Knürr® DCD User manual

EMERSON
Network Power

User manual
Emerson Network Power DCD
Knürr DCD
Liebert DCD

Rear door heat exchanger up to 35kW for mounting on a rack

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Unit code and component location

Model number - part 1/2										Model details											Part 2/2			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
D	C	D	3	5	A	6	3	3	0	0	0	0	0	0	1	0	0	0	0	S	X	0	0	1

1. - 3. Product identification

DCD = ENP DCD

4. - 5. Nominal cooling capacity

35 = 35 kW

6. Rack height

A = 2000 mm (78 – 6/8”)

B = 2100 mm (82 – 5/8”)

C = 2200 mm (86 – 5/8”)

M = modification (custom – SFA only)

7. Rack width

6 = 600 mm (23 – 5/8”)

7 = 700 mm (27 – 4/8”)

8 = 800 mm (31 – 4/8”)

M = modification (custom – SFA only)

8. Rack depth

E = 1000 mm (39 – 3/8”)

F = 1100 mm (43 – 3/8”)

G = 1200 mm (47 – 2/8”)

3 = 3rd part rack adaptor

0 = no rack

M = modification (custom – SFA only)

9. Chilled water connection – hinge position

1 = top – left

2 = top – right

3= bottom – left

4 = bottom – right

10. Options

0 = No options (Not available at the moment)

11. – 15. Not in use

0 = No options (Not available at the moment)

16. Color

1 = RAL 7035 (light grey)

G = RAL 7021 (dark grey)

2 = non standard color (SFA)

17. – 20. Not in use

0 = No options (Not available at the moment)

21. Packaging

P = Land freight – short distance (pallet, shrink wrap, cardboard protection)

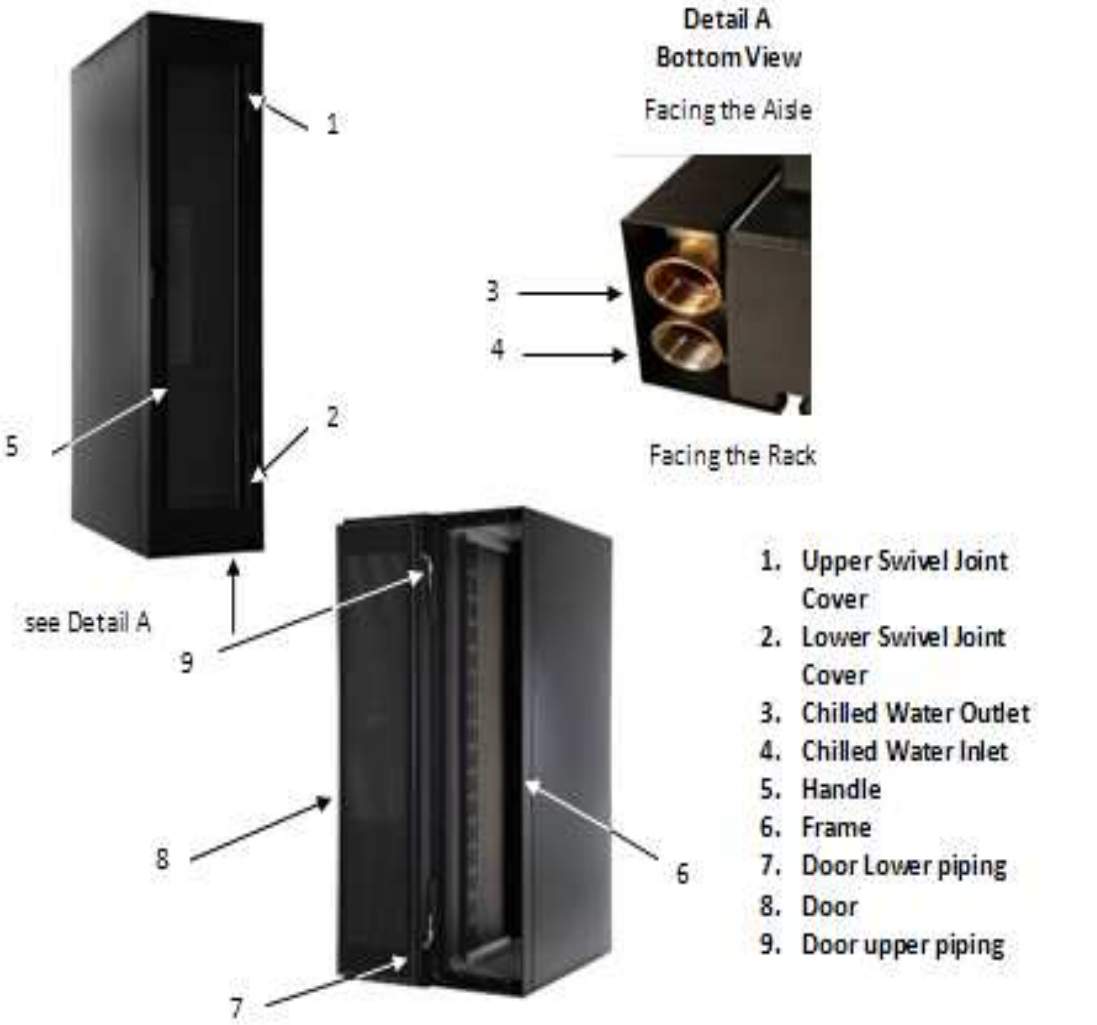
S = Seaworthy (air freight) – long distance (wooden crate)

22. SFA – special features

X = SFAs included

A = no SFAs

23. – 25. Order identifier



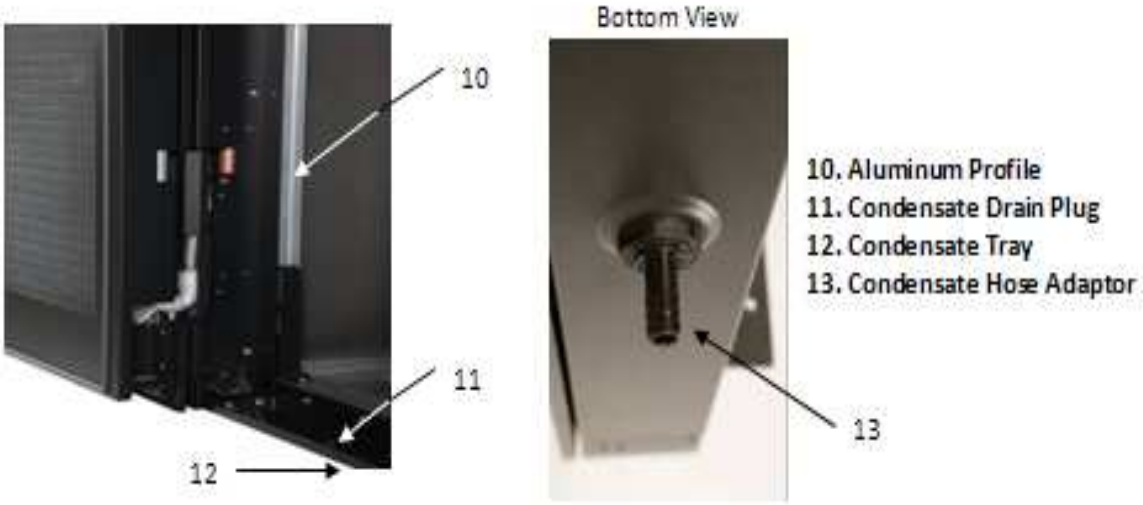


Fig. 1 Component location

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0 Abstract

ENP DCD is an air - water heat exchanger that is integrated into the rear door of a server rack. The heat exchanger is suitable for absorbing heat loads from server racks of up to 35 kW. It can be configured in such way that no heat is released to the installation area.
Cooling effect occurs when the server exhaust air passes through the heat exchanger in the rear section of the server rack. The cooling air is moved through the heat exchanger only by the server fans. ENP DCD thereby supports the cold room concept in which is the warm exhaust air from servers always led to a cooling device where its temperature is reduced to the temperature level of the server supply air. The supply air for chilled water system flows freely through the installation area.

1 Safety

1.1 Symbols

	Attention! Danger spot! Safety notice!
	Caution! Hot surface.
	Attention! Refers to possible damage to the device.
	Note! Marks possible hazards for the environment.
	Important note, information.

1.2 Safety notice

	Our engineers can give you comprehensive advice in assembling the ENP DCD. Extensive material, functional and quality testing guaranty high benefit and a long lifecycle. Nonetheless, such devices may cause hazards if improperly handled by untrained personnel and if used for purposes they are not intended for.
	Carefully read this assembly and operational manual prior to assembling and commissioning the ENP DCD.
	Hazard by works on the device carried out by non-experts. Maintenance and cleaning operations are only permitted to be performed by trained personnel. In order to keep the device in operationally safe condition and to grant its long lifecycle, maintenance and cleaning intervals must be fulfilled by all means.
	Operate the ENP DCD only in accordance with its specified purpose, within its limits of capacity and approved operating means.
	When performing any works on and with the device, please mind: • Any respectively applicable regulations (e.g. VDE regulations or other nationally applicable guidelines) • Any applicable accident prevention regulations (BGV) • Any respective provisions • Any applicable environment protection acts Operate the device only in its proper condition. In the event of functional disturbances or deficiencies, the device must immediately be taken out of operation and the operator's responsible person must be informed of its state. The device must only be taken into operation again after the flawless function of the device has been restored.

	Caution! Hot surface! Defect fans, power supply units or control boards may have run hot. Allow them to cool down before commencing any operations.

2 Storage and transportation

- Keep the device in its original packaging, protected from the weather and in dry conditions
- Protect the working parts from dirt (e.g. sand, rain, dust, etc.)
- Store at temperatures between **-30 °C and +50 °C** (-22 °F and +122 °F)
- Chilled water circuit must be empty during storage (risk of frost damage)
- After long period of storage (1 year +) inspect functionality of water – bearing hinges
- Remove all the packaging before commencing operation of the device
- Chilled water connections are not to be used as a transport handles
- When transporting always make sure the device is properly fastened and secured against slipping

Width	**Dry net weight +/- 5% kg (lb)**
	DCD
600 mm	~ 95 kg / ~ 210 lb
700 mm	
800 mm	
Land freight packaging	+40 kg / +88 lb
Seaworthy packaging	+125 kg / +276 lb

Tab. 1 Unit weight

3 Installation and commissioning

3.1 Preparations for installation

	Before installing the device it is crucial You check each of the following points. These checks will ensure safe and trouble free operation of ENP DCD. Perform these tests with great care.

- **Check the device for shipping damage**

  Packaging may not appear to have been damaged; however, it is necessary to inspect the device before proceeding to installation. Ignoring this advice may at worst lead to a functional failure. (*When returning the device because of the shipping damage – If the device is not being sent in its original, packaging please make sure the distance between the device and the new packaging is at least 30 mm ~ 1.18 in*)

- **Qualified installation**

  Please find the checklist enclosed in the annex to help with installation. Commissioning can also be done by specialised company. In this case please find the commissioning protocol enclosed in the annex.

- **Room Preparation**

  The room should be well-insulated and must have a sealed vapour barrier. The vapour barrier in the ceiling and walls can be a polyethylene film. Paint on concrete walls and floors should contain either rubber or plastic. The vapour barrier is the single most important requirement for maintaining environmental control in the conditioned space.

3.2 Piping and connection methods

If possible when using a chilled water distribution unit such as the Knürr CoolTrans or the Liebert XDPW, connect the ENP DCD in an “ring” configuration (see Fig. 1) or Tichelmann ring (Fig. 2) In this system the pressure drop for each of the units is approximately the same which results in even cooling performance.

