



ENGINEERING
TOMORROW



eBook | Danfoss micro channel heat exchangers

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

**Discover the heat exchangers that
optimize your energy performance**

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

» START HERE

Danfoss Heat Exchangers

Micro channel heat exchangers

Customized, easy-to-install heat transfer solutions from Danfoss

Simple technology; **advanced optimization**

Gaining the huge benefits of an optimized system might seem like something that requires complex, inaccessible technology and great effort, but thanks to Danfoss Heat Exchangers that is not the case.

Danfoss' range of customizable, easy-to-install micro channel heat exchanger (MCHE) solutions is prepared to meet the challenges of air conditioning and refrigeration systems, both today and in the future.



Navigate through this eBook by **clicking the different**  **buttons**



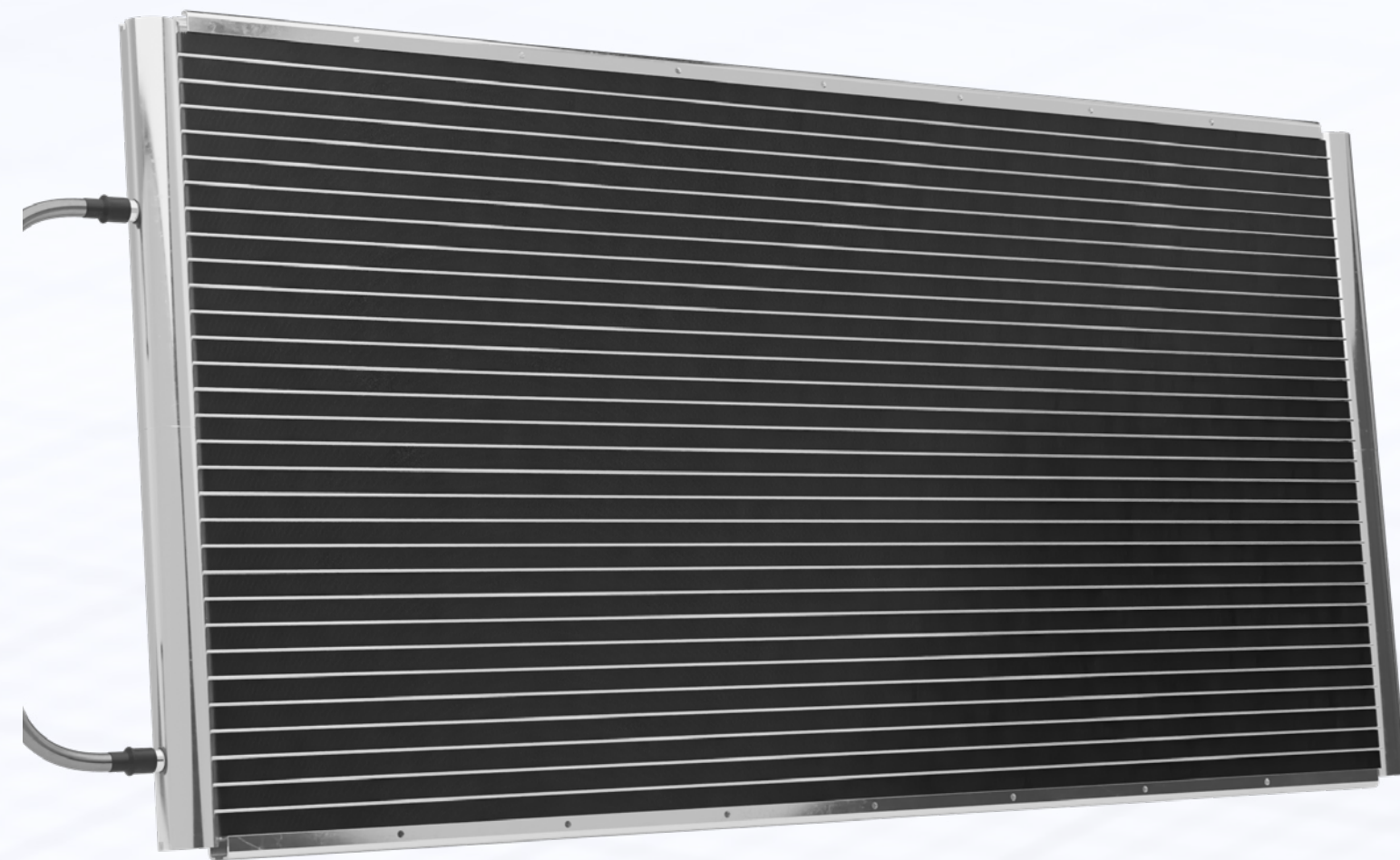
Micro channel heat exchangers

Our footprint

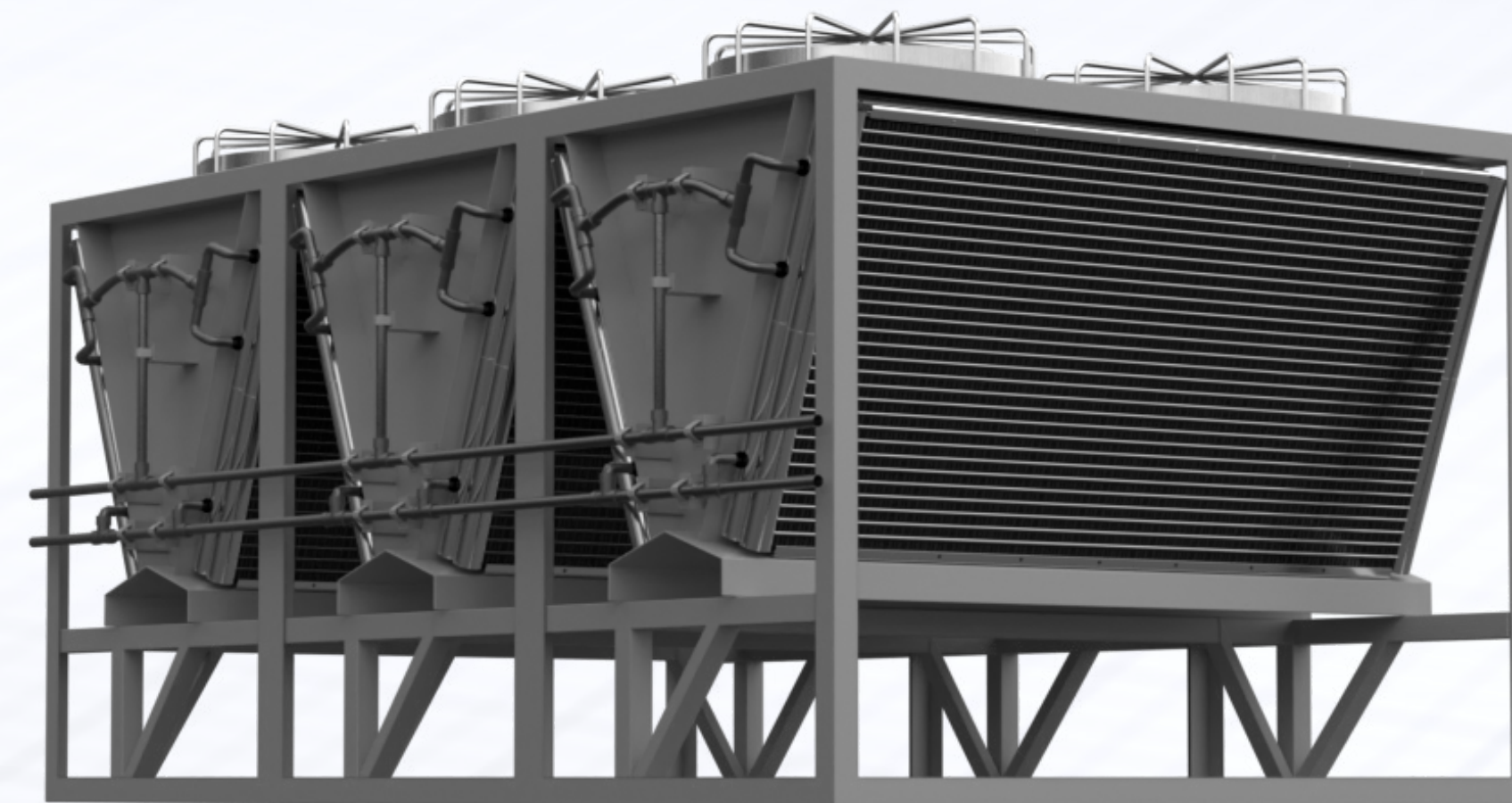


Micro channel heat exchangers

Technology and application overview



Micro channel
technology



Main applications

Technology overview

Micro channel heat exchangers

This section is about the **following topics:**

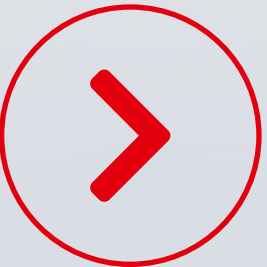
- ● ● Introduction to MCHEs
- ● ● MCHE technology
- ● ● Benefits of MCHEs



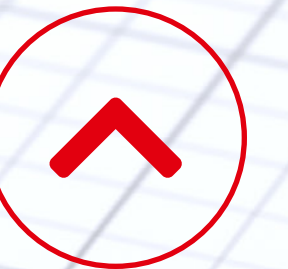
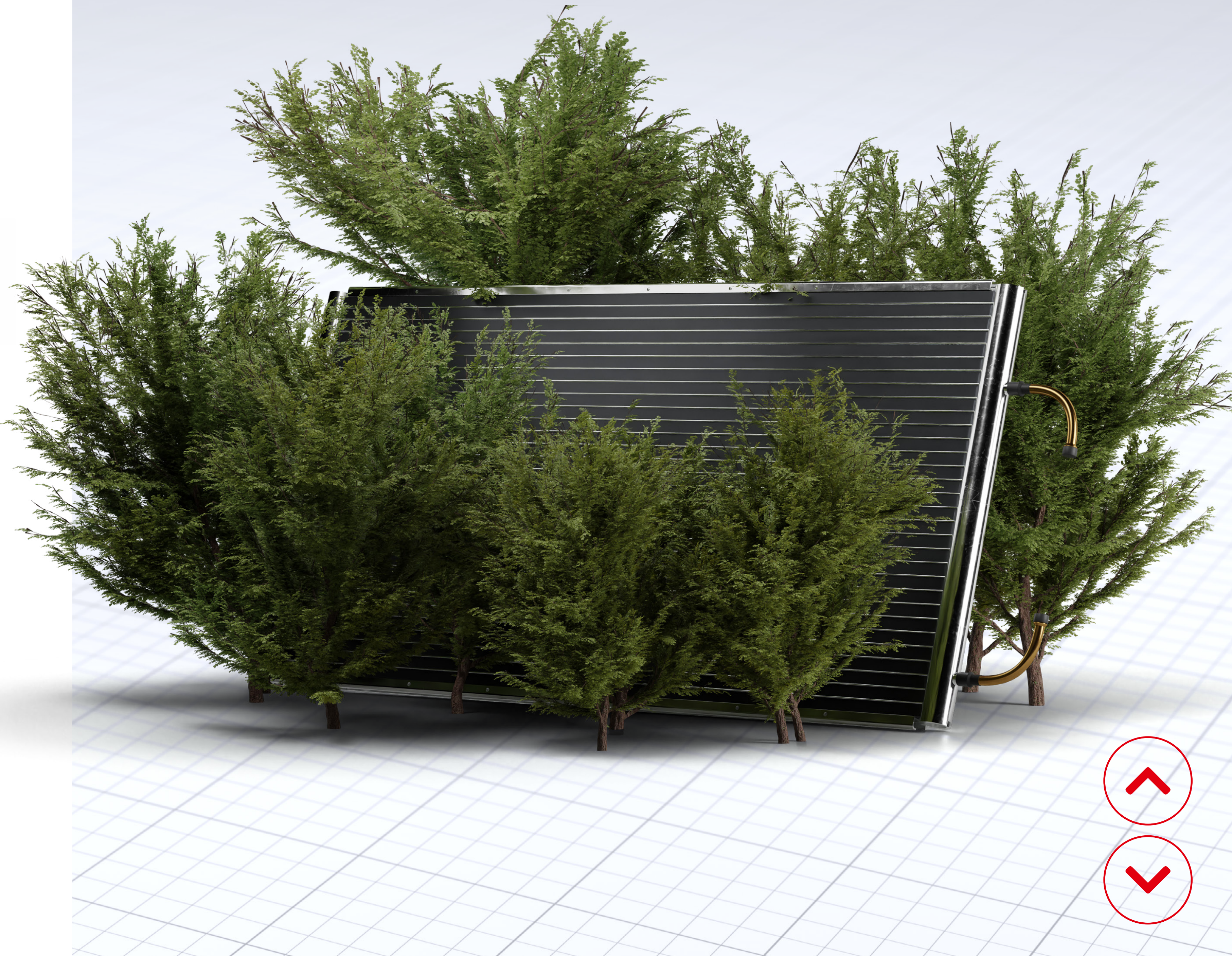
Watch the video
Learn about MCHE technology



