Emerson Network Power

Rack Cooling Solutions

All issues and arguments to date can be summarized under three main criteria for assessing data center infrastructure.

1. Availability

The key issue for all data centers is availability. Maximum computing power, rapid access or lowest costs, are of little use if availability is jeopardized by uncertainties, failures or even lengthy downtimes.

Data center services users, whether it be in-house or a customer that outsources its computing power, will only remunerate the finest computing technology (including cloud computing) if they can rely one hundred percent on the availability of the data they need.

With Emerson Network Power data center infrastructure, you are always in a position to achieve the degree of availability that matches your scope of work.

2. Efficiency

A customer who can rely on the availability will still be dissatisfied if this availability is achieved at the expense of efficiency. Efficiency must be seen as a multi-purpose term. Efficiency covers:

The functionality of technical processes, e.g. expressed in the efficiency of the cooling or power supply.

Cost effectiveness in terms of both investment and running costs. When we talk about investment, it is not just the pure equipment investment that matters;

other important factors are:
- Building costs.
- Consequential costs for recirculation facilities
- Consequential costs for power supply
- Efficiency of the cooling and power supply facilities
- Consumption values and costs for operating equipment
- Monitoring, service and repair costs

Timely efficiency in relation to processing speed and the period from data provision to data output.

3. Adaptability

Availability and efficiency are only sufficient if planning, project management and implementation is short term rather than sustainable.

Future-proofing and adaptability for Emerson Network Power are also crucial factors in the development and delivery of data center infrastructure.

Future-proofing redners data center infrastrucutre operational even:

- there is a demand for increased computing capacity
- the heat loads caused by new server types – or changes to the proportions of different server types – are increased or redistributed
- current flow and speed, volume flow or the pressure ratios are changed.

Products from Emerson Network Power are future-proof and provide an appropriate and efficient response.

Adaptability delivers highly efficient results even during planning and project management and is, naturally, also part of future-proofing.

Knürr® DCL

Modular Rack Cooling from 6 kW to 60 kW

**Rack cooling enables you to expand server performance without interfering with existing room cooling.
The design of Knürr DCL is built on the three principles:**

Adaptability

- Two "room neutral" architectures for all power density

- Can be retrofitted easily on site.

- Various combinations from up to four server racks.

Availability

- N +1 fan redundancy.

- Multi-level "fail-safe" controller.

- Comprehensive alarm and monitoring functions.

- Automatic emergency door opening

Efficiency

- Minimizes power consumption with controlled EC fans.

- Long freecooling periods due to large dimensioned heat exchanger.

Knürr DCL with DCM rack

Knürr® DCL

Simple fan replacement

Knürr DCM® server rack for cooling with Knürr® DCL, Liebert®; integrated power distribution modules and cable management.

Embedded controller

Knürr® DCL fans

Switchover between a 2 and 3-way valve

Knürr® DCL Benefits

■ **Availability**
An essential requirement for data center operators is to ensure uninterrupted availability. Knürr guarantees this by means of:
– Embedded controller hardware guaranteeing autonomous continued operation of the control system in the event of a component failure.
– Access control and data security guaranteed by means of HTTPS and SNMP V3.
– Alarm management can be integrated into DCIM (Data Center Infrastructure Management).

■ **Efficiency**
Given current competition, no data center operator can leave the costs issue to chance. Anyone who only thinks about the upfront costs or wants to cut costs at the expense of reliability will be in for unpleasant surprises later on.
– Greater power density in the data center results in better use of space and reduced building costs.
– High cold-water supply temperature increases the proportion of free cooling during cold-water generation and improves the energy efficiency rating (EER) of the chiller.
– Low air-side pressure loss reduces the power consumption of the fans.

■ **Adaptability**
The modular DCL design accommodates frequently changing requirements:
– Two room-neutral cooling architectures for medium- to high-power density.
– Simple retrofitting on site.
– A number of combinations with up to 4 server racks to choose from.

