiency ratio	31,59	

Weitere Prüfungen:
Further tests:

Der Kaltstart mit einer Innentemperatur von 30°C und einer Außentemperaturen von - 20°C war erfolgreich.
The cold start with the inside temperature of 30°C and the outside temperature of -20°C was successful.

Der Warmstart mit einer Innentemperatur von 55°C und einer Außentemperaturen von 50°C war erfolgreich.
The warm start with the inside temperature of 55°C and the outside temperature of 50°C was successful.

Kältetechnik: i.A. Peter Schnepf

Der Sachverständige für Kältetechnik: Martin Schmid

Das unterschriebene Original wird bei der Prüfstelle aufbewahrt.
The signed original is stored at the test station.

Wall-Air WLD performances **fully approved**

by independent laboratory TUV Munich

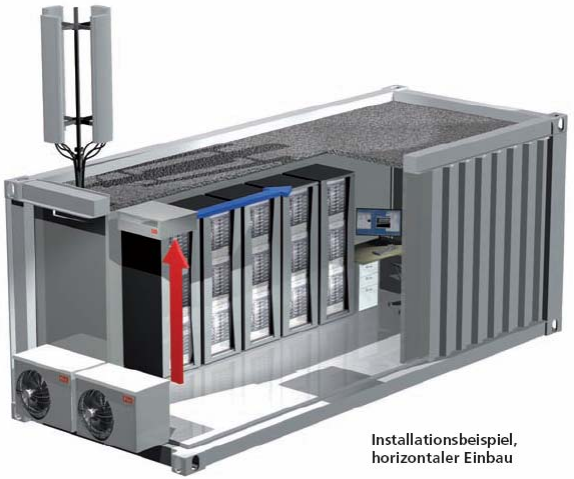
(Germany)

1. Cooling capacity
2. Power input
3. Airflow
4. Freecooling capacity
5. Mix-Mode
6. Noise level
7. Hot start 50°C outdoor 55°C indoor
8. Cold start -20°C outdoor 30°C indoor (compressor running)

Mehr Sicherheit.
Mehr Wert.

Split-Air LN

...the space and energysaving version



Installationsbeispiel, horizontaler Einbau

Split-Air LN units

- Space and energysaving split unit for reliable cooling
- Free cooling and Mix mode

Indoor unit
Evaporator unit

- Indoor unit suitable for vertically or horizontally installation
- Low noise level makes the outdoor unit suitable for use in residential areas
- factory tested, and ready to start on day 1

Outdoor unit
Compressor-condenser unit

Split-Air LN - Features

Standard

- Condenser Fan speed control
- Airflow and clogged filter signal
- In- and external temperature sensor

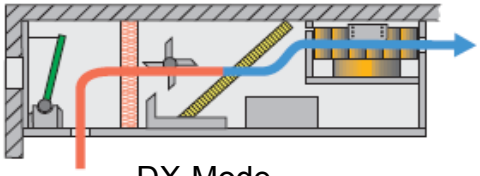
Indoor unit
Evaporator unit

Options

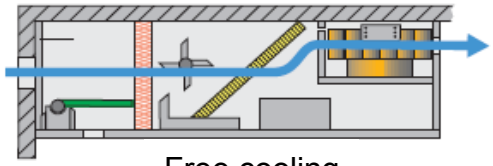
- Electrical Reheat
- Compressor soft start
- Fast plug connectors for site power supply
- Ducts for indoor unit
- High temperature refrigerant R134a
- BMS-Gateways MIB and WIB7000
- CompTrol SMS
- ……

Outdoor unit
Compressor-condenser unit

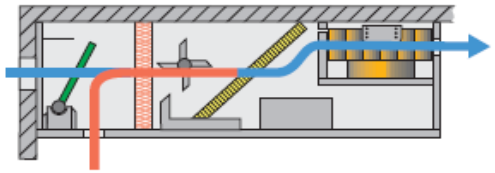
Split-Air Low Noise



DX-Mode



Free cooling



Mix-Mode

Characteristics

- Design for residential area
- Same indoor unit CSI
- Low noise OUTDOOR unit CSE