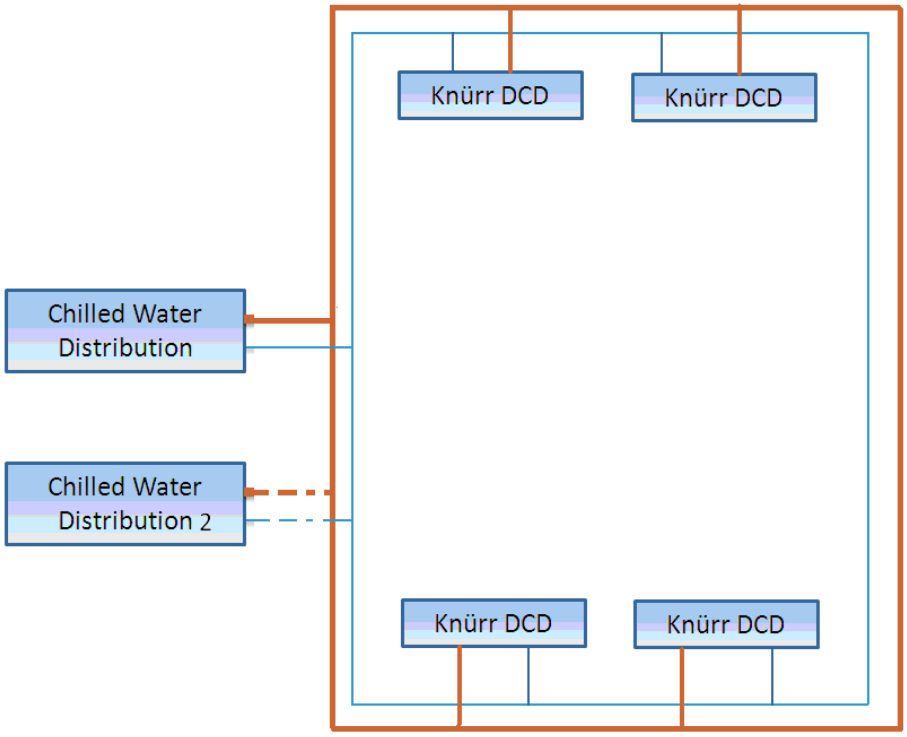


Fig. 1 Ring piping

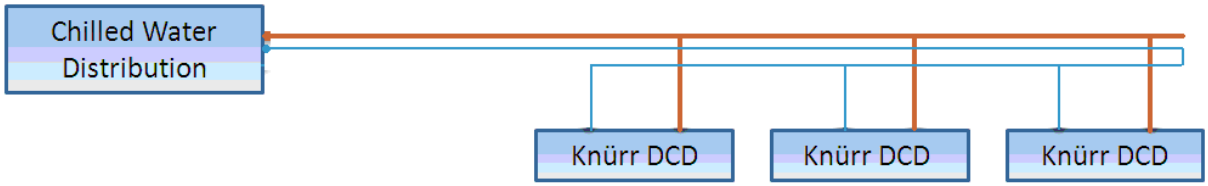


Fig. 2 Tichelmann ring piping

However, if it is not possible, connect the ENP DCD units in a non-interlaced configuration as seen in Fig. 3.

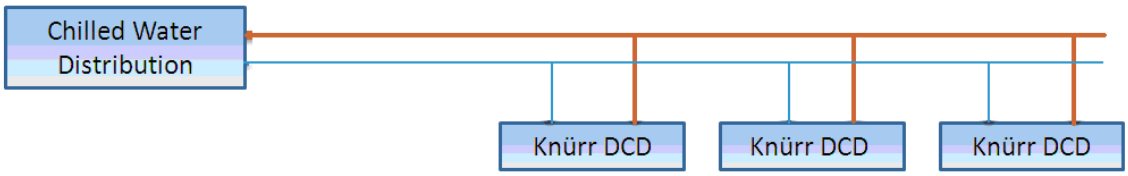


Fig. 3 Non - interlaced piping

It is recommended to add a set of 2 ball valves to each unit (supply and return pipe) to allow the unit to be disconnected from the system for repairs and maintenance without taking the whole system down.

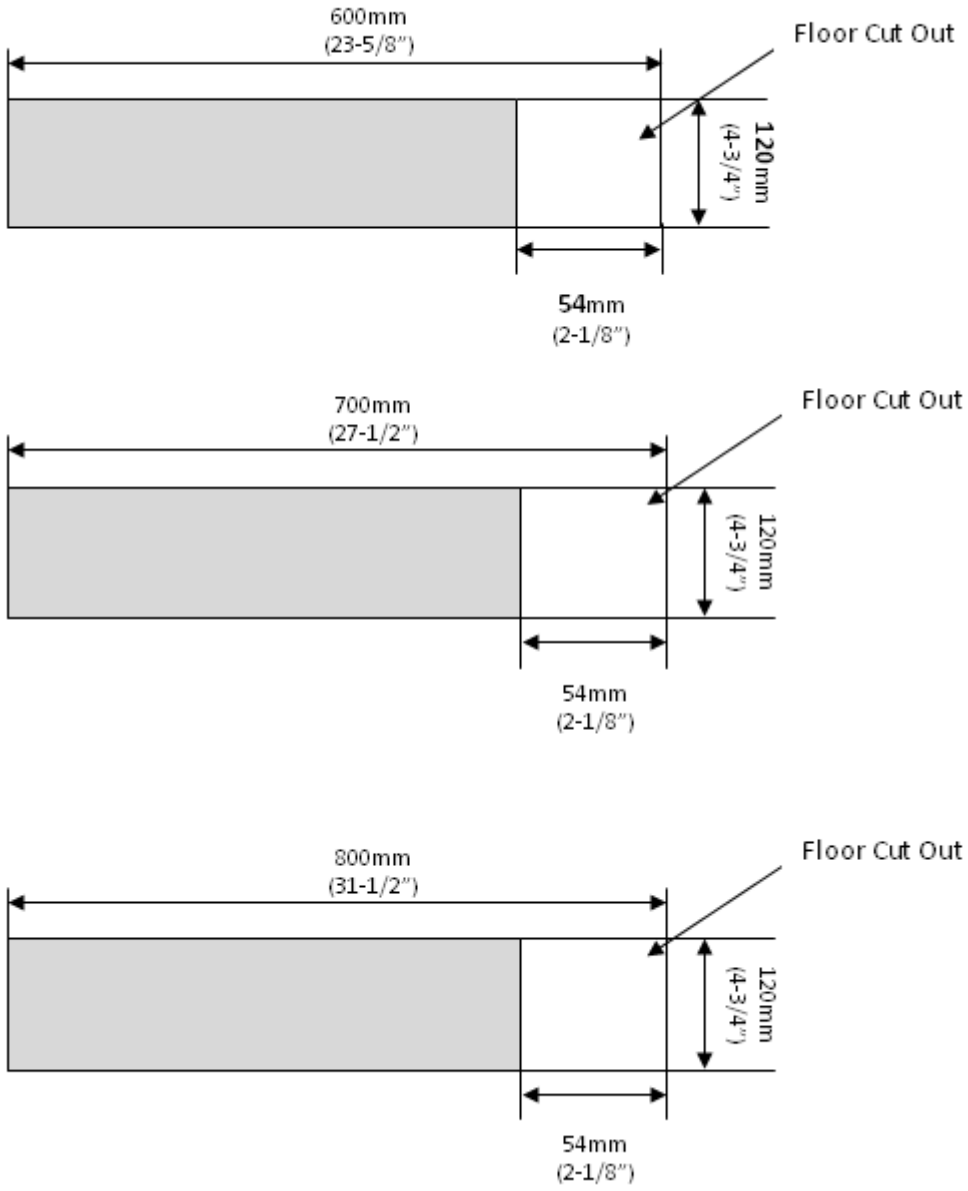


Fig. 4 Floor cut outs - unit itself

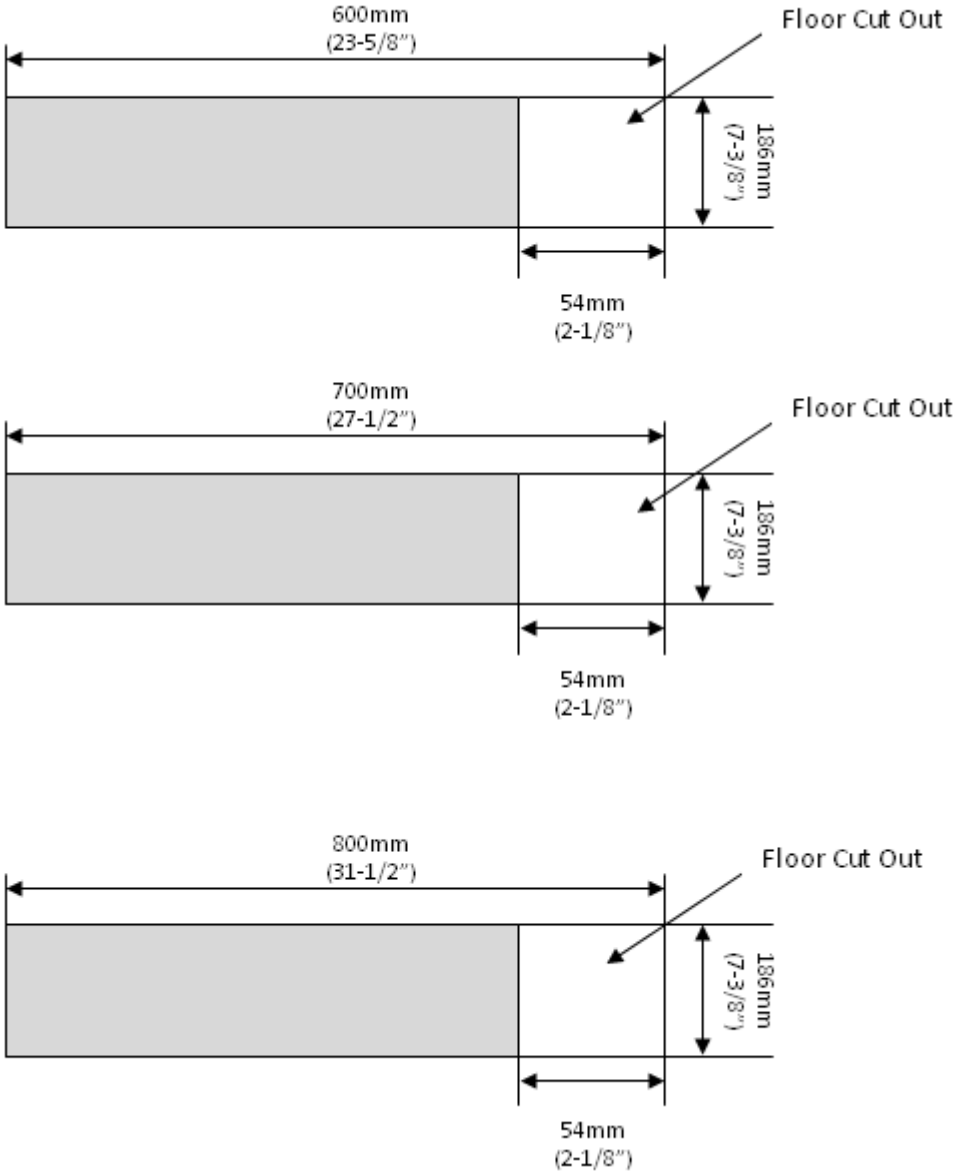


Fig. 5 Floor cut outs - unit with aluminium frame

3.3 Assembly procedure and tools required

	Assembly of the ENP DCD must be carried out in vertical position of the device. Please use a level to make sure this requirement is met when commencing the installation. ENP DCD and the rack must be vertically aligned to provide proper functionality. Strict separation between the hot and cold air within the case must exist.
	To ensure suficient air circulation please make sure there are no obstructions (e.g. packaging materials, tools etc.) left in… • Grids • Heat exchanger • Air intake • Air outlet

This guideline only applies if you have bought ENP DCD as a separate product (not being part of a rack already). If you bought the ENP DCD as a part of the rack it would come already assembled. (In this case please proceed (after unpacking – Fig. 7) to attaching the hose adaptor piece from beneath Fig. 12). The procedure described is valid for Knürr racks (DCM) only.

	Installation and commissioning of the ENP DCD must be performed only by qualified personnel. All actions must be in accordance with regulations and instructions of the manufacturer.
	Warning! Protective equipment (e.g. boots) must be worn during installation and maintenance of this device. Please check your local regulations on using safety equipment before commencing any operations. This procedure also requires at least 2 persons to complete. The unit weighs **95 kg** (approx. 210 pounds)

Tab. 2 List of tools required

Socket hexagonal screw driver - **8 mm** (5/16")(for M5 screws)

Open – jaw wrench **41 mm** (1-5/8")

Open – jaw wrench **36 mm** (1-7/16")

Phillips screw driver PH3

Utility knife

Forklift, pallet jack (or similar device)

Tab. 3 Packaging list

Quantity	Component description	
1	ST mounting bracket for miracel+	
1	ST mounting bracket for miracel+	
1	ST cover swivel-joint fixed compo	
1	ST cover swivel-joint fixed compo	individual components
1	ST cover swivel-joint door compon	
1	ST cover swivel-joint door compon	
1	ST foam UL94-HF1 20mmx32mm	
1	ST Condensate Drain-Set	
1	ST Wire - Grounding 250/6 RA5xRA5	
1	ST EARTH WIRE 200/6 RA5xFH6,3pl	
7	ST M5 TENSILOCK NUT	bag nr.1
6	ST M5 MOUNTING NUT-MIR.EXTRUSION	
8	ST washer M5	
30	ST Star Screw M5x10	bag nr. 2
16	ST Spring Nut M5 broad	bag nr. 3
8	ST DIN965 M6x16	bag nr. 4

To unpack ENP DCD (shipped separately) follow the instructions shown in Fig. 6.