Watch the video
MCHE factory tour



Watch the video
Introduction to MCHE



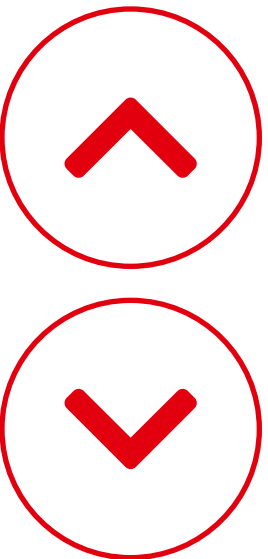
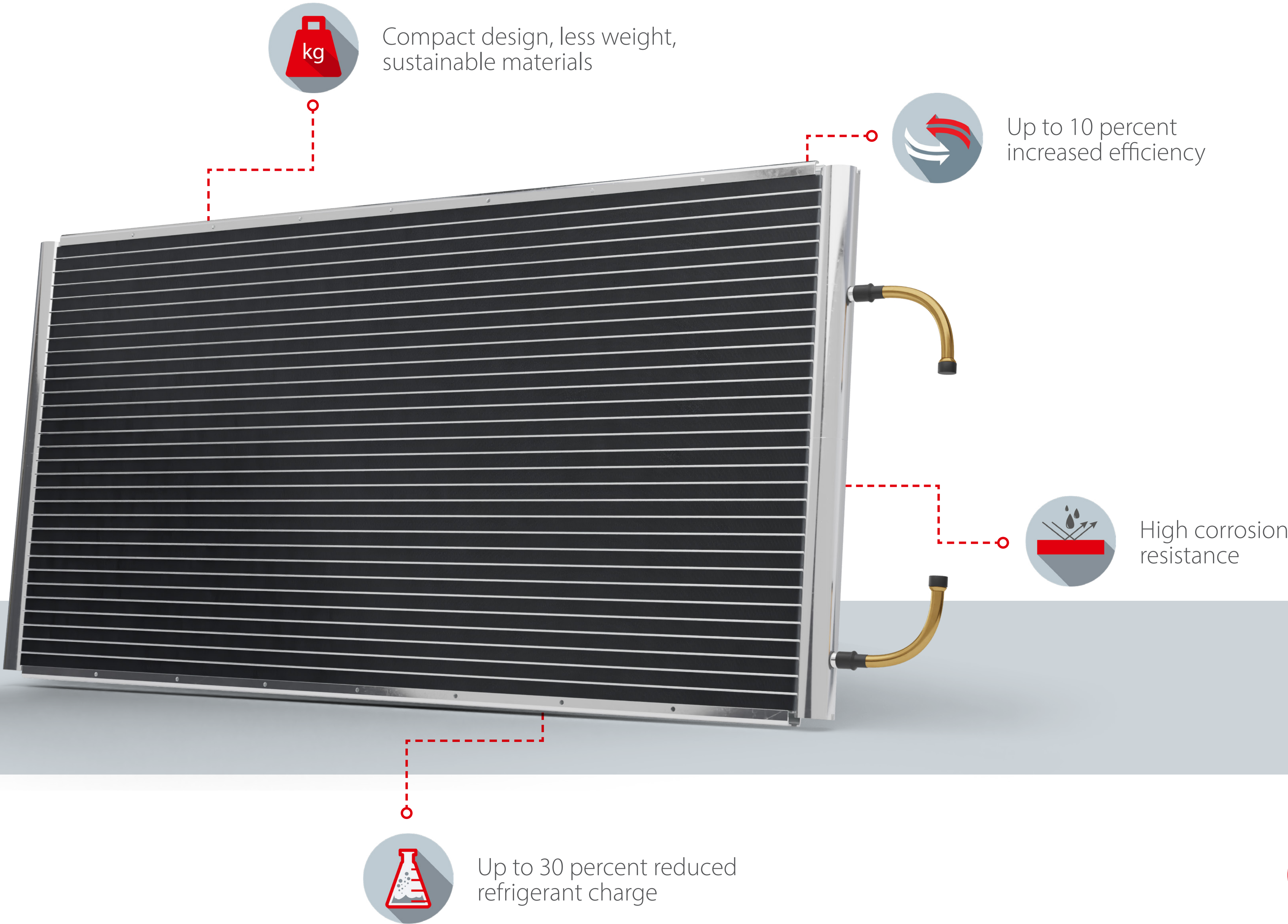


Technology overview

MCHE benefits

The micro channel 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.





Technology overview

MCHE customization

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 one of the most sustainable solutions in the market due to its high strength, sealed design and recyclable materials.

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



Manifold

Al 3003 clad 4343+1%Zn
20mm, 1.5mm wall

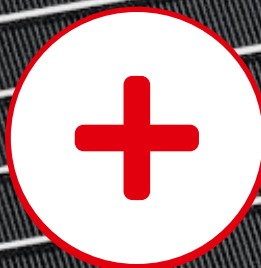
Al 3003 clad 4045+1%Zn
26mm, 1.9mm wall
32mm, 2.5mm wall

Al 3005MOD clad 4045+1%Zn
38mm, 2.5mm wall
43.5mm, 2.8mm wall



Height

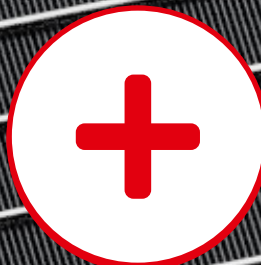
8" – 70" (200 – 1700mm)



Tube

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



Fin

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



Length

8" – 154" (200 – 3900mm)





Technology overview

MCHE specifications

	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)