Indoor unit
Evaporator unit

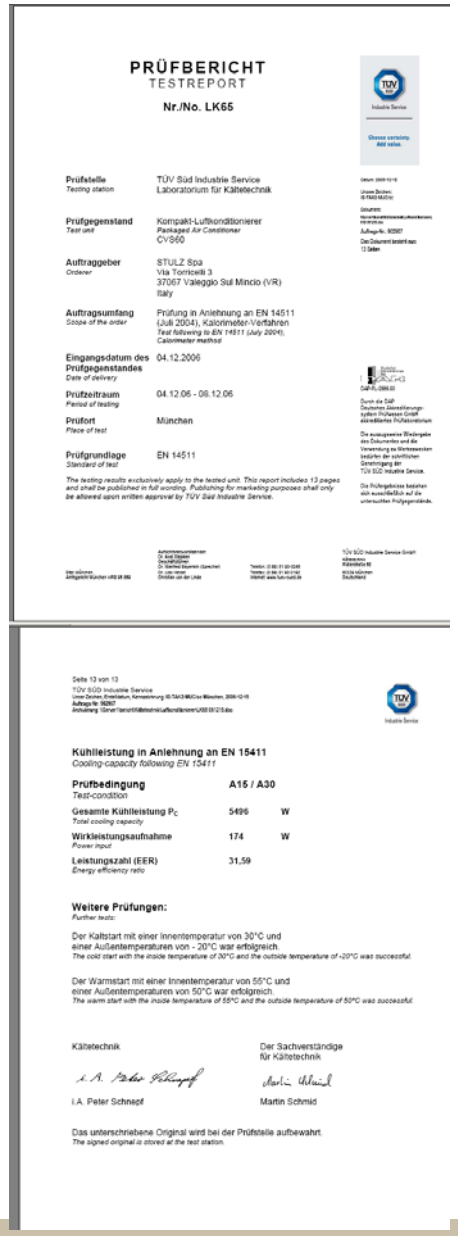
Outdoor unit
Compressor-condenser unit

Split-Air Low Noise

		CSL40	CLS 60	CSL80	CLS 90	CLS A2
Total/sensitive cooling capacity (230/1/50) [1]	kW	3.4/3.4	5.2/4.8	6.5/6.4	9.2/9.0	11.1/10.9
Total/sensitive cooling capacity (400/3/50) [1]	kW	3.8/3.8	5.2/4.8	6.5/6.4	9.2/9.0	11.1/10.9
Air flow (compressor operation/free cooling)	m³/h	1000/900	1200/1100	1700/1500	2300/2100	3000/2700
Heating [2]	kW	1.5	1.5	4.5	4.5	4.5
Sound level (interior/exterior)[3]	dBA	60/43	62/43	59/43	62/46	64/51
Height/width/depth (indoor unit)	mm	310/856/1050	310/856/1050	375/956/1300	375/956/1300	375/956/1300
Height/width/depth (outdoor unit)	mm	578/806/400	641/1052/454	641/1052/454	1386/1052/454	1386/1052/454
Weight (indoor unit)	kg	70	70	90	100	100
Weight (outdoor unit)	kg	60	80	80	130	130
Supply voltage [4]	V/Ph/Hz			230/1/50 / 400/3/50		

[1] Conditions: Inside temperature 25 °C / rel. humidity 40 % / outside temperature 35 °C [2] Optional
[3] 2 m clear distance [4] Other voltages on request

Performances TÜV approved



PRÜFBERICHT
TESTREPORT
Nr./No. LK65

Prüfstelle / Testing station	TÜV Süd Industrie Service Laboratorium für Kältetechnik
Prüfgegenstand / Test unit	Kompakt-Luftkonditionierer Packaged Air Conditioner CVS60
Auftraggeber / Ordener	STULZ Spa Via Torricelli 3 37067 Valeggio Sul Mincio (VR) Italy
Auftragsumfang / Scope of the order	Prüfung in Anlehnung an EN 14511 (Juli 2004), Kalorimeter-Verfahren Test following to EN 14511 (July 2004), Calorimeter method
Eingangsdatum des Prüfgegenstandes / Date of delivery	04.12.2006
Prüfzeitraum / Period of testing	04.12.06 - 08.12.06
Prüfort / Place of test	München
Prüfgrundlage / Standard of test	EN 14511

The testing results exclusively apply to the tested unit. This report includes 13 pages and shall be published in full wording. Publishing for marketing purposes shall only be allowed upon written approval by TÜV Süd Industrie Service.

Seite 13 von 13

Kühlleistung in Anlehnung an EN 15411
Cooling-capacity following EN 15411

Prüfbedingung / Test-condition	**A15 / A30**	
Gesamte Kühlleistung P_C / Total cooling capacity	5496	W
Wirkleistungsaufnahme / Power input	174	W
Leistungszahl (EER) / Energy efficiency ratio	31,59	

Weitere Prüfungen:
Further tests:

Der Kaltstart mit einer Innentemperatur von 30°C und einer Außentemperaturen von - 20°C war erfolgreich.
The cold start with the inside temperature of 30°C and the outside temperature of -20°C was successful.

Der Warmstart mit einer Innentemperatur von 55°C und einer Außentemperaturen von 50°C war erfolgreich.
The warm start with the inside temperature of 55°C and the outside temperature of 50°C was successful.

Kältetechnik — Der Sachverständige für Kältetechnik

i.A. Peter Schnepf — Martin Schmid

Das unterschriebene Original wird bei der Prüfstelle aufbewahrt.
The signed original is stored at the test station.

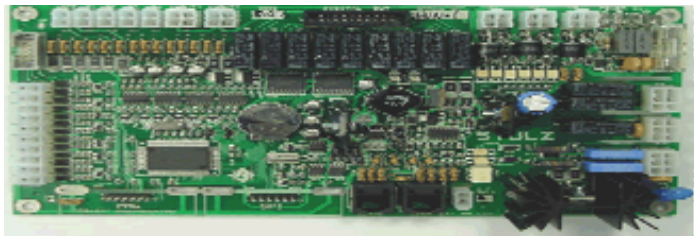
Split-Air LOW NOISE performances **fully approved** by independent laboratory TUV Munich (Germany)

1. Cooling capacity
2. Power input
3. Airflow
4. Freecooling capacity
5. Assited freecooling
6. Noise level
7. Hot start 50°C outdoor 55°C indoor
8. Cold start -20°C outdoor 30°C indoor (compressor running)

Mehr Sicherheit.
Mehr Wert.

