ENGINEERING
TOMORROW

eBook | Danfoss microchannel heat exchangers

Next-level air conditioning and refrigeration with **Danfoss MCHEs**

Discover the microchannel heat exchangers that will optimize your energy performance

No matter your cooling need, Danfoss Heat Exchangers offer you a customized solution that is tailored to your exact specifications

Microchannel heat exchangers

Our footprint

Danfoss warehouse - CDC DK
Danfoss ADC - DK

Danfoss warehouse - US

Danfoss warehouse - SDC IT

NAM coating supplier

Danfoss ADC - Tallahassee, US

EU coating supplier

CN coating supplier

NAM coating supplier

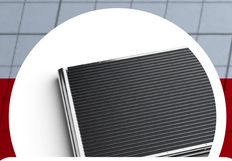
Danfoss MCHE R&D Center
Danfoss ADC - Haiyan, CN

Danfoss MCHE Engineering Center
Monterrey, MX

Danfoss MCHE factory
Monterrey, MX
2022 weekly capacity: 7,500 sqm
2023 weekly capacity: 13,000 sqm

Danfoss ADC - IN

Danfoss MCHE factory
Haiyan, CN
Weekly capacity: 8,000 sqm



2006
Microchannel technology inception

2008
Mass production and delivery

2012
Opened production facility in Haiyan, China

2013
Opened heat exchanger performance lab in Haiyan, China

2013
Opened materials science lab in Haiyan, China

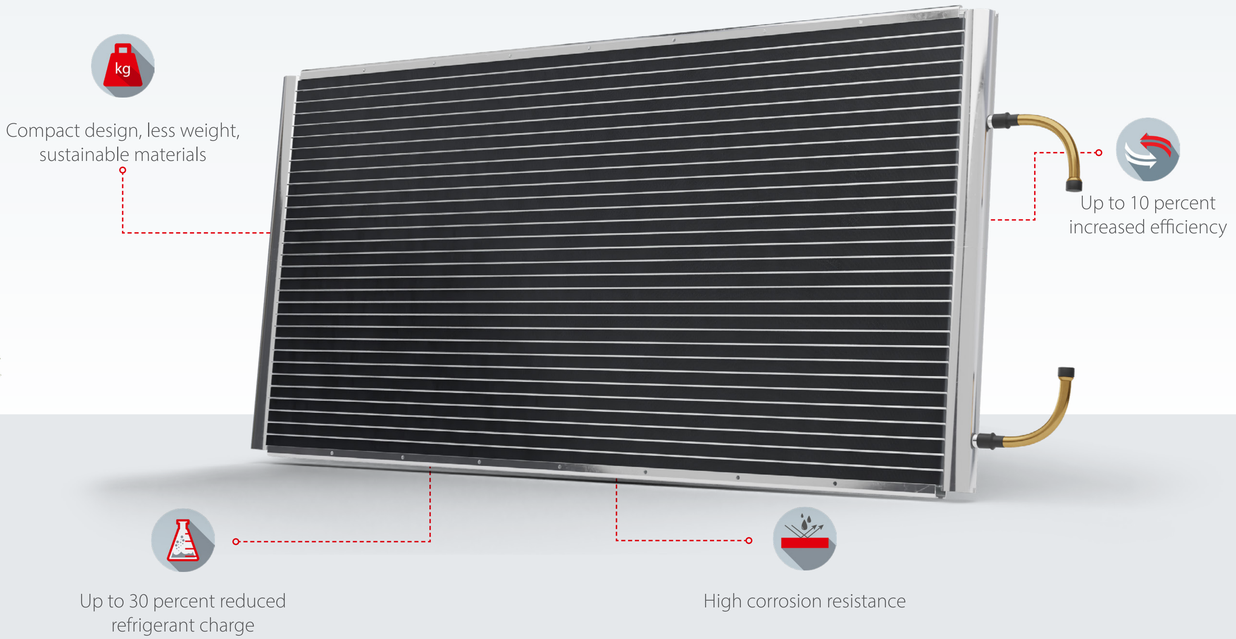
2013
Opened production facility in Monterrey, Mexico

2018
Opened global application development center (ADC) in Haiyan, China

2022
Mexico capacity expanded

Microchannel heat exchangers

Technology overview



The microchannel heat exchanger (MCHE) is ideal for use in residential and commercial air conditioning systems as well as in refrigeration equipment driven by energy efficiency and reduction of the refrigerant charge.

