Data Center Cooling

Our comprehensive cooling solutions portfolio includes adaptable, modular and scalable solutions for networking, data center and communications applications.

CADDY ERICO HOFFMAN ILSCO RAYCHEM SCHROFF

We connect and protect

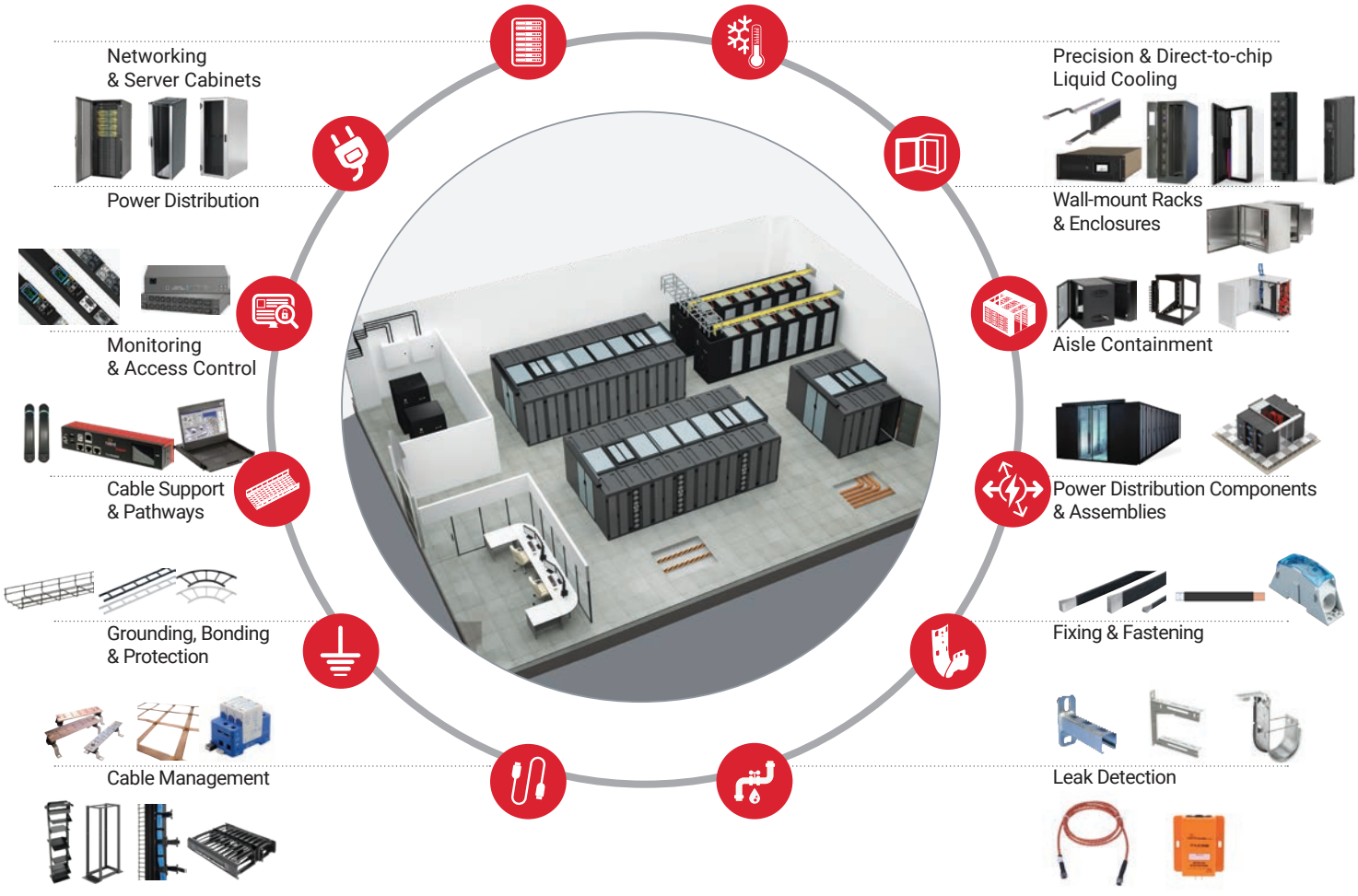
nVent.com

nVent IT Infrastructure Portfolio

INTRODUCTION

Content streaming, online banking, cloud computing, sophisticated smart phone apps, eCommerce, industrial automation. These are just a few examples of applications that are fueling data processing and traffic demand in data centers throughout the world.
Emerging technologies, such as Artificial Intelligence (AI), telemedicine, machine learning, autonomous (driverless) vehicles and other real time modeling applications will accelerate demand further.

NEXT GENERATION DATA CENTER INNOVATION FOR A CONNECTED WORLD



Find out more on nVent Cooling Solutions

nVent DATA CENTER SUSTAINABILITY & ELECTRIFICATION KEY VALUE PROPOSITIONS

- **Eco-Friendly**
- **Energy Efficiency**
- **Customer Productivity**
- **Lifespan and Serviceability**

Precision And Liquid Cooling Overview

CDUS & LIQUID COOLING

Coolant distribution units serve as the vital core of liquid-cooled data centers, functioning as the beating heart that sustains optimal operating conditions.

Liquid cooling through Coolant Distribution Units (CDUs) has revolutionized cooling performance in data centers, offering unparalleled efficiency and enhanced thermal management capabilities.

By utilizing liquid as a cooling medium, CDUs facilitate the transfer of heat more effectively than traditional air cooling methods, allowing for greater heat dissipation and improved temperature regulation.

This advanced cooling technology not only optimizes the thermal management of servers and equipment but also enables data centers to operate at higher power densities without compromising performance or reliability.

DIRECT-2-CHIP WITH CDUS

Direct-to-chip cooling represents a cutting-edge approach to thermal management in data centers, where cooling mechanisms are applied directly to the heat-generating components of processors and other hardware.

By bringing cooling elements closer to the heat source, direct-to-chip cooling solutions such as liquid cooling or microfluidic systems enhance heat dissipation efficiency and enable more precise temperature control.
This innovative cooling method not only improves the overall performance and reliability of servers but also allows data centers to operate at higher power densities.

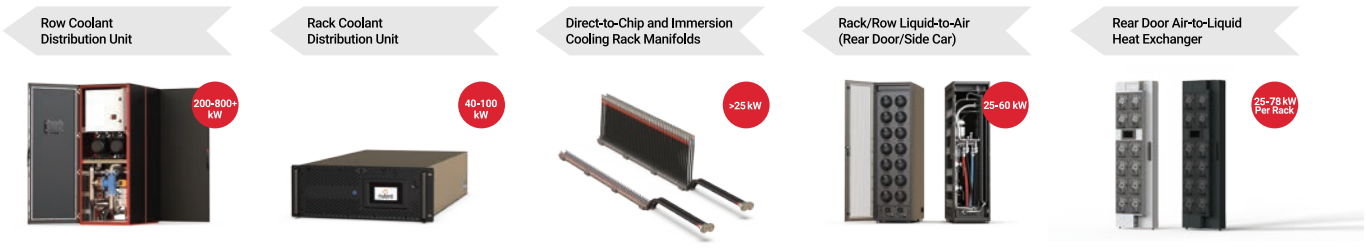
Increasing heat densities challenge data center operators and the demand for reduced data latency requires more computing power at the edge.

MAXIMIZE INFRASTRUCTURE PERFORMANCE AND UPTIME

Legacy cooling in data centers uses technology based on traditional air conditioning systems. Entire rooms, sometimes complete buildings, are cooled with a single system. These Computer Room Air Conditioning units (CRAC) or Computer Room Air Handler (CRAH) worked well for a number of years because data rooms were smaller, IT cabinets were not densely packed, and less heat was generated in a given space. While still popular today, whole room cooling can be inefficient and expensive.

Continuum Of Cooling

COMPLETE PORTFOLIO
AIR AND LIQUID COOLING SOLUTIONS



**Cooling capacities are based on optimized performance conditions - subject to change with alternative operating parameters

Making the Switch to Liquid Cooling

Operating within an environmental class requires full performance of the equipment over the entire environmental range of the specified class, based on non-failure conditions.

The warmer facility water would help alleviate the concerns of upfront capitol on primary side cooling but it leads to other important factors to consider such as IT equipment max. temperature and also the approach temperature you have to live with. If approach temperature is constant, and the IT equipment can run at elevated temperatures, then CDU thermal capacity remains the same across the DC facility water temperature range.

FWS Table 3.1 represents facility water

IMPROVE CAPACITY AND CREATE EFFICIENCY

Increased data center density to meet data demand is making air cooling less feasible for many operators. Densely packed server racks impede airflow, and air cooling cannot handle high heat loads efficiently. Data centers that try to cope by increasing air velocity can quickly become wind tunnel-like environments that are difficult to work in and expensive to operate.

When air cooling systems need to work overtime to maintain necessary operating temperatures, facilities can also experience equipment failures, unplanned downtime and high energy costs. For many data centers, liquid cooling can offer better performance while saving energy and helping data centers operate more sustainably.