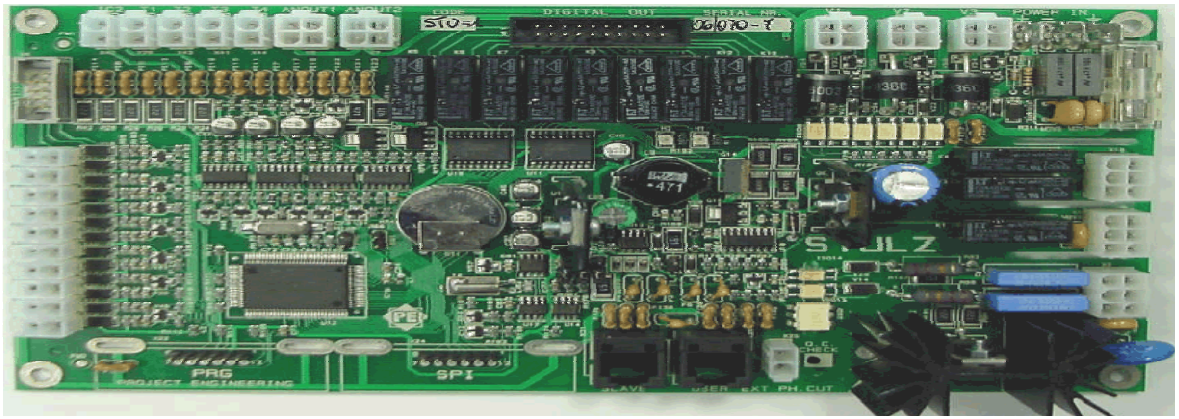
C2020

...control system



C2020 IO-C standard Functions

- Controlling of all operating modes
- Sequencing of up to five units
- Flash EPROM for simple configuration and software Updates
- Individual forwarding of alarms (9 contacts available)
- High-pressure alarm management
- Night mode
- Energy-saving mode
- Control of existing comfort-A/Cs via C2020



C2020 Options

Keypad

- Multilingual display
- 3 User levels
  - Operator
  - Service (password-protected)
  - Manufacturer (password-protected)

Hardware key

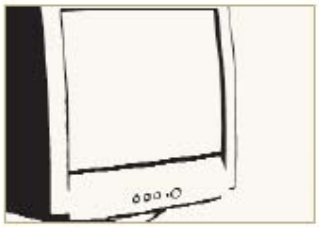
- for uploading and downloading software without laptop
- for copying the configuration to other units

C2020 Network solutions

SMS

E-mail

Alarm/
ZLT



HTTP/
SNMP

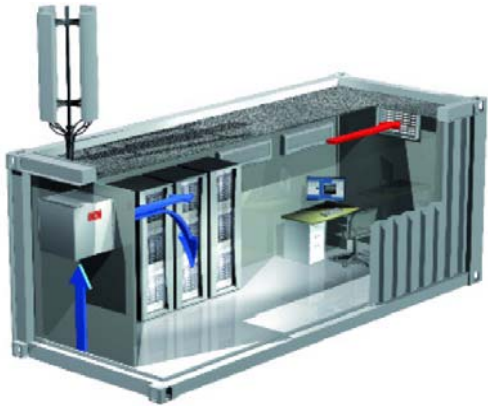
Available BMS protocols

- Modbus 1)
- Saia bus 1)
- P90 1) 2)
- SNP 1) 2)
- Network bus 1) 2)
- SDC 1) 2)
- Ni bus 1) 2)
- LonTalk 1) 2)
- SNMP 1) 2)
- HTTP 1) 2)
- N2 bus 1) 2)
- Unigyr bus 1) 4)
- Sinec L2 bus 1) 4)
- GSM CompTrol(r) SMS 1) 3)

Additional requirements
1) RS485 interface card
2) Gateway:STULZ
3) GSM-Modem:STULZ
4) Gateway:Other supplier

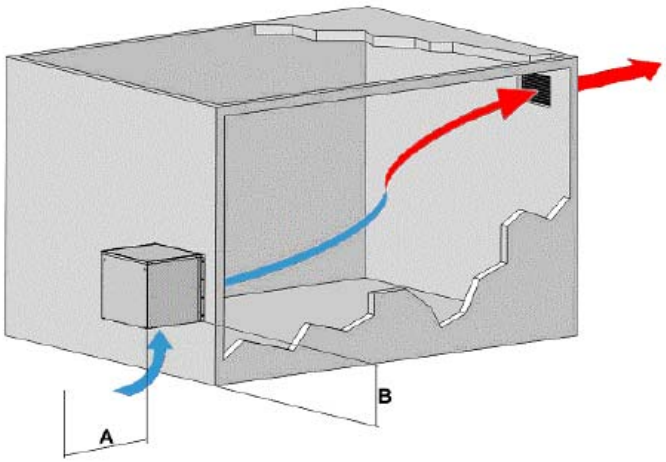
Free-Air-3

... the ideal supplement to an existing Comfort air-conditioning unit or stand- alone as fresh air cooling system



Free-Air-3

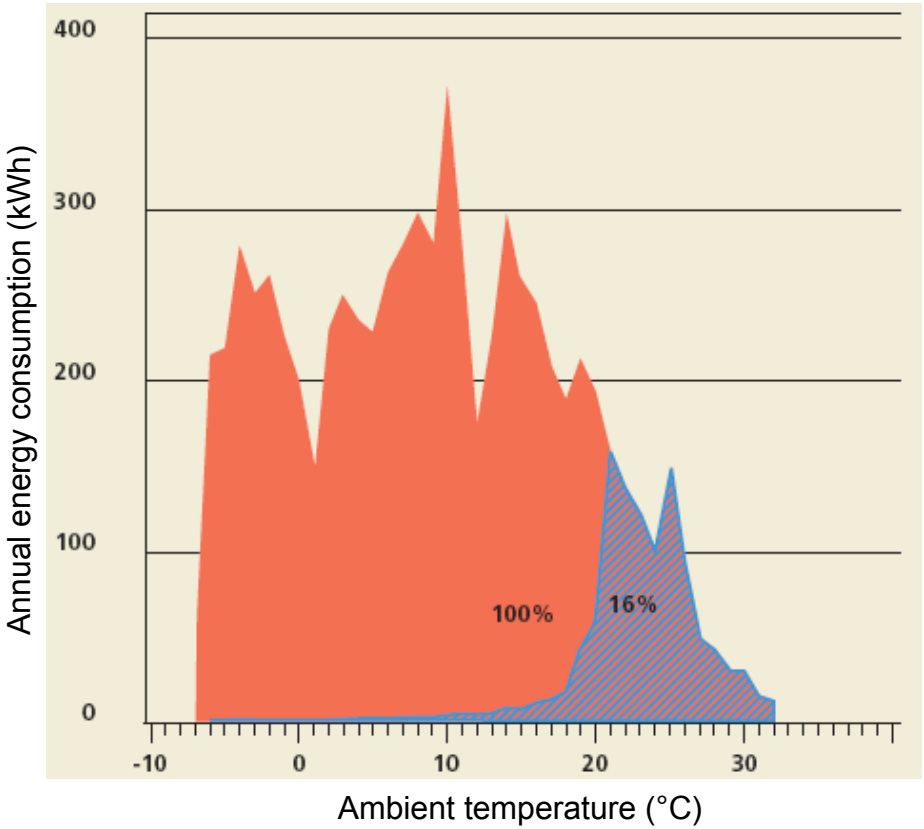
The use of free cooling offers potential of high energy savings. In shelters where only comfort A/C-units are used for cooling is this potential still unused