The MCHE technology offers several advantages over traditional fin & tube coils.

They are very customizable and can be produced in various lengths, heights and thicknesses.

With the MCHE you get an ingeniously simple, all-aluminum design that is not only lightweight but is also immune to galvanic corrosion.

The aluminum construction makes it a very sustainable solution due to its recyclable materials, sealed design and high strength.

Height	Length	Manifold	Tube	Fin
8″ – 70″ (200 – 1700mm)	8″ – 154″ (200 – 3900mm)	**Al 3003 clad 4343+1%Zn** • 20mm, 1.5mm wall **Al 3003 clad 4045+1%Zn** • 26mm, 1.9mm wall • 32mm, 2.5mm wall **Al 3005MOD clad 4045+1%Zn** • 38mm, 2.5mm wall • 43.5mm, 2.8mm wall	**Al 3102** • 12/16/18/20.6/25.4mm, 1.3mm high • 25.4mm, 2mm high • 32mm, 2mm high **Al 9153/31104** • 12mm, 1.3mm high • 18mm, 1.3mm high • 25.4mm, 1.3mm high • 25.4mm, 2mm high • 32mm, 1.3mm high • 32mm, 2mm high	**Al 3003MOD clad 4343** • 12/16/18/20.6/25.4mm, condenser, 23 FPI, 8.1mm high • 32mm, condenser, 21 FPI, 8.1mm high • 18 (23 FPI) 25.4mm (21 FPI), condenser, 7.6mm high • 16, 20.6mm, evaporator, 16 FPI, 8.1mm high • 25.4mm, evaporator, 18 FPI, 8.1mm high • 32mm, evaporator, 16 FPI, 8.1mm high

	Corrosive atmosphere[1] equivalent aluminum corrosion rate				
	Very low to low (C1, C2) Negligible	Medium (C3) 2 g/m²	High (C4) 5 g/m²	Very high (C5) 10 g/m²	Very high to extreme (CX) >10 g/m²
MCHE SLA[2]	✓	✓	✗	✗	✗
MCHE LLA[3]	✓	✓	✗	✗	✗
Top coating	✓	✓	✓	✗	✗
E-coating	✓	✓	✓	✓	✗
Double coating	✓	✓	✓	✓	✓

1) Defined corrosivity categories refer to ISO9223, 2) Danfoss Standard Life Alloy (SLA), 3) Danfoss Long Life Alloy (LLA)

RTU & DOAS

Rooftop units & dedicated outdoor air systems

A rooftop AC unit refers to an air conditioning system that is installed on the roof of a building rather than inside the building itself.

These units are commonly found on commercial or industrial buildings, such as office buildings, schools, or hospitals.

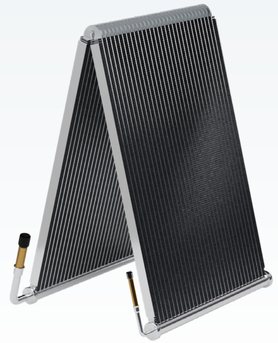
The rooftop AC unit consists of an outdoor unit that houses the compressor and condenser, and an indoor unit that is connected to the ductwork of the building. The outdoor unit is typically placed on a platform or mounted on the roof of the building and is designed to withstand various weather conditions.

One of the primary advantages of rooftop AC units is that they free up valuable indoor space, as they do not require a separate unit to be installed. They also allow for easy maintenance and repair, as technicians can access the unit from the roof without disrupting normal building operations.