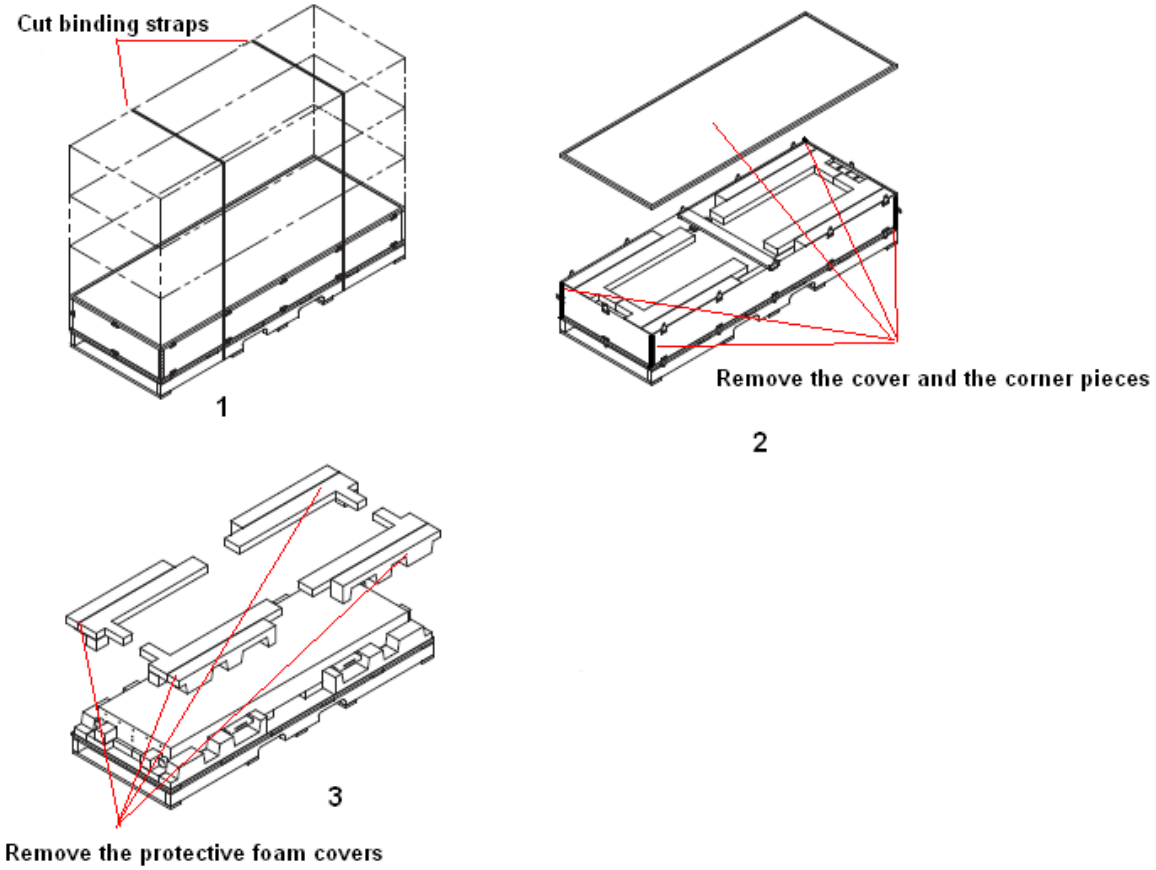
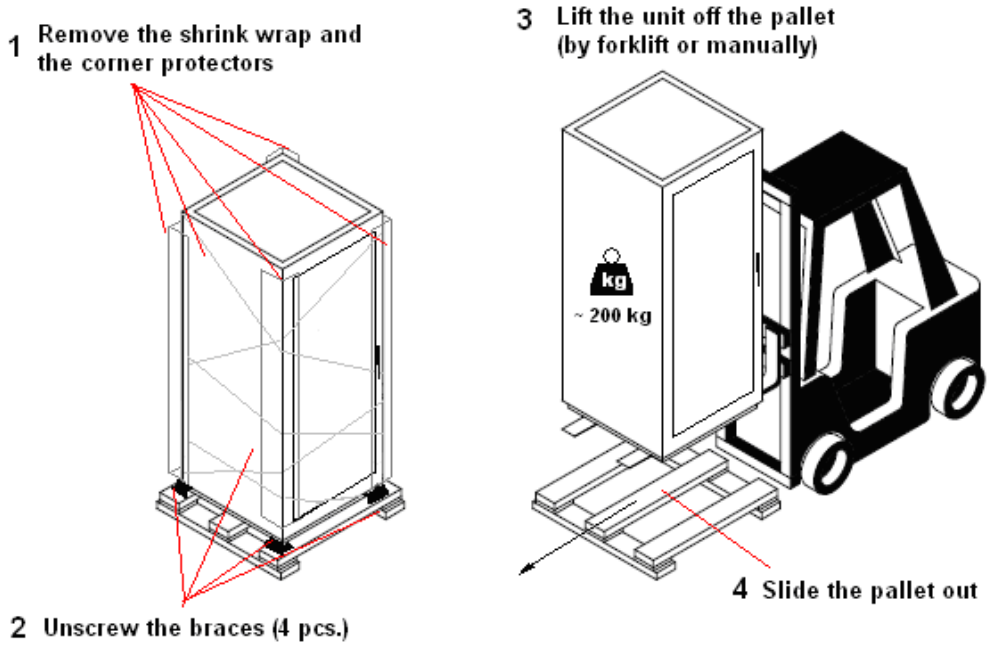


Fig. 6 Unpacking ENP DCD

To unpack the ENP DCD as a part of the rack follow instructions show in Fig. 7.



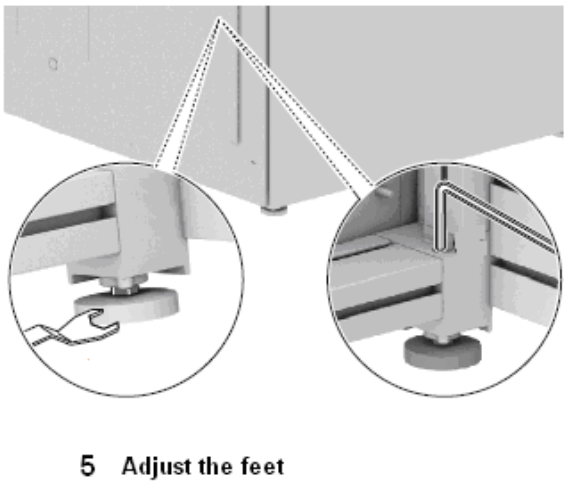


Fig. 7 Unpacking the ENP DCD (part of the rack)

1 After removing the packaging, first lift the ENP DCD frame of the pallet (Fig. 8). At this point the door and the frame are not fixed together yet.

Fig. 8 Lifting the frame

2 Then align the frame of the ENP DCD to server rack properly. Mark the positions of the frame holes (there are 16 holes) on the aluminium profile of the server rack and put the frame aside again.

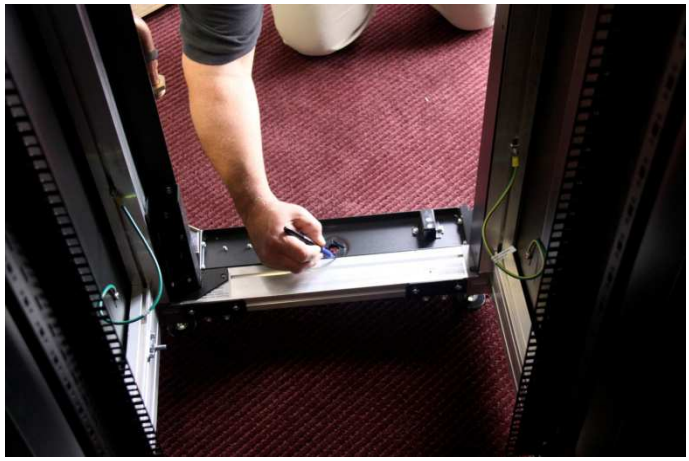


Fig. 9 Marking the position

3 After that, insert the spring nuts into the groove of the rack aluminium profile in to previously marked position (Fig. 10).

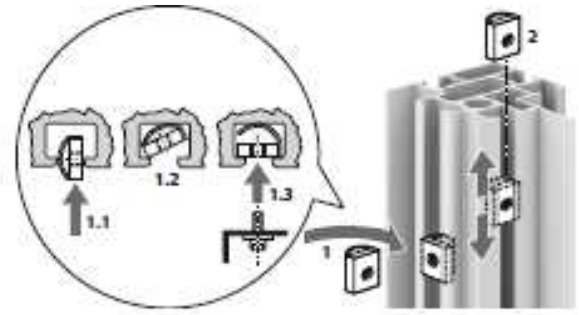


Fig. 10 Inserting the spring nuts

4 Insert 3 diamond nuts into the grove of each horizontal member of the rack aluminium profile in the previously marked position (Fig. 11).

Fig. 11 Diamond nuts

5 Before proceeding to the next step, connect the hose adaptor piece (5/8 “) into the condensate tray (remove the white plastic plug first) (Fig. 12).

Fig. 12 Hose piece adaptor

6 In the next step place the adhesive strip of foam (included) on the rack's aluminium profile (hinge side) in such way that when the ENP DCD frame is in the position the foam strip will seal the gap between rack and the ENP DCD frame (It might be necessary to trim the foam strip with utility knife) (Fig. 13).

Fig. 13 Position of the sealing foam

7 Now you can start attaching the frame of ENP DCD to the rack using the socket screw driver (Fig. 14). Tighten the screws all around the perimeter of the frame, first lightly and then to **3 Nm** (2 pound foot). This is the only way to prevent the frame from twisting and to ensure the parts fit properly.

Fig. 14 Tightening the screws

Make sure there is no twist in the frame before proceeding. The next step in installation is to attach the heat exchanger door to the frame.

	Attention! Risk of injury! The heat exchanger door is very heavy (**95 kg**, approx 210 pounds). At least 2 persons are required for manipulation with the door.

8 Carefully align the door to the frame and insert the door into the frame (Fig. 15).

Fig. 15 Installing the door

9 Hinges are already attached to the door. Fasten them to the frame of the ENP DCD using the Phillips screw driver. Then check if the door moves freely all the way. If you notice any irregularities or roughness in the movement of the door, check for obstructions or loosen the screws of the hinges and tighten them again. (The rough movement might have occurred because of the twist in the hinges).

10 Pull the flexible piping slightly to elongate. This allows the piping enough length to connect the union nuts.

Fig. 16 Flexible piping

11 Before connecting the heat exchanger (in the door) with the pipe work in the frame of the ENP DCD, put sealing rings in this connection (Fig. 17). Use two wrenches when tightening the union nuts to reduce the stress on the pipes (Fig. 18). Torque value for this connection is **85 Nm** (64 foot/pound).

Fig. 17 Inserting sealing rings

Fig. 18 Tightening the union nuts

Fig. 19 Piping connected

12 Check again if the door is moving freely at this point. If so you can attach the swivel joint covers.

13 The two outmost swivel joint covers are to be attached to the hinge side of the door. The two inside swivel joint covers are to be attached to the hinge side of the frame (Fig. 21). Use hexagonal screw driver to fasten the screws. Correct orientation of the hinge covers is indicated by slotted holes (See picture).