Detail of the DCL data center
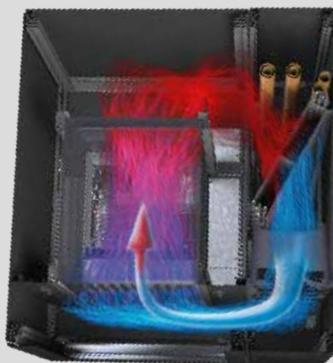
Knürr® DCL
Configurations

■ **DCL-L facilitates efficient rack cooling from 1 to 4 server racks**

Knürr® DCL – L

■ Air flow completely contained in rack or in the row.
■ No thermal load or air flow in the room for greatly reduced noise levels.
■ Comprehensive separation of IT equipment and IT room; precisely controlled cooling air temperature.
■ No special room requirements; raised floor not necessary.

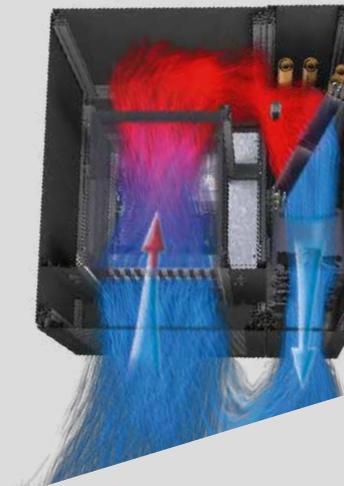Knürr® DCL-L with one-sided connection to Knürr DCM®

*Flow diagram

Knürr® DCL – H

■ Hybrid configuration: Containt warm air and cold air supplied to the room.
■ Cooling devices and racks are open at the front and closed at the rear.
■ No thermal load in room; warm air contained within racks.
■ Cold air distribution throughout the room; cold air reserve available in the event of cooling failure.
■ A better alternative to hot aisle containment.
■ Raised floor not required.

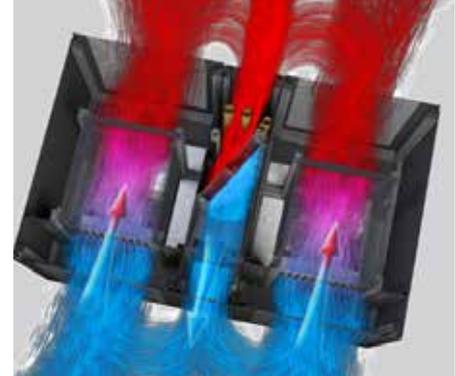Knürr® DCL-H with one-sided connection to Knürr DCM®

*Flow diagram

Knürr® DCL – R

■ Aisle cooling device for SmartAisle cold aisle containment.
■ State of the art controller.
■ Switching to Knürr DCL-L or DCL-H can be done simply by changing the doors.

Knürr® DCL-R with one-sided connection to Knürr DCM®

*Flow diagram

* Diagrams show horizontal cross-section from above.

Knürr® DCL
Basic Specifications

Cooling power levels/specification		Knürr® DCL 30 kW	Knürr® DCL 34 kW
Product name Knürr® DCL for rack cooling		Knürr® DCL30L	Knürr® DCL34L
Product name Knürr® DCL for hybrid solution		Knürr® DCL30H	Knürr® DCL34H
Product name Knürr® DCL for aisle cooling		Knürr® DCL30R	Knürr® DCL34R
Nominal cooling power*		30 kW	34 kW
Volume flow rate of air		5000 m³/h	6000 m³/h
Volume flow rate of water		4.5 m³/h	5.0 m³/h
Max. water pressure		10 bar (145 PSI)	10 bar (145 PSI)
Number of fans		5	6
Max. power consumption of fans		5 x 170 W	6 x 170 W
Dimensions	Height	2000 mm	2200 mm
	Width	300 mm	
	Depth DCL-L	1.200 mm - 1.300 mm	
	DCL-H	1.100 mm - 1.300 mm	
	DCL-R	1.000 mm - 1.300 mm	

* when cooled at a water temperature of 16/22 °C and air inlet temperature of 43 °C

Knürr® DCL with Knürr® DCM

Knürr® DCL
Order number

Model number – Part 1/2										Detail of model											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	L	3	0	L																			
D	C	L	3	4	H																			
D	C	L	3	0	R																			