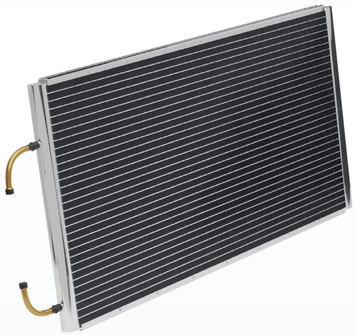
Features:

- Bending tubes have good refrigerant distribution, compact design, and are easy to install
- Special fin design has better water drainage and heat transfer performance
- Special tube design enhance heat transfer and reduce refrigerant charge (Same portfolio with condenser)
- Vertical tube placement for condensate water drainage
- Interior distributor improves refrigerant distribution and saves installation space
- Dedicated refrigerant collector in outlet manifold improves refrigerant distribution and reduces pressure drop (large size evaporator may use dual outlet manifold to balance pressure for distribution)

Standard MCHE evaporators

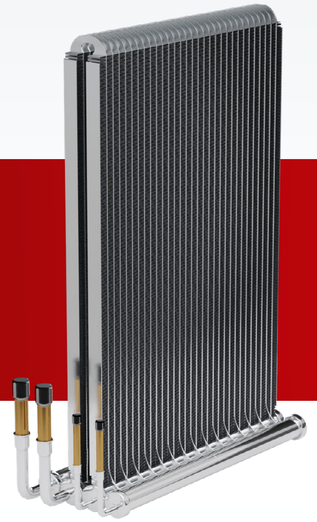


Standard MCHE condensers



RTU & DOAS

Rooftop units & dedicated outdoor air systems



iMCHE (interlaced MCHE) evaporator and condenser

Features:

Dual-circuits in one heat exchanger

- iMCHE can be multi-inlet/outlet design and can be customized for multi-circuit systems

Flexible design for each circuit

- Set different channels for each circuit according to uneven capacity in dual systems

Danfoss proprietary distribution tech

- Danfoss' new generation distributor design will distribute the refrigerant flow evenly, and achieve good heat exchange capacity
- Danfoss innovative collector in the outlet manifold improves refrigerant distribution and reduces pressure drop

Benefits:

- Excellent capacity on part load
- Higher efficiency
- Excellent distribution of refrigerant

MCHE next-gen indoor evaporator

Features:

Dedicated evaporator design

- Optimized tube for evaporator applications, high heat transfer performance but keeping lower pressure drop

Compact design for multi-row coil (1.5 rows)

- Angle-free bending for compact design and easy installation

Danfoss proprietary distribution tech

- Danfoss' new generation distributor design will distribute the refrigerant flow evenly, and achieve good heat exchange capacity
- Danfoss innovative collector in outlet manifold improves refrigerant distribution and reduces pressure drop

Benefits:

- Higher capacity & efficiency (vs current MCHE)
- Excellent distribution of refrigerant
- Stable performance on full & part load
- No need for distribution iteration (uniform distributor fits most conditions)

Chillers & free cooling

Microchannel heat exchangers

An air to water chiller is a type of HVAC system that uses air as the primary source of cooling and transfers that cooling to water, which is then used to cool a building or process. Air to water chillers are commonly used in commercial, industrial, and institutional settings, such as hospitals, universities, and data centers.

The basic principle of operation for an air to water chiller is to use an outdoor air-cooled condenser to extract heat from the air and transfer it to a refrigerant. The refrigerant is then pumped to an indoor water-cooled evaporator, where it absorbs heat from the water and cools it down. The chilled water is then circulated through the building's cooling system, where it absorbs heat and returns to the evaporator to be cooled again.

One of the advantages of air to water chillers is that they are more energy efficient than traditional air-cooled chillers because they transfer the cooling load to water, which has a higher heat capacity than air.

They are also quieter and have a smaller footprint than traditional chillers, as the outdoor unit can be placed further away from the building.

V-coil for chiller / RTU

Features:

- Danfoss proprietary v-section to extend space utilization
- Take full advantage of area between coil slabs
- Use same parts (tube, fin, manifold, baffle, connector) as in current micro channel heat exchanger portfolio
- Modular design offers different Split V-Coil solutions
- Suitable for glycol / free cooling chiller

Benefits:

- Maximize condenser performance and take full advantage of the area between coil slabs
- Highly customizable, modular and flexible
- Better logistics option
- Save the panel material in V area