Retrofitting provides a very fast return on investment in shelters….

- where comfort A/C units work with a high part of latent capacity
- where diesel generators produce the required power

Free-Air-3 is cutting the energy costs



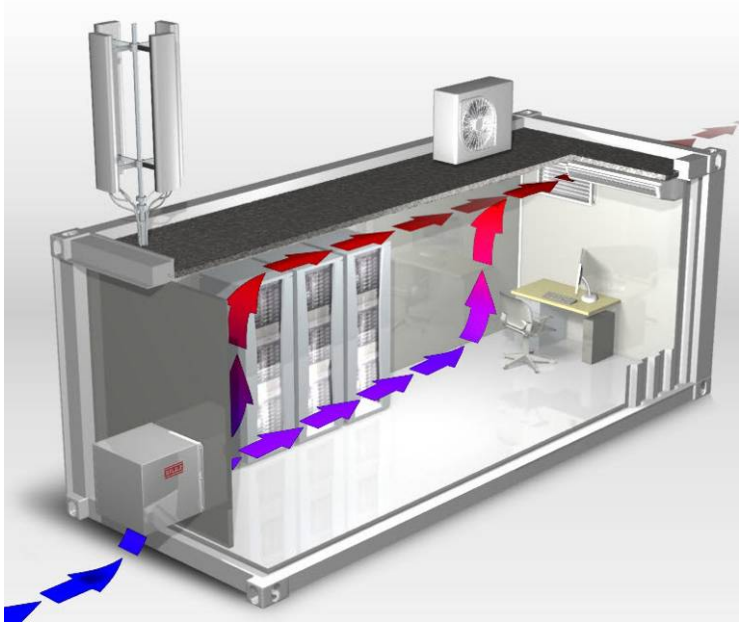
Energy consumption of a comfort A/C unit without free cooling

Energy consumption of a system with free cooling

The example shows a 3.5 kW unit / Location Germany
Energy savings of up to 84 %

Working mode: Free cooling

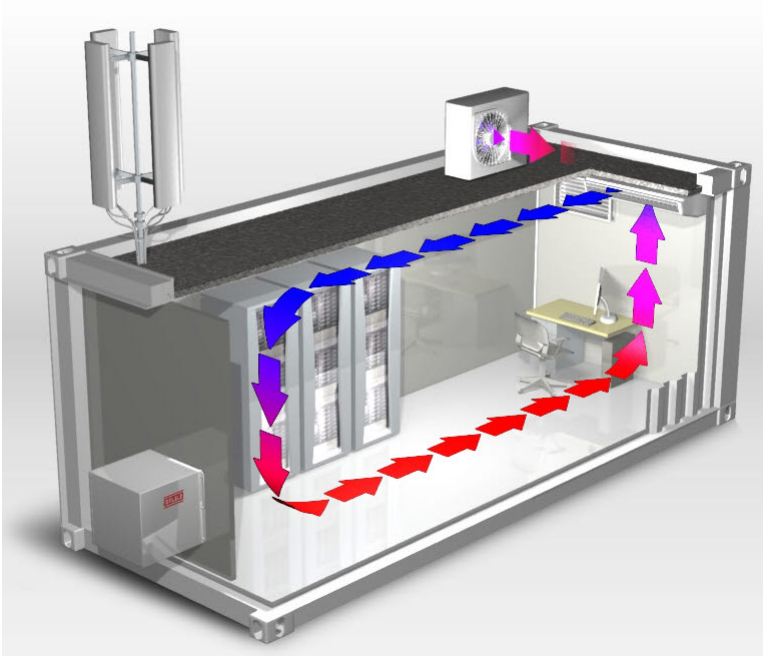
Free-Air-3 can be operated on its own or in combination with comfort A/C units. As soon as the temperature difference between shelter- and ambient temperature is big enough, the Free-Air-3 control logic stops the comfort A/C units and cools in Free cool operation



=> Free-Air-3 Fan speed controlled by C102 between 0% and $n_{,max}$ (adjustable)

Working mode: Cooling with comfort A/C-units

Without free cooling conditions, only comfort A/C-units (if present) can work



⇒FreeAir controls via C102 up to two comfort A/C-units.
Ability to set individual parameters for each unit

In „Assisted free cooling“ mode FreeAir and comfort A/C-units work together (Mode can be activated)

Emergency mode

Enabling conditions:

- The shelter-temperature exceeds an adjustable value
- The temperature difference between shelter- and ambient is > 1 °C