1. – 3. **DCL (Modular Rack Cooling for Data Centers)**
DCL – Knürr® DCL

4. – 5. **Nominal Cooling Capacity**
30 – 30 kW (height 2000 mm / 42 U)
34 – 34 kW (height 2200 mm / 47 U)

6. **Application**
L – Cooling with closed cold-air circulation (without side panels)
H – Hybrid cooling (open in the front; closed at the rear - without side panels)
R – Cooling with perforated doors (with side panels)

7. **Depth**
1 – 1000 mm (only for DCL-R version)
R – 1100 mm (not for DCL-L version)
2 – 1200 mm
H – 1300 mm

8. **Rollers and Ramp for Transport**
0 – No rollers (2 devices on one pallet)
D – Transport rollers (one device on one pallet with ramp)

9. **Power Connection**
2 – 230 V AC 1-phase 50/60 Hz CE
4 – 230 V AC 1-phase 50/60 Hz CE with A/B switching
2 – 230 V AC 1-phase 50/60 Hz 2-pole CE
B – 230 V AC 1-phase 50/60 Hz 2-pole CE with A/B switching

10. **Water Connection and Heat Exchanger Redundancy**
Z – Water connection, bottom
Y – Water connection, top
9 – Water connection, top and bottom
V – Redundant water connection, bottom (external valve)

11. **Filter (only for DCL-R)**
N – No filter
A – MERV 1 (not possible for 1000 mm depth)
C – MERV 1, filter monitoring (not possible for 1000 mm depth)

12. **Screen Display**
0 – Without
Y – 145 cm display (5.7"); touchscreen

13. **Preparation for Automatic Door Opening**
0 – Not prepared
1 – Prepared for one rack with automatic door opener
2 – Prepared for two racks with automatic door opener
3 – Prepared for three racks with automatic door opener
4 – Prepared for four racks with automatic door opener

14. **Cooling Water Monitoring / Condensate Pump**
0 – Without
T – Temperature sensor inlet flow / return flow
4 – Heat meter
5 – Condensate pump
6 – Temperature sensor inlet flow / return flow + condensate pump
7 – Heat meter + condensate pump

15. **Environmental Monitoring**
0 – Without
S – Smoke detection
H – Humidity monitoring
B – Smoke detection and humidity monitoring

16. **Color**
1 – RAL 7021, (dark-grey)
G – RAL 7035, (light-grey)
2 – No standard color

17. – 18. **Free (for Future Use)**

19. **Communication Interface**
0 – Standard / always available (HTTPS, SSH, MODBUS TCP, SNMP - to V3)
D – Digital input / output (8/4)
M – Modbus RTU
B – Bacnet
V – 4 digital input / output + Modbus RTU
W – 4 digital input / output + Bacnet

20. **Server Rack Monitoring (Accessory Kit)**
0 – Without
1 – Door contacts 1 rack
2 – Door contacts 2 racks
A – Door contacts 3 racks
B – Door contacts 4 racks
3 – 2 x temperature sensors 1 rack
4 – 2 x 2 temperature sensors 2 racks
C – 3 x 2 temperature sensors 3 racks
D – 4 x 2 temperature sensors 4 racks
7 – Door contacts + temperature sensors 1 rack
8 – Door contacts + temperature sensors 2 racks
E – Door contacts + temperature sensors 3 racks
F – Door contacts + temperature sensors 4 racks

21. **Packaging**
P = Land freight – short distance (pallet, shrink film, cardboard protection)
S = Sea freight (air freight) – large distance (wooden crate)

22. **Special Note**
A = No special customer request to be confirmed by contractor; standard device
X = Includes special customer request to be confirmed by contractor

23. – 25. **Manufacturer's Configuration Number**

Knürr® DCD

Cooling Door for Maximum Energy Efficiency

ENP DCD is an air-water heat exchanger that is integrated in the rear door of a server rack. The heat exchanger is designed to absorb heat loads of up to 35 kW from server racks.

- Compact solution for new and existing data centers.

- Highest possible energy efficiency with shortage of fans.

- Supports cold-room concept.

- Permanent water circulation piping can be routed through water-carrying hinges.