2 slab coils

2 slab coils
1 V-coil

2 slab coils
2 V-coils

1 slab coil
2 V-coils

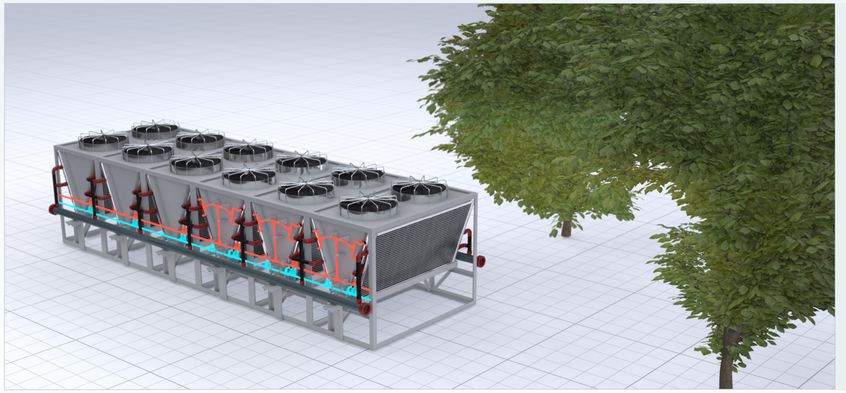
Chillers & free cooling

Microchannel heat exchangers

MCHE free cooling

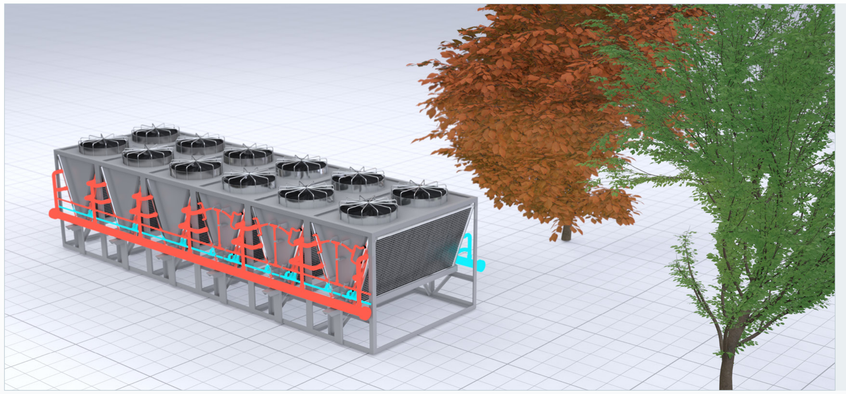
The MCHE is ideal for use in data center cooling systems driven by energy efficiency and reduction of the refrigerant charge. With the addition of a free cooling cycle, we offer a customizable, innovative solution to deliver highly reliable cooling and reduce energy cost in a sustainable way.

	Glycol MCHE (Radiator)	Glycol MCHE (Standard)	Glycol MCHE (High performance)
Tube width	25.4 mm	32 mm	32 mm
Thickness	2.0 mm	2.0 mm	2.0 mm
Port number	3	6	6
Fin height	8.1 mm	11.4 mm	8.1 mm
Fin density	18 / 23 FPI	18 FPI (±2)	21 FPI (±2)
Manifold	32 / 38 mm	38 / 43.5 mm	43.5 mm
Design pressure	6 bar (87 psi)	10 bar (145 psi)	10 bar (145 psi)
Burst pressure	30 bar (435 psi)	50 bar (725 psi)	50 bar (725 psi)



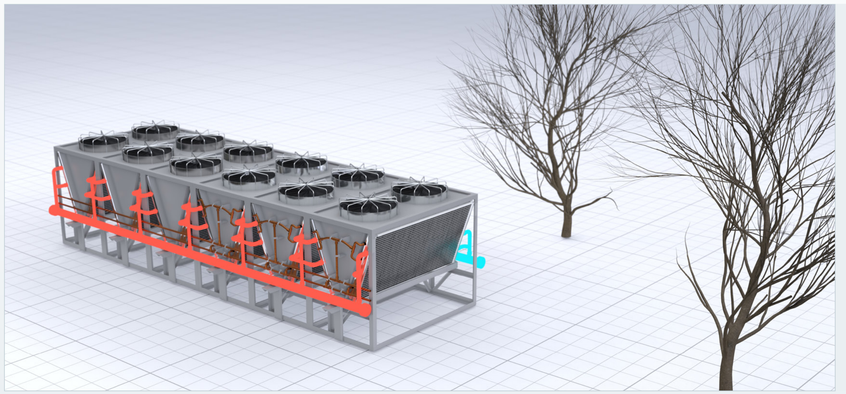
Summer configuration
Refrigerant cycle only. During high ambient seasons, the cooling is provided by the MCHE refrigerant system.