Liquid cooling can help data centers increase capacity while maintaining efficient space and energy use. It can also offer a favorable return on investment and lower the total cost of ownership for data center facilities. Liquid cooling systems provide an effective solution for achieving the required temperature parameters and reducing the energy consumption of cooling systems. Liquid provides a much greater heat transfer capacity than air, which helps liquid cooling increase power usage effectiveness (PUE), reducing energy costs and contributing to environmental sustainability.

THERE ARE THREE PRIMARY TYPES OF LIQUID COOLING:

Indirect liquid-cooled - heat is transferred to liquid through an air-to-water heat exchanger located within a row or cabinet.

Direct liquid-cooled - heat is transferred directly to an attached liquid-cooled heat transfer component, such as a cold plate or immersion cooling.

Hybrid direct and indirect water-cooled - selective cooling of the highest energy-consuming components with direct contact liquid cooling with the balance of the cabinet cooled via a secondary air-to-water cooling device.

To determine which option is best for your specific data center, reach out to an nVent expert.

PREPARE FOR THE FUTURE OF NEXT-GEN IT EQUIPMENT

As technology advances and AI and machine learning applications proliferate, IT equipment has grown to require more and more power — and more power typically means higher heat loads. Cooling advanced equipment in an air-cooled data center requires facilities to deliver more air through server racks. The energy efficiency and power use problem brought on by advanced IT equipment compounds itself: chips require more power and generate more heat, and that in turn requires additional power put towards cooling.

Moving from a room or row based cooling to a rack or direct-to-chip based cooling solution allows to increase the water-supply temperature.

W17/W27

Typically data centers that are traditionally cooled using chillers and a cooling tower, but with an optional water-side economizer to improve energy efficiency, depending on the location of the data center.

- Primary Facilities - Chiller/Cooling Tower
- Secondary/Supplemental facilities - Water side economizer (Cooling Tower)
- Facility water temp

W17 = °C (°F) a 17 (62.6)

a. Minimum water temperature for all classes is 2°C (35.6°F)

W32/W40

Typically operated without chillers in most locations; however, some locations may still require chillers.

- Primary Facilities - Cooling Tower
- Secondary/Supplemental facilities - Chiller or district heating system.

W32 = 32°C (89.6°F)
W40 = 40°C (104°F)

W45/W+

Typically operated without chillers to take advantage of energy efficiency and reduce capital expense.
Some locations may not be suitable for dry coolers.

- Primary Facilities - Cooling Tower
- Secondary/Supplemental facilities - District heating system (see page 20).

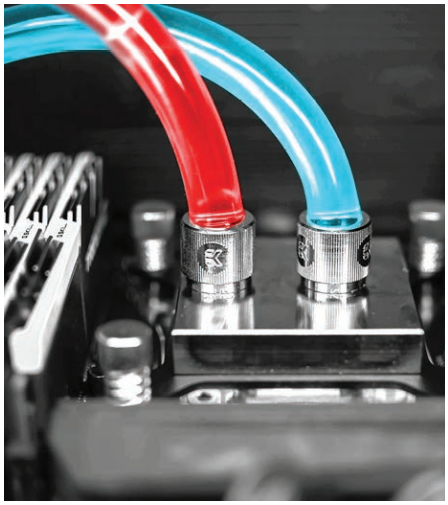
W45 = 45°C (113°F)
W+ = >45°C (113°F)

*ASHRAE Table 3.1 2021 Thermal Guidelines for Liquid Cooling

High Density Liquid Cooling (HDLC)

Coolant Distribution Unit (CDU)

Rack Manifold



Cold Plate (Chip Level Cooling)

DIRECT WATER COOLING SOLUTIONS

- Typically reduces energy consumption and operating costs
- Superior cooling capacity
- Acoustic sound abatement
- Facility water is typically not clean enough to be in the manifolds and whitespace. It is essential to have a separate technology cooling system (TCS). The system, can intelligently control filtration, temperature & pressure as well ensuring clean water. CDU will transfer the heat from TCS to FWS (Facility water system).
- Functions in non-raised floor environments—either by including the piping in the slab floor or installing it in a plinth base under the cabinet
- Clustering high density heat loads into liquid cooled cabinets frees up floor space within the data center
- Higher chilled water temperatures avoid humidification issues, which decrease efficiency and increase energy costs

FEATURES

- ASHRAE Table 3.1 W+ warm direct liquid cooling
- 700kW+ cooling capacity
- Direct-to-chip & manifold connectivity
- Smart monitoring & control interface
- Integrated leak detection
- Redundant centralized pumps

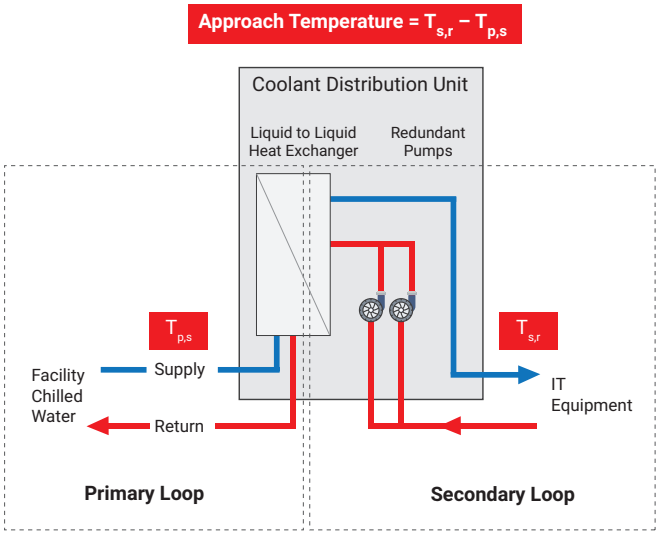
COOLANT DISTRIBUTION NETWORK

- Rack-mounted manifolds and hose kits
- Material - copper and stainless steel
- Joints - brazing, welding mechanical couples
- Dripless quick connectors

EXPERIENCE AND CAPABILITIES

- 15+ years liquid cooling experience
- Specialized in custom Coolant Distribution Unit (CDU) design
- Thermal modeling & analysis
- System design & manufacturing
- Leak testing & quality control

HDLC Design Considerations

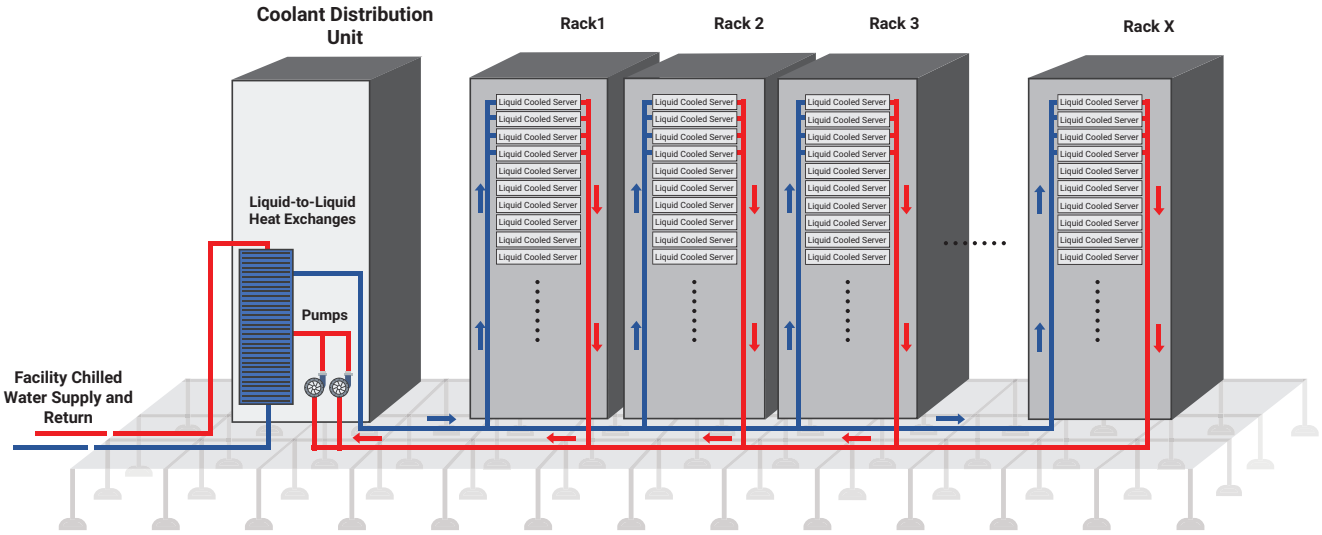


SPECIFYING LIQUID COOLING SYSTEMS

The major sub-assemblies within a high density liquid-cooled system are typically specific to unique product designs – such as the control system, cold plates, manifolds, arrangement of piping, pumps, valves, etc. Additional common cooling system components and subsystems include quick connects, hoses and connections.

- Heat load
- Secondary return water temperature and secondary flow rate
- Primary (facility) water supply temperature and flow rate
- Secondary pressure drop
- Approach temperature
- Allowable max power consumption
- Form factor / dimensional constraints
- Voltage
- Controls/communication
- Agency approvals

EXAMPLE HIGH-DENSITY LIQUID COOLED (HDLC) SYSTEM



In this example, the CDU separates the facility water, or primary side, from the much more tightly controlled secondary side water, which flows to the network of liquid cooled servers. Pumps within the CDU circulate the secondary water through the server cold plates and back to the CDU's heat exchanger, which transfers heat from the secondary loop into the facility water, without the two fluids ever touching.