=> Free-Air-3 Fan speed 100 %

Working mode: Dehumidification

Requirements:

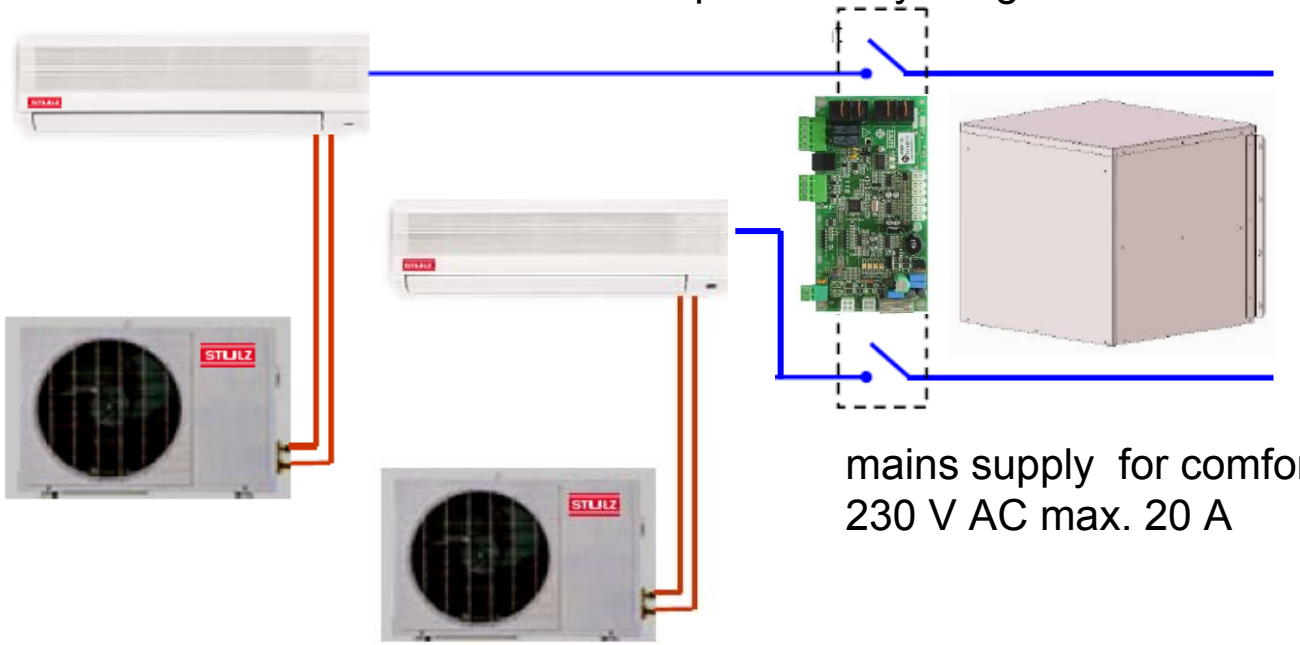
- System of FreeAir and comfort A/C-units
- Humidity sensor (Option ACTRHS)

Enabling conditions:

When humidity exceeds the set threshold, the unit is in dehumidification mode

⇒FreeAir Fan speed 0%
comfort A/C-units : ON

Installation example: FCL + 2 x comfort A/C-units



- Enabaling of Free cooling and ON/OFF-controlling of the comfort A/C units via C102-controller
- automatic restart after power failure

C102 controller functions

- Control and monitoring of Frre-Air-3 and connected comfort A/C-units
- Measuring of DC power consumption
- Monitoring of the DC voltages
- Fan speed reduction in case of mains power failure (function can be activated)
- Filter alarm can be triggered by differential pressure or via a manually adjustable fan operating time

User Interfaces

LCD user- and service interface KPDC1010

- plain text display
- password protected menus

User keypad ACTUKPD

- Keypad with 3-digit 7-segment display
- for user functions such as change setpoints, display and reset of alarms

Free-Air-3: Easy in installation and maintenance

- easy mechanical and electrical installation
- Ready for operation on the very first day
- Existing comfort A/C units with remote On/Off can be integrated with ease
- Optimal utilisation of the shelter room thanks outdoor installation
- Semi-automatic start-up test for checking the FCL components
- Maintenance accessibility from outside

Free-Air-3 Basic version

- powder coated frame made of galvanised steel
- Airflow and clogged filter signal
- Filtration class EU4
- Microprocessor to control the complete system incl. existing comfort units
- EBM DC-Fan
- 48 VDC Power supply allows working in emergency ventilation mode