Energy savings



Fall/spring configuration
Refrigerant and free cooling cycles. The water is partially chilled by the refrigerant cycle. The free cooling cycle operates without a compressor, which can save energy consumption.

Energy savings



Winter configuration
Free cooling cycle only. During the low ambient season, the water is completely chilled by the free cooling cycle. This yields significant savings due to low energy consumption.

Energy savings

Residential air conditioning

Microchannel heat exchangers

Better heat transfer: MCHEs have a large surface area-to-volume ratio, which allows for better heat transfer compared to traditional heat exchangers. This means that MCHEs can provide more efficient heat transfer in smaller spaces, allowing for more effective cooling in residential AC systems.

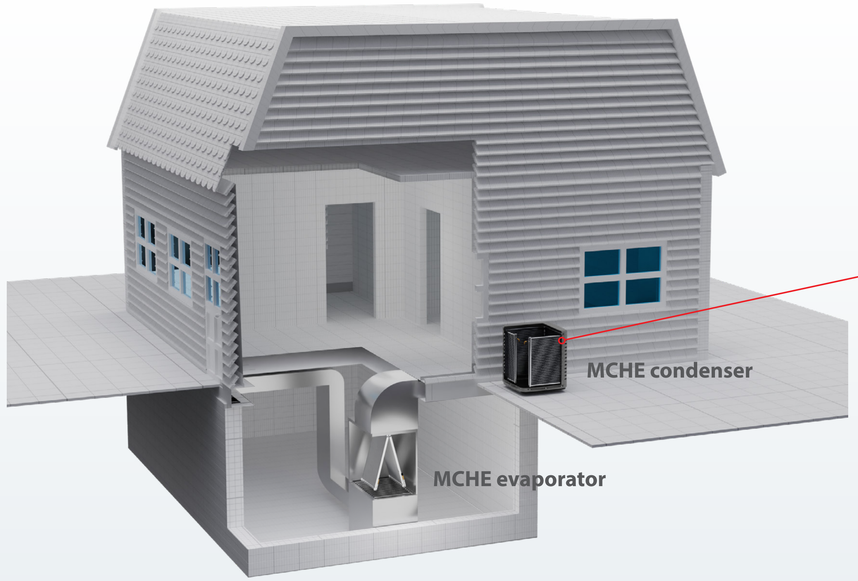
Compact size: MCHEs are smaller and lighter than traditional heat exchangers, making them a good choice for residential AC units where space is limited. This can also simplify installation and reduce overall system weight.

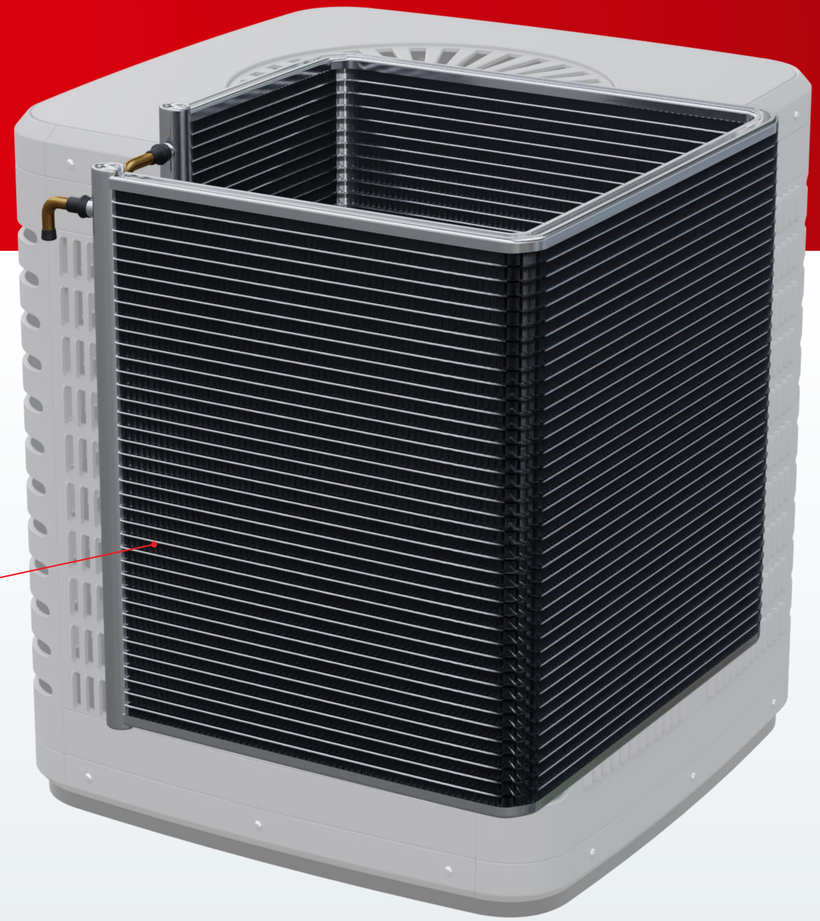
Environmentally friendly: MCHEs typically use less refrigerant than traditional heat exchangers, which can reduce the overall environmental impact of the AC system.

