



TECHNICAL DATA

ACTIVE COOLING

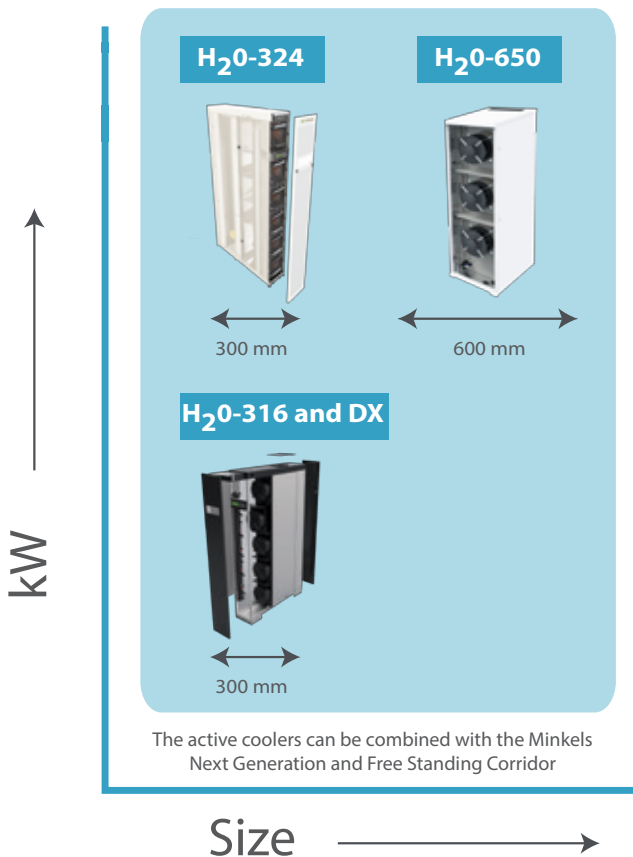


Active cooling

The portfolio includes active cooling equipment based on:

H₂O (water) and DX (refrigerant)

These products are typically placed as frames between the 19-inch cabinets



Minkels offers a wide range of flexible and energy efficient cooling solutions to offer the best possible data centre solution in all circumstances and for every situation, whether for a small server room or a large data centre, newly built or existing office buildings, high or low capacity per cabinet or air or water cooling. You can make a selection from our standard cooling assortment (www.minkels.com/downloads) but you may be in need of more flexibility. If this is the case, Minkels offers the possibility of a mass customised cooling solution. These products consist of building blocks which can be combined and integrated into a solution which suits your data centre and/or server room.

Please contact our sales support department or your account manager and we will configure the solution which best suits your situation. You can find the contact details on the back side of this datasheet.

The cooling portfolio consists of both passive and active systems for cooling or optimising cooling of your valuable IT-equipment. The applications of these products are versatile.

In this datasheet we will discuss the active cooling products! This means, the solutions contain active components (like airconditioning, fans, etc).

H₂O

Minkels offers a complete 'row-based cooling' portfolio. These 'row-based' cooling units are placed between the 19-inch (server) cabinets and offer cooling power in a very efficient and flexible manner. Supplemented by the total Minkels portfolio, a state-of-the-art total solution emerges.

Why row based cooling?

Row based cooling has taken off immensely in server rooms and data centres in the past years, as there are a number of fundamental advantages to this type of cooling as opposed to traditional cooling using a raised floor and air conditioning units (CRACs).

- The IT-equipment (heat source) and cooling installations are situated much closer together. This shortens the cooling air distribution paths considerably, resulting in a much lower energy use in the fans.
- The cooling air is better distributed in the to be cooled volume. This leads to a higher reliability of the cooling installation and a lower chance of hotspot development.
- Scalability/expandability. As the necessary cooling volume grows, the cooling installation too can easily expand. In this way, an investment is only needed when the actual cooling demand increases.
- Compact construction as a raised floor is not necessary.
- Row based cooling also offers new possibilities in existing situations. Such a situation could be the construction of high density zones in a data centre designed for a low density application. Many (older) data centres conclude that the existing cooling installation is not suitable for use with the latest generation of IT-equipment. Of course, this is inextricably tied to the quickly increasing energy use per cabinet.