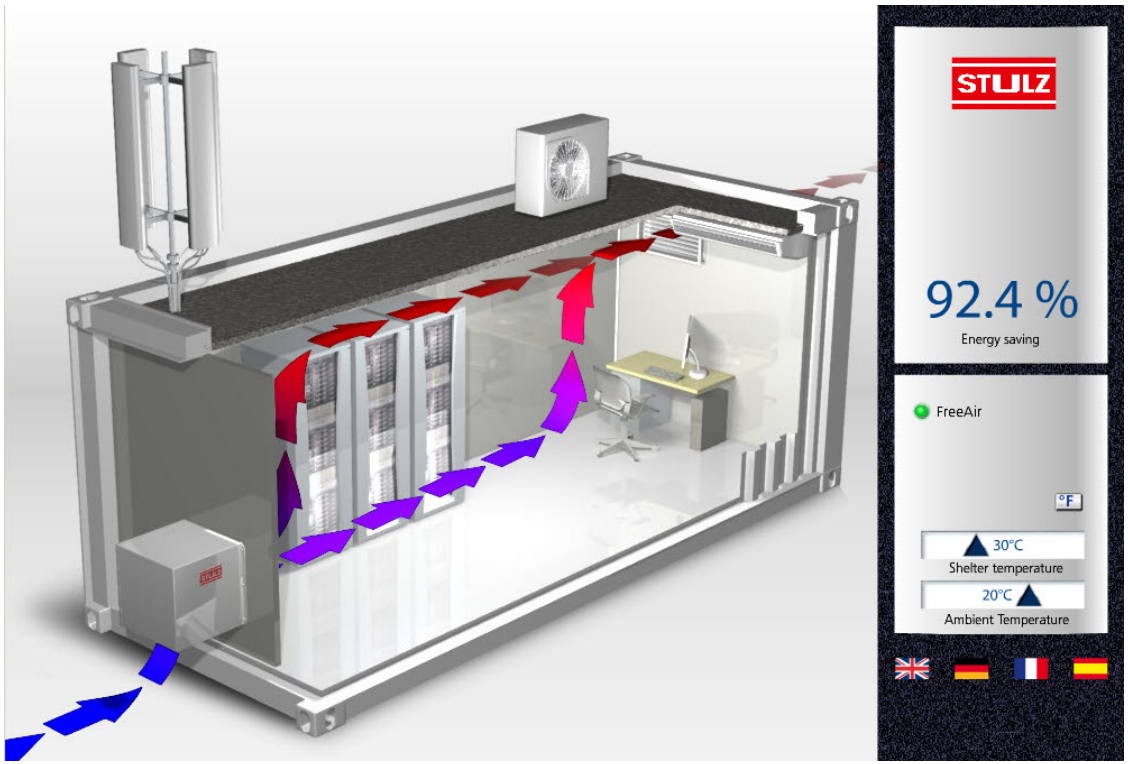
Free-Air-3: Options and technical data

- Aluminum or stainless steel housing
- Humidity sensor
- Connection to building services management systems
- Weather-proofed excess pressure louver

		FCL35	FCL60
Cooling capacity[1]	kW	3.5	6.0
Airflow	m³/h	1,050	1,724
Power input	kW	0.036	0.12
EER cooling[1]		97.2	50.0
Noise level, outside[2]	dB(A)	44	46
Backup operation[1] Airflow	m³/h	2,300	3,400
Power consumption	kW	0.236	0.420
No. of fans/Type		1/EC fan	1/EC fan
Height	mm	604	682/604
Width	mm	720	730/720
Depth	mm	612	609/602
Weight	kg	35	70
Electrical power supply	V DC	48	48

1)Inside temperature 30 °C / rel. humidity 40 % /ambient temperature 20 °C
2) Noise level at 1 m distance, free-field conditions

Free-Air-3 online- simulation tool



- slider for Shelter- an ambient temperature
- Visualisation of operation modes
- Calculations of energy savings