Improved reliability: MCHEs have fewer joints and welds compared to traditional heat exchangers, which reduces the risk of leaks and improves overall system reliability. This can result in reduced maintenance costs and improved system uptime.

This type of air conditioning is best suited for medium to large homes that require cooling of multiple rooms at once. A central air conditioning unit uses a split system that regulates air through ducts installed in the home. This is also known as a ducted system.

A split system uses a combination of two air conditioning units. The outdoor unit contains the condenser and the compressor, while the indoor unit houses the evaporator coils and the air handler. Like any typical air conditioner, central air conditioning also uses a refrigerant to remove heat from the indoor air. This heat is funnelled outside and cool air is pushed in through the ducts.





Reduced noise: The compact size of MCHEs can help reduce noise levels in residential AC systems. This is because the smaller size of the MCHEs allows for a reduction in the size of the air ducts and fans required for the AC system, resulting in quieter operation.

Improved performance: MCHEs have a low air-side pressure drop, which can improve the overall performance of the AC system by reducing the amount of energy required to move air through the system.

Reduced refrigerant charge: MCHEs can operate with a lower refrigerant charge compared to traditional heat exchangers. This reduces the risk of refrigerant leaks, which can result in lower maintenance costs and improved safety.

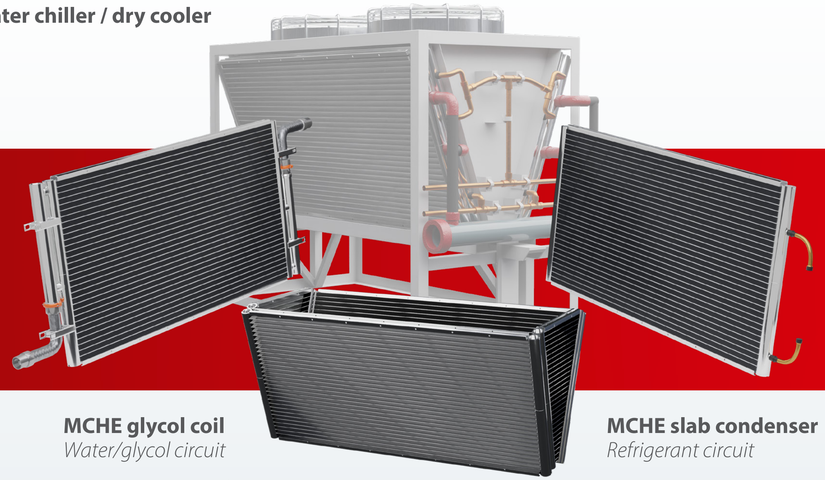
Data center solutions

Microchannel heat exchangers

Data center cooling is exactly what it sounds like: controlling the temperature inside data centers to reduce heat. Failing to manage the heat and airflow within a data center can have disastrous effects on a business.

Not only is energy efficiency seriously diminished—with lots of resources spent on keeping the temperature down—but the risk of servers overheating rises rapidly.