With respect to its volume, water has a 3,500 times higher heat capacity versus air.

nVent DATA CENTER
SUSTAINABILITY & ELECTRIFICATION KEY VALUE PROPOSITIONS

Eco-Friendly | **Energy Efficiency** | **Customer Productivity** | **Lifespan and Serviceability**

Rack & Facility Manifold Considerations

Facility Manifolds can be installed in raised floor or ceiling.

Keep the pipework system design simple, include provisions for draining, flushing, bleeding & expansion.

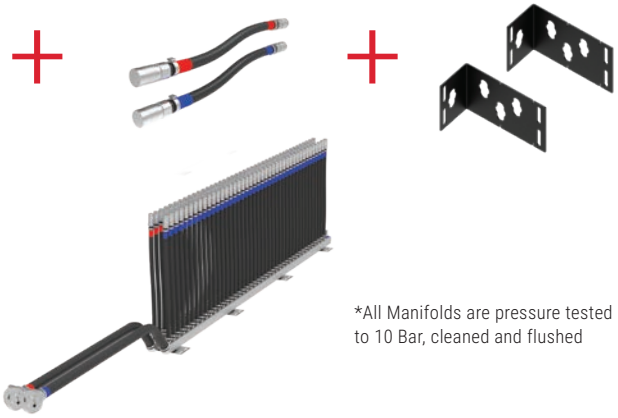
Redundancy: Ensure pipework is connected for performance and pressure. Then in a result of CDU failure the other CDUs can pick up the performance

- The CDUs can be connected to the existing infrastructure if available
- nVent Recommends 4- or 6-inch DN100 or DN150 pipework
- Rack manifolds can be at the side of the rack, the back of the rack or separated
- Pipework can be steel, copper, plastic, but always needs to be compatible with the cold plate
- Future proofing your IT Rack. Ensure you have enough space for Manifolds 2–4 and ensure you have enough space for the PDUs. An 800 mm wide and 1200 mm depth should accommodate these requirements.

RACK MANIFOLD CONSIDERATIONS

Configurable Attributes

- Configuration
  - Standard
  - Hose Whip
- Supply/Return Hose Length
- Supply/Return Hose Connector
- Number of Connectors
- Connector Type
- Hose Whip Length



*All Manifolds are pressure tested to 10 Bar, cleaned and flushed

HOSE WHIPS & JUMPER HOSES

- If servers come with own hoses use manifolds without hose whips
- If servers has no hoses use manifolds with hose whips, hose whips are not removable from the manifold
- Use jumper hoses as adapter between manifold and server only (two quick disconnects)

Dimensions

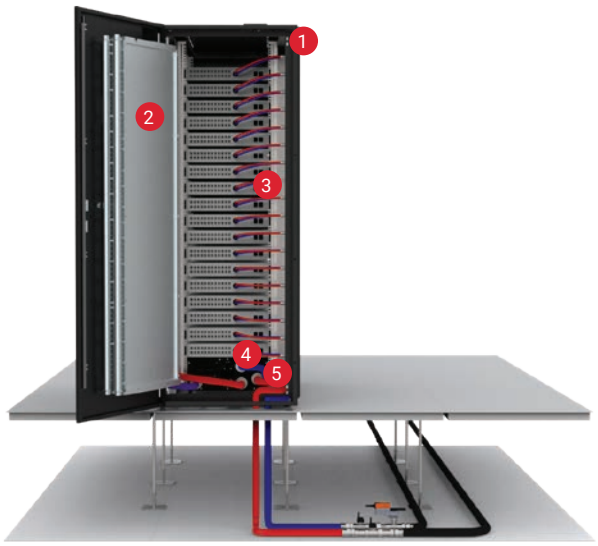
- 42U, 47U and 52U racks
- Height will not exceed 1.8m, up to 42 ports
- Standard profile = 1.5" x 1.5"
- Custom sizes available for various applications
- Hose length are configurable

Connectors

- Standard
  - Parker NSP06
  - Staubli SCG06*
- Non-std**
  - UQD Series
  - Alternate SCG & NSP sizes

Hybrid Liquid Cooling
Combining Liquid and Air Cooling

EXCEPTIONAL EFFICIENCY PERFORMANCE



RDHX Pro is combined with a rack or row mounted Direct Contact Liquid Coolant Distribution Unit to achieve new levels of rack-level cooling efficiency.

1. Server cabinet
2. RackChiller RDHX Pro chilled water heat exchanger
3. Rack mounted Coolant Distribution Manifold
4. Coolant Distribution Unit
5. Integrated liquid pathway

BENEFITS

- Reduces energy consumption
- Enables higher rack density
- Quick and easy installation
- Modular design for easy future upgrades
- Ideal for Edge Computing applications
- Designed to remove 100% of the heat generated in IT racks configured with high density heat loads

FEATURES

- Combines the extreme heat removal of Direct Contact Liquid Cooling at the chip level with a Rear Door air-to-water heat exchanger for residual heat removal
- Sophisticated, coordinated controls
- Warm water exiting the RackChiller RDHX Pro complements the input requirements of the Rack Coolant Distribution Unit
- High temperature return water increases efficiency and can be used for heat re-use

HIGH DENSITY LIQUID COOLING REFERENCE

	Operating Point
Coolant Supply [°C]	24
Coolant Return [°C]	36
Air Flow [m³/h]	6200
Primary Flow [m³/h]	27 (CDU) – 60 (RDHX)
Air Supply (to servers) [°C]	28
Air Return (from servers) [°C]	49
Cooling Performance [kW] Example scenario 100 kW 10 Racks = 122 12 Racks = 109 14 Racks = 99.8	**Customer Requirement 100 kW per rack** CDU800 per Rack can cool up to 78 kW RDC @ 24C - 44 kW per rack Total cooling 78 kW + 44 kW = 122 1222 kW/1.2 MW for 10 Racks
Coolant Pressure Drop [kPa]	100

High Performance Row CDU

BENEFITS

- Enable waste heat reusage or high temperature primary circuit for maximum cooling efficiency
- Minimize amount of row CDUs required for high load installations ➔ optimize floor space requirements
- Systems layout and design reduces need for redundant CDUs
- Minimum planning effort
- Reduced set up and installation time

RACKCHILLER CDU800

The nVent RackChiller CDU800 is designed for efficient and safe supply of IT equipment. The entire system is focused on providing the highest reliability, availability, and serviceability for supporting direct-to-chip liquid cooling.

CDU800 is fed from a primary facility water system (FWS), where the integrated pumps drive the secondary technology cooling system (TCS) cooling loop flow. The heat exchanger transfers the excess heat from the secondary coolant to the primary.

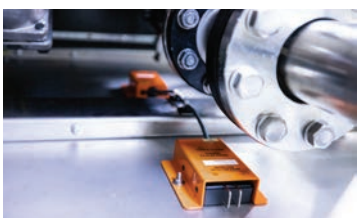
The complete system is integrated into an aesthetical enclosure with removable side panels and doors. The CDU can be installed onto a slab or raised floor, in-row with equipment racks or into a separate facility room.

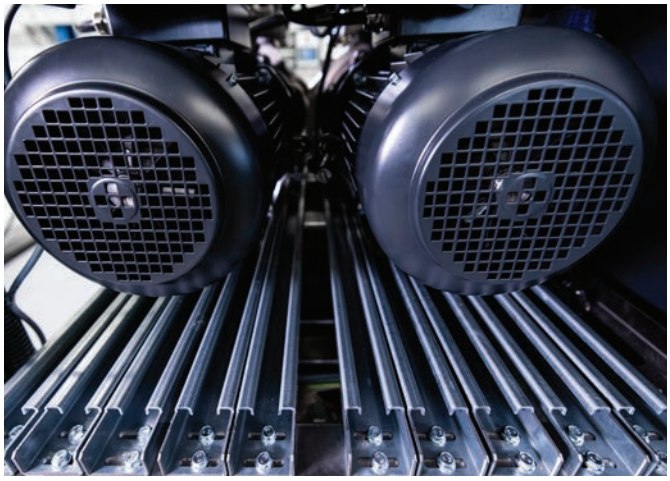
FEATURES

- Redundant high-performance, leak-free pump system
- Integrated variable speed drives
- Coolant connections through top or bottom panel
- Integrated 10-inch touch panel display
- Remote control features through Ethernet, SNMP v3, Modbus
- On-board integrated leak detection
- 800 kW of performance at 6 K approach temperature difference (balanced flow) or 4 K (increased primary flow)
- Built in primary side 3-way valve with bypass shut valve – can operate as 2-way valve
- Dew point tracking and control of secondary supply temperature above condensing conditions

Watch the video to learn more about CDU800

The RackChiller CDU800 offers one of the highest performance densities in a standard rack footprint.