available at http://www.stulz.com/products/telecom-ac/free-air

Humidification systems

Electrode Steam Humidifier

Hot steam

Ultrasonic Humidifier

Cold fog

Electrode Steam humidifier

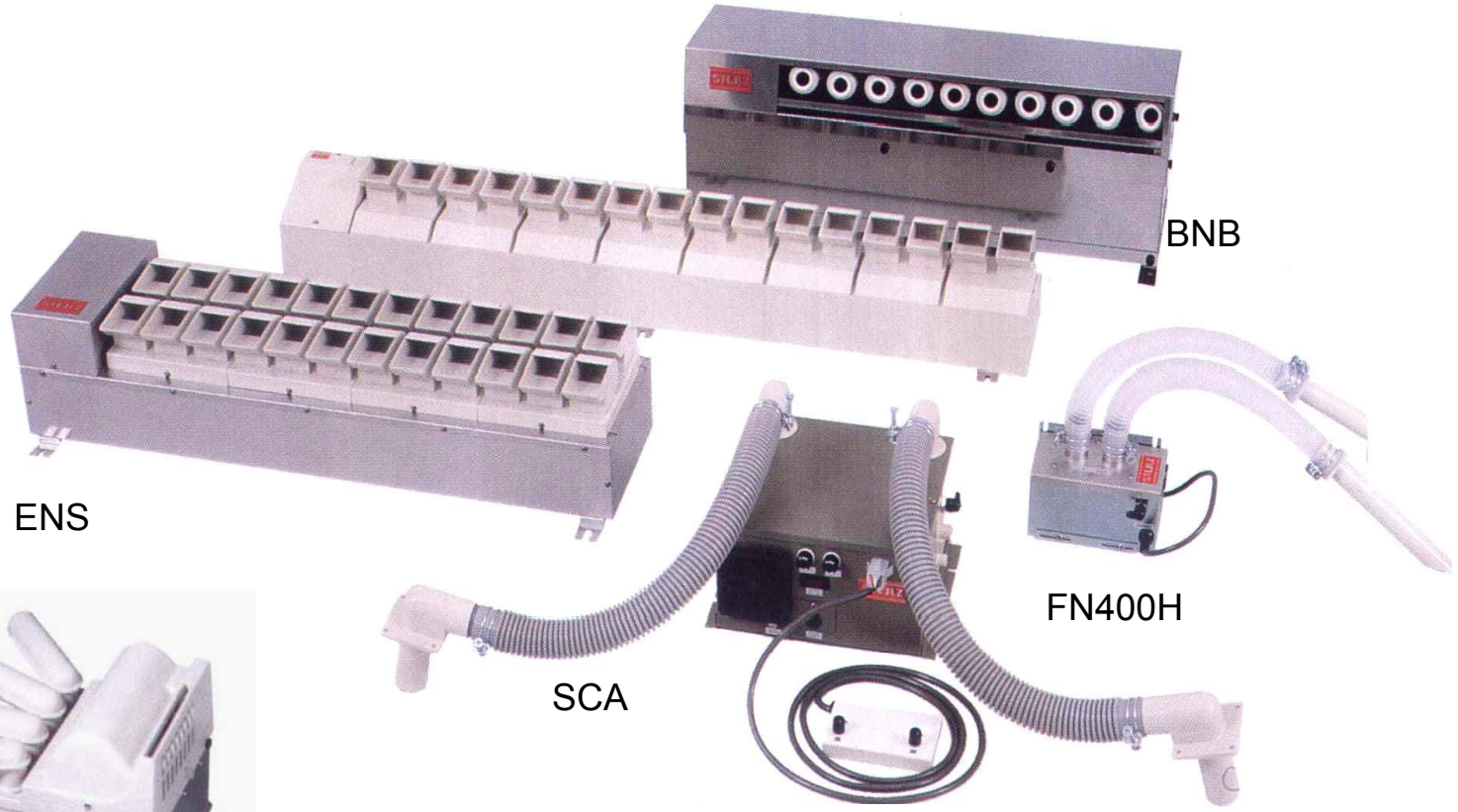
SupraSteam

- steam capacity 1,5 to 65 kg/h
- for duct or room - humidification
- water type: tap water
- one-way - or cleanable steam-cylinder
- low capital costs
- application area : BMS, industry, stocks, offices, spa areas

Operation modes:

- proportional with humidity-sensor
- external control signal
- ON/OFF-mode

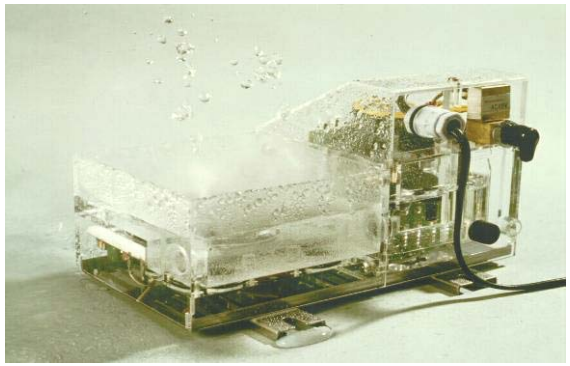
UltraSonic humidifier systems

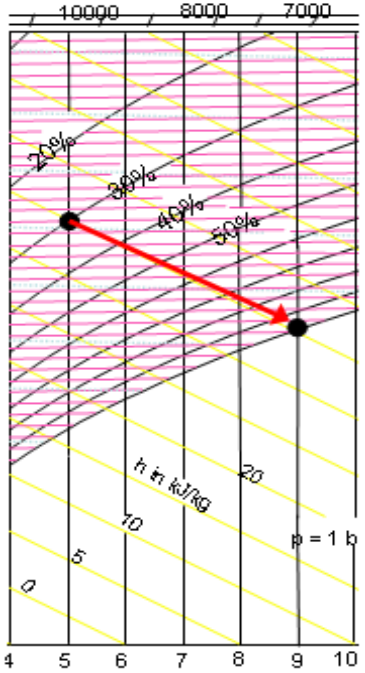



KNB

Benefits of UltraSonic humidifier systems

- Extremly low energy costs, rapid payback (Energy consumption Ultrasonic humidification 60W/kg – immersed electrode humidifier 750 W/kg)
- Adiabat cooling - No additional heat in the air
- Low power supply 48VAC/1Ph/50-60Hz
- Excellent control characteristics (no delay on the start)
- Very fine fog (diameter of water droplets just approx. 0.001 mm)
- Very low noise
- Reduction of bacterias by ultrasonic waves
- No contermination of the air trough minerals