Opened Knürr® DCD

Special water-bearing hinge

Water-connection fitting for the top

Condensation-water discharge fittings

Condensate pan

Knürr® DCD Benefits

■ **Availability**
 – No additional fans are required for cooling; fan failure is no longer an issue.
 – System is highly reliable.
 – Fewer sources of failure.
 – No additional fans needed; thus no heat is wasted.
 – Guaranteed 35 kW cooling.
 – Minimal air pressure drop for cooling air.
 – Conduit and collector for condensate water in the event of the temperature dropping below dew point. Condensate water is discharged via a flexible 5/8" hose attached to a male coupling.

■ **Efficiency**
 – Optimal space utilization through ultra compact design and hence very low room costs.
 – Lowest possible pressure loss in water cooling circulation: only 54 kPa minimizes energy consumption of pumps.
 – Minimal pressure loss in cooling air flow through optimized heat exchanger structure and linear air paths without bends: no energy costs incurred by additional fan for cooling unit.

■ **Adaptability**
 – Standard heights for 2000 and 2200 mm (42 / 47U).
 – Standard widths 600, 700 and 800 mm.
 – Top or bottom cold-water connection (field can be adjusted).
 – Using a special adapter frame, the Knürr® DCD cooling door is compatible with server racks from other manufacturers.
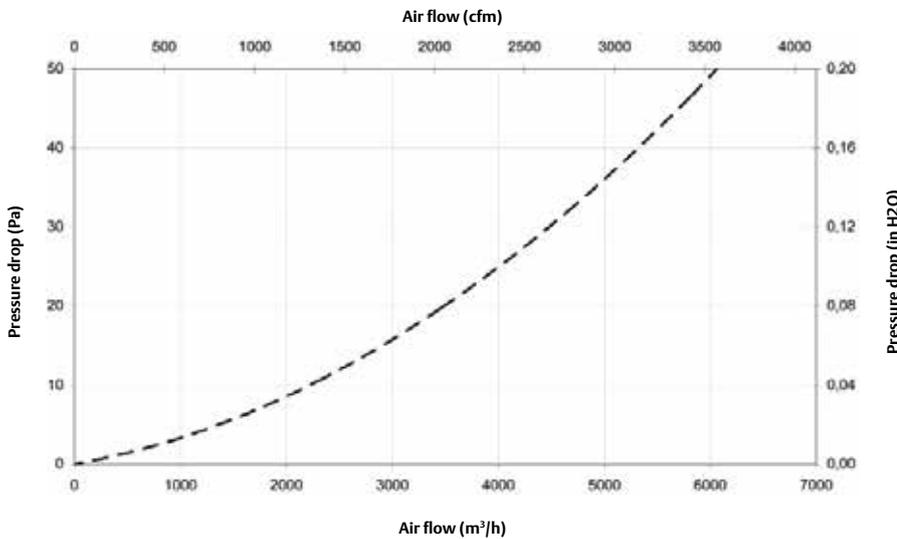
35Pa can be handled in servers with typical fans

PUE = 2

PUE = 1.2
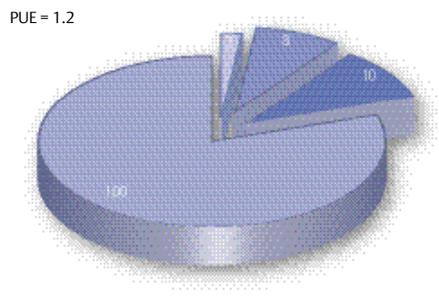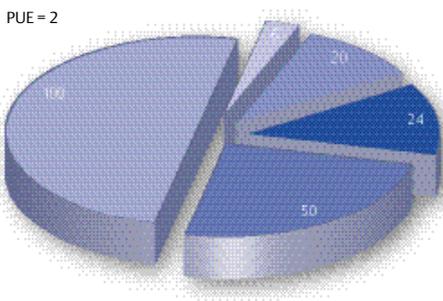
- ■ Lighting
- ■ Electrical losses
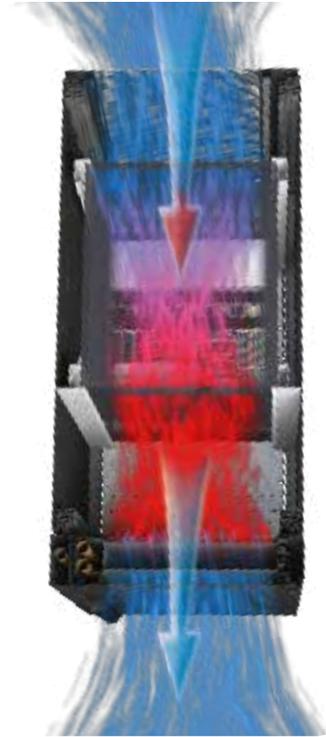- ■ Air circulation
- ■ Cooling
- ■ IT equipment