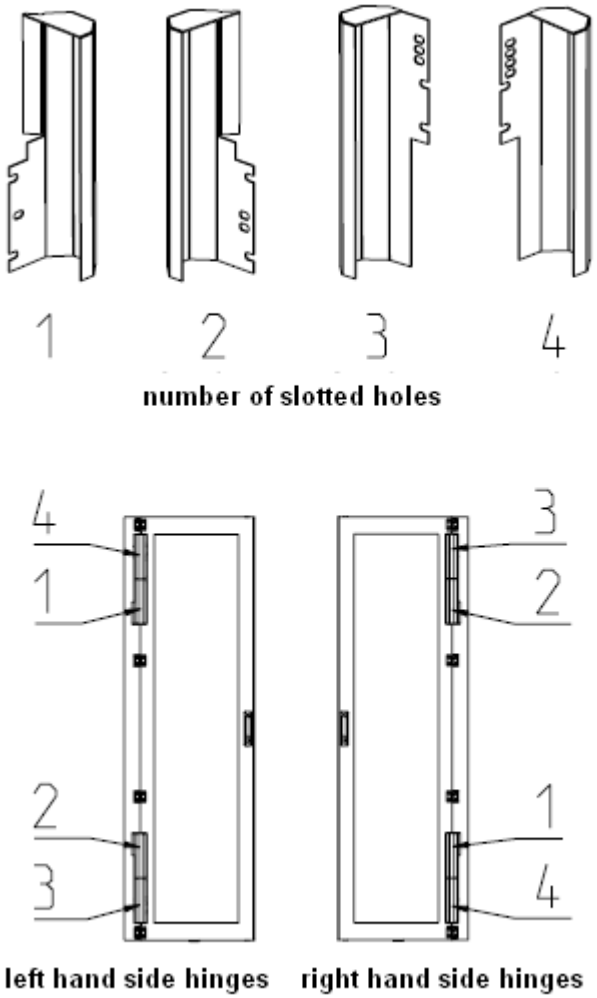


Fig. 20 Hinge covers orientation and position

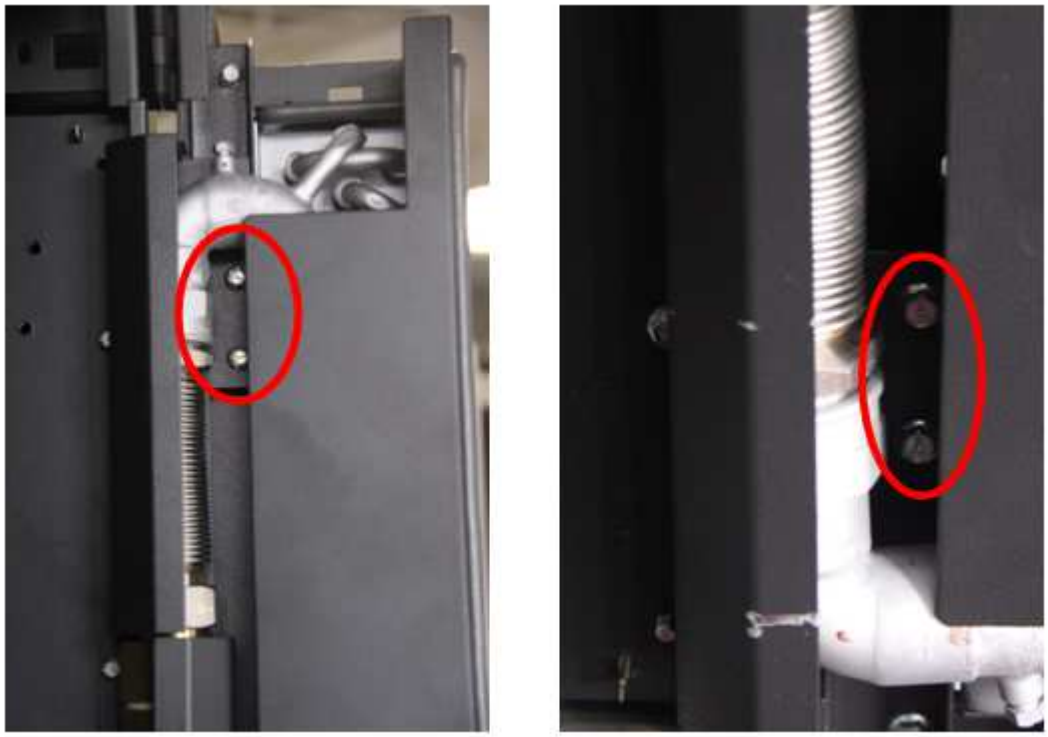


Fig. 21 Outmost swivel joint covers connection points

Fig. 22 Attaching the swivel joint covers

14 Locate the inside swivel joint cover connection points. The two inside swivel joint covers are to be attached to the hinge side of the frame. Correct orientation of the hinge covers is indicated by a sticker on the covers themselves. Use hexagonal screw driver to fasten the screws (Fig. 22)

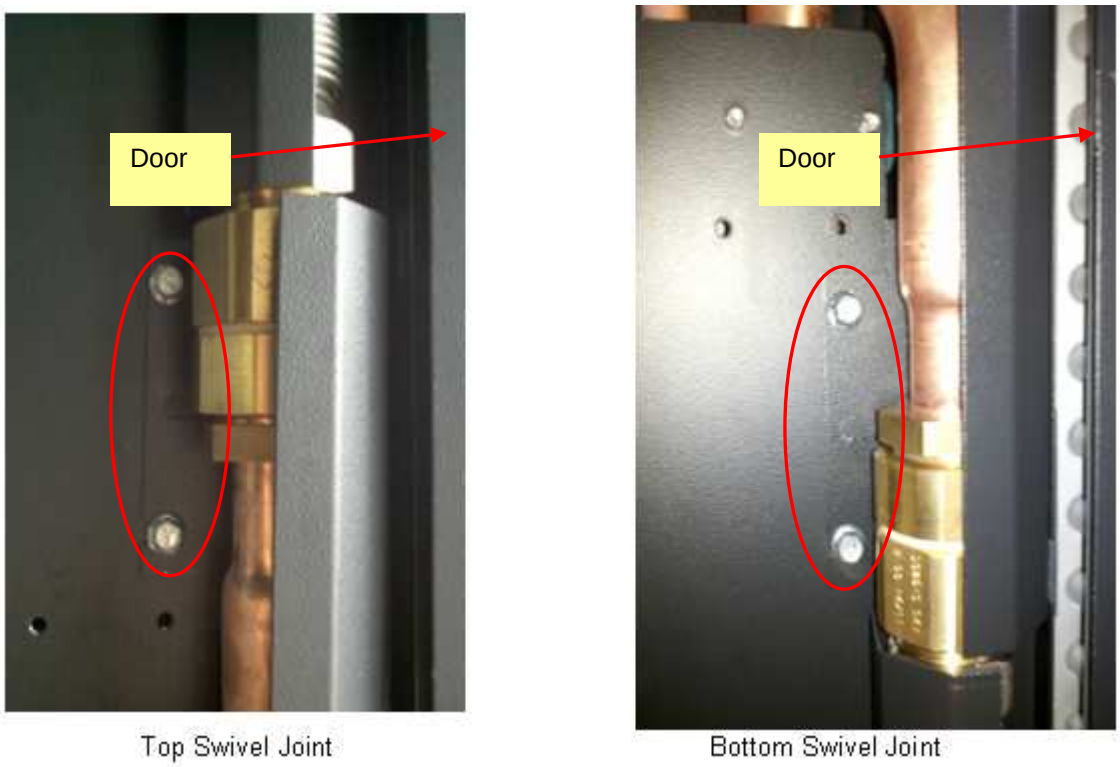


Fig. 23 Inside swivel joint covers

15 In the last step connect the grounding wire of the door to the frame of the ENP DCD (Fig. 24).

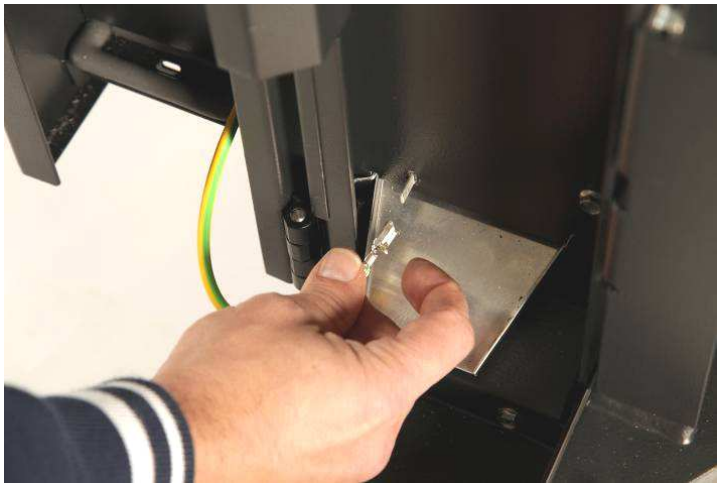


Fig. 24 Attaching the grounding wire

Check if this connection is alright (e.g. by using “diode” or continuity test on a multimeter).

16 Check functionality of the door lock. ENP DCD is equipped with DIRAK 1333 lock. It is a ½” inch cylinder lock. Keys are provided.

3.3 Chilled water connection

	Check the chilled water system for leaks visually before commissioning. Please check the chilled water pipe connection to the heat exchanger regularly. Tighten this connection if necessary. When setting up the heat exchanger for the first time please inspect the mechanical condition of the chilled water supply and connection thoroughly.

(*Note: Using the optional connection set (chapter 5.2) improves the ventilation and enables chilled water flow monitoring and regulation*)

	There is a risk of frost damage to the device during longer stops (e.g. storing etc.) Make sure the heat exchanger and the supply pipes are free of any water (use compressed air if necessary) and remove all the vents and the screws before storing.

	The coil and piping can be damaged due to thermal expansion of the cooling fluid with no means of expansion (e.g. closing the ball valves on both the supply and the return pipes). Always allow for thermal expansion either by leaving at least one of the valves open or by opening the bleeding valve on the door.

Supply and return pipes are marked by label on the unit itself. Torque value for this connection is **85 Nm (64 foot/pound)**.

Fig. 25 Chilled water connection

	For water supply from the bottom left or top right of the position, the supply water connection is the outward pipe. The return water connection is then the position towards the rack. With water connection from top-left or bottom right, the water supply connection is the pipe towards the rack. The return pipe then has the position toward the outside.

3.4 Filling with water

If using a chilled water distribution unit such as the Knürr CoolTrans or Liebert XDPW, refer to its user manual for instructions on filling the ENP DCD and starting the system. **Heat exchanger fluid volume is approximately 12 liters (3.17 US Gal.)**

Bleeding the air off the system

1. Find the bleeding valve. This valve is located on the upper door piping (seeFig. 26).
2. Manually depress the pin to open the valve.
3. Keep the air bleed valve open until the eater coming out has no bubbles.

Fig. 26 Bleeding point

3.5 Housing integrity

To provide optimal cooling function following requirements must be met

- Strict separation between the hot and cold air must exist within the rack
- All the bushings (cable lines, piping etc) must be sealed to prevent any leakages

3.6 Application conditions

	Appropriate use The device is a rear door heat exchanger for a server cabinet with integrated chilled water piping. The server fans themselves remove the heat from the racks to protect the temperature sensitive components in the rack. The waste heat from inside of the rack is transferred via the chilled water circuit to the outside and passed to the on-site chilled water system.
	For reliable function of the ENP DCD, chilled water must be available in an appropriate amount, at the appropriate temperature and pressure. The water quality must be in accordance with VGB-R 455 P. (see Annex)

Tab. 4 Operation conditions

Operating ambient temperature	**10 °C ÷ 35°C** (*other temperatures on request*) 50 °F – 95 °F
Maximum absolute air humidity on site	8 $g \cdot kg^{-1}$
Chilled water temperature intake	**12 °C**, 53.6 °F (*other temperatures on request*)
Chilled water temperature outlet	**18 °C**, 64.4 °F (*other temperatures on request*)
Water temperature difference	**6 K**, 10.8 °F
Use of antifreeze	Not recommended (*on request*)
Chilled water connection	Rack – rear side (*top or bottom connection*) 1” female threaded (DIN ISO 228 - 1)
Condensate tray drain connection	Rack – rear side
Maximum operating pressure	10 bar (145 psi)

	The cold water supply temperature should be higher than the dew point temperature of the installation space. ENP DCD is designed only for sensible cooling; dehumidification of the room by means of ENP DCD should be avoided. The built - in condensate tray with condensate drain is designed only for a short-term condensation.

4 Description

4.1 General function

The design of ENP DCD allows installation in the back of a server cabinet. Heat produced by internal components (e.g. servers etc.), is reliably removed by the door with built-in chilled water system. The cooling system is completely safe so that no water get into the server area. The cooling system consists of a high efficiency air - water heat exchanger. By operating as a rear door heat exchanger with an appropriate design (see Appendix) no heat (thermal load) in the surrounding area is given.

