



Hitachi's
Modular
Cooling
Solutions

Natural Circulation
Refrigerant Solutions

Providing Power
Efficient Data Centre
Cooling on Demand

Natural Circulation (NC) Technology Overview

New and existing data centres are subject to an ever-increasing set of changes due to new server technologies, increased capacities, legislative influencers and commercial pressures.



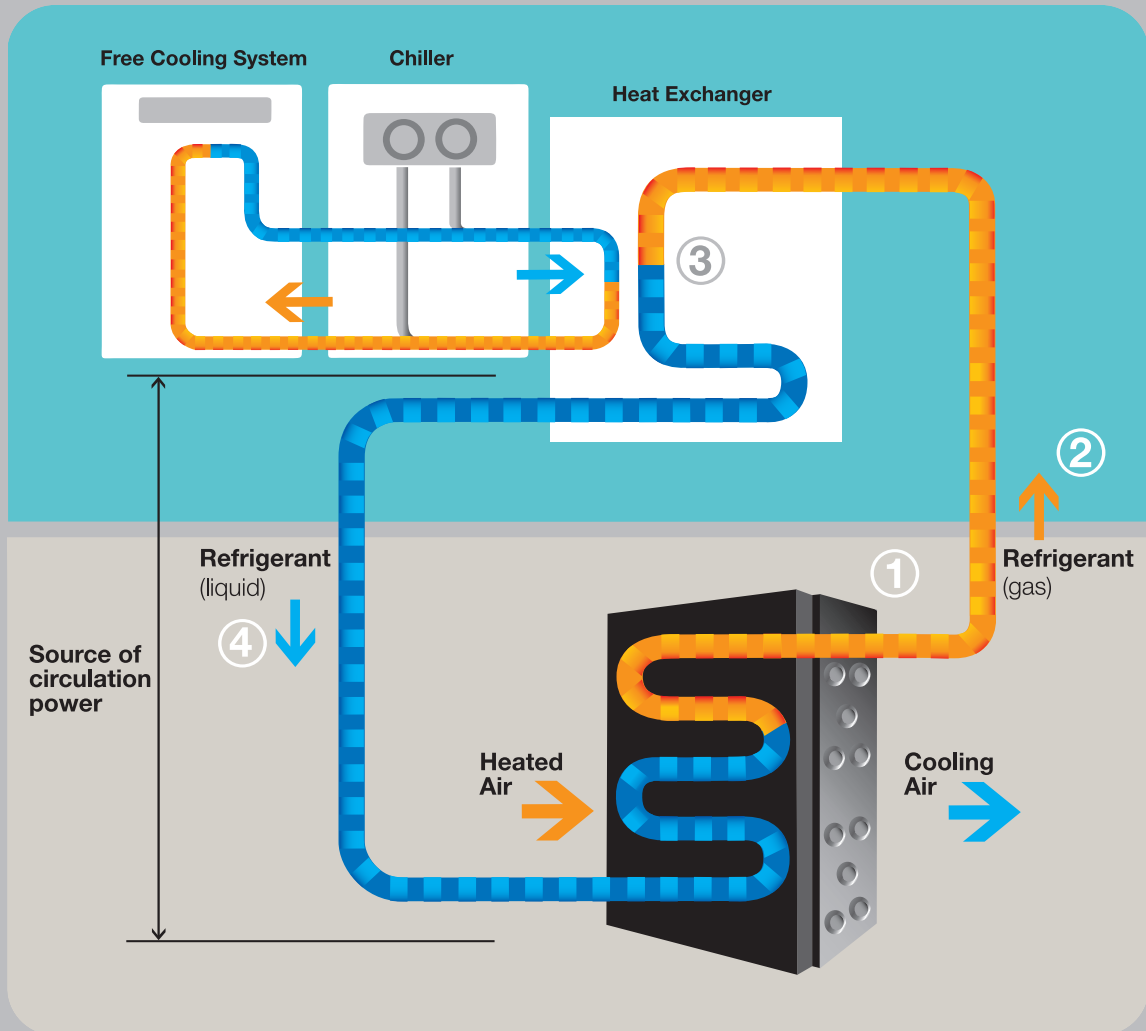
The constantly changing IT environment coupled with increased expectations from Data Centre users and owners requires the ability for data centres to be scalable and retrofitted as the market evolves while improving power efficiencies. Operators don't always have the luxury of starting from a blank slate and therefore the ability to retrofit an operating data centre with minimal disruption is essential.

Existing facilities as well as new facilities inherit a range of IT technologies including high-density server equipment such as Blade Server technologies. These technologies when in operation often create hot spots within a data centre and not adequately cooled by existing cooling equipment. As a result, there lies the need for a scalable solution that is capable of installation within a short timeframe with little to no disruption to existing IT and Mechanical or Electrical services.