As an endorser of the European Code of Conduct for Data Centres, Minkels focuses strongly on minimising the energy use of her products. Thus, all H₂O cooling units have been equipped with variable speed, energy efficient fans, proportional control water valves, optimised internal airflows and smart control system.

Minkels distinguishes between the following products:

- H₂O-316
- H₂O-324
- H₂O-650



H₂O-316

The H₂O-316 has a cooling capacity of 16 kW (TW,in = 12°C , TW,out = 18°C. TL,Return = 35°C, 30% RV). These products are typically used in small and medium sized server rooms. This provides customers with a reliable IT-cooling solution at an attractive investment cost.

Features

- Product-specifically designed for the cooling of IT-equipment
- Favourable price performance
- A solution for every situation or capacity
- Compact construction which allows for use without a raised floor



H₂O-324

The H₂O-324 has a cooling capacity of 24 kW (TW,in = 12°C, TW,out = 18°C. TL,Return = 40°C, 20% RV). This product was designed for use in medium-sized to large server rooms and small data centres. Extra robustness and redundancy has been incorporated into the design. For example, it is possible to switch a controller which is in use without any loss of functionality and an extra fan has been added (n+1) to ensure the flow of air. Special attention has been paid to energy savings, which is why the H₂O-324 has a very good ROI.

Features

- An energy efficient product through use of an EC fan with good ROI
- Very high reliability and extra built-in redundancy
- Is delivered as a flat-pack and constructed between the 19-inch racks
- Suited for use in difficult-to-reach spaces
- Independent of each other, the fans can assume a variable speed



H₂O-650

The H₂O-650 has a cooling capacity of 50kW (H₂O-650: TW,in = 12°C , TW,out = 18°C. TL,Return = 40°C, 20% RV). Because of the still increasing energy density per cabinet, Minkels has chosen to offer a 50kW capacity on the footprint of a server cabinet. This makes the H₂O-650 suitable for larger server rooms and data centres. Because of its standard dimensions, this product is also suited to supporting local energy density (high density zones) in existing data centres.

Features

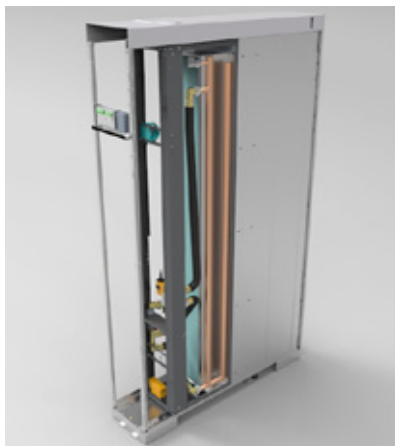
- High capacity in a small footprint
- Dimensions are identical to that of a server cabinet
- Lay-out of the room does not need to be adapted specifically to fit the cooling equipment
- 3-phase power supply to simplify electric balancing in the power network
- Possibility for applying moistening
- Possibility for measuring/displaying the actual supplied cooling capacity
- Independent of each other, the fans can assume a variable speed