	Attention! The cooling with ENP DCD works only if a strict air separation exists between server cold air intake and server warm air outlet. Unused rack spaces must be sealed with empty plates.

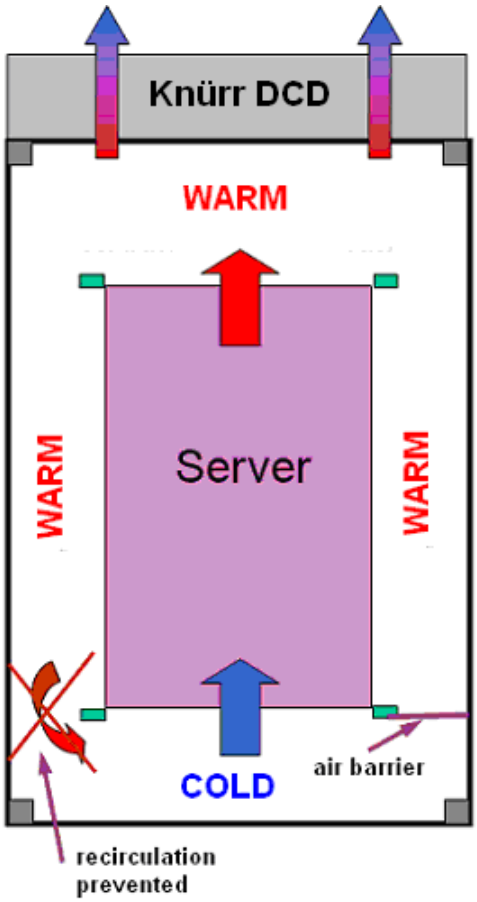


Fig. 27 Top view of the rack equipped with ENP DCD

4.2 Cooling principle

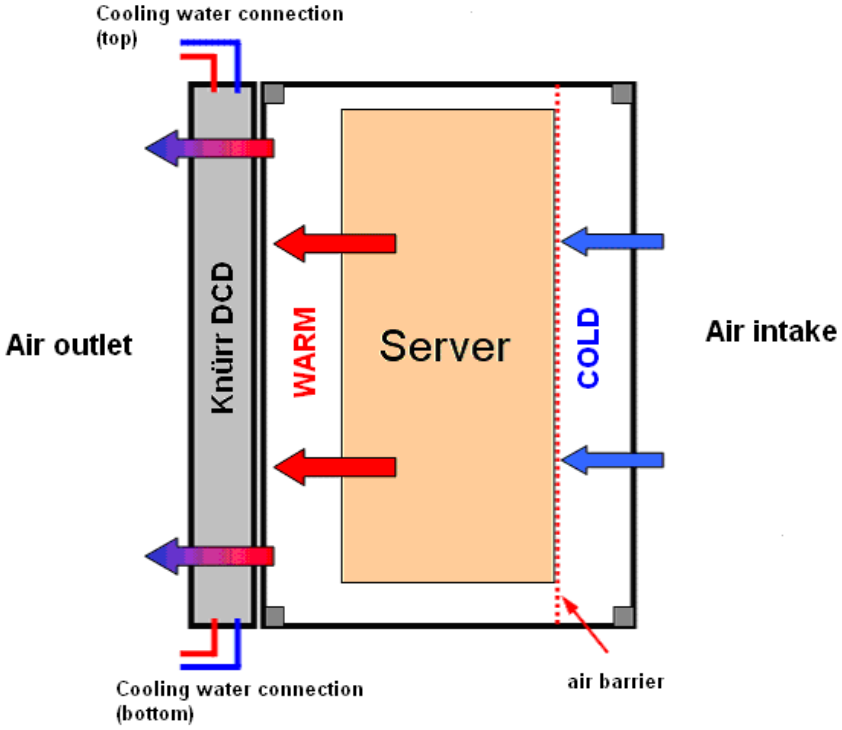


Fig. 28 Side view of the rack equipped with ENP DCD

Air heated by the server (e.g. **40 °C**, 104 °F), is forced through the special air – water heat exchanger. In the heat exchanger the air is cooled down to e.g. **20 °C – 25 °C** (68 °F – 77 °F). The server fans force the cooling air through the heat exchanger of ENP DCD. The “pressure drop - flow rate” dependency curve is shown in the Appendix (9.4).

	Prior to using ENP DCD the system and the servers must be checked whether they match hydraulically. In particular, the server fans must be able to generate sufficient pressure to drive the air through the ENP DCD.

The chilled water is provided by chilled water onsite distribution.

	In case of chilled water supply system failure the cooling is provided either by adjacent ENP DCDs and / or the installation room cooling system. In this case the server waste heat is released into the installation room.

4.3 Submittal drawings

Tab. 5 Unit dimensions

	2000 mm (78-3/4")			**2200 mm** (85-3/4")		
600 mm (23-5/8")	**B=1954mm** **F=322mm** **I=45mm** **L=52mm**	**C=600mm** **G=151mm** **J=40.7mm** **M=73mm**	**D=493mm** **H=120mm** **K=24mm** **N=25mm**	**B=2176mm** **F=322mm** **I=45mm** **L=52mm**	**C=600mm** **G=151mm** **J=40.7mm** **M=73mm**	**D=493mm** **H=120mm** **K=24mm** **N=25mm**
	B=77-7/8“ F=12-5/8“ I=1-6/8” L=2”	C=23-5/8“ G=6” J=1-5/8” M=2-7/8”	D=19-3/8“ H=4-6/8” K=1” N=1”	B=85-3/4“ “ F=12-5/8“ I=1-6/8” L=2”	C=23-5/8“ G=6” J=1-5/8” M=2-7/8”	D=19-3/8“ H=4-6/8” K=1” N=1”
700 mm (27-1/2")	**B=1954mm** **F=372mm** **I=45mm** **L=52mm**	**C=700mm** **G=151mm** **J=40.7mm** **M=73mm**	**D=593mm** **H=120mm** **K=24mm** **N=25mm**	**B=2176mm** **F=372mm** **I=45mm** **L=52mm**	**C=700mm** **G=151mm** **J=40.7mm** **M=73mm**	**D=593mm** **H=120mm** **K=24mm** **N=25mm**
	B=77-7/8“ F=14-5/8“ I=1-6/8” L=2”	C=27-1/2“ G=6” J=1-5/8” M=2-7/8”	D=23-3/8“ H=4-6/8” K=1” N=1”	B=85-3/4“ F=14-5/8“ I=1-6/8” L=2”	C=27-1/2“ G=6” J=1-5/8” M=2-7/8”	D=23-3/8“ H=4-6/8” K=1” N=1”
800 mm (31-1/2")	**B=1954mm** **F=422mm** **I=45mm** **L=52mm**	**C=800mm** **G=151mm** **J=40.7mm** **M=73mm**	**D=693mm** **H=120mm** **K=24mm** **N=25mm**	**B=2176mm** **F=422mm** **I=45mm** **L=52mm**	**C=800mm** **G=151mm** **J=40.7mm** **M=73mm**	**D=693mm** **H=120mm** **K=24mm** **N=25mm**
	B=77-7/8“ F=16-5/8“ I=1-6/8” L=2”	C=31-1/2“ G=6” J=1-5/8” M=2-7/8”	D=27-1/4“ H=4-6/8” K=1” N=1”	B=85-3/4“ F=16-5/8“ I=1-6/8” L=2”	C=31-1/2“ G=6” J=1-5/8” M=2-7/8”	D=27-1/4“ H=4-6/8” K=1” N=1”

Please find the reference to the dimensions stated in this table in the Fig. 29 and Fig. 30.

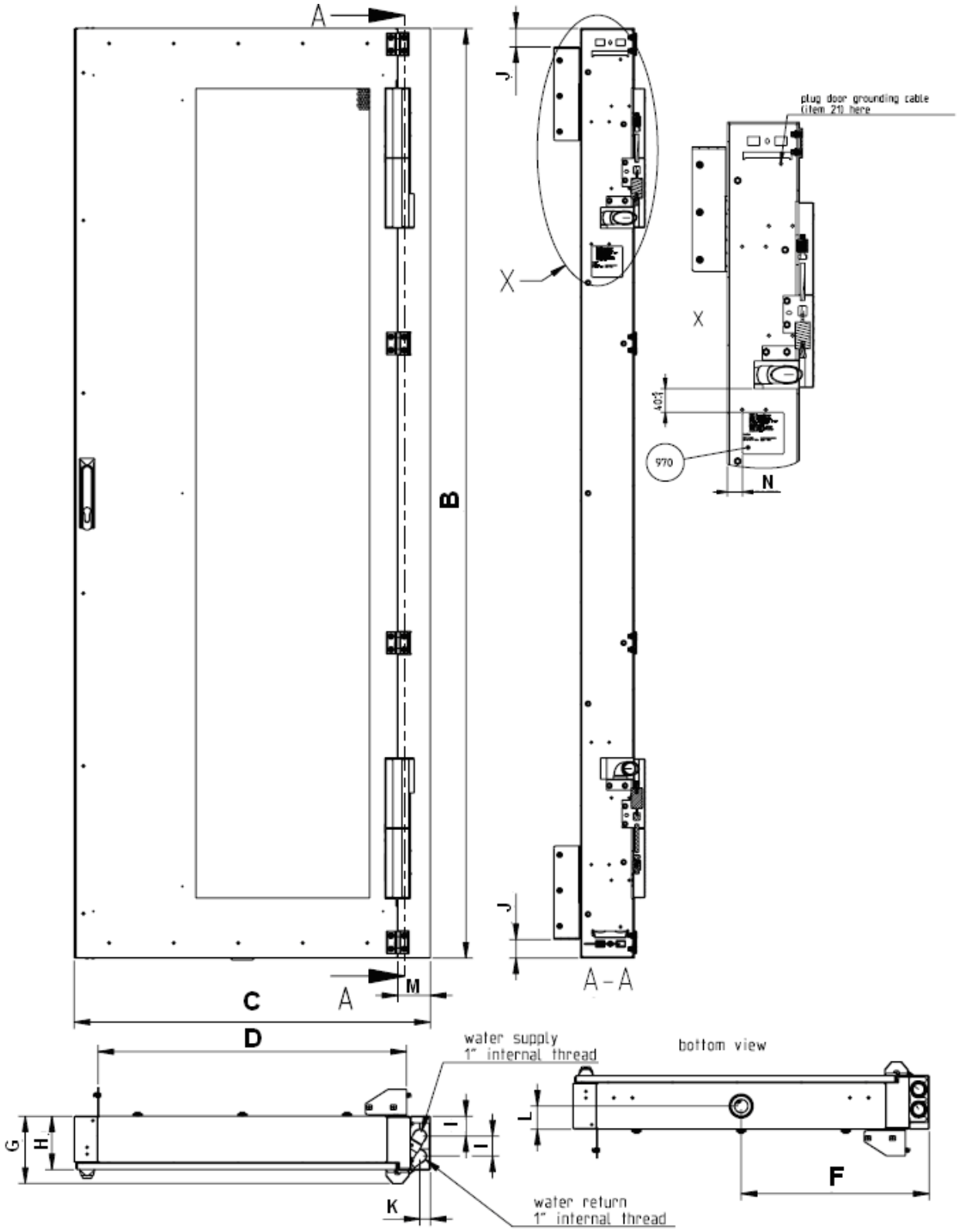


Fig. 29 Submittal drawings – ENP DCD (right hinges)

(1 mm = 0,0394 in.)