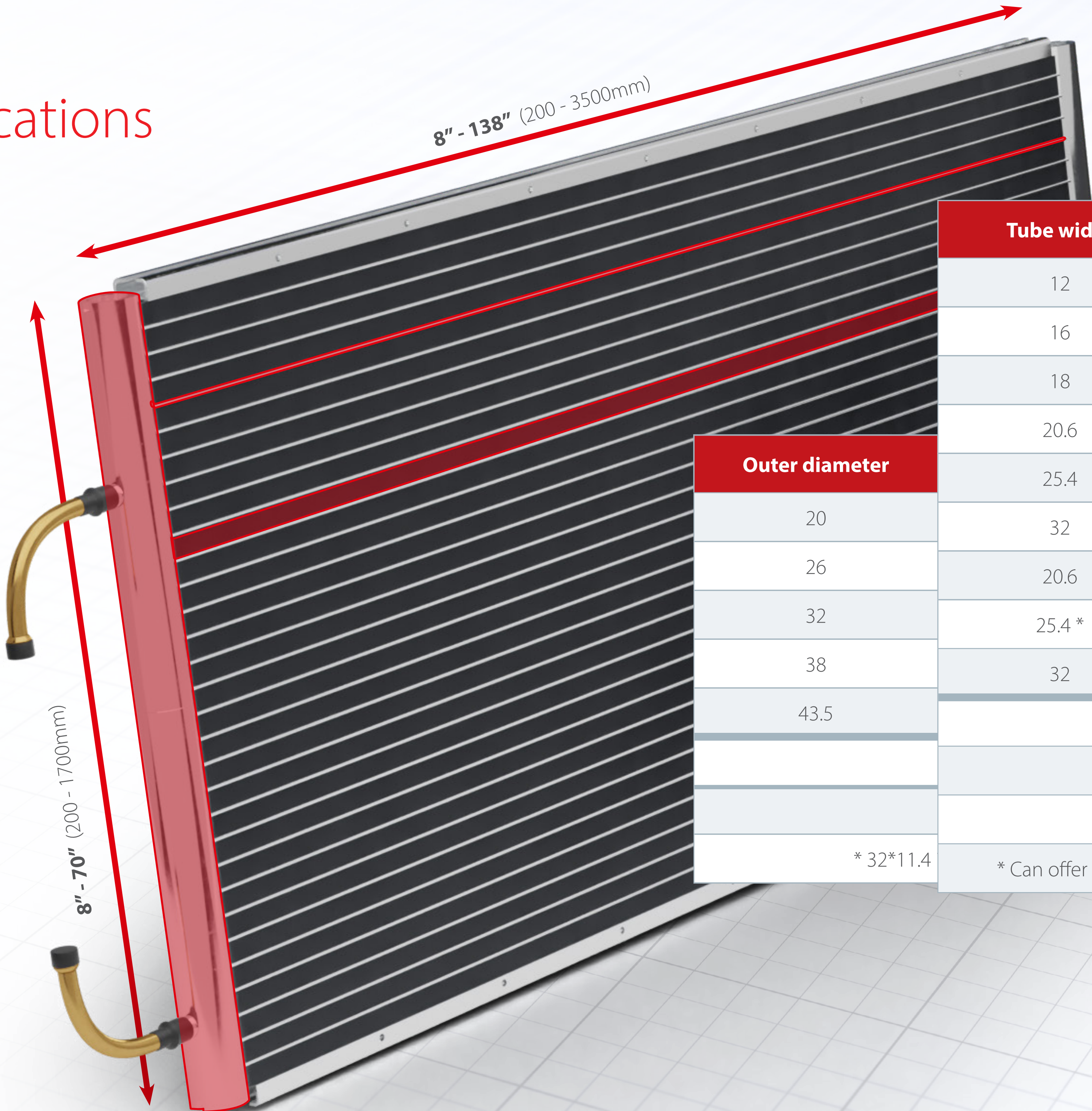
Technology overview


Recommended **condenser** specifications

Tubes >

Manifold >

Fins >



	Tube width	Tube thickness
	12	1.3
	16	
	18	
	20.6	
25.4		
Outer diameter	32	2
20	20.6	
26	25.4 *	
32	32	
38		
43.5	Unit: mm	
	Standard alloy & Long-life alloy	
	Standard design pressure: 45 bar	
* 32*11.4	* Can offer PS 30 bar (for low density refrigerants)	





Technology overview

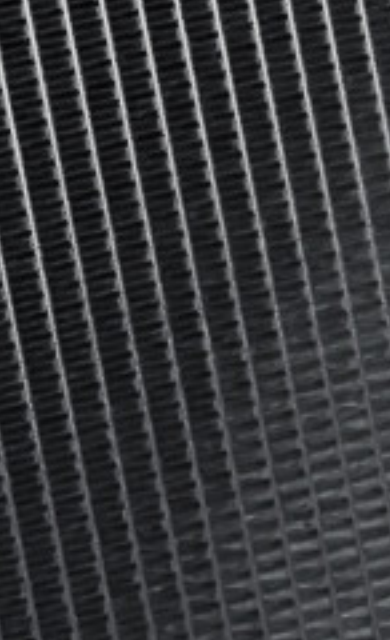
Recommended **evaporator** specifications

Tubes >

Manifold >

Fins >



	Tube width	Tube thickness
	16	1.3
	20.6	
	25.4	
	32	
Outer diameter	20.6	Thickness
20	25.4	2
26	32	
32	Unit: mm	
38	Standard alloy & Long-life alloy	
43.5	Standard design pressure: 45 bar	
Unit: mm		