Cooling H₂O-316, H₂O-324 and H₂O-650

H₂O-316



H₂O-316



H₂O-316



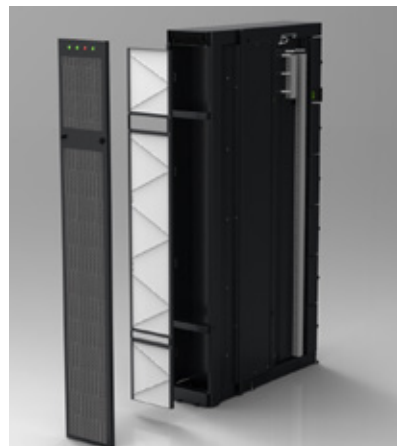
H₂O-324



H₂O-324



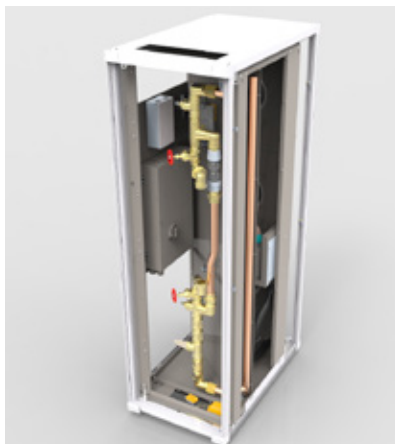
H₂O-Air filter



H₂O-650



H₂O-650



H₂O-650



Cooling

H₂O-316, H₂O-324 and H₂O-650

H ₂ O –SPECIFICATIONS				
General specifications		H ₂ O-316	H ₂ O-324	H ₂ O-650
Standards/ Directives		CE – EN60950 – EN61000 ROHS		
Colour		RAL 7047 (grey) / RAL 9011 (black)		
Total cooling capacity ¹	kW	16	24	49,3
Net cooling capacity	kW	15,0	23,3	47,8
Control cooling capacity		Continuously variable 0 – 100%		
Air inlet temperature IT Hardware ²	°C	18-27		
Max permitted local air humidity		13°C dew point (e.g. from 35% tot 100%)		
Cooling medium		Water/ Water-Glycol		
Display type		LCD – Graphic display LCD 64*128, background illumination by LEDs, colour white/blue		
Noise level	dB(A)	69,5	68	
Dimensions & weight				
Height	mm	2000/ 2075/ 2200/ 2275 / 2400 ³		
Width	mm	300	300	600
Depth	mm	1000/ 1100/ 1200	1100/ 1200	1000/ 1100/ 1200
Weight (empty)	kg	±180	±180	±350
Delivered fully installed		Yes	No ⁴	Yes
Water specifications				
Recommended min water input temperature	°C	12		
Max water volume	l/min	65	65	140
Max pressure loss	bar	0,9	1,1	0,8
Max working pressure	bar	8,0	5,0	8,0
Water valve type ⁵		2-way proportional		
Water connection	inch	1,0	1,0	1,5
Water supply connection type		DN 25, PN 30 internal thread	DN 25, PN 30 internal thread	DN 40, PN 16 internal thread
Pipe connection		Top & bottom	Bottom	Top & bottom
Water volume	l	11,5	10,0	15,0
Condensation connection		Ø16mm – flexible hose	5/4" – External thread	Ø16mm – flexible hose
Air specifications				
Number of fans		5	6	3
Fan type		AC	EC	EC
Variable speed		Yes	Yes	Yes
Energy consumption / fan	W	±180	±108	±480
Hot Swappable		Yes		
Toolless replacement		No	Yes	No
Redundancy in unit		No	Yes	No
Zone regulation		No	Yes	Yes
Regulation parameters ⁶		T _{in} – dT		
Dehumidification mode		Yes	Optional	Yes
Humidifier		No	No	Optional

Cooling

H₂O-316, H₂O-324 and H₂O-650

Max air flow	m3/h	4400	4800	8400
Max air flow – including air filter	m3/h	3800	4400	8100 ⁷
Filter class		G3 (Optional)	G3 (Optional)	G3 (G4 - Optional)
Filter type		zig - zag		
Supported airflow patterns		open/ closed/ hybrid loop		open loop
Dirty filter indicator		dP sensor	timer	dP sensor
Electrical specifications				
Power consumption	W	950	700	1500
	V/ph/ Hz	230/1/50-60	230/1/50-60	400/3/50-60
Connection to unit		C14	C14	Wired
Dual power-feed		Yes		
Cable connection		CEE/SCHUKO/C13/wired		Not applicable
Cable length	m	4	4	Not applicable
Monitoring & Control				
Temperature sensors (front)		2	2	3
Temperature sensors (rear)		2	2	3
Humidity sensor (rear)		Yes	Optional	Yes
Fan speed indication		Yes		
Water flow sensors		-	-	Optional
Water temperature sensors		-	-	Optional
Modbus – RTU RS-485		Yes	Yes	Yes
Modbus – TCP-IP		Optional	Optional	Optional
SNMP – HTTP		Optional	No	Yes
I/O (dry contacts)		9	2	9