RackChiller CDU800 Technical Specifications

SPECIFICATIONS

General Data

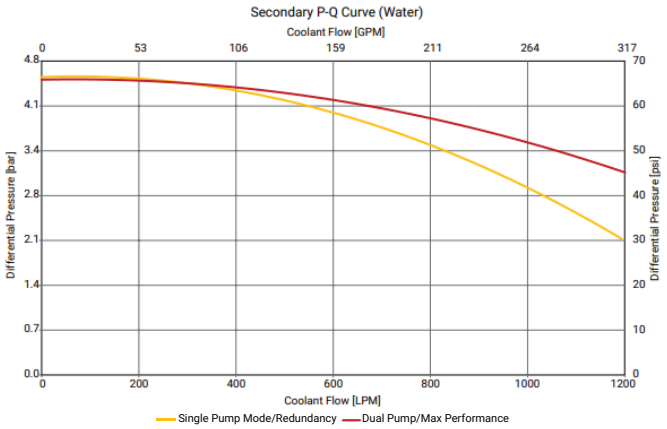
- 800 kW+ of cooling capacity @ 6K (850 LPM Primary)
- Pipe Connection: 3-inch ID hygienic tri-clamp
- Liquid Temp Range: 20–70°C (68–158°F)

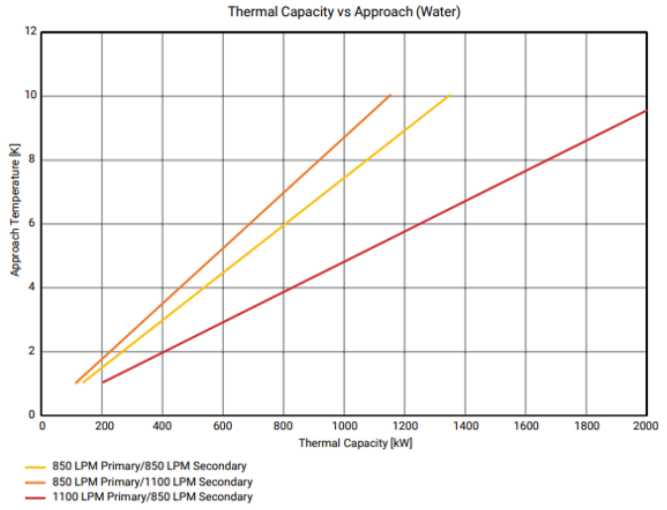
Primary Rating

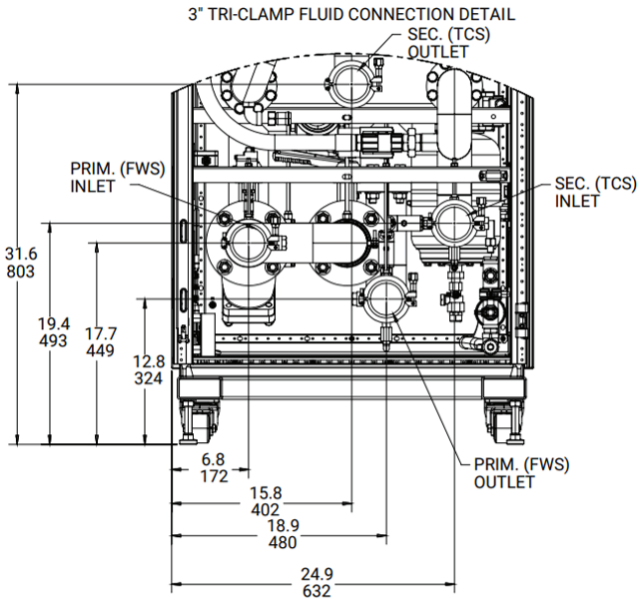
- Coolant: treated water with up to 20% PG
- Maximum Allowable Flow Rate: 1200 LPM (317 GPM)
- Maximum Head Loss (at 850 LPM, Water): 1.3 Bar (19 psi)
- Maximum System Pressure: 10.3 Bar (150 psi)
- System Volume: 50 L (13 Gal)
- Primary Filter Size: 250 micron

Secondary Performance

- Coolant: treated water with up to 30% PG
- Maximum Flow (single pump): up to 1100 LPM (290 GPM) at 2.6 bar (38 psi)
- Maximum Flow (dual pumps): up to 1100 LPM (290 GPM) at 3.4 bar (49 psi)
- Maximum Allowable Static Pressure: 3.5 Bar (50psi)
- Maximum System Pressure: 8.6 Bar (125 psi)
- Pressure Relief Valve Activation Pressure: 9.0 Bar (130 psi)
- System Volume: 100 L (26 Gal)
- Secondary Filter Size: 50 micron







INDUSTRY STANDARDS

UL/cUL Listed; File No. SA7402

CE

Eco-Friendly

Energy Efficiency

Customer Productivity

Lifespan and Serviceability

Standard Product

Catalog Number	Description	Height in./mm	Width in./mm	Depth in./mm	Voltage Rating (V)	Phase	Rated Frequency (Hz)	Rated Current (A)	Power Consumption (kW)	Noise (dB)	Weight Dry (lb./kg)	Weight Package (lb./kg)
CDU8004L002	380–480V 3-PH with Primary Filtration	87.00 2200	31.00 800	47.00 1200	480	3	50/60	47.5	22.2	68	2500 1134	2820 1279

** Two pumps at full load

RackChiller CDU40 Rack-Mount CDU

The nVent RackChiller CDU40 is a rack-based Coolant Distribution Unit, built for the needs of today's demanding HPC requirements. The unit is capable of managing 40 kW+ of heat load in small 4U of space. The RackChiller CDU40 is a highly efficient heat exchanger that uses ASHRAE W45 warm water to manage processor and component heat. It offers N+1 redundant pump design to provide safe supply of liquid coolant to the IT.

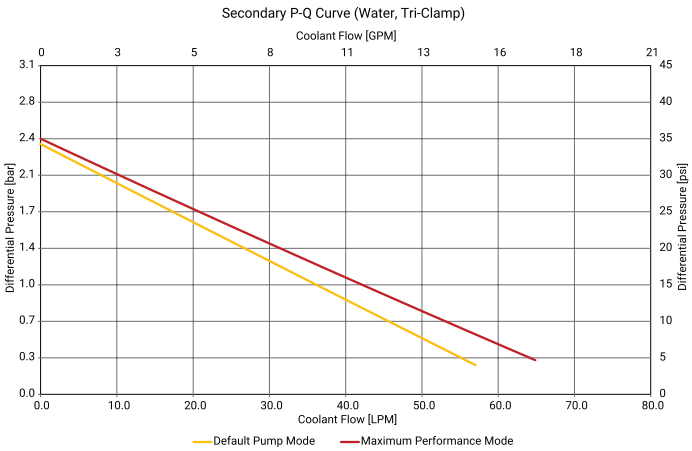
There are two versions available,

- Empty CDU without quick couplings
- Filled CDU with quick couplings

BENEFITS

- Enables up to 40 kW of liquid heat load in a single rack
- High degree of safety through N+1 pump design
- Best fit for small installations or when high modularity required

Increase performance and / or efficiency of a single rack.



SPECIFICATIONS

General Data

- Pump redundancy: 3 pumps for N+1 redundancy
- Power requirement: 100V – 240V 50/60 Hz
- Current consumption 2.47 – 4.44A
- Power supply 2, N+1, 1000W each
- Cooling capacity: 40 kW at 10 C Approach (64 LPM Primary)
- Minimum approach temperature: 5K
- Secondary coolant supply range ASHRAE W17 to W45 (previous W1 to W4)
- Power consumption: 670W (default mode), 970W (max performance mode)
- Liquid Temp Range: 10–70°C (50–158°F)

Primary Rating

- Coolant: treated water with up to 25% PG
- Maximum Allowable Flow Rate: 80 LPM (21 GPM)
- Maximum Head Loss (at 64 LPM, Water): 0.1 bar (2 psi)
- Maximum System Pressure: 3.8 bar (55 psi)

Secondary Performance

- Coolant: treated water with up to 25% PG
- Maximum Flow (dual pumps): 60 LPM (16 GPM) at 0.5 bar (7 psi)
- Maximum Flow (triple pumps): 75 LPM (20 GPM) at 0.4 bar (6 psi)
- Maximum System Pressure: 1.4 bar (20 psi) - Secondary bypass opens at 20 psi, over pressure valve opens at 30 psi
- System Volume: 9.5 L (2.5 Gal)

Standard Product

Catalog Number	Description	Height in./mm	Width in./mm	Depth in./mm	Volume (g/l)	Voltage Rating (V)	Rated Frequency (Hz)	Rated Current (A)	Cooling Capacity (kW)	Weight (lb./kg)
CDU0402R001	Dry - No Coolant with tri-clamp	6.97 177	16.93 430	39.13 994	2.51/9.5	100-240	50/60	2.47-4.44	40	141.00 64
CDU0402R001Q	Filled - With Coolant with CGB20	6.97 177	16.93 430	39.13 994	2.51/9.5	100-240	50/60	2.47-4.44	40	164.00 74

RackChiller CDU100 Rack-Mount CDU

The nVent HOFFMAN RackChiller CDU100 is a rack-based CDU, built for the needs of today's most demanding HPC requirements. Capable of managing 100 kW+ of heat load in a remarkably small 4U of space. The RackChiller CDU100 is an extremely efficient heat exchanger that uses ASHRAE W45 warm water to manage processor and component heat.