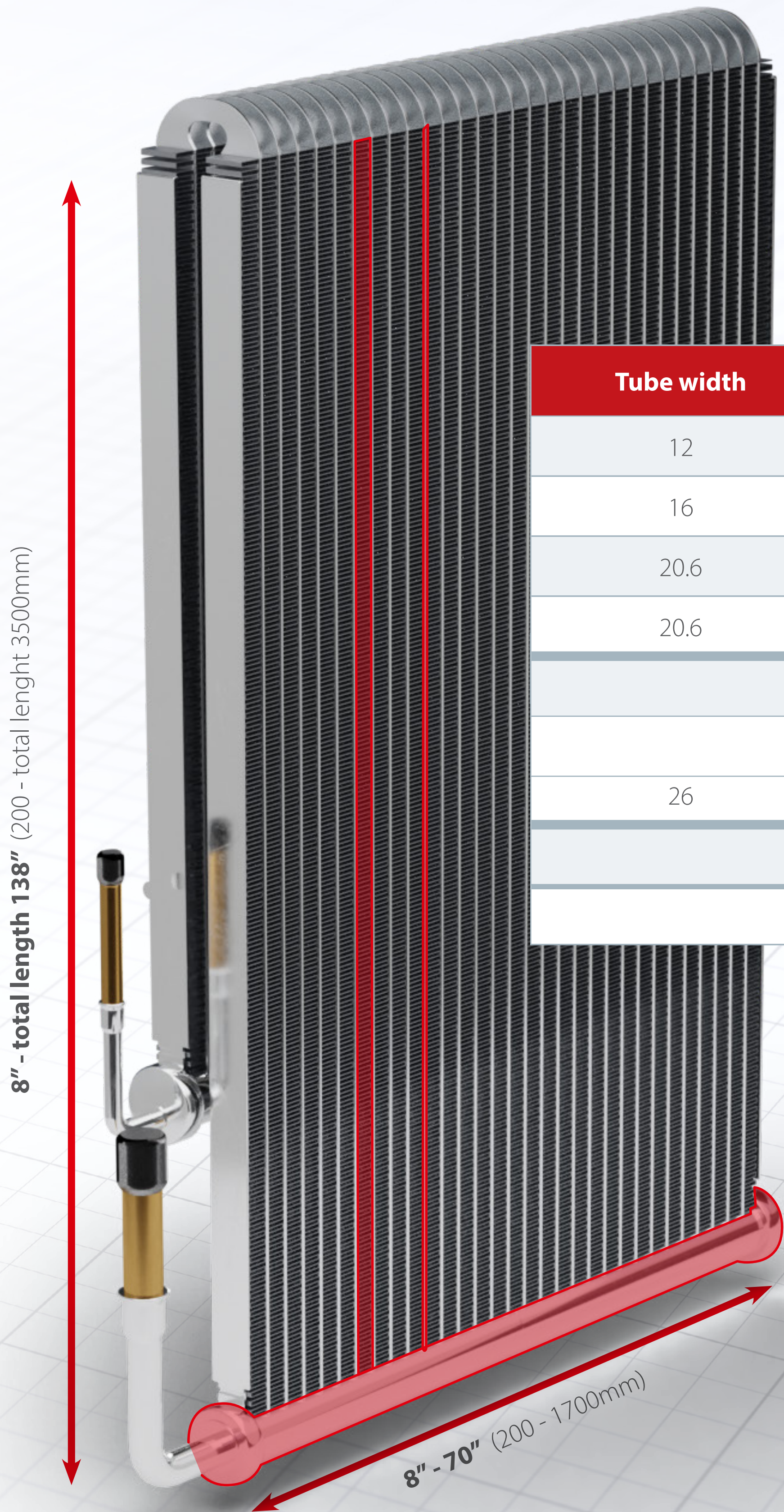
Technology overview

Recommended **reheat coil** specifications

Tubes >

Manifold >

Fins >



Tube width		Tube thickness
12	1.3	
16		
20.6		
20.6	2	
Unit: mm		Wall thickness
Standard alloy & Long-life alloy		1.5
26	16 / 20.6	1.9
Unit: mm		
		Unit: mm