1 Cooling capacity at the following specifications:

H₂O-316: TW,in = 12°C , TW, out = 18°C. TA, return = 35°C, 30% RH

H₂O-324: TW,in = 12°C , TW, out = 18°C. TA, return = 40°C, 20% RH

H₂O-650: TW,in = 12°C , TW, out = 18°C. TA, return = 40°C, 20% RH

2 ASHRAE, 2012, Classification A1 – A4

3 2400 mm only available for H₂O-650

4 Product is delivered as package. Local assembly required.

5 3-way valve available on project-basis for the H₂O types 316 and 650.

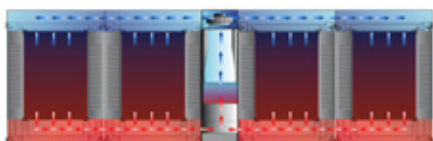
6 Tin refers to the input temperature for the equipment. dT refers to the temperature difference of the air between the front and rear of the equipment.

7 Measured with a G3 filter.

AIRFLOWS

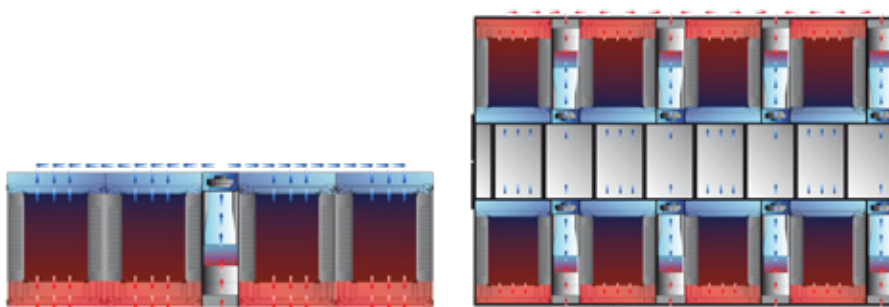
Closed loop solution

In a closed loop solution, the indoor unit's airflows are directly guided into the adjacent 19-inch cabinets. During this process, the indoor unit extracts the hot air directly from the IT-equipment and, as cold air, guides this back to the front. No exchange of air in the room in which the setup is located takes place. The system enables you to divide the cooling capacity over several cabinets.



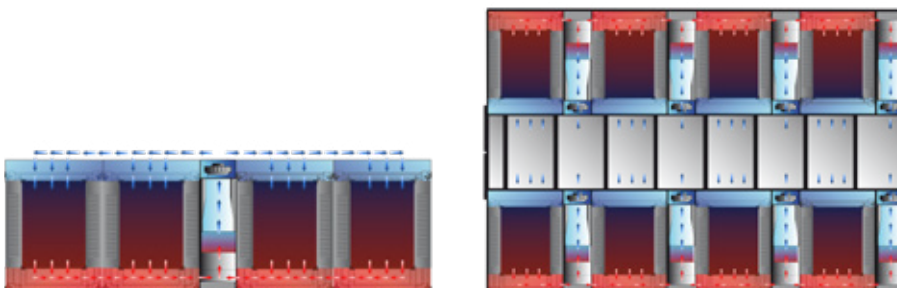
Open loop oplossing

In an open loop solution, the cooling air is brought directly into the room outside of the cabinets. The module extracts the hot air from the room (warm corridor) and, as cold air, guides this back to the front (cold corridor) of the cabinet. For an optimal result, it is advisable to apply the Minkels aisle containment system when using an open loop solution.