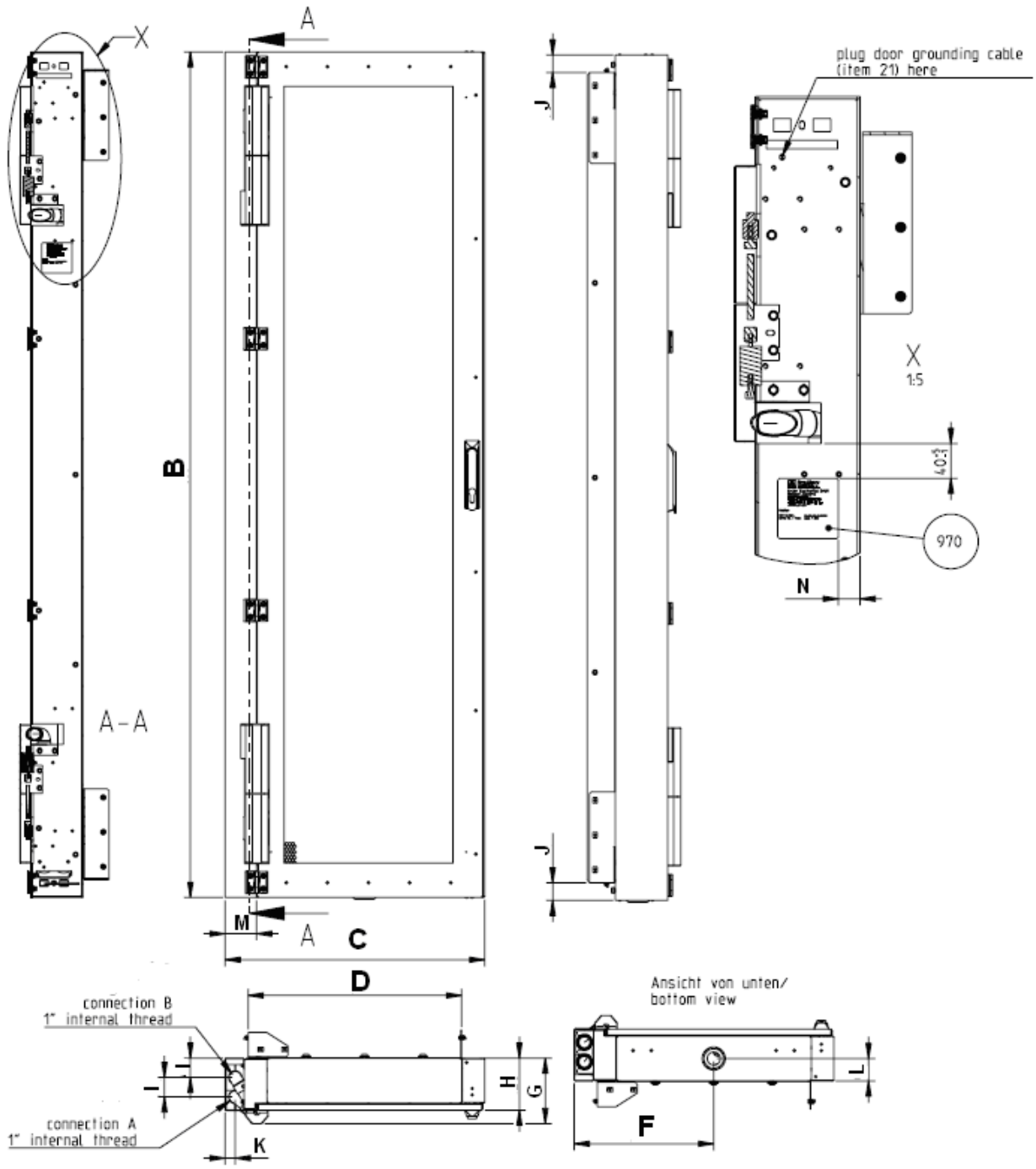


Fig. 30 Submittal drawings – ENP DCD (left hinges)

(1 mm = 0,0394 in.)

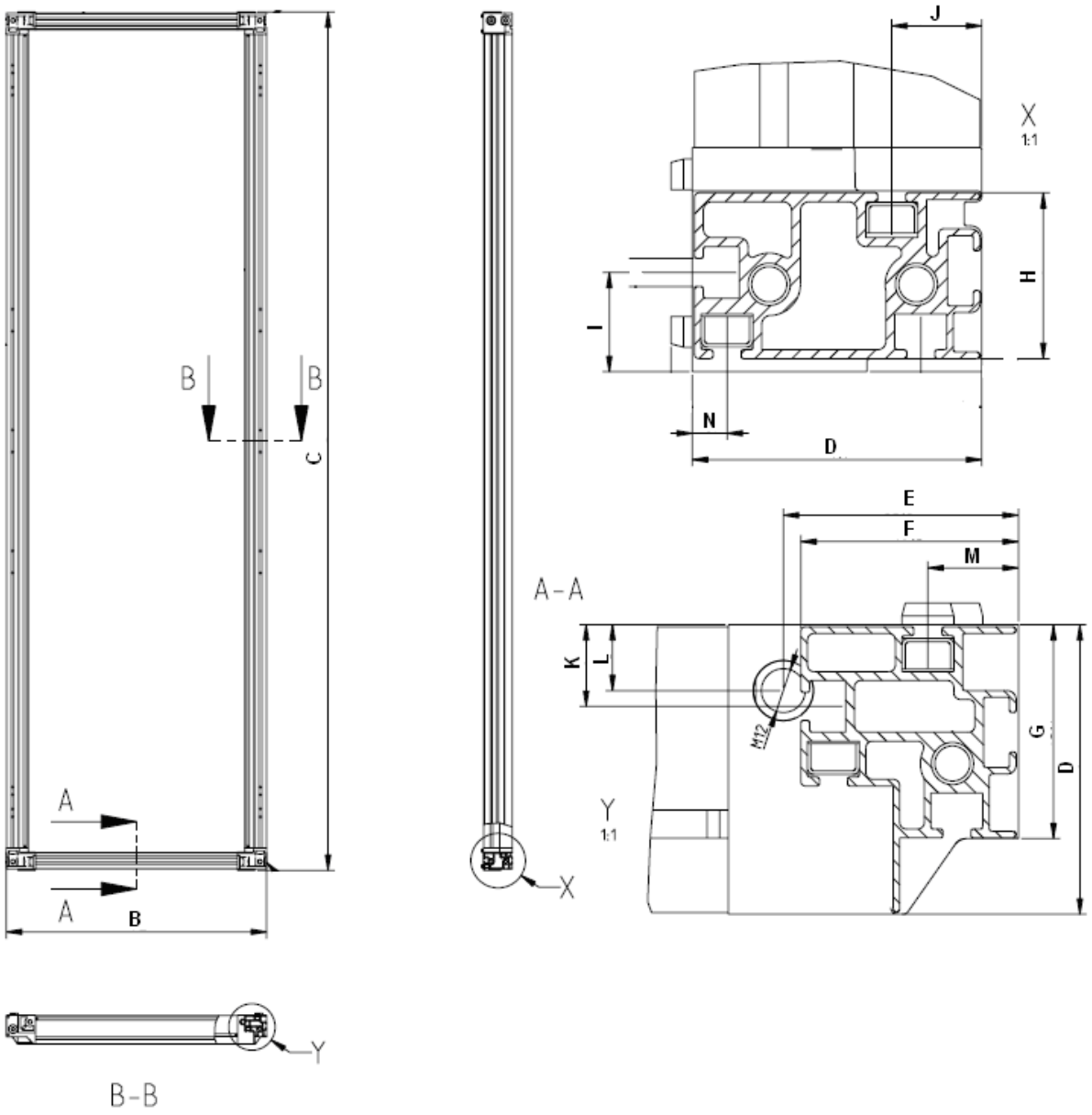


Fig. 31 Aluminium frame submittal drawing
(1 mm = 0,0394 in.)

Tab. 6 Aluminium frame dimensions

[mm]				[in]			
B=592mm	**C=1954mm**	**D=65.9mm**	**E=53.5mm**	B=23-2/8"	C=76-7/8"	D=2-5/8"	E=2-1/8"
F=49.5mm	**G=48.7mm**	**H=37.7mm**	**I=22.6mm**	F=2"	G=1-7/8"	H=1-1/2"	I=7/8"
J=20.5mm	**K=18.6mm**	**L=15mm**	**M=20.6mm**	J=6/8"	K=6/8"	L=5/8"	M=6/8"
N=7.9mm				N=2/8"			

Tab. 7 Technical specifications

Cooling air side	
Housing material	Steel plate (powder coated)
Operating ambient temperature	**10 °C ÷ 35°C** (50 °F – 95 °F) (*other temperatures on request*)
Maximum absolute air humidity on site	8 $g \cdot kg^{-1}$
Air outlet temperature	**18 °C ÷ 27 °C** (64.4 °F – 80.6 °F) (*in accordance with ASHARE*)
Air temperature difference IN - OUT	15 K ÷ 20 K
Chilled water side	
Cooling performance	**35 kW**
Chilled water temperature inlet	**12 °C ÷ 18 °C** (53.6 °F – 64.4 °F)(*other temperatures on request*)
Chilled water temperature outlet	**18 °C ÷ 24 °C** (64.4 °F – 75.2 °F)(*other temperatures on request*)
Maximum operating pressure	**10 bar** (145 psi)
Pipe connection IN / OUT	1” F (on the frame) (DIN ISO 228 - 1)

5 Variants and options

5.1 ENP DCD built in the server rack (Optional)

ENP DCD is typically delivered as a part of a specially prepared server rack. The DCM server rack offers guaranteed air separation between the hot and the cold air within the cabinet.
(*For a detailed description check the "Knürr DCM" manual*)

Fig. 32 Server rack with the ENP DCD

5.2 Connection set ENP DCD (Optional)

This set is for recommended connection of the ENP DCD with the on site chilled water system.

ENP DCD connection set consists of

- **Reinforced hose with nickel - plated connections**
  EPDM resistant to water and anti freeze

Temperature range	**0 °C ÷ 110 °C** (32 °F – 230 °F)
Maximum operating pressure	10 bar (145 psi)
Inner diameter	25 mm (1”)
Connection	1” F / 1” M (DIN ISO 228 - 1)
Length	1500 mm (59,1”)

(1 mm = 0,0394 in.)

- **Ball valve with fitting**
  Ventilation and drain connection ¾”; possibility of pressure and temperature measurements.

Connection 1” F (DIN ISO 228 - 1)

- **Shut off and regulation valve**
  Discharge vent ¾”; possibility of pressure and temperature measurements.

Connection 1” F (DIN ISO 228 - 1)