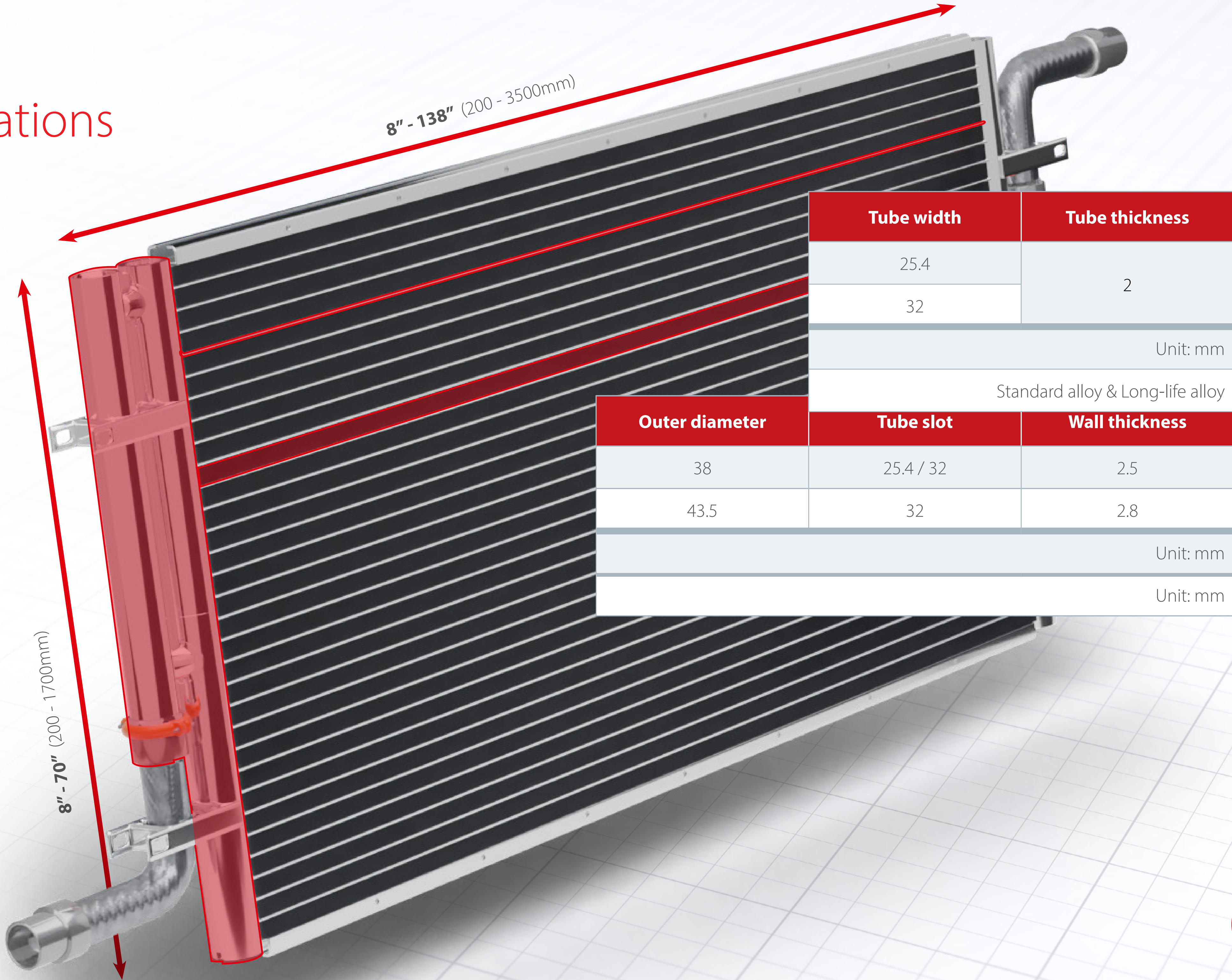
Technology overview

Recommended **glycol coil** specifications

Tubes >

Manifold >

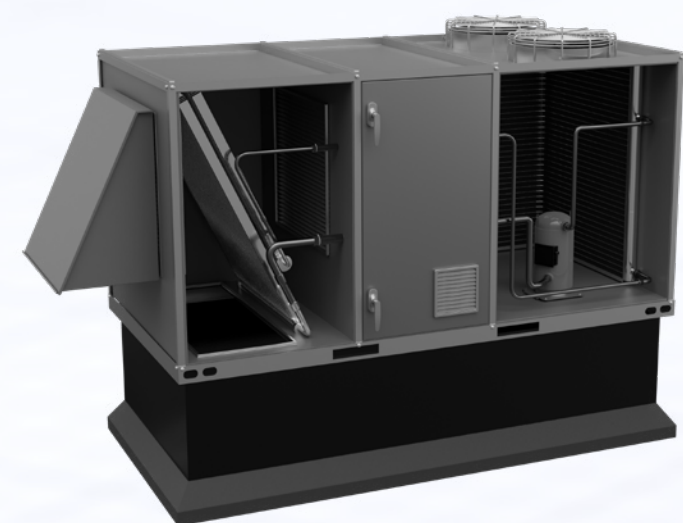
Fins >





Main applications

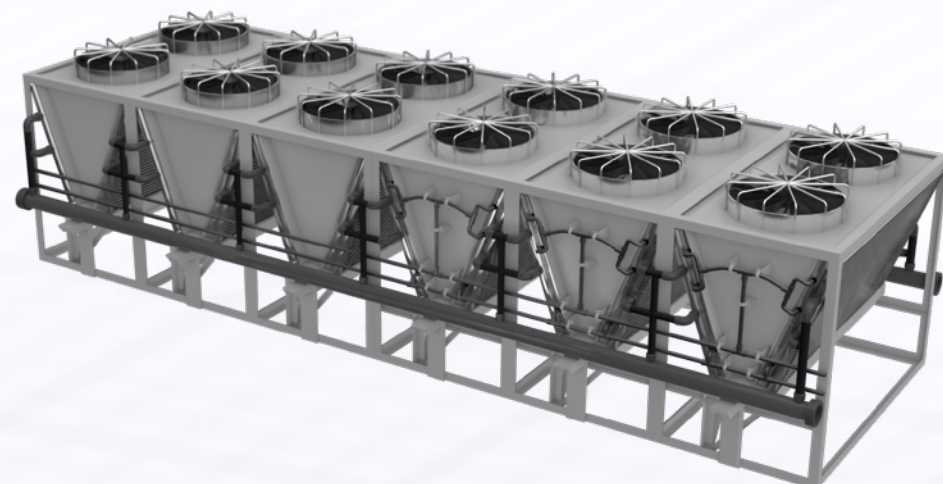
Micro channel heat exchangers



RTU & DOAS



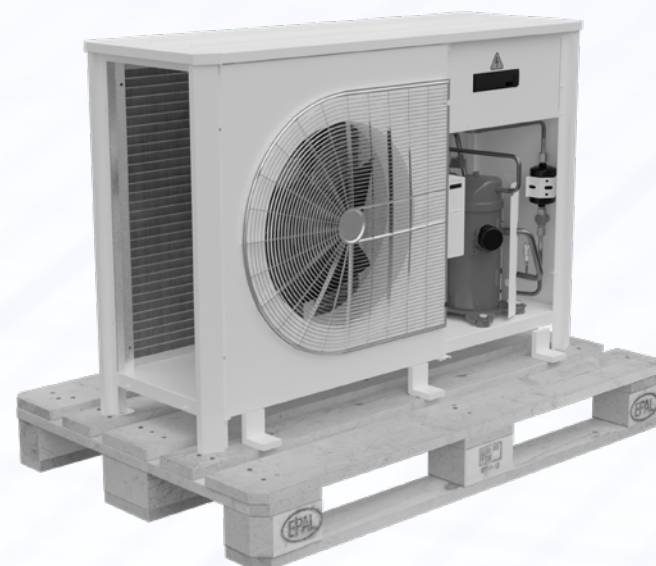
Chillers



Data center solutions



Residential AC



Refrigeration



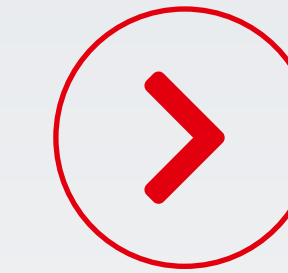


Danfoss Heat Exchangers

RTU & DOAS

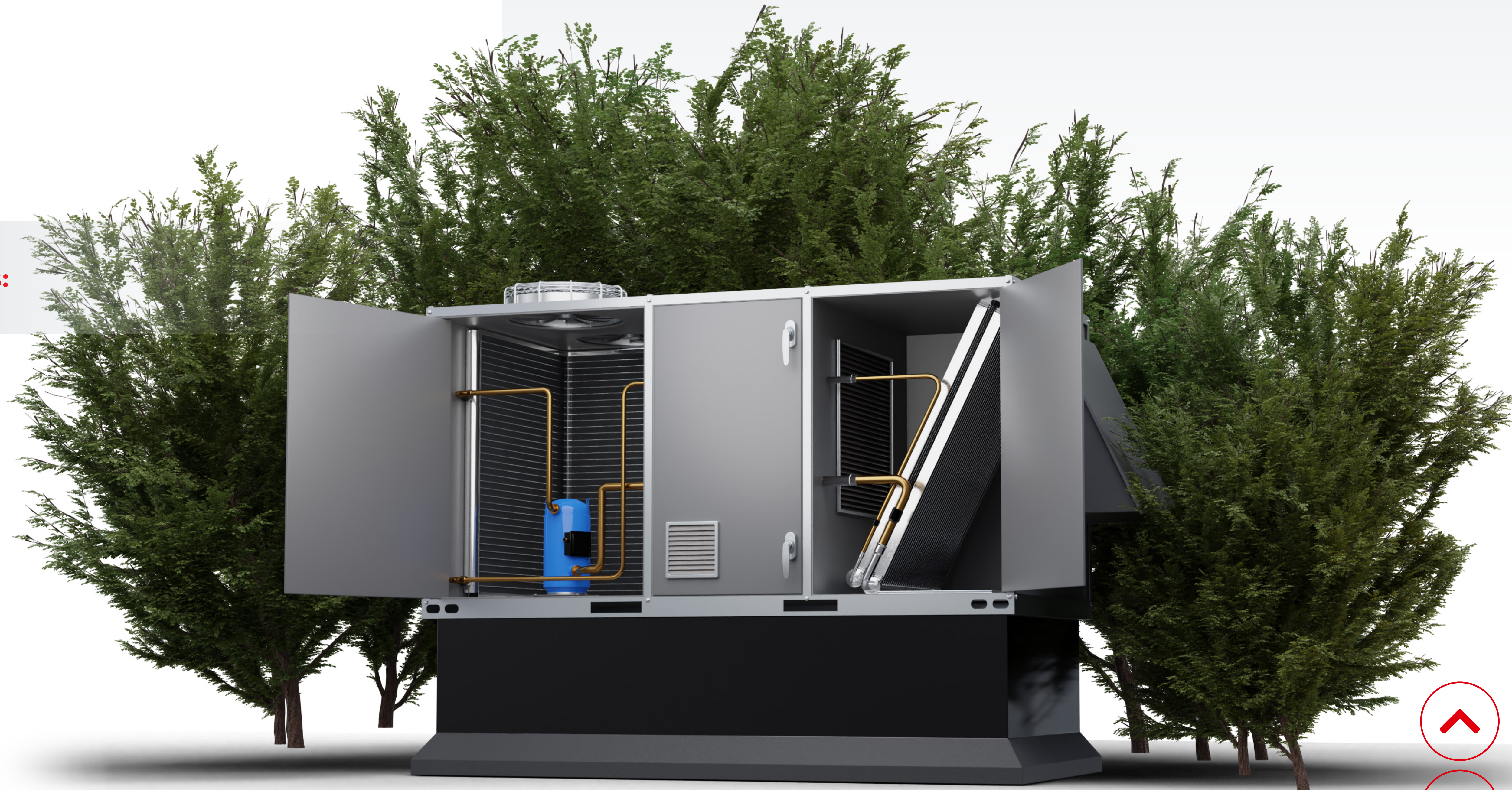
Rooftop units & dedicated outdoor air systems

Watch the video
Next-gen MCHE indoor evaporator



This section is about the **following topics:**

- • • Rooftop AC units
- • • Self-contained AC units
- • • Packaged AC units





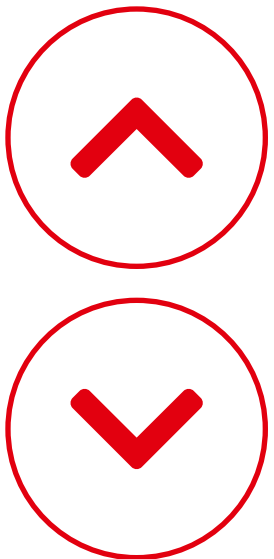
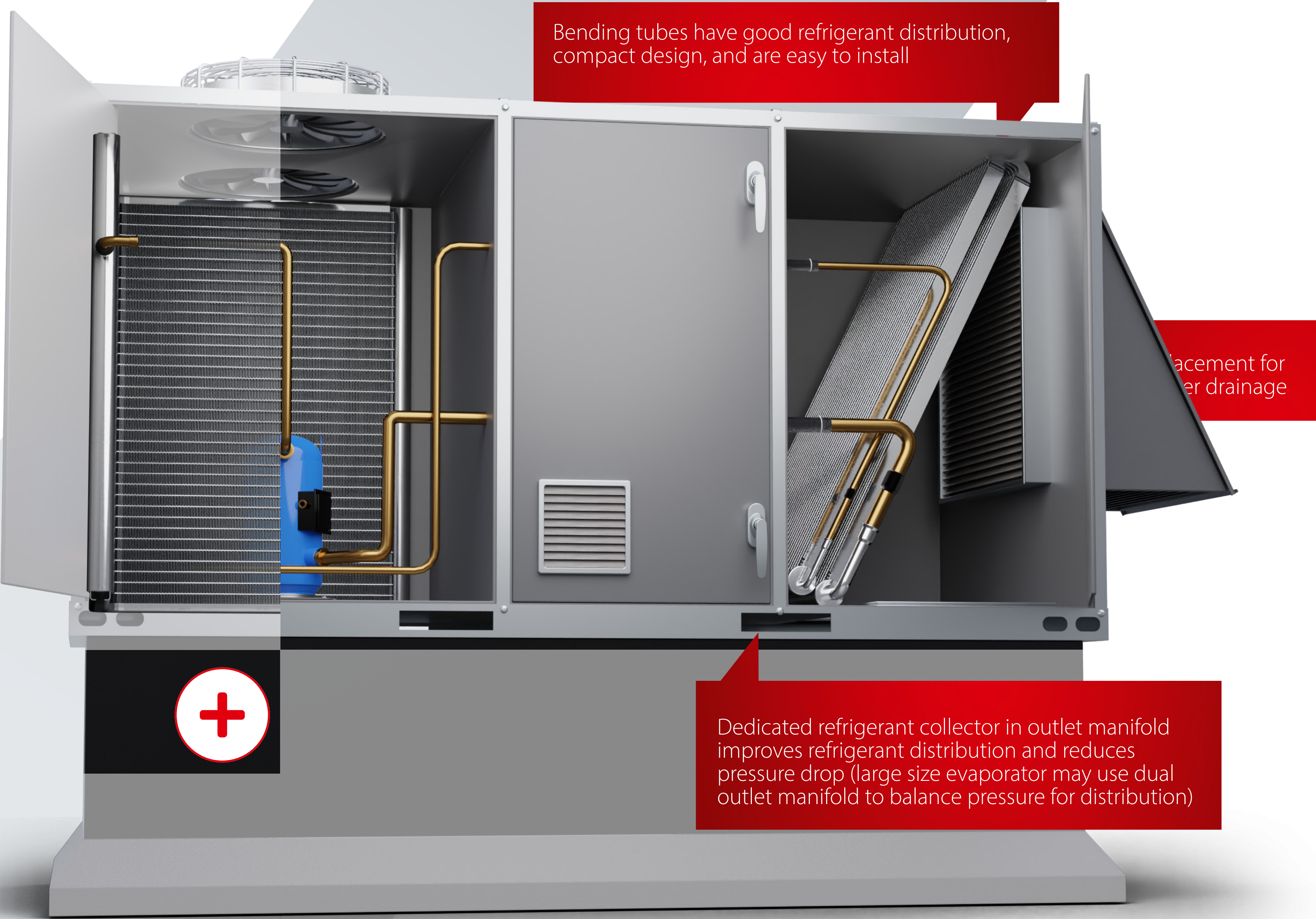
RTU & DOAS

Micro channel heat exchangers

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 indoor 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.





RTU & DOAS

Regular MCHEs

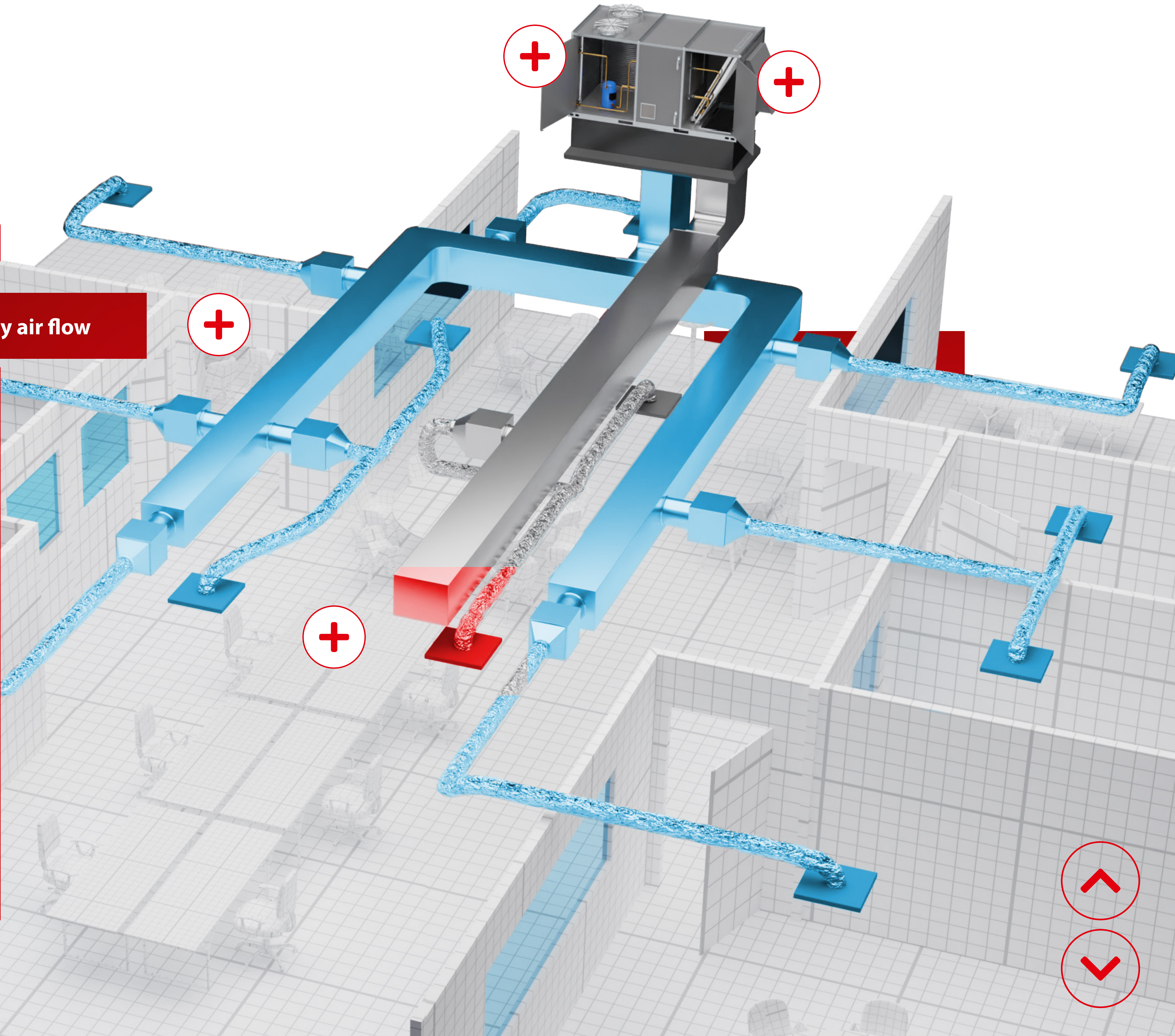


Supply air flow

Evaporators

Slab coils • Formed coils

RTU • DOAS • Residential





RTU & DOAS

Danfoss INNOVATION: Interlaced MCHEs



iMCHE (interlaced MCHE)

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

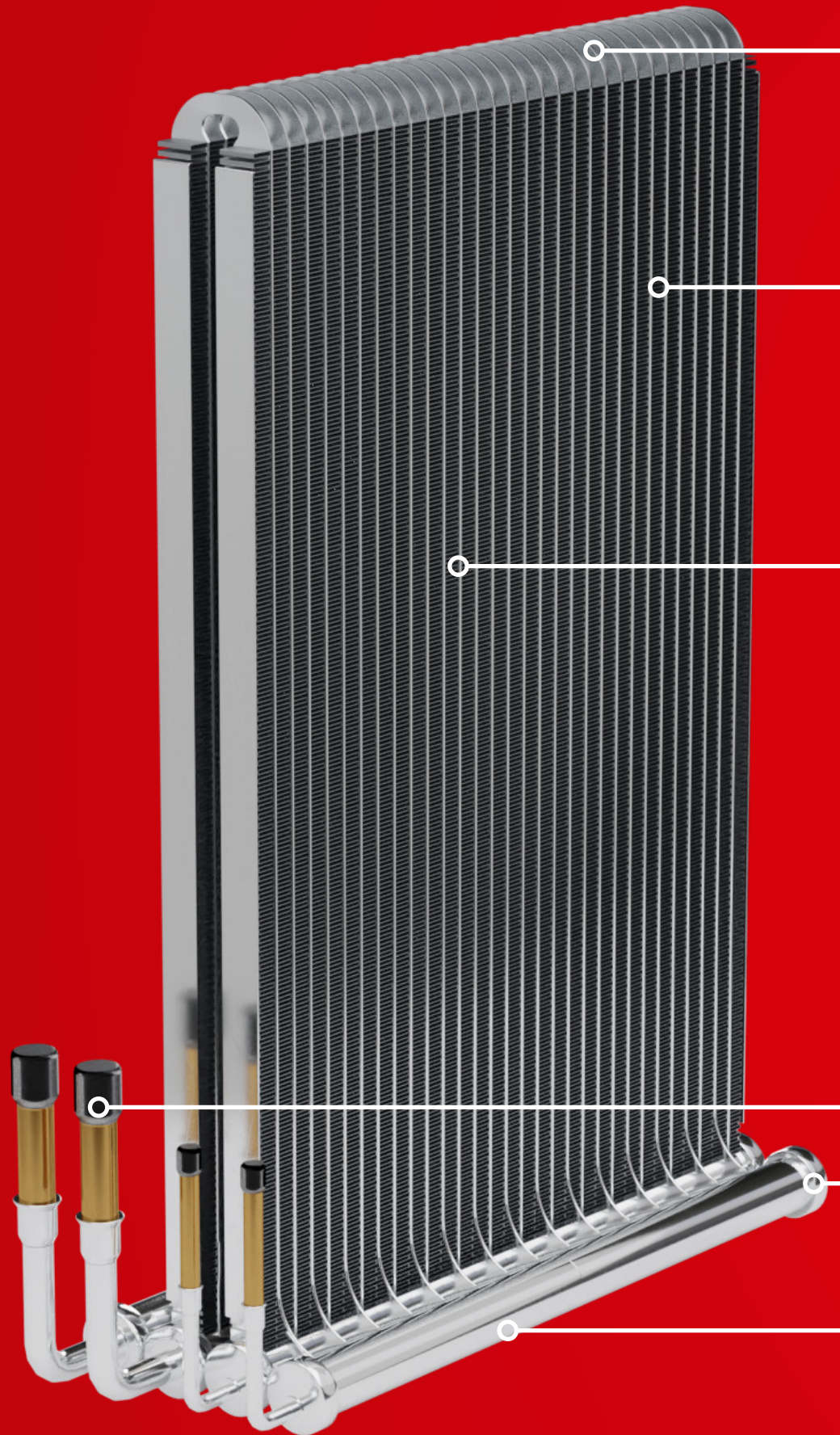
- Set different channels for each circuit according to uneven capacity in dual system

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



Compact design for multi-row coil

- Angle-free bending for compact structure and easy installation
- Free coil bending angle to fit application with tunnel

Special fin design has better water drainage and heat transfer performance

Louver structure fin and flat tube can reduce the noise level

Multi-circuit design

The flexible iMCHE can be designed with multi-inlet/outlet to fit to multi-circuit systems

Dedicated refrigerant collector in outlet manifold improves refrigerant distribution and reduces pressure drop

Patented distribution technology

iMCHE evaporators with Danfoss distributor design will distribute refrigerant flow evenly, and achieve a good heat exchange capacity

Technology

can adapt to fit

can be designed with
to fit to multi-circuit systems

re

can be designed in "L"-shapes and
to reduce stallation footprint

to reduce the heat
refrigerant-side and air-side
with lower hold-up
refrigerant charge

Load performance

maximizing heat
at part-load

n

applied to optimize part
load





RTU & DOAS

Danfoss INNOVATION: Next-gen evaporator

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)