Hybrid 'Cold' loop solution

This solution is a combination of a closed and an open loop solution. The hot air is extracted from the cabinet in the same way as in a closed loop solution, so directly from the back of the cabinet. This hot air is cooled in the DX-module and presented at the front of the cabinets in the same way as in an open loop solution. In this configuration, too, the application of a Minkels aisle containment will lead to savings. In addition, it is possible to fully reverse the airflows. This will lead to a hybrid 'hot' loop solution.



Cooling DX



DX

DX is the modular cooling solution for small server rooms. It is an easily installed, energy-efficient cooling solution. The product was designed to provide professional and reliable cooling of your IT-equipment. Because of precision cooling, it is a much better alternative than traditional comfort cooling. DX was designed for both smaller businesses and larger organisations with decentralised server rooms and SER's. This cooling solution can be placed in-between the 19-inch racks. This can be realised in many ways. The cooling air is directly guided to your valuable IT-equipment. It is not necessary to install a raised floor. The DX is offered with 4,5 – 8 – 11 – 14 – 22 kW cooling capacity.

The advantages of DX

- Precise air conditioning
- Scalable capacity
- Raised floors not required
- Can be integrated perfectly in cabinet rows, cold and hot aisle containments
- Can deal with all usual airflow patterns

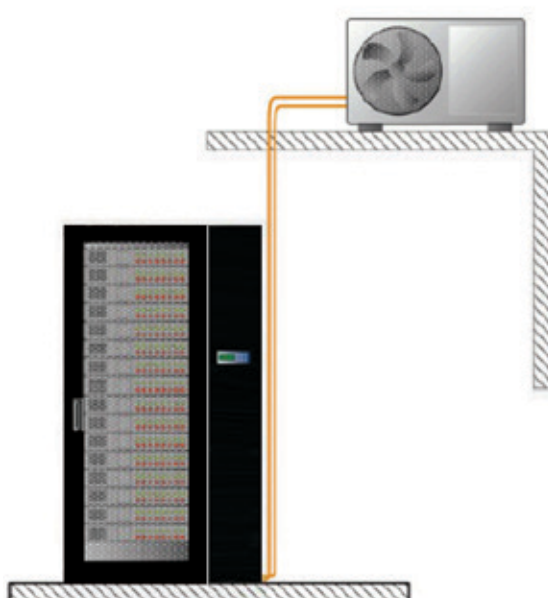
The DX system consists of an indoor and an outdoor unit. The indoor unit is placed inside the server room and linked to the outdoor unit using specialised cooling pipework. These pipes can be fitted to the indoor unit both on the top and bottom. This ensures high flexibility in the design of a room. The system can be applied in three different ways: closed loop, open loop and hybrid loop.

Outdoor unit

The compact DX outdoor unit uses an energy-efficient inverter-controlled compressor. The inverter compressor has a low inrush current which means you do not experience a peak demand on the network. The energy-efficient compressor adapts its frequency and thus the cooling capacity continuously, based on the actually required cooling capacity. This makes this solution much more efficient and ensures that there are no temperature fluctuations in your server room. Additionally, the DX outdoor unit makes use of the energy-efficient refrigerant R410A.

KNOWLEDGE AND EXPERIENCE

Minkels has amassed extensive knowledge and experience in implementing row based cooling in server rooms and data centres. Of course, we would be happy to help you make the right product and design choices. The Minkels sales and service team would be happy to help you! Please do not hesitate to contact us. You can find the contact details on the back side of this brochure.



Cooling DX

DX – SPECIFICATIONS		unit DX4	unit DX8	unit DX11	unit DX14	unit DX22
Total cooling capacity ¹	kW	4.5	8	11	14	22
Net cooling capacity	kW	3.9	7.4	10.1	13.1	21.1
Capacity control		stepless from approx. 30% to 100%				
Air inlet temperature IT hardware ²	°C	18 - 27				
Max. permissible local humidity		13°C dew point (e.g., 35% at 30°C)				
Range outdoor temperature ³	°C	-15 until +43°C				
Refrigerant type	-	R410A				