Knürr® DCL
Configurations

Knürr® DCD open without trim

Server rack cooling components with Knürr® DCD cooling door

Server rack air flow with Knürr DCL (cross-section)

Knürr® DCD/DCM
Basic Specifications

Cooling-air side	
Housing material	Sheet steel (powder-coated)
Operating ambient temperature	10 ° C ÷ 35 ° C (50 ° F - 95 ° F) (other temperatures available upon on request)
Max. absolute humidity on site	8 g/kg
Air outlet temperature (as per ASHARE)	18 ° C ÷ 27 ° C (64.4 ° F - 80.6 ° F)
Air temperature difference - OFF	15 K ÷ 20 K

| Cold-water side	
Cooling power	35 kW
Cold water inlet temperature	12 ° C ÷ 18 ° C (53.6 ° F - 64.4 ° F) (other temperatures available upon on request)
Cold water outlet temperature	18 ° C ÷ 24 ° C (64.4 ° F - 75.2 ° F) (other temperatures available upon on request)
Max. operating pressure	10 bar (145 psi)
Pipe connection IN / OUT	1" female (on frame) (DIN ISO 228-1)

Knürr® DCD
Configuration number

Model number – Part 1/2										Detail of model											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																				

1. – 3.	**DCD (ENP DCD)** DCD – Data Center Door
4. – 5.	**Nominal cooling capacity** 30 – 35 kW
6.	**Rack height** A – 2,000 mm (78 – 6/8") B – 2,100 mm (82 – 5/8") C – 2,200 mm (86 – 5/8")
7.	**Rack width** 6 – 600 mm (23 – 5/8") 7 – 700 mm (27 – 4/8") 8 – 800 mm (31 – 4/8")
8.	**Rack type** A – Prepared for DCM rack (separatelly ordered) 3 – 3rd party rack adapter 0 – No rack
9.	**CW connection – hinge possition** 1 – top left 2 – top right 3 – bottom left 4 – bottom right

10.	**Options** 0 – No options (N/A at the moment)
11. – 15.	**Not in use** 0 – No options (N/A at the moment)
16.	**Color** 1 – RAL 7035 (light-grey) G – RAL 7021 (black-grey)
17. – 20.	**Not in use** 0 – No options (N/A at the moment)
21.	**Packaging** P – Landfreight – short distance (Shrink wrap, pallet, cardboard) S – Long distance (Seafreight) – (Wooden crate) 0 – No packaging (only when Digit 8 = A)
22.	**SFA – special features** A – Standard unit X – SFAs included
23. – 25.	**Factory configuration number**

Rack Cooling Accessories
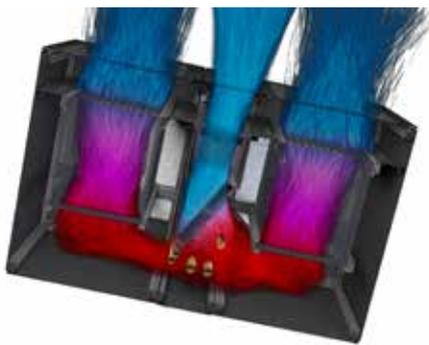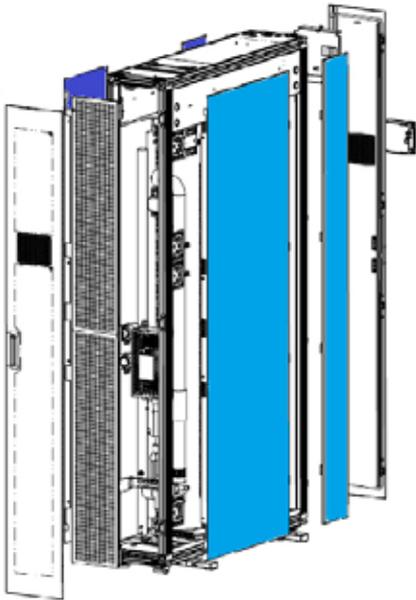
Knürr® DCL Partition Panels