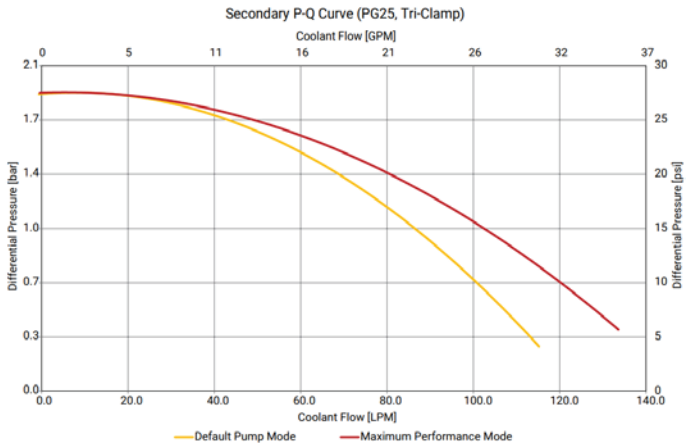
There are two versions available,

- Empty CDU with quick couplings
- Filled CDU with quick couplings

BENEFITS

- Enables up to 100 kW of liquid heat load in a single rack
- High degree of safety through N+1 pump design
- Best fit for extreme liquid load per rack, or high in 2-3 racks

Increase performance and / or efficiency of 1 – 3 racks.



SPECIFICATIONS

General Data

- Pump redundancy: 2 pumps for n+1 redundancy
- Power requirement: 100V – 240V 50/60 Hz
- Current consumption 10 – 15A
- Power supply 2, N+1, 2500W each
- Cooling capacity: 100 kW at 6 C Approach (100 LPM Primary)
- Minimum approach temperature: 4K
- Secondary coolant supply range ASHRAE W17 to W45 (previous W1 toW4)
- Power consumption: 820W (default mode), 1134W (max performance mode)
- Liquid Temp Range: 10 – 70°C (50 – 158°F)

Primary Rating

- Coolant: treated water with up to 25% PG
- Maximum Allowable Flow Rate: 100 LPM (26 GPM)
- Maximum Head Loss (at 100 LPM, PG25): 0.9 bar (13 psi)
- Maximum System Pressure: 3.4 bar (50 psi)

Secondary Performance

- Coolant: treated water with up to 25% PG
- Maximum Flow (single pump): 115 LPM (30 GPM) at 0.5 bar (7 psi)
- Maximum Flow (dual pumps): 130 LPM (34 GPM) at 0.5 bar (7 psi)
- Maximum System Pressure: 2.8 bar (40 psi) - Secondary bypass opens at 40 psi, over pressure valve opens at 50 psi
- System Volume: 15.6 L (4.1 Gal)

Standard Product

Catalog Number	Description	Height in./mm	Width in./mm	Depth in./mm	Volume (g/l)	Voltage Rating (V)	Rated Frequency (Hz)	Rated Current (A)	Cooling Capacity (kW)	Weight (lb./kg)
CDU1002R001	Dry - Without Coolant	6.97 177	16.93 430	37.40 950	4.12/15.6	100-240	50/60	10-15	100	137 62
CDU1002R001Q	Filled - With Coolant	6.97 177	16.93 430	37.40 950	4.12/15.6	100-240	50/60	10-15	100	167 76

Rear Door Heat Exchangers

RACKCHILLER REAR DOOR PRECISION COOLER

nVent RDHX Pro chilled water heat exchanger is designed for managing high heat load cooling requirements within higher-density server, computing and storage racks. The entire system is integrated within an aesthetically framed perforated door with protective covers to isolate the liquid source and cooling loop from the rack-mounted equipment. The RDHX Pro installs on equipment racks as a separate complete rear door, enabling it to be retrofitted to existing racks. nVent Rear Door chilled water heat exchanger cools the warm exhaust air generated by the fans in the existing rack-mounted IT equipment through a large cooling coil surface before reintroducing back to the room.

FEATURES

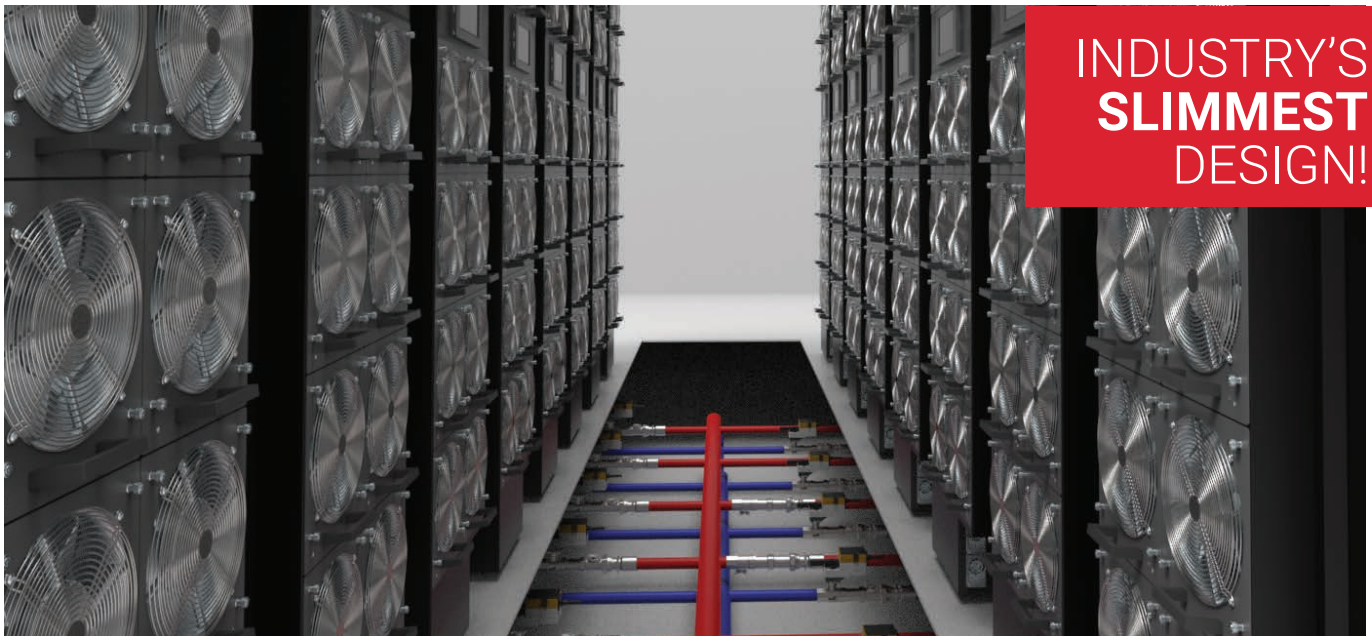
- Passive solution without fans - no noise, no additional power consumption, low maintenance requirements
- Active solution with fans supporting the air flow and minimize pressure drop of the heat exchanger
- Optional water control kit allows water flow regulation according the actual heat load
- Frame solution allows separation of coil and condensate management from the rack mount equipment
- Rear space inside the cabinet is completely available for cabling and power distribution
- Available in 600 mm up to 800 mm width in 2,000 mm (42RU), 2,200 mm (47RU)
- Easily adapts to nVent cabinets; retrofit kits available for third party cabinets

BENEFITS

- Modular standard design - easy to adapt to your requirements
- Minimal planning outlay, short setup time
- Versatile infrastructure solutions and product combinations

Upgrade the passive to active door as you scale with replacement fan wall.

Eco-Friendly | **Energy Efficiency** | **Customer Productivity** | **Lifespan and Serviceability**



INDUSTRY'S **SLIMMEST** DESIGN!

PASSIVE The passive RackChiller consists of a mounting frame and a perforated door with integrated heat exchanger. The overall depth is approx. 241 mm.

ACTIVE The active RackChiller consists of a mounting frame and a perforated door with integrated heat exchanger and fans. The overall depth is approx. 281 mm.