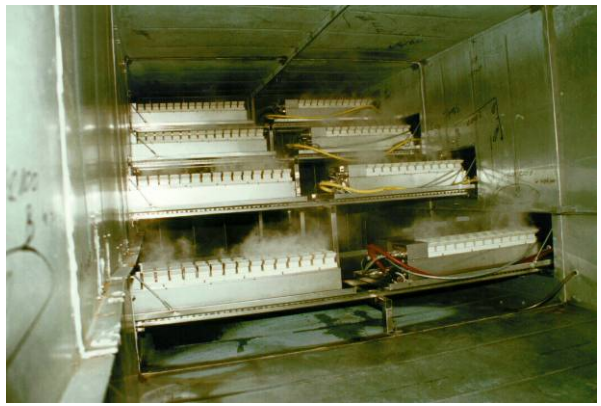




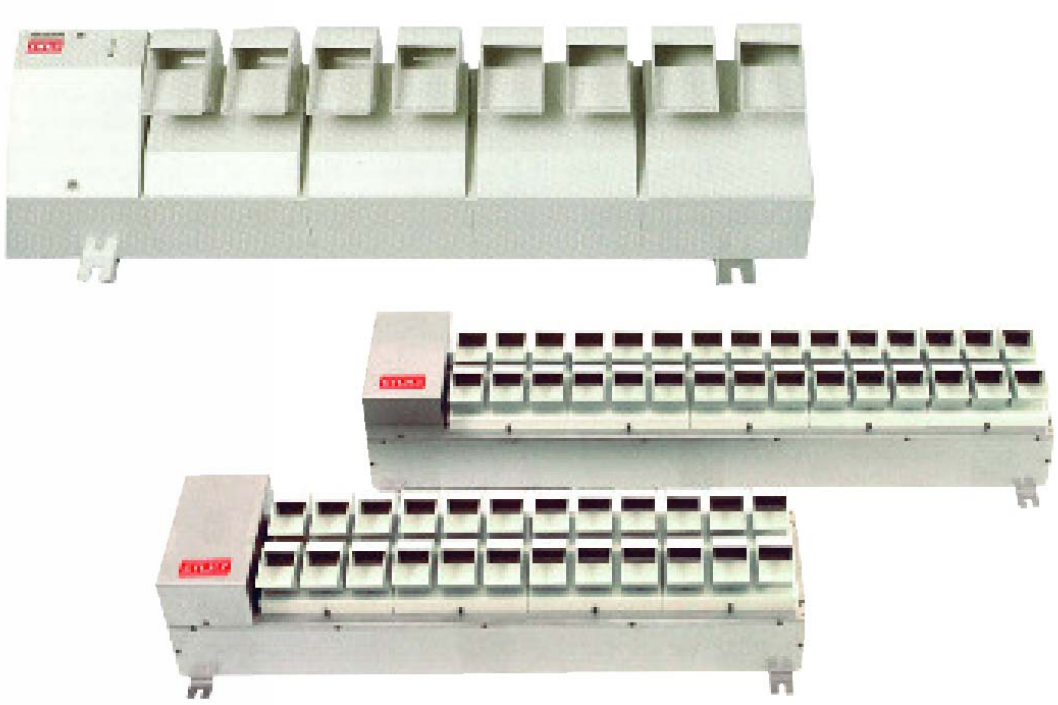
UltraSonic humidifier systems

ENS series

- Adiabatic humidifier for duct or AHU applications
- Humidity capacity 1,2 – 18 kg/h



Example for a assembly of ENS-humidifier



UltraSonic humidifier systems

BNB series

- Adiabatic humidifier for direct room humification
- integrated fan blower
- Humidity capacity 1,0 – 8,0 kg/h

Example for directroom humidification

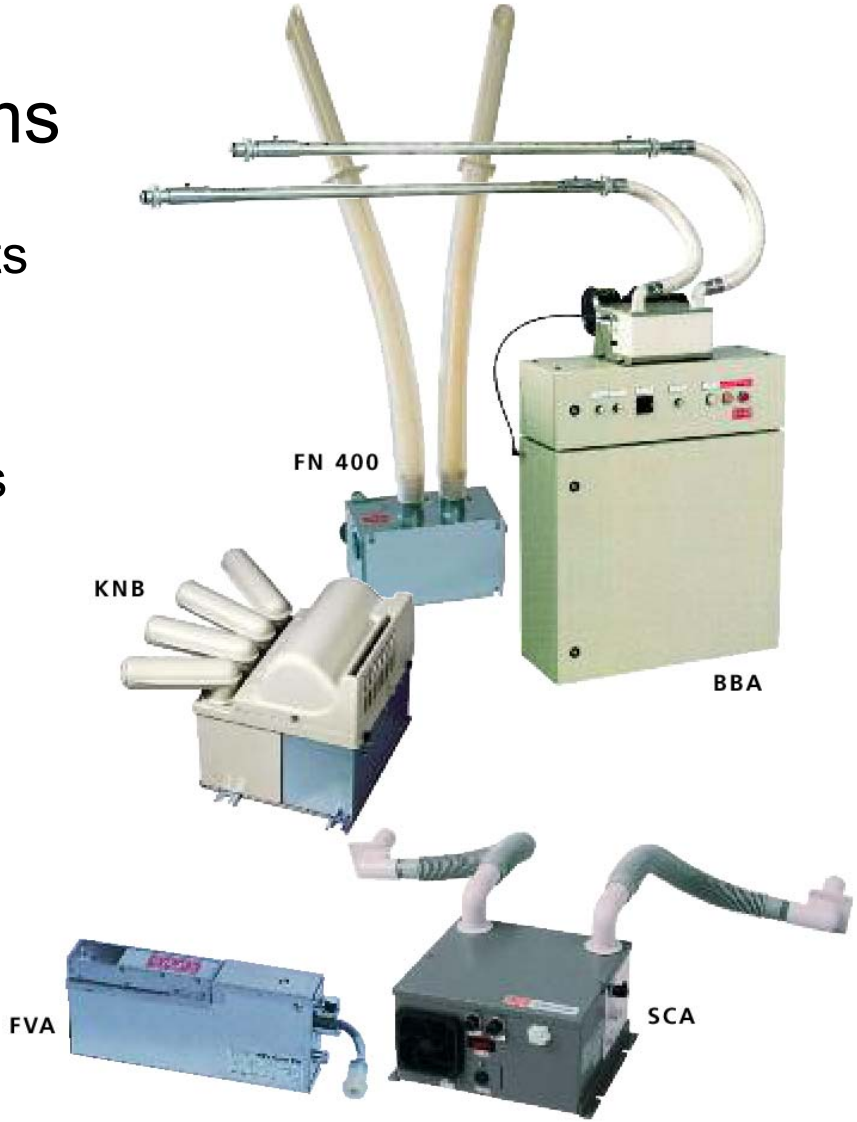
UltraSonic humidifier systems

… with distribution systems

Adiabatic humidifier for directed points

- for sales counter, print shop industry, air condition units
- for greenhouses, fruit storehouses

KNB- series:	2,0 kg/h
BBA- series:	1,0 – 2,0 kg/h
SCA- series:	1,0 – 2,0 kg/h
FN400 series:	0,4 kg/h



USM/USS UltraSonic controller

UltraSonic controller
- each humidifying system requires the installation of one USM
- up to 15 humidifiers can be controlled as a master-slave solution

USM master control unit
- with plain text display
- for entering setpoints
- status messages/alarms

USS slave control unit
- further humidifiers in the system are controlled by the USS

USM Master controller

USS Slave controller

...thank you for your attention.