■ **Application**
– Used for changing air flow rate.

■ **Material**
– Sheet steel, 1.0 mm.

■ **Color**
– Powder coated texture, RAL 7021, dark-grey.

H [mm]	D [mm]	Description	Order No.
2000	1000-1100	Internal side panel front, right H2000 D1000 - 1100 dark-grey	**080130708**
2000	1200-1300	Internal side panel front, right H2000 D1200 - 1300 dark-grey	**080130718**
2200	1000-1100	Internal side panel front, right H2200 D1000 - 1100 dark-grey	**080130808**
2200	1200-1300	Internal side panel front, right H2200 D1200 - 1300 dark-grey	**080130818**
2000	1000-1100	Internal side panel front, left H2000 D1000 - 1100 dark-grey	**080130728**
2000	1200-1300	Internal side panel front, left H2000 D1200 - 1300 dark-grey	**080130738**
2200	1000-1100	Internal side panel front, left H2200 D1000 - 1100 dark-grey	**080130828**
2200	1200-1300	Internal side panel front, left H2200 D1200 - 1300 dark-grey	**080130838**
2000	1000	Internal side panel rear, right H2000 D1000 dark-grey	**080130748**
2000	1100-1200	Internal side panel rear, right H2000 D1100 - 1200 dark-grey	**080130758**
2000	1300	Internal side panel rear, right H2000 D1300 dark-grey	**080130768**
2200	1000	Internal side panel rear, right H2200 D1000 dark-grey	**080130848**
2200	1100-1200	Internal side panel rear, right H2200 D1100 - 1200 dark-grey	**080130858**
2200	1300	Internal side panel rear, right H2200 D1300 dark-grey	**080130868**
2000	1000	Internal side panel rear, left H2000 D1000 dark-grey	**080130778**
2000	1100-1200	Internal side panel rear, left H2000 D1100 - 1200 dark-grey	**080130788**
2000	1300	Internal side panel rear, left H2000 D1300 dark-grey	**080130798**
2200	1000	Internal side panel rear, left H2200 D1000 dark-grey	**080130878**
2200	1100-1200	Internal side panel rear, left H2200 D1100 - 1200 dark-grey	**080130888**
2200	1300	Internal side panel rear, left H2200 D1300 dark-grey	**080130898**

Knürr® DCL / DCM Add-on Kit
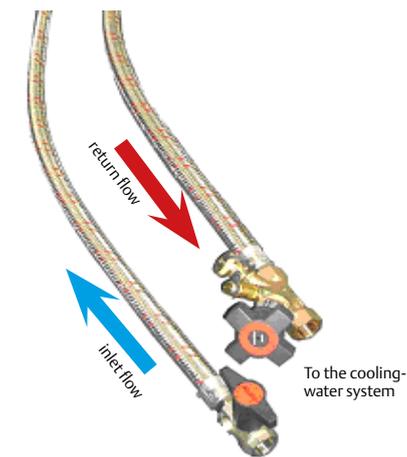
■ **Application**
– Connects and seals the DCL and DCM racks.

■ **Consists of**
– Connection plates, vertical sealing strips, horizontal sealing strip.

■ **Material**
– Metal plate, plastic extrusion strips, foam strips.