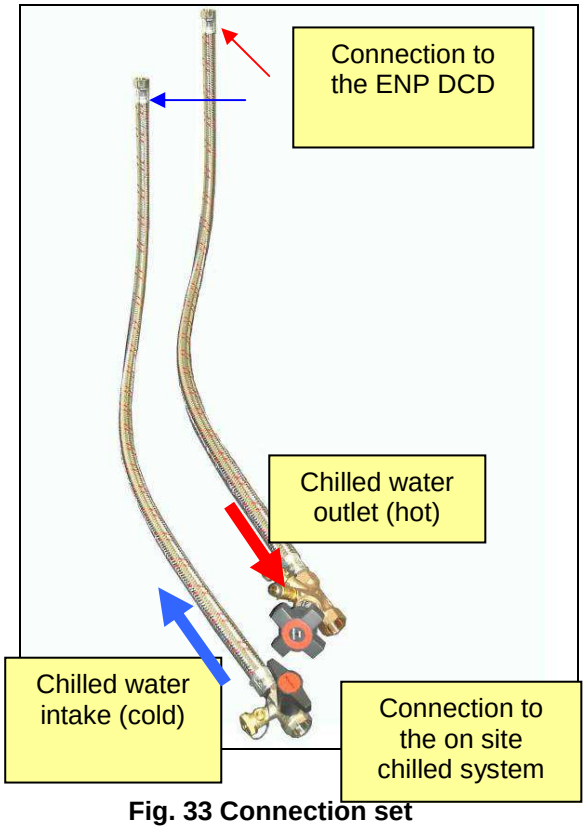


Fig. 33 Connection set

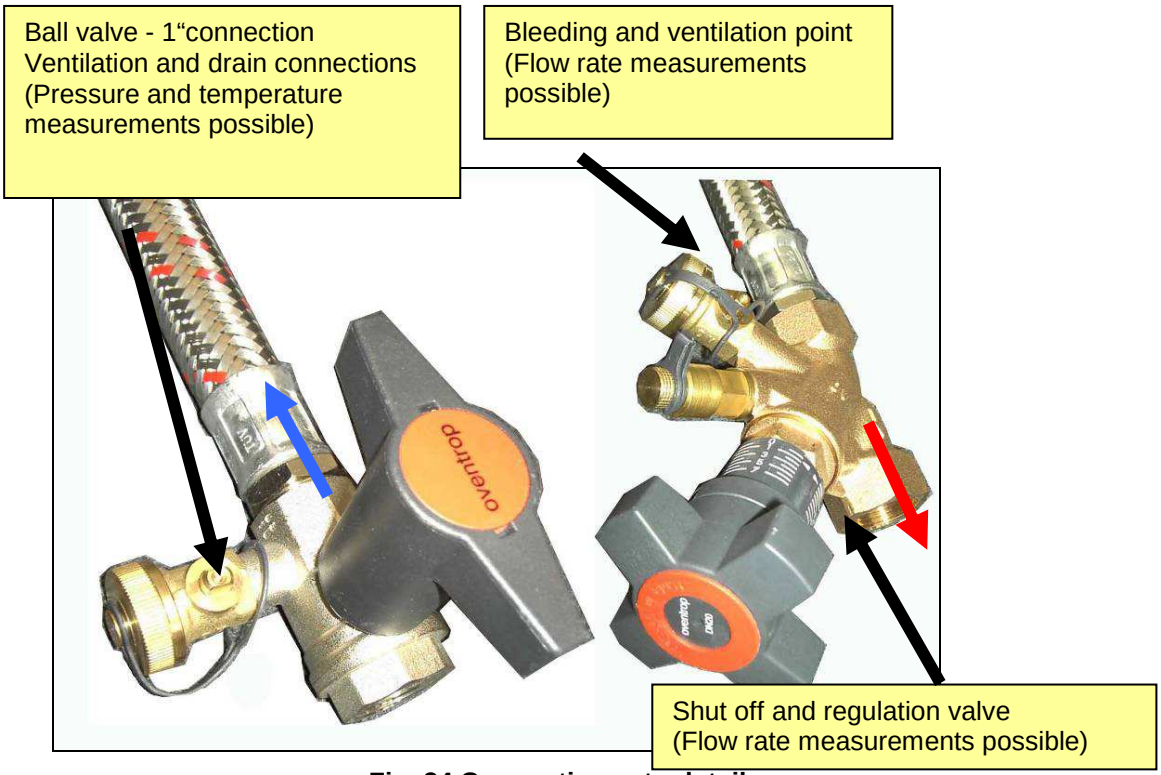


Fig. 34 Connection set - detail

(*Note: All parts of the set are supplied as individual parts and are connected by the customer*)

6 Maintenance and repairs

	All maintenance and repair jobs are to be performed by qualified personnel only. All actions must be in accordance with regulations and instructions of the manufacturer.
	For maintenance and repair jobs use only the tools and spare parts approved by manufacturer of the device.
	Before commencing any work on the chilled water system let the system drain.
	General maintenance actions to be carried out • Check the heat exchanger pollution (dust etc.) • Check functionality of the valves • Check the chilled water system for leaks visually
	Please note that dirt (dust layer etc.) on the heat exchanger reduces the performance of the device (increased pressure loss, worse heat transfer). Vacuum cleaner, soft brush, or compressed air can be used to clean the fins of the heat exchanger.

7 Disassembly and disposal

	Disassembly of the ENP DCD may be performed by qualified personnel only.
	Shut down the chilled water system before disassembly and prevent it from restarting.
	Dispose all the components and parts in accordance with local waste management and regulations. We recommend a recycling company. All components consist of: • Aluminium, steel, brass, copper • Marked plastic components

8 Customer service

All Knürr products are subject to continuous quality control and comply with applicable regulations. For any questions you have related to our products, please contact the manufacturer of your system directly:

Knürr GmbH
Glashüttenstraße 1
01623 Lommatzsch

Tel.: +49 (0) 800 000 6295

Email: service@knuerr.com

9 Annexes

9.1 Quality Requirements for water used in the ENP DCD

In order to safeguard the maximum lifetime of air/water heat exchangers, the water applied for chilling purposes must meet the VGB Chilled Water Guidelines (VGB-R 455 P). The chilled water used must be soft enough to prevent deposits, but it must not be too soft which would lead to corrosion of the heat exchanger.

The following table contains the most important impurities and counter-measures for their removal:

Water impurity	Method for removal
Mechanical impurity (dp < 0.3 mm)	Filter the water
Excess hardness	Soften the water by ion exchange
Moderate level of mechanical impurities and hardeners	Add dispersion or stabilizing agents
Moderate level of chemical impurities	Add deadening agents and inhibitors
Biological impurities (bacteria and algae)	Add biocides

It is recommended to get as closest as possible to the following hydrological parameters:

Tab. 8 Hydrological requirements

Hydrological data		
pH values	(7 ÷ 10,5)	
Carbonate hardness	(3 ÷ 8)	°dH
Free carbon dioxide	(8 ÷ 15)	mg/dm3
Combined carbon dioxide	(8 ÷ 15)	mg/dm3
Aggressive carbon dioxide	0	mg/dm3
Sulphides	< 10	mg/dm3
Oxygen	< 50	mg/dm3
Chloride ions	< 250	mg/dm3
Sulphate ions	< 10	mg/dm3
Nitrates and nitrites	< 7	mg/dm3
COB	< 5	mg/dm3
Ammonia	< 5	mg/dm3
Iron	< 0.2	mg/dm3
Manganese	< 0.2	mg/dm3
Conductivity	< 30	µS/cm
Solid residue from evaporation	< 500	mg/dm3
Potassium manganese consumption	< 25	mg/dm3
Suspended matter	< 3	mg/dm3
(partial flow cleaning is recommended)	(3 ÷ 15)	mg/dm3
(permanent cleaning)	> 15	mg/dm3

9.2 Checklist for Setting up the Device

Tab. 9 Set up checklist

Performed checks	Done (to be signed upon completion)	Remarks
Check device for damage upon receipt.		
Check the ground for being horizontal.		
Check bearing capacity of ground.		
Add-on and align, connect to server cabinet, position feet of the rack and adjust them horizontally		
Cables connected with server cabinet: - Temperature sensors (optional) - Server shut-down (optional) - Door contact (optional)		
Unit connected with set of external valves (optional): - Valve drive - Flow meter with temperature sensors (optional)		
Optional automatic door opening adjusted at server cabinet		
No remainders of packaging inside ENP DCD		
All assembly tools removed		
Bushings into the device proper and air-tight		
Chilled water connection leak-proof / pressure-tested		
Chilled water system de - aerated		
Volume flow of chilled water adjusted		
Condensed water line unobstructed		
Smell trap of chilled water system functional		
Condensate tray connected to condensed water line		
All front panels closed (air ducts technically separated)		

....
Place: Date: Signature of Tester

9.3 Commissioning Protocol

ENP DCD Commissioning Protocol

1 General Details

1.1 Customer/Site of installation

Customer's name: ……..

Customer's address: ……..

……..

……..

Contact partner: ……..

Phone number: ……..

Site of installation / room number: .....

Humidity at site of installation: ..... % rel. humidity

Ambient temperature ..... ° C

1.2 Configuration

Cabinet type:

ENP DCD 35 kW ☐

Commissioning number (if applicable): .....
Serial number: .....

Special remarks:
.....
.....
.....

2 State Check

2.1 General State

Customer's proof of bearing capacity of ground / transport ways ☐

Check of alignment ☐

Transport damage to housing: yes ☐ no ☐

Remarks
.....
.....
.....

Residual packaging removed: yes ☐ no ☐

Assembly tools removed: yes ☐ no ☐

Air ducts checked: yes ☐ no ☐
(Server cabinet front plates closed…)

2.2 Chilled Water System within the Facility

Chilled water: with anti-freeze ☐ without anti-freeze ☐

ENP DCD

Connected to: CTU ☐ cold water system, direct ☐

Circuit in building, direct ☐

Chilled water temperature (primary): Feed: ..... °C Return: ..... °C

Chilled water pressure Feed: ..... bar Return: ..... bar

Connection:

with Knürr connection set ☐

set of external valves ☐

Customer's hydraulic plant OK

(visual check): yes ☐ no ☐

Remarks: ……..

3 Functional Check

3.1 Mechanical Functions

Damage to heat exchanger/
Connections/ lamellas / surface: none ☐ existing ☐
Remarks:
.....

Front door, closing: yes ☐ no ☐
Remarks:
.....

Rear door, closing: yes ☐ no ☐
Remarks:
.....

Pipe duct inlets / cable bushings closed: yes ☐ no ☐
Remarks:
.....

Condensed water drain open / connected: yes ☐ no ☐
remarks:
.....

Fans run perfectly (bearings OK)

Visual check yes ☐ no ☐
Remarks:
.....

3.2 Thermodynamic Checks

Condensed water forming at heat exchanger yes ☐ no ☐
Remarks:
.....

Chilled water entering heat exchanger: .....° C

Chilled water leaving heat exchanger: .....° C

Cabinet temperature in front of heat exchanger: .....° C

Cabinet temperature behind of heat exchanger: .....° C

Chilled water network bleeded: yes ☐ no ☐

Pressure of chilled water network tested: yes ☐ no ☐
(customer's protocol available)

Volume flow adjusted: yes ☐ no ☐

external ☐

Water flow: …… l / min external ☐

Remarks:
.....

Correctness of above values is hereby confirmed.
Commissioning was performed during on-going operation.

yes ☐ no ☐

.....	.....	.....
Commissioning firm	Date	Signature
.....	.....	.....
Customer	Date	Signature