The Natural Circulation (NC) Cooling solution represents an ideal solution for new and existing data centre facilities requiring modular cooling requirements for medium and high-density environments.

Hitachi has incorporated its Natural Circulation technology into Rear Door, Rack Type, and Cloud Unit. The NC system requires no pump or compressor. The heat from the server vaporises the refrigerant, causing it to rise. When cooled, it condenses and falls. Utilising these rising and falling streams, the system is able to circulate the refrigerant without an externally powered driving force.

Hitachi developed the “Refrigerant Natural Circulation Cooling System” which does not use a pump or a compressor thereby realising significant energy savings.



1. The refrigerant temperature of the cooling system rises by the heated air from the devices in rack cabinets and the refrigerant becomes a gas. At this time, the heated air is cooled by the heat of vaporisation and the cooling system exhausts it as a cooling air.
2. The refrigerant (gas) rises naturally as a result of low density.
3. The refrigerant (gas) is cooled by cold water and the refrigerant becomes a liquid as a result of the use of a heat exchanger.
4. The refrigerant (liquid) descends without using power by gravitation and returns to the cooling system.

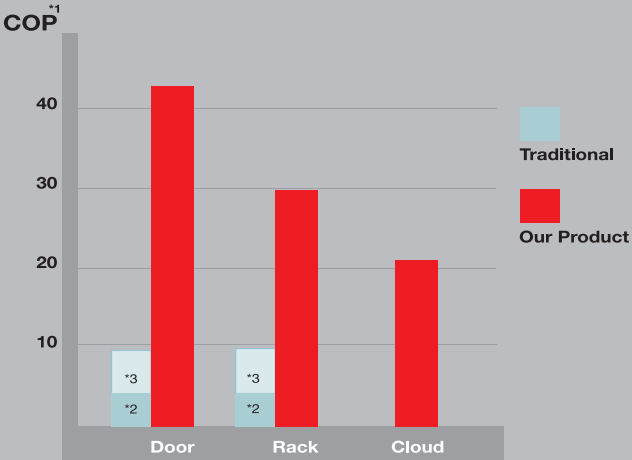
Natural Circulation Cooling Units

The Hitachi Natural Circulation Cooling (NC) solutions provides the benchmark for adaptive cooling solutions that meet a variety of data centre needs while delivering a significant reduction in Total Cost of Ownership (TCO).

Common elements associated with the units are the need for external heat exchangers located above the units, Cooling Refrigerant R134a, and a chilled water supply.

Most importantly is that no external power source (Pumps or Compressors) is required in order to provide the cooling capabilities. The elimination of these power sources provides very efficient solutions which deliver COP's in excess of 20 or more.

Each unit can operate independently and scaled up per unit type, or the units can be mixed and matched in order to deliver different capacities based on your varying existing or future requirements.

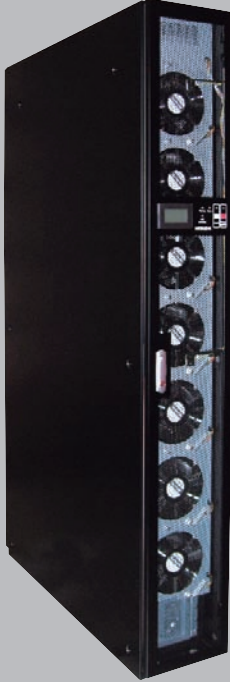


Comparison of COP (Traditional v.s. Our Products)
 *1 COP (Coefficient Of Performance) =Cooling Capacity ÷ Power Consumption
 *2 Include CDU Power (Minimum COP)
 *3 Unit Only (Maximum COP)

Hitachi is providing three units as part of the NC suite including:



NC Door



NC Rack



NC Cloud

NC Door

The Natural Circulation (NC) Cooling Door attaches to the rear of the IT rack, replacing the existing rear door of the IT rack, and is capable of installation while the IT equipment is in operation. The electrical installation is independent of the existing IT wiring and therefore no alteration to existing electrical connections are necessary except for standard wiring to the PDU or MCB.

The NC Door consists of the following basic components:

- Rear Door with 10 fans
- Dual coil air/refrigerant heat exchangers (5 fans per heat exchanger) fixed to the rear door
- Connection adapter for the existing 42U IT rack



Features

- Installation with adapter kit
- Automatic or Manual fan speed setting
- Individual fan monitoring
- Dual power supplies (A & B) - optional
- N+1 fan redundancy
- Quick swap fans
- Automatic valve operation for regulating cooling power
- Integrated control panel for monitoring sensors (air/refrigerant temperatures, pressures, humidity, power consumption of unit, and more)