Description	Order No.
Add-on kit DCL / DCM	**080134530**

return flow

inlet flow

To the cooling-water system

Draining and purging valve with nipple for measurement device connection (3/4", female) (for measuring water flow rate)

Ball valve
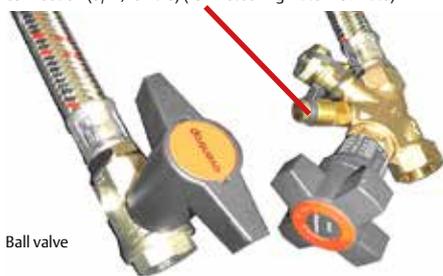
Shut-off and control valves
(to set the volumetric flow rate)
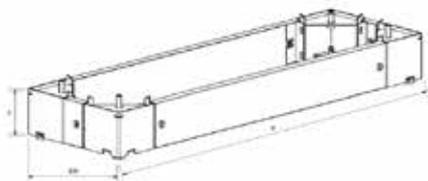
Knürr® Chilled Water Connecting Kit

- **Application**
  – Simple connection to water circulation, simple start-up.

- **Consists of**
  – Two flexible armored tubes, stainless steel plated, water-resistant and frost-resistant EPDM. Nickel-plated pipe connections.

- **Temperature range**
  – 0 – 110° C.

- **Operating pressure**
  – Max. 10 bar.

- **Inner diameter**
  – 31 mm.

- **Connections**
  – Threaded connection, 1 1/4"(or 1"), flat sealing.

- **Length**
  – 1500 mm.

- **Ball valve connections**
  – 1 1/4" (or 1").

Shut-off and control valves with 3/4" draining and purging connection and a nipple for measuring pressure and temperature.
Connections: 1 1/4" (or 1").

Description	Order No.
Cold-water connection kit 5/4" (for DCL)	**080090910**
Cold-water connection kit 1" (for CoolTherm and DCD)	**080090660**

Knürr® DCL Plinth

- **Application**
  – For installing lower cold-water connection without a raised floor.

- **Material**
  – Sheet steel, 1.0 mm.

- **Color**
  – Powder-coated,
    RAL 7021 - dark-grey,
    RAL 7035 - light-grey.

H [mm]	D [mm]	Description	Order No.
100	1000	Plinth H100 D1000 dark-grey	**011479838**
100	1100	Plinth H100 D1100 dark-grey	**011479848**
100	1200	Plinth H100 D1200 dark-grey	**011479858**
100	1300	Plinth H100 D1300 dark-grey	**011479868**
100	1000	Plinth H100 D1000 light-grey	**011479831**
100	1100	Plinth H100 D1100 light-grey	**011479841**
100	1200	Plinth H100 D1200 light-grey	**011479851**
100	1300	Plinth H100 D1300 light-grey	**011479861**
200	1000	Plinth H200 D1000 dark-grey	**011479788**
200	1100	Plinth H200 D1100 dark-grey	**011479798**
200	1200	Plinth H200 D1200 dark-grey	**011479808**
200	1300	Plinth H200 D1300 dark-grey	**011479818**
200	1000	Plinth H200 D1000 light-grey	**011479781**
200	1100	Plinth H200 D1100 light-grey	**011479791**
200	1200	Plinth H200 D1200 light-grey	**011479801**
200	1300	Plinth H200 D1300 light-grey	**011479811**
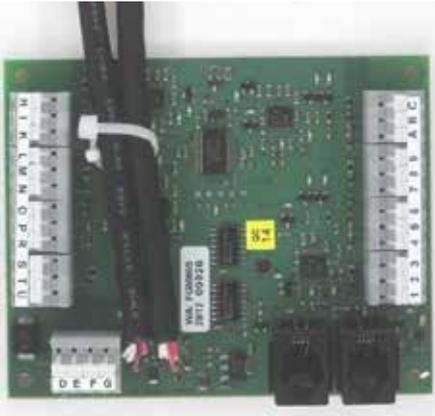
Sensor module

Temperature sensor with cable and plug

Knürr® Additional Temperature Sensor Kit

■ **Application**
– For installing the remote temperature measuring point (e. g. in SmartAisle containment).

■ **Consists of**
– Sensor module, temperature sensor with cable and plug.

Description	Order No.
Temperature sensor	400006856
Analog sensor module	400006853