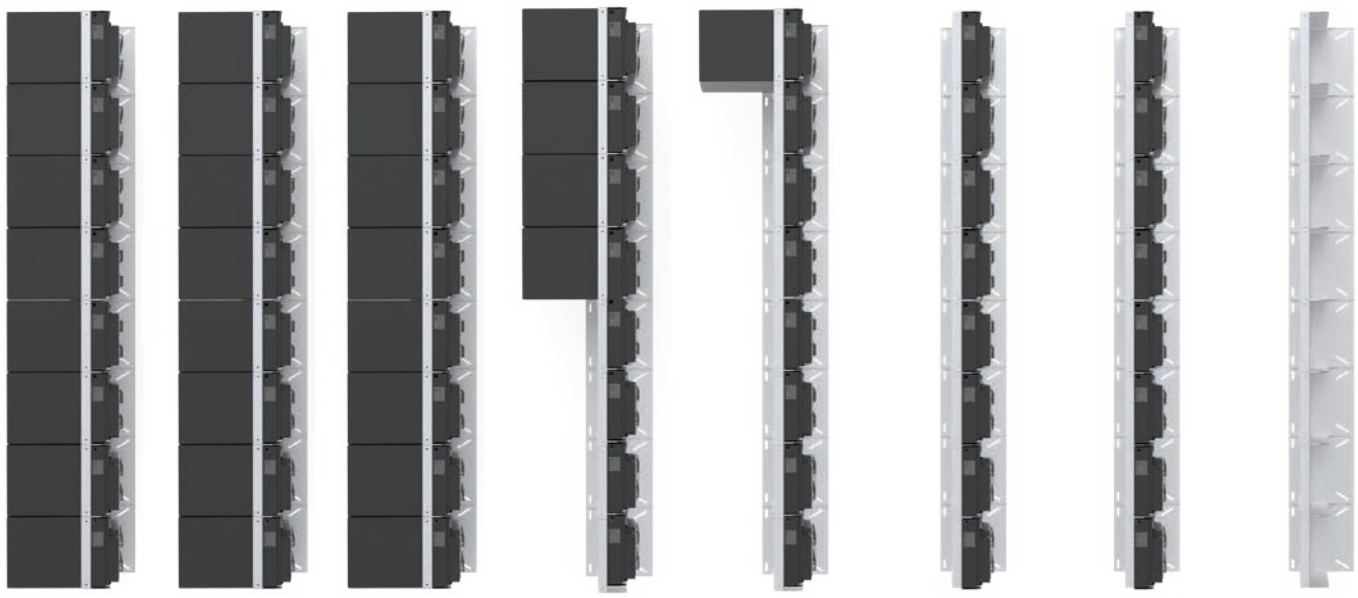
RDHX Pro Active Technical Data

Performance	RDHX Pro
Total Depth (active door) [mm]/[inch]	281/10
Fans	12
Air Flow [m³/h]/[CFM] 800 W	10.000/5882
Air Flow [m³/h]/[CFM] 600 W	8000/4700
Water Flow [m³/h]	6.0
Water pressure drop (at full flow) [bar]	1
Performance (14°C water sup., 24°C air sup.) [kW]	78
Performance (24°C water sup., 27°C air sup.) [kW]	44
Power Consumption [W]	1800
Fan Control	Automatic
Valve Control	Automatic
Valve Type	2-Way

Performance	RDHX Pro
Condensate Tray	Optional
Condensate Pump	Accessory
Dual/Redundant PSU	Accessory
Air Humidity Sensors	1
Water Sensors	Yes
Leak Detection	Accessory
Controller Swap	Tool-less quick swap
Fan Swap	Tool-less quick swap
PSU Swap	Tool-less quick swap
Communication Interfaces	Modbus RTU, Modbus TCP, SNMP, Redfish, Web Browser
Local interface / HMI	7" Touch Panel Display

Standard Offering	RDHX Pro			
Key Application/Market Positioning	Data center cooling in facilities with controlled room air, warm water temperatures, increased air temperatures			
Size	600 W x 42 U/2000mm	800 W x 42 U/2000mm	600 W x 47 U/2000mm	800 W x 47 U/2000mm
Top Cover	Panel with cutouts for flexible hoses and cabling			
Bottom Cover	Panel with cutouts for flexible hoses and cabling, integrated drip tray			
Size Variation	Custom			
Return Air Filter	Accessory			
Hose Package	Optional			
Condensate Pump Package	Optional			
Door Switch Package	Optional			
External Temp Sensor	Optional			
Power Supplies	Up to 2			

RDHX Pro Fan Wall Design, scale your data center as you grow.



In-Row 45 Cooling

RACKCHILLER IN-ROW PRECISION COOLER

The nVent SCHROFF RackChiller In-Row45 chilled water cooleris designed to manage the critical cooling requirements of server and networking racks. The cooling system is integrated into a Varistar CP mobile frame for ideal side by side connection to Varistar CP or third party racks. The cooler comes with perforated front and rear doors. This allows seamless integration into rows of racks with hot or cold aisle containment. The integrated fans move the warm exhaust air from the hot aisle through an air to water heat exchanger where the heat is transferred to a water circuit. The air is then provided into the cold aisle towards the equipment. The units can be scaled optimally to suit individual packaging density and redundancy requirements.

FEATURES

- Fans, power supplies, controller all are hot-swappable
- 7" high resolution touch screen interface
- Integrated casters and levelling feet for simple reconfiguration of rows
- Hydraulic connection and cabling through top or bottom panel
- Automatic fan speed and valve opening control
- Standard dimensions: 300W /2000H. Version in 1000D and 1200D available; other dimensions upon request.

BENEFITS

- Ideal for hot Aisle Containment.
- Maximum availability and quick repair
- Designed for efficient operation at increased facility water temperatures
- Combination with direct to chip liquid cooling
- Modular standard - easy to adapt to individual requirements
- Minimal planning outlay / short setup time
- Minimum changes between In-Row and LHX (In-Rack) design - simplifies planning, layout and specification.

ROW LEVEL COOLING CONFIGURATIONS

Open Aisle

Open aisle row configuration includes a single row or dual row of cabinets that separate open cold and hot aisle, no aisle containment. The nVent SCHROFF RackChiller draws hot air from the rear of the cabinets in the hot aisle, removes the heat through an air-to-water heat exchanger and supplies cooled air to the front of IT equipment in the cold aisle.

To increase efficiency it is allways better to combine in row cooling with a containment system to minimize air leakage.

Hot Aisle Contained Row

Hot aisle contained row configuration contains the hot exhaust air generated from IT equipment to prevent mixing with cool air in the room environment. The nVent RackChiller draws the contained hot air from the hot aisle, removes the heat through an air-to-water heat exchanger, and feeds cooled air to the front of IT equipment in the uncontained cold aisle.

Cold Aisle Contained Row

Cold aisle contained row configuration contains chilled air provided by the nVent SCHROFF RackChiller in the cold aisle to prevent mixing with hot air generated by the exhaust of equipment within the hot aisle. The nVent RackChiller draws the contained hot air from the hot aisle, removes the heat through an air-to-water heat exchanger, and feeds cooled air to the front of IT equipment in the contained cold aisle.

Customer Productivity

Lifespan and Serviceability

For Decentralized IT and Communication

NVENT SCHROFF VARISTAR LHX+ 5/10 AIR/WATER HEAT EXCHANGER

The Varistar LHX+ electronic cabinet including air/water heat exchanger with 5 kW or 10 kW cooling capacity is well-suited for applications where a fully sealed cabinet is required.

- Cooling capacity from 5kW up to 10 kW
- Control unit with remote control
- Temperature regulation accuracy of +/- 0.1°C
- Static load of 1,000 kg
- EMC protection
- IP55 — Protection class IP 55

COOLING

Concept:

- 19-inch heat exchanger (6 U) installed in lower cabinet section
- Scalable cooling performance
  - Double fan unit for 10 kW cooling performance
  - Single fan unit for 5 kW cooling performance
- The fan units can be exchanged without having to replace the ehat exchanger
- Air flow volume of ~ 1000 / 1800 m^3/h
- Water flow temperature from 6°C to 25°C
- Ambient temperature from 5°C to 50°C

ADVANTAGES AND FEATURES

- **Scalable:** By replacing the heat exchanger with an integrated fan with a heat exchanger with two fans, the cooling performance can be modified from 5 kW to 10 kW. The infrastructure in the cabinet stays the same.
- **Future-oriented:** When the number of complex electronics in the cabinet increases and the power density along with it, only the heat exchanger must be replaced to achieve higher cooling performance.
- **Hot-swap applicable:** EC fans with speed control can be maintained without tools and even replaced in ongoing operation.
- **Space-saving:** Available starting at 600W x 800D base area per cabinet.
- **Precision control:** Controller with precise temperature regulation accuracy of +/- 0.1°C.
- **Greater productivity, higher safety:** Heat exchanger control directly at the cabinet via the display on the door. Remote access control with EtherCAT, Ethernet/IP, Modbus, or Profibus is also possible. Web server access optional.

ORDER INFORMATION

	Description
Complete solution (heat exchanger and cabinet) Usable assembly height 35 U	Varistar LHX+ 5 kW, cabinet: 2000H 600W 800D IP55
	Varistar LHX+ 5 kW, cabinet: 2000H 600W 1000D EMC IP55
	Varistar LHX+ 10 kW, cabinet: 2000H 600W 1000D EMC IP55
Replacement components	10 kW heat exchanger with two 230-V fans
	5 kW heat exchanger with one 230-V fan
	Control kit
	Flow rate and water T° sensor kit
	Display and accessories for LHX+
	Door contact switch kit

Learn more about LHX+ 5KW and 10KW

Aisle Containment

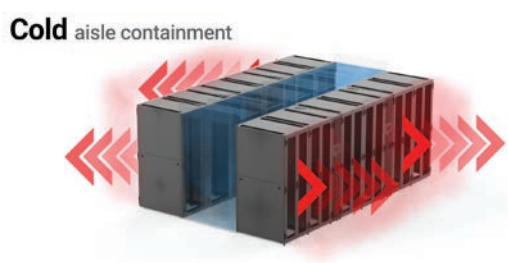
IMPROVED AIR MANAGEMENT HELPS TO REDUCE ENERGY COSTS

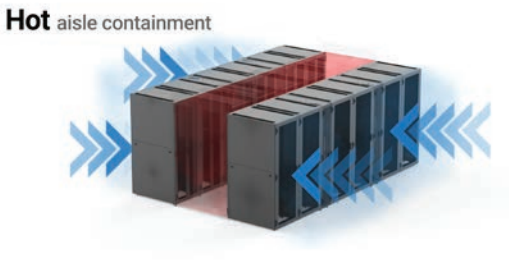
The use of containment systems can dramatically reduce energy costs, minimize hot spots and improve the carbon footprint of the data center. Both hot aisle containment (HAC) and cold aisle containment (CAC) systems greatly improve the data center cooling efficiency by segregating cold and hot airstreams and preventing them from intermixing. The basic design principle is to enclose the hot or cold aisle through the use of aisle-way doors, roof or baffle panels, and internal sealing within the cabinets. nVent offers tailored modular aisle containment solutions that include containment doors, aisle top covers, cladding elements and halogen-free gaskets.