Benefits

- No compressor
- No pumps
- Low energy consumption
- Adaptable to most rack vendors
- Existing racks can be used
- Quick installation
- Very few adjustments before fully operational
- Minimal maintenance required due to few moving parts
- Cools the servers' exhaust heat
- Low operating pressure (use of standard copper pipes)
- No specialized installation required
- Significant Total Cost of Ownership (TCO) reduction

| Cooling Capacity | Width | Height | Depth | Weight | Fans | Air-Volume flow | Power Consumption | Refrigerant |
|------------------|-------|--------|-------|--------|---------|-----------------------|-------------------|-------------|
| 10 kW | 594mm | 1995mm | 164mm | 85kg | 10 Fans | 2000m ³ /h | 230W | R134a |

Natural
Circulation
Cooling



NC Rack

The Natural Circulation (NC) Cooling Rack slides between or beside existing IT racks and is capable of installation while the IT equipment is in operation. The electrical installation is independent of the existing IT wiring and therefore no alteration to existing electrical connections are necessary except for standard wiring to the PDU or MCB.

The NC Rack consists of the following basic components:

- Rack type with 7 fans
- Dual coil air/refrigerant heat exchangers fixed within the rack



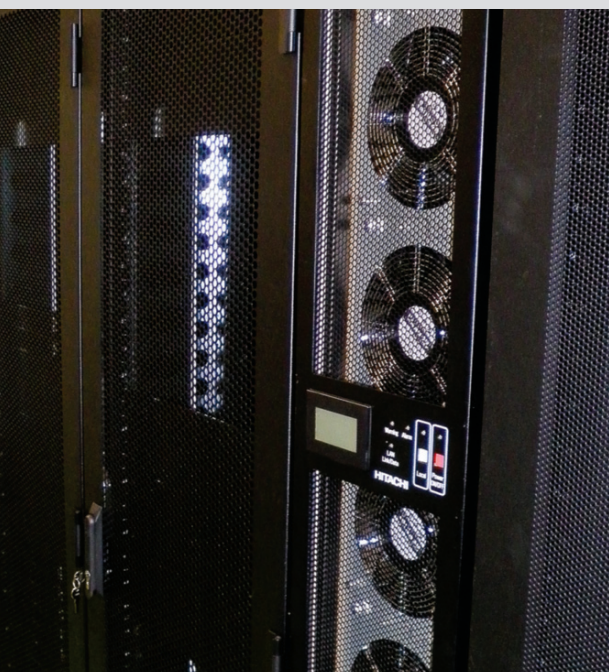
Features

- Slim design to minimise floor space
- Automatic or Manual fan speed setting
- Individual fan monitoring
- Dual power supplies (A & B)- optional
- N+1 fan redundancy
- Quick swap fans
- Automatic valve operation for regulating cooling power
- Integrated control panel for monitoring sensors (air/refrigerant temperatures, pressures, humidity, power consumption of unit, and more)

Benefits

- No compressor
- No pumps
- Low energy consumption
- Quick installation
- Very few adjustments before fully operational
- Minimal maintenance required due to few moving parts
- Cools the servers' exhaust heat
- Significant Total Cost of Ownership (TCO) reduction
- Low operating pressure (use of standard copper pipes)
- No specialized installation required

| Cooling Capacity | Width | Height | Depth | Weight | Fans | Air-Volume flow | Power Consumption | Refrigerant |
|------------------|-------|--------|--------|--------|--------|-----------------|-------------------|-------------|
| 23 kW | 293mm | 2000mm | 1117mm | 250kg | 7 Fans | 4260m³/h | 780W | R134a |



NC Cloud

The Natural Circulation (NC) Cloud Unit resides above IT Racks enabling additional IT capacity within data halls by eliminating the need for large CRAC units located along corridor floors. Refrigerant pipework is located above the aisle eliminating the need for a raised floor. The electrical installation is independent of the existing IT wiring and therefore no alteration to existing electrical connections are necessary

except for standard wiring to the PDU or MCB. The NC Cloud Unit consists of the following basic components:

- Cloud Unit with 4 fans (Height=600mm), 6 fans (Height=450mm)
- Single coil air/refrigerant heat exchangers fixed within the unit
- Hanging the unit directly or putting it on a lattice system ceiling