SPECIFICATIONS INDOOR UNIT		unit DX4	unit DX8	unit DX11	unit DX14	unit DX22
Number of fans	pcs	3		5		
Max. airflow						
open loop with air filter	m³/h	2600		3800		
closed loop	m³/h	2800		4400		
Max. power consumption per fan						
AC fan	watt	180				
Max. current per fan						
AC fan	A	0.83				
Electrical power supply indoor unit	V/ph/Hz	230/1/50-60, powered by outdoor unit				
Power consumption	watt	590	590	950	950	950
Filter class and quantity ⁴	-	EU3, 3 pcs				
Heat exchanger:						
surface	m²	0.40				
materials	-	copper pipes / aluminium slats				
Dimensions indoor unit:						
width	mm	300				
height	mm	2000 (41HE) / 2075 / 2200 (46HE) / 2275				
depth	mm	1000 / 1100 / 1200				
Weight indoor unit (empty)	kg	165		170		
Noise level	dB(A)	69	69	71	71	71
Pipe connections indoor unit ⁵						
liquid pipe	inch	1/2" SAE				
gas pipe	inch	3/4" SAE				
condensation discharge ⁶	mm	Ø16 (outer diameter)				

Cooling DX

SPECIFICATIONS OUTDOOR UNIT	unit DX4		unit DX8	unit DX11		unit DX14		unit DX22
Dimensions outdoor unit:								
width	mm	800	968	970		970		970
height	mm	640	750	845		845		1300
depth	mm	290	340	370		370		370
Net weight outdoor unit	kg	43	60	74		74		122
Refrigerant content	kg	1.4	2.95	3.8		3.8		5.4
Refrigerant pre-charged to max. pipe length	m	15	30					
Max. pipe length ⁷	m	30	50	50		50		70
Max. height difference between outdoor and indoor unit ⁸	m	20	30	30		30		30
Pipe connections outdoor unit ⁹								
liquid pipe	inch	1/4" SAE	3/8" SAE	3/8" SAE		3/8" SAE		3/8" SAE
gas pipe	inch	1/2" SAE	5/8" SAE	5/8" SAE		5/8" SAE		7/8" SAE
Noise level	dB(A)	47	48	49		51		57
Power supply outdoor unit								
current consumption	A	4.8	10.4	11.7	3.8	17.3	5.5	9.1
LRA / maximum current	A / A	5 / 12	5 / 17	5 / 24	5/ 15	5 / 24	5/ 15	5 / 19
Electrical feed outdoor unit	V/ph/Hz	230/1/ 50-60	230/1/ 50-60	230/1/ 50-60	400/3/ 50-60	230/1/ 50-60	400/3/ 50-60	400/3/ 50-60
Max. power consumption	kW	1,07	2,37	2,66	2,55	3,94	3,70	6,24
Certifications	EN378-2:2008+A1:2009+A2:2012 EN60335-1:2012 EN60335-2-40:2003+A11:2004+A12:2015+A1:2006+A2:2009+A13:2012 EN62233:2008 EN550014-1:2006+A1:2009+A2:2011 EN550014-2 :1997+A1:2001+A2:2008 EN55022:2010 EN61000-3-2:2006+A1:2009+A2:2009 EN61000-3-3:2008 EN61000-3-11:2000 EN61000-3-12:2011 EU No 206/2012 EN50581:2012 EN14825:2012 EU No327/2011 CE RoHS 2							

- Under nominal conditions: Outdoor temp 35°C, Return air 35°C / 25% RH.
- ASHRAE, 2012, Class A1 - A4.
- Until outdoor temperature 35°C the maximum compressor speed is 100%. Between 35°C and 43°C this will be reduced. See MHI-manual for information required.
- Filters are optionally available for open-loop setups.
- Both liquid and gas pipes insulated. Connection possible at either the top or bottom of the indoor unit. See instruction manual for further details.
- Flexible plastic hose.
- Pay attention to height differences between the indoor and outdoor unit. See MHI-manual for information required.
- When outdoor unit above indoor unit.
- Both liquid and gas pipes insulated. See instruction manual for information required.



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