Air-to-water chiller / dry cooler



MCHE glycol coil
Water/glycol circuit

MCHE slab condenser
Refrigerant circuit

MCHE V-coil condenser

Room / row / rack cooling

CRAH (computer room air handler)
(water/glycol)

Evaporator

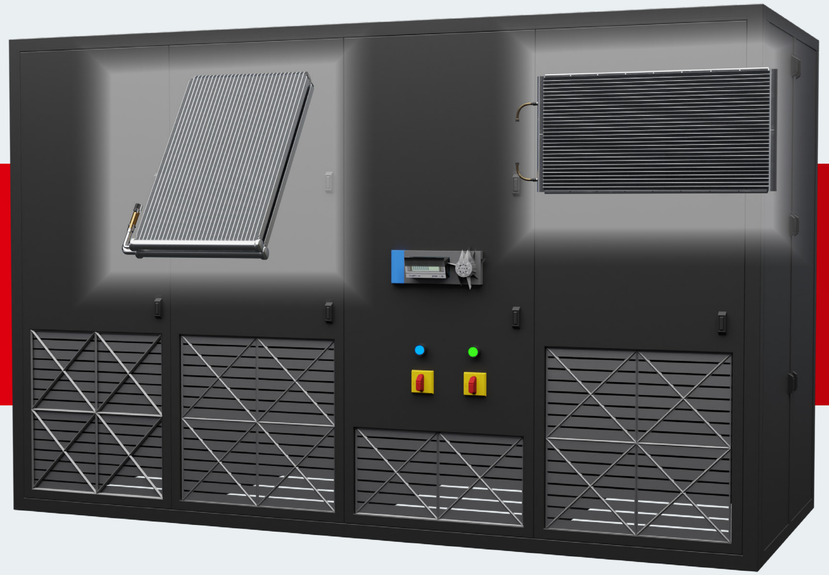
RDHX (rear door heat exchanger)
(water/glycol, refrigerant)

Evaporator

Thermosiphon, free cooling
(water/glycol, refrigerant)

Evaporator

Condenser



CRAC (computer room air conditioning)
Direct expansion (refrigerant)

Evaporator

Condenser

Refrigeration

Microchannel heat exchangers

A condensing unit typically is a high side assembly of a refrigeration system. It is an assembly of a compressor, condenser, fan motor, controls and a mounting plate. It has the function of a heat exchanger to cool down and condense the incoming refrigerant vapor into liquid and a fan for blowing outside air through the heat exchanger section to cool the refrigerant inside.

Condensing units have various designs and come in many sizes ranging from small household appliance units to very large industrial units used in food and manufacturing processes.

High efficiency: MCHEs have a high heat transfer coefficient, which makes them more efficient than traditional heat exchangers. This results in a higher overall efficiency for the refrigeration system, which can reduce energy consumption and lower operating costs.

Environmentally friendly: MCHEs typically use less refrigerant than traditional heat exchangers, which can reduce the overall environmental impact of the refrigeration system.

Better heat transfer: MCHEs have a large surface area-to-volume ratio, which allows for better heat transfer compared to traditional heat exchangers. This means that MCHEs can provide more efficient heat transfer in smaller spaces, allowing for more effective cooling in refrigeration systems.

Reduced refrigerant charge: MCHEs can operate with a lower refrigerant charge compared to traditional heat exchangers. This reduces the risk of refrigerant leaks, which can result in lower maintenance costs and improved safety.

Improved performance: MCHEs have a low air-side pressure drop, which can improve the overall performance of the refrigeration system by reducing the amount of energy required to move air through the system.

Durability: MCHEs are made from corrosion-resistant materials, which makes them less susceptible to damage from exposure to the elements. This can result in longer lifespan for the refrigeration system and reduced maintenance requirements.

Compact size: MCHEs have a compact design, which allows for more efficient use of space in refrigeration systems. This can help reduce the size and weight of the overall refrigeration system, making it easier to install and maintain.

Vehicle refrigeration equipment | **Ice machines** | **Ice cream machines** | **Supermarket cabinets** | **Refrigeration storerooms** | **Kitchen freezers**

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To learn more about how Danfoss can help you improve your energy efficiency and optimize your solutions, please visit our website and get in touch today.

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