BENEFITS

- Consistent separation of cold and hot air
- Enables optimized aisle airflow and temperature
- Low investment with short ROI – minimal maintenance costs
- Short implementation time with minimum investment
- Varistar or Proline sealed containment for maximum efficiency
- Proline Express containment for highest modularity and minimized installation cost

Containment systems allow for higher cold temperatures per ASHRAE and ΔT, optimizing cooling systems and contributing to reduced energy costs.

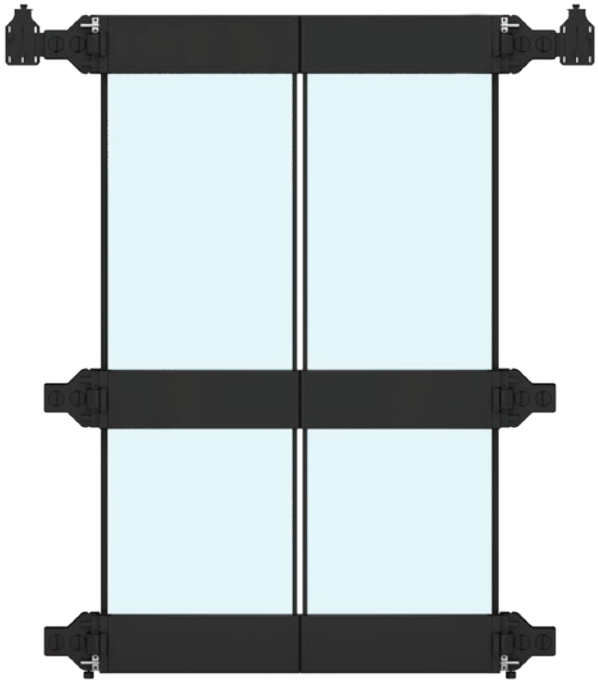




Proline Quick Containment

QUICK AND INSTALLATION AND RECONFIGURATION

The Proline Express containment is a set of predefined standard components optimized for easy installation using magnetic fixtures. It's conception minimizes the upfront planning effort, the components are designed such that there is no need for customization to the specific requirements of the facility. The containment assembly is done very fast as no screws are used. This also facilitates the reconfiguration of the containment in case of floor plan changes. This makes it a perfect fit for both retrofit solutions and ne installations.



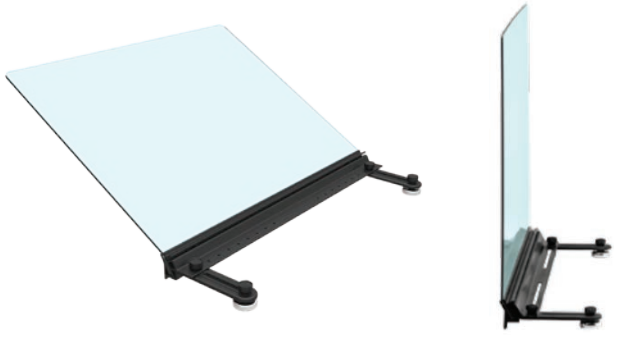
PROLINE EXPRESS SEALED DOORS AND TRANSOM WINDOWS

FEATURES

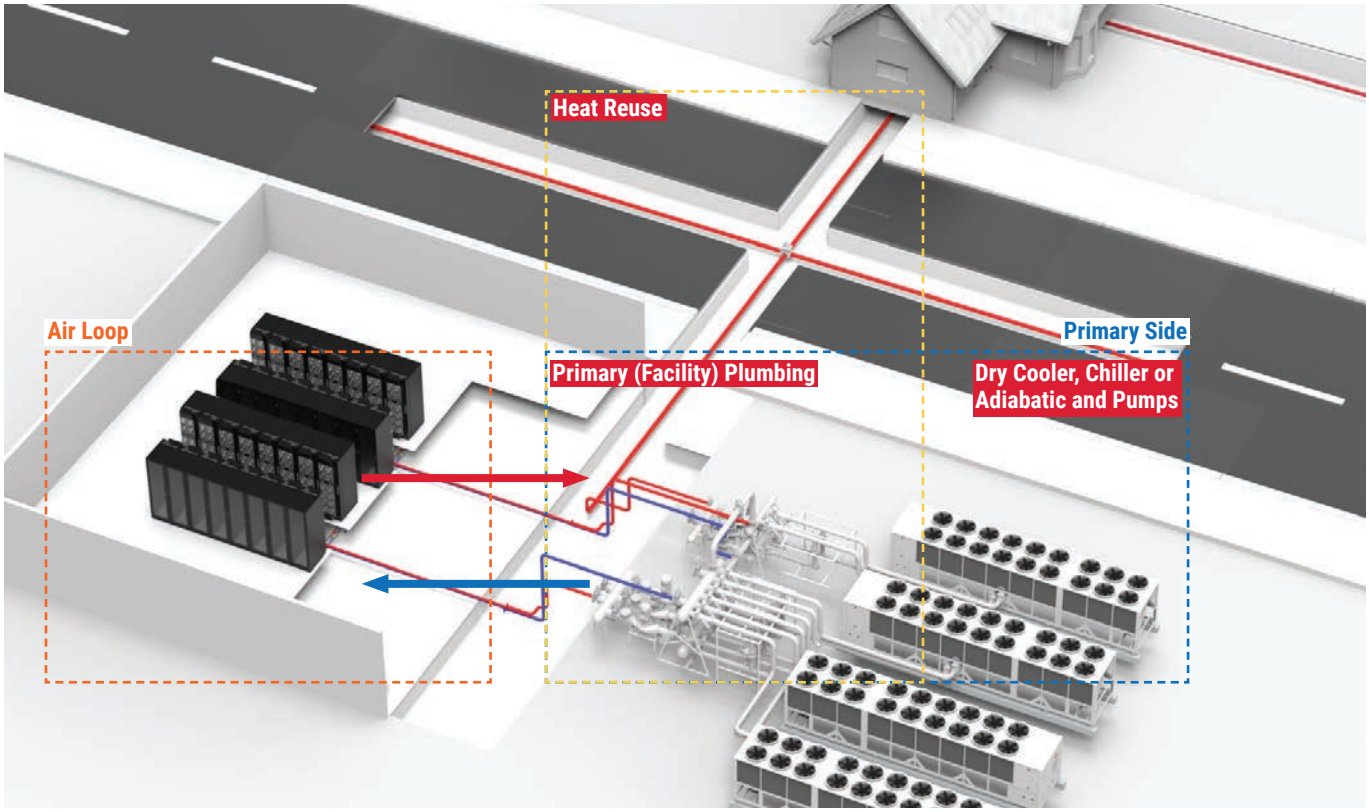
- Designed for 48-inch (1200 mm) wide aisles, but can also provide benefits for wider aisles
- The Bi-directional doors require a minimum 6-inch (152 mm) clearance from the front edge of the cabinet along its entire height for the hinges to attach
- Works with a variety of cabinets 76-inch (1930 mm) and taller
- Doors can be installed to hot or cold aisle
- Doors attached to side of rack magnetically

PROLINE EXPRESS RACK TOP BAFFLES

The Rack Top Baffles are suitable for most standard width cabinets with solid, perforated or semi-solid steel tops. These attachment mounts allow a high degree of flexibility across the top of the cabinet to work around obstructions. The baffles prevent hot exhaust air from wrapping over the tops of racks. The angular baffle is designed for cold aisle application, vertical baffle hot aisles. However, the components are reconfigurable to allow for both angular or vertical installation.