Features

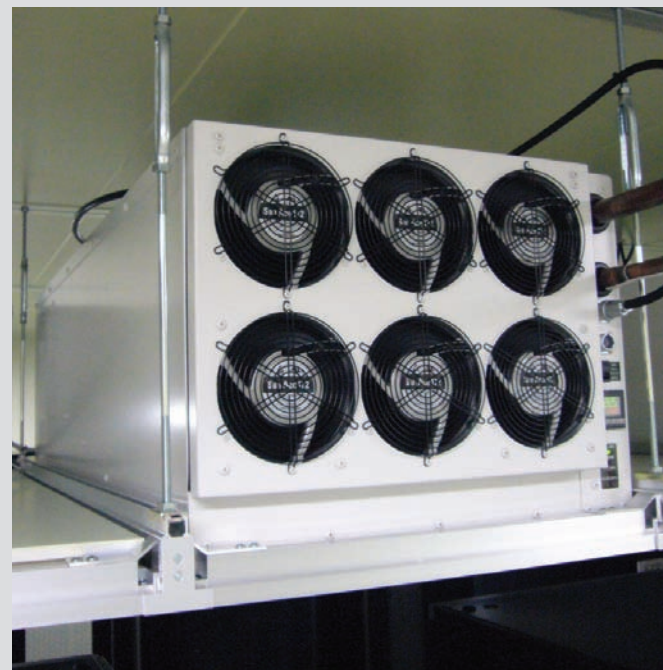
- Manual fan speed setting
- Quick swap fans
- Automatic valve operation for regulating cooling power



Benefits

- No compressor
- No pumps
- Low energy consumption
- Minimal maintenance required due to few moving parts
- Maximises floor space for IT infrastructure
- Significant Total Cost of Ownership (TCO) reduction
- Low operating pressure (use of standard copper pipes)
- No specialized installation required

| Cooling Capacity | Width | Height | Depth | Weight | Fans | Air-Volume flow | Power Consumption | Refrigerant |
|------------------|-------|--------|--------|--------|--------|-----------------|-------------------|-------------|
| 15 kW | 565mm | 600mm | 1400mm | 120kg | 4 Fans | 3000m³/h | 700W | R134a |
| 15 kW | 565mm | 450mm | 1400mm | 95kg | 6 Fans | 3000m³/h | 960W | R134a |



NC Specifications

| No | Item | NC Door | | NC Rack | | NC Cloud (H=600mm) | | NC Cloud (H=450mm) | | |
|----|--|-------------------------|---|------------------------------|---|------------------------------|---|------------------------------|---|------------------------------|
| | | Specification | Remarks | Specification | Remarks | Specification | Remarks | Specification | Remarks | |
| 1 | Cooling Capacity | | 10kW | | 23kW | | 15kW | | 15kW | |
| 2 | Condition | | Assuming intake air at 40°C and outlet air at 25°C to/from cooling coil with refrigerant supply at 16°C | | Assuming intake air at 40°C and outlet air at 25°C to/from cooling coil with refrigerant supply at 16°C | | Assuming intake air at 40°C and outlet air at 25°C to/from cooling coil with refrigerant supply at 16°C | | Assuming intake air at 40°C and outlet air at 25°C to/from cooling coil with refrigerant supply at 16°C | |
| 3 | Electrical Requirements | Input | 200V-240V±10% 50/60Hz | | 200V-240V±10%, 50/60Hz | | 200V-240V±10%, 50/60Hz | | 200V-240V±10%, 50/60Hz | |
| 4 | | Input Power Connections | Single Phase | | Single Phase | | Single Phase | | Single Phase | |
| 5 | | Full Load Amps | 1.75A@200V, 1.53A@240V | In case of maximum Fan Speed | 6A@200V, 5A@240V | In case of maximum Fan Speed | 4.0A@200V | In case of maximum Fan Speed | 7.2A@200V | In case of maximum Fan Speed |
| 6 | | Rated Load Amps | 1.15A@200V, 0.96A@240V | | 3.9A@200V, 3.3A@240V | | 3.6A@200V | | 4.8A@200V | |
| 7 | | Power Consumption | 230W | In case of single AC input | 780W | In case of single AC input | 700W | | 960W | |
| 8 | Dimensions mm | Height | 1995 | | 2000 | | 600 | | 450 | |
| | | Width | 594 | | 293 | | 565 | | 565 | |
| | | Depth | 164 | | 1117 | | 1400 | | 1400 | |
| 9 | Weight [kg] | Unit only | 85 | | 250 | | 120 | | 95 | |
| 10 | Number of Fans | | 10 | | 7 | | 4 | | 6 | |
| 11 | Airflow, Nominal, m ³ /min(m ³ /h) | | 33.4m ³ /min(2000m ³ /h) | | 71m ³ /min(4260m ³ /h) | | 50m ³ /min(3000m ³ /h) | | 50m ³ /min(3000m ³ /h) | |
| 12 | Audible Noise, Sound Pressure | | 70dBA | | 80dBA | | 77dBA | | 79dBA | |
| 13 | Cabinet Exterior Finish | | Black | | Black | | Ivory/Black | | Ivory/Black | |
| 14 | Option | Redundant Power Supply | | | Redundant Power Supply | Concurrent Maintenance | | | | |
| | | BACNet Interface | | | BACNet Interface | Condensation Pump | | | | |

HITACHI
Inspire the Next

Hitachi Europe Ltd.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire
SL6 8YA
Tel: 01628 585000
www.hitachi.eu/edc/