9.4 ENP DCD – performance charts

Performance diagrams

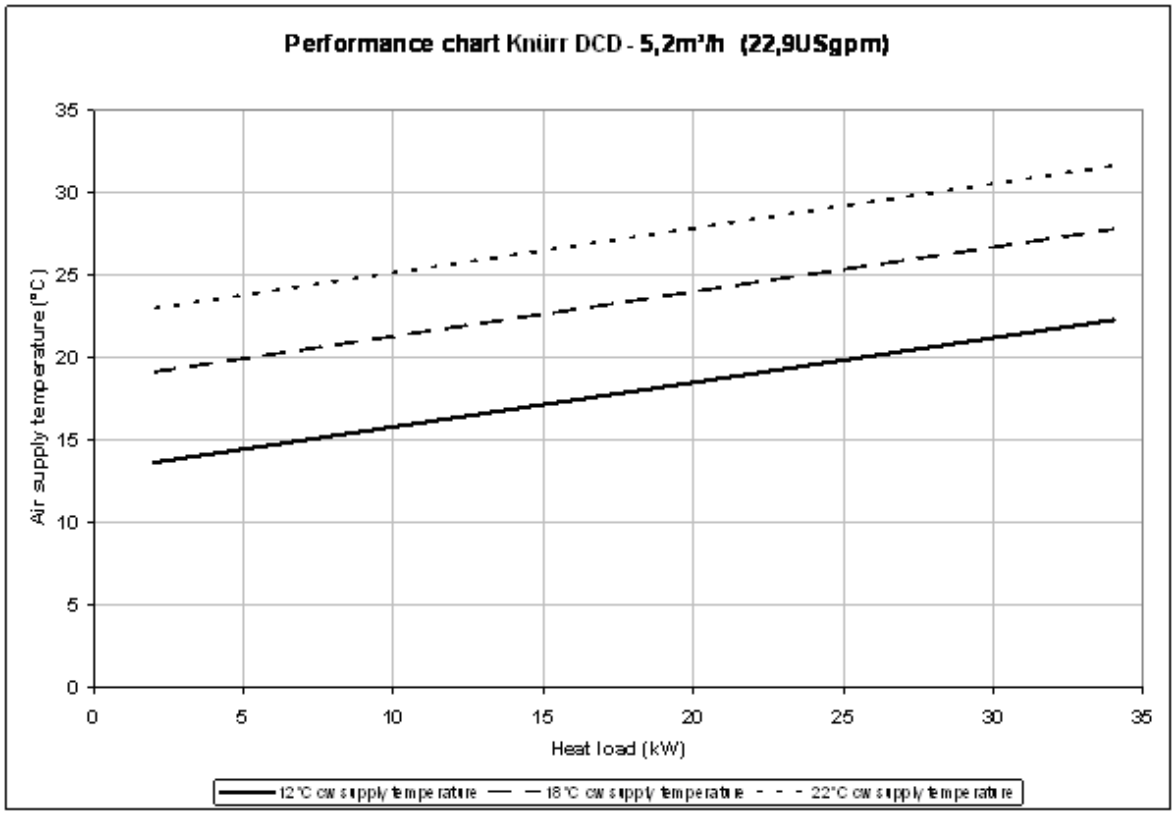


Fig. 35 Performance chart 1

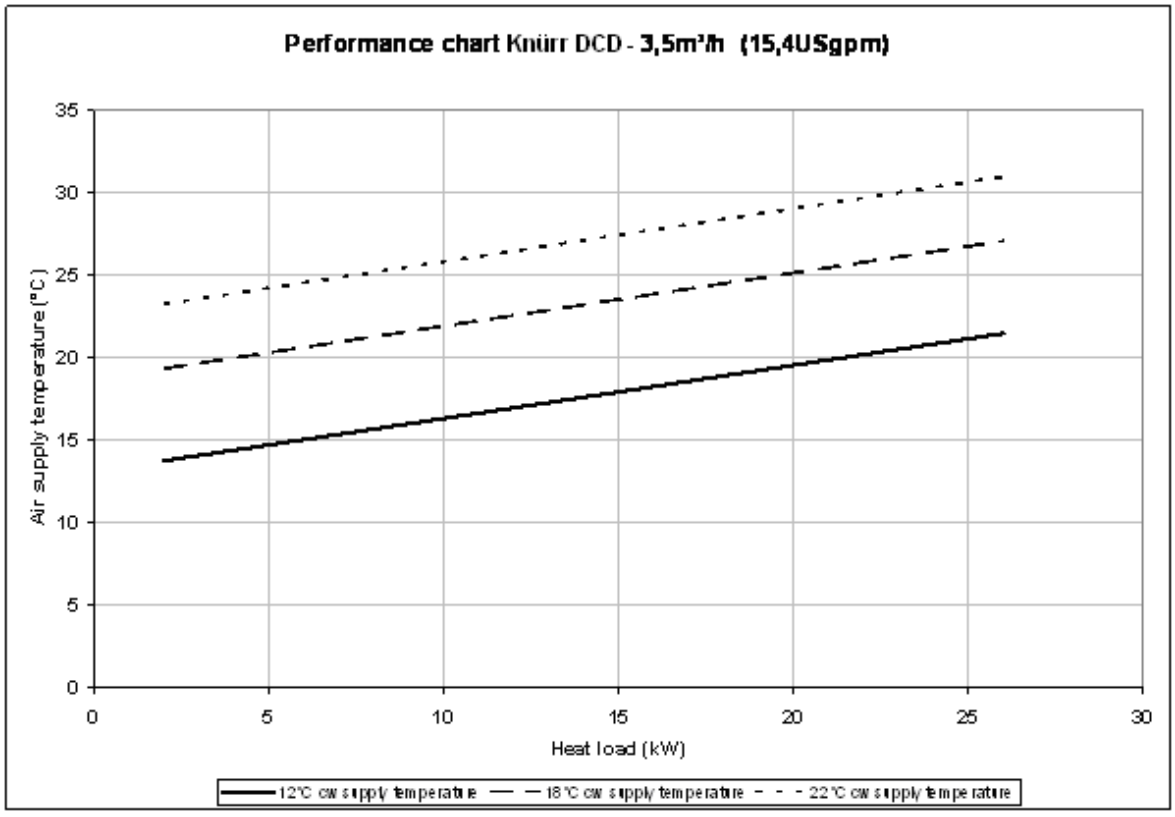


Fig. 36 Performance chart 2

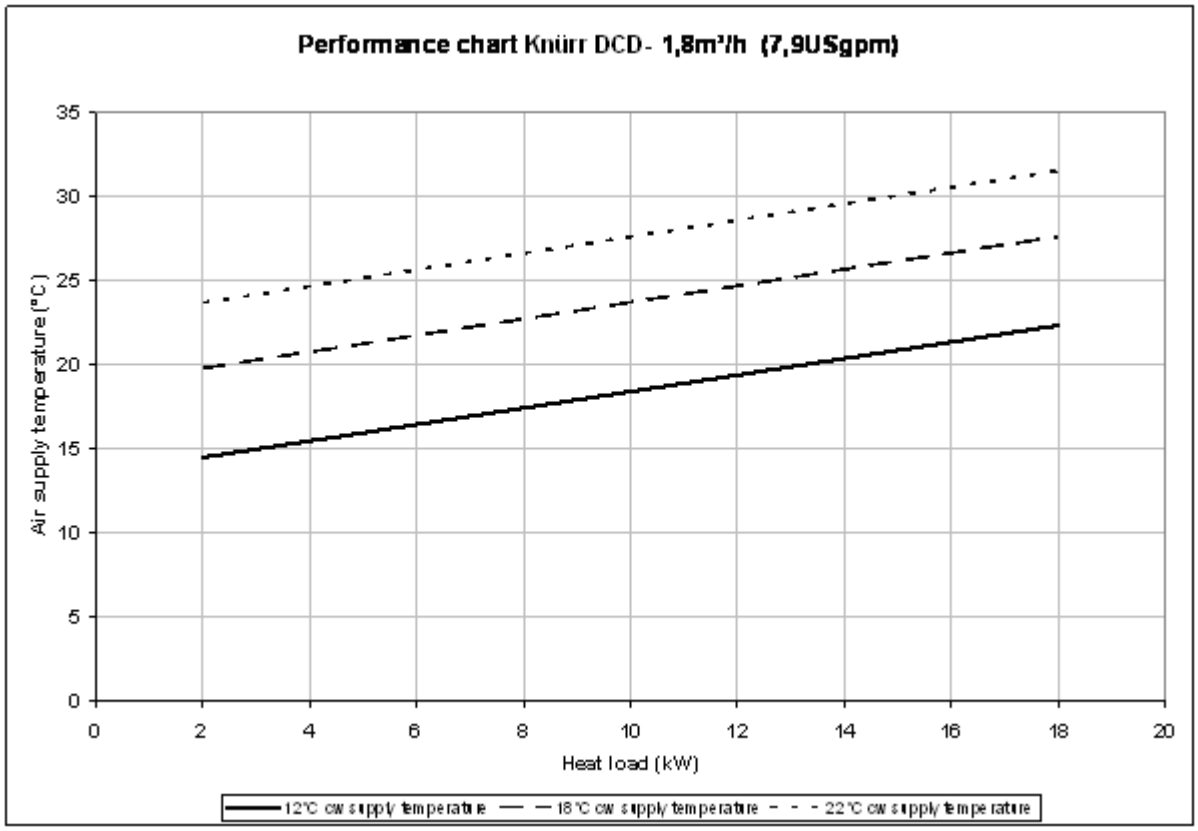


Fig. 37 Performance chart 3

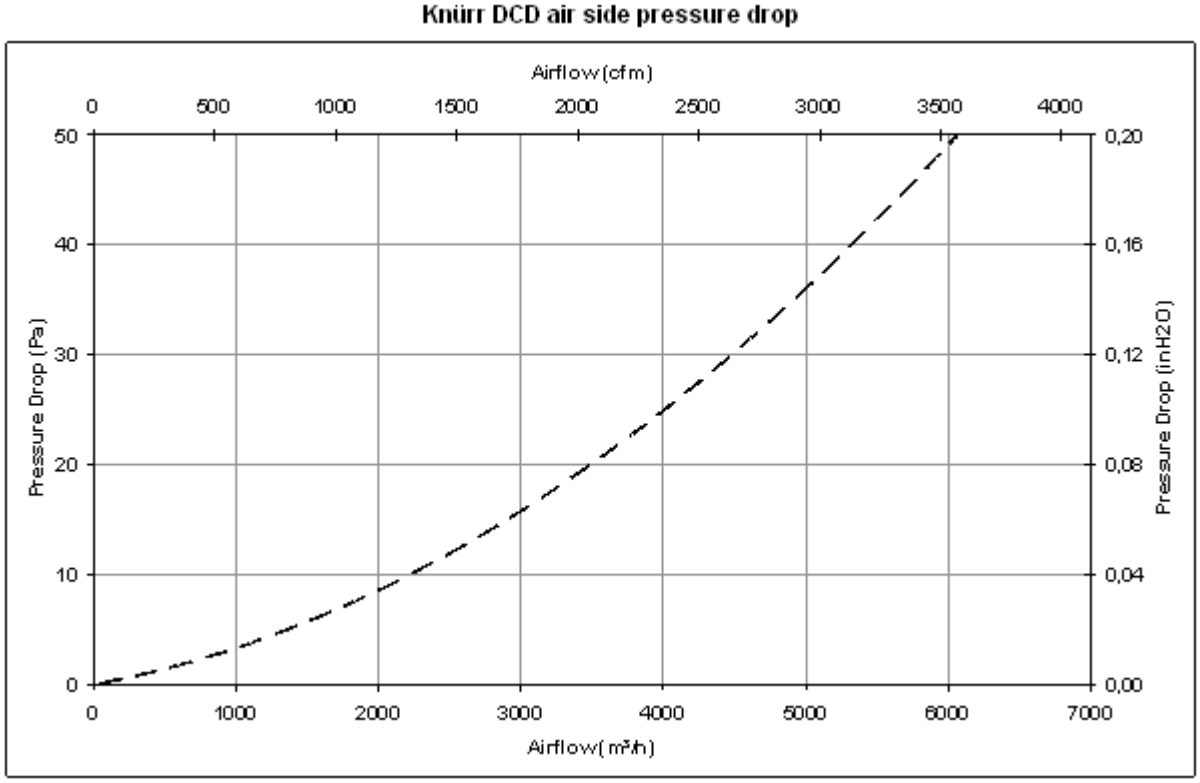


Fig. 38 Air side pressure drop

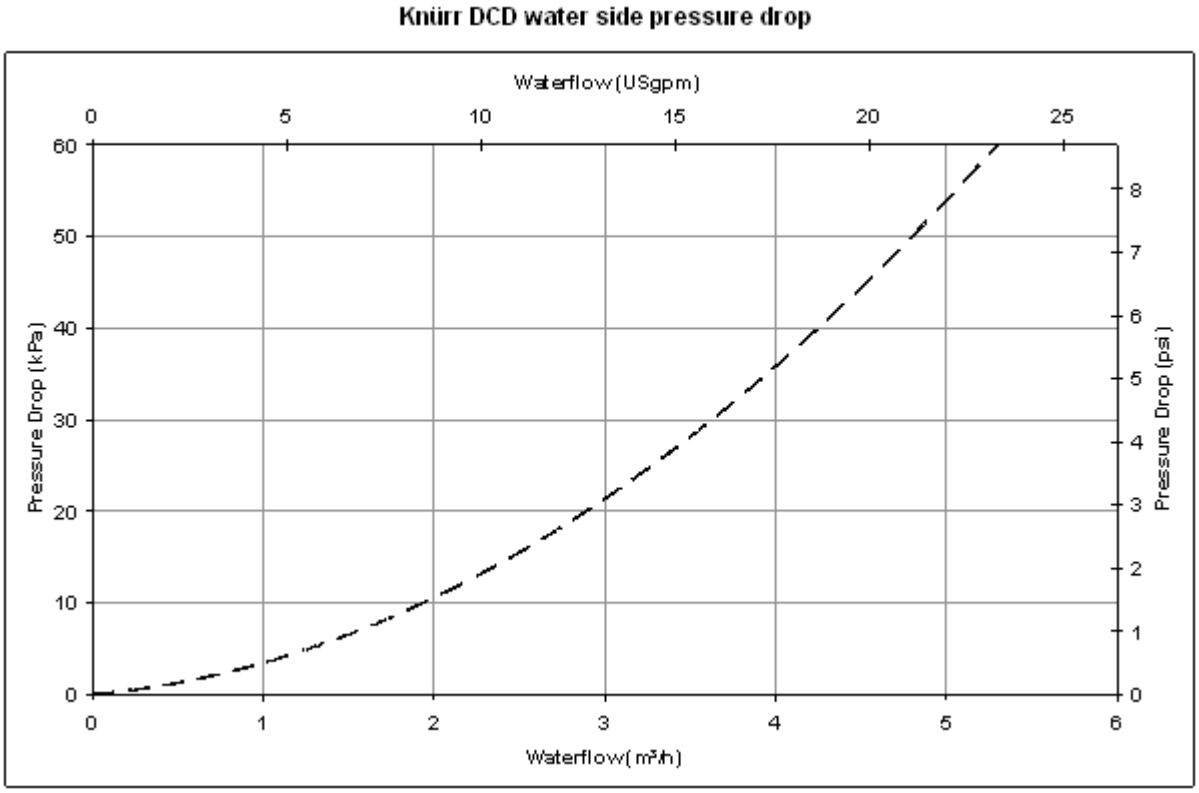


Fig. 39 Water side pressure drop

9.5 Unit conversion chart

Tab. 10 Unit conversion

1 mm	0.0394 in
1 kg	2.205 lbs
1 bar	14.504 psi
[°F]	$([°C] \cdot 1.8) + 32$

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