Heat Reuse — A Sustainable Solution



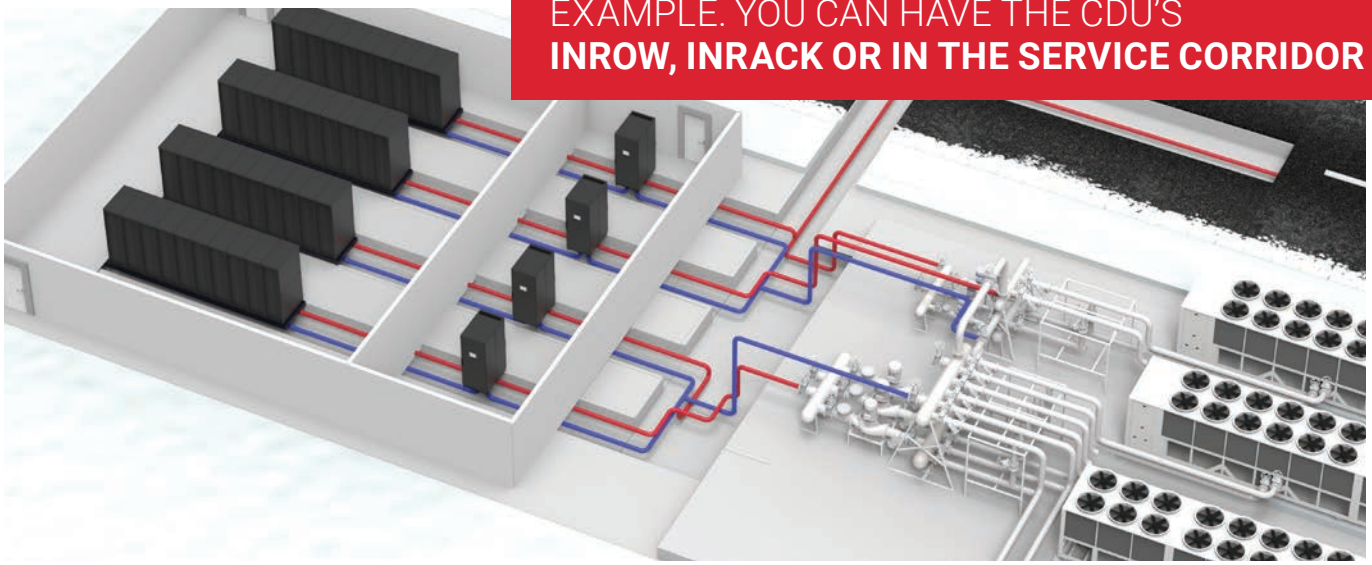
HOW MUCH ENERGY COMES OUT OF THE DATA CENTER AS HEAT, HOW MUCH IS WASTED, AND WHAT CAN YOU DO WITH IT?

The short answer to the first question is “all of it”. Energy is not consumed, but changes from one form to another. After performing other tasks, what is left is heat. So a 100MW data center will produce, 100MW of heat. Once the energy is heat, any that is not wanted elsewhere is released and, effectively, wasted.

SO WHY IS LIQUID COOLING THE PERFECT CHOICE FOR HEAT RECOVERY?

Short answer: higher temperature heat is better useable than low temperature, e.g. with water warmer than 50°C you can already heat homes, hospitals, swimming pools, saunas, the list goes on. And is not exclusive to colder climates. Draw the heat once and eventually sell that energy back to the grid. A win win for data center providers especially colocation companies.

LIQUID COOLING HEAT REUSE CONFIGURATION EXAMPLE. YOU CAN HAVE THE CDU’S **INROW, INRACK OR IN THE SERVICE CORRIDOR**



Thermal Simulation

Computational Fluid Dynamics (CFD) can be used to model the thermal and aerodynamics behaviour inside a data center while applying models of the infrastructure components and IT gear.

Digital twin for existing or future data centers generates access to data not easy to obtain like flow paths, velocities, air movement patterns, etc. and allows for evaluation of the infrastructure performance and efficiency and optimization of the layout, like position of cooling equipment and sensors. Virtual recording and test leads to quick turnover for case scenarios like fallout plans, redundancies, capacity reserves.

TYPICAL PROJECT TASKS

- Project scope/resources/schedule agreed upon
- On-site evaluation and consultation
- Analyze and optimize with CFD models
- Final meeting with evaluation report and recommendations for data center layout

LEIPZIG DATA CENTER
CASE STUDY

RACK HEAT DENSITIES ACCORDING TO CUSTOMER SPECIFICATION

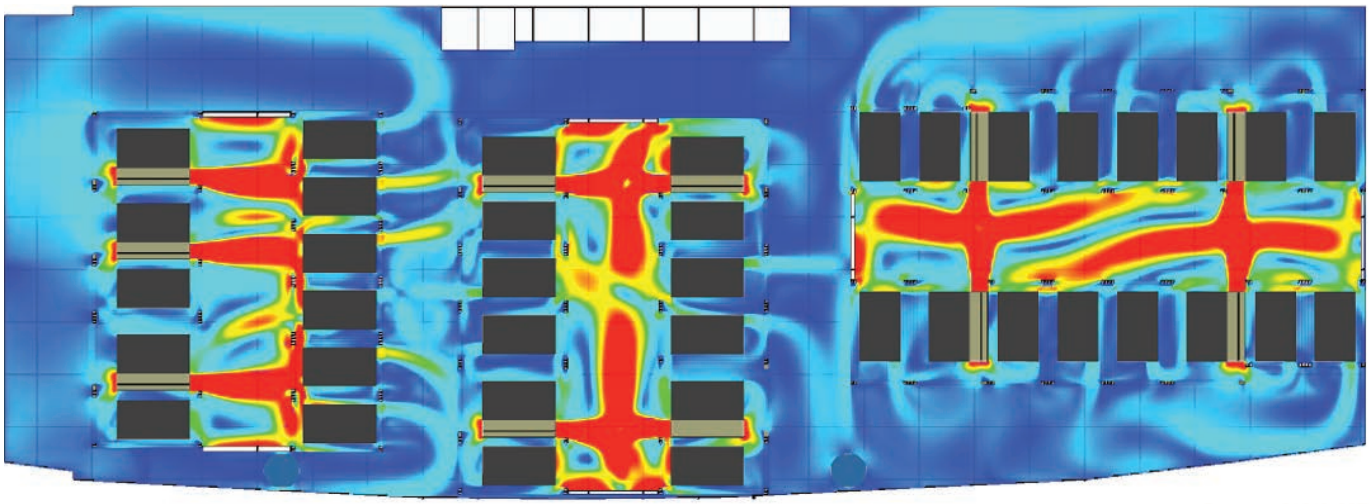
- Cold Aisle Containment with row coolers

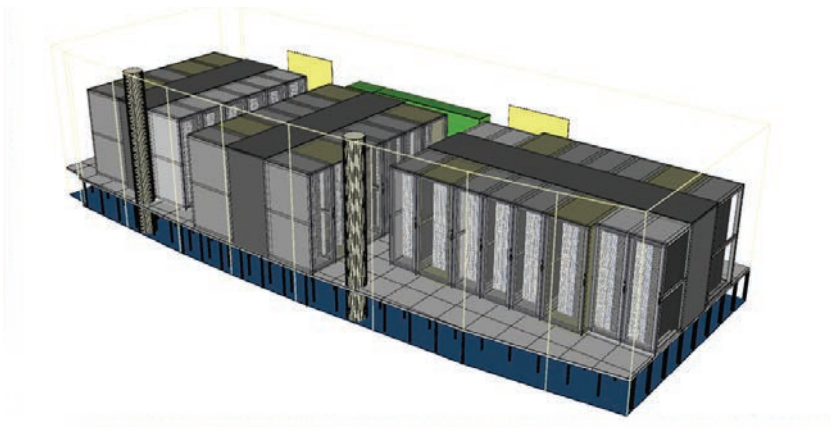
INITIAL EVALUATION

- Original floor plan and cooler operation was satisfactory
- However, high cold aisle pressurization in combination with increased power consumption for cooling
- Non preferable air distribution to equipment

RESULTS AFTER OPTIMIZATION

- Improved cooler set up to reduce power consumption
- Better flow distribution / no overcooling of equipment





Data Center Service and Maintenance

ASSESSMENT AND PLANNING:

- **Site Survey:**
  Conduct a thorough assessment of the data center's existing infrastructure.
- **Requirements Analysis:**
  Understand the specific needs for cooling based on the data center's size, heat load, and design.

MAINTENANCE PROGRAM:

- **Regular Inspections:**
  Schedule periodic inspections of all cooling components.
- **Preventive Maintenance:**
  Implement routine maintenance tasks such as cleaning filters, checking fluid levels, and ensuring proper flow rates.
- **Thermal Imaging:**
  Use thermal imaging to detect hot spots or inefficiencies in the cooling system.

INSTALLATION AND START UP:

- **Air to Liquid Rear Door Heat Exchangers:**
  These units are attached to the rear of server racks to remove heat directly from server exhaust air. The installation process involves mounting the units, connecting to the coolant loop, and integrating with the existing cooling infrastructure.
- **Coolant Distribution Units (CDUs):**
  Install the CDUs to manage the distribution of coolant to the heat exchangers. This includes connecting supply and return lines, and ensuring proper flow rates and pressure levels.
- **Rack and Wall Manifolds:**
  Install manifolds for efficient distribution of coolant to the racks and heat exchangers. This includes piping work and ensuring leak-proof connections
- IT infrastructure such as Aisle Containment, Busbars, Racks & Cable management
- **Start ups:**
  Test the entire cooling system for operational efficiency, ensuring all components work in harmony.

Service Program by nVent Data Center Solutions

REPAIR SERVICES:

- **Rapid Response Team:** Establish a team equipped to quickly address and repair any issues with the cooling system.

SPARE PARTS INVENTORY:

- Maintain a stock of critical spare parts for quick replacement.

TRAINING:

- Train the maintenance staff on troubleshooting and repairing specific components of the cooling system.

DOCUMENTATION AND REPORTING:

- **System Documentation:** Maintain detailed records of the cooling system's design, installation, and modifications.

PERFORMANCE REPORTING:

- Regularly monitor and report on the system's performance, including temperature, flow rates, and energy consumption.

SAFETY AND COMPLIANCE:

- **Safety Protocols:** Adhere to strict safety protocols during installation and maintenance.
- **Compliance:** Ensure that the system complies with relevant industry standards and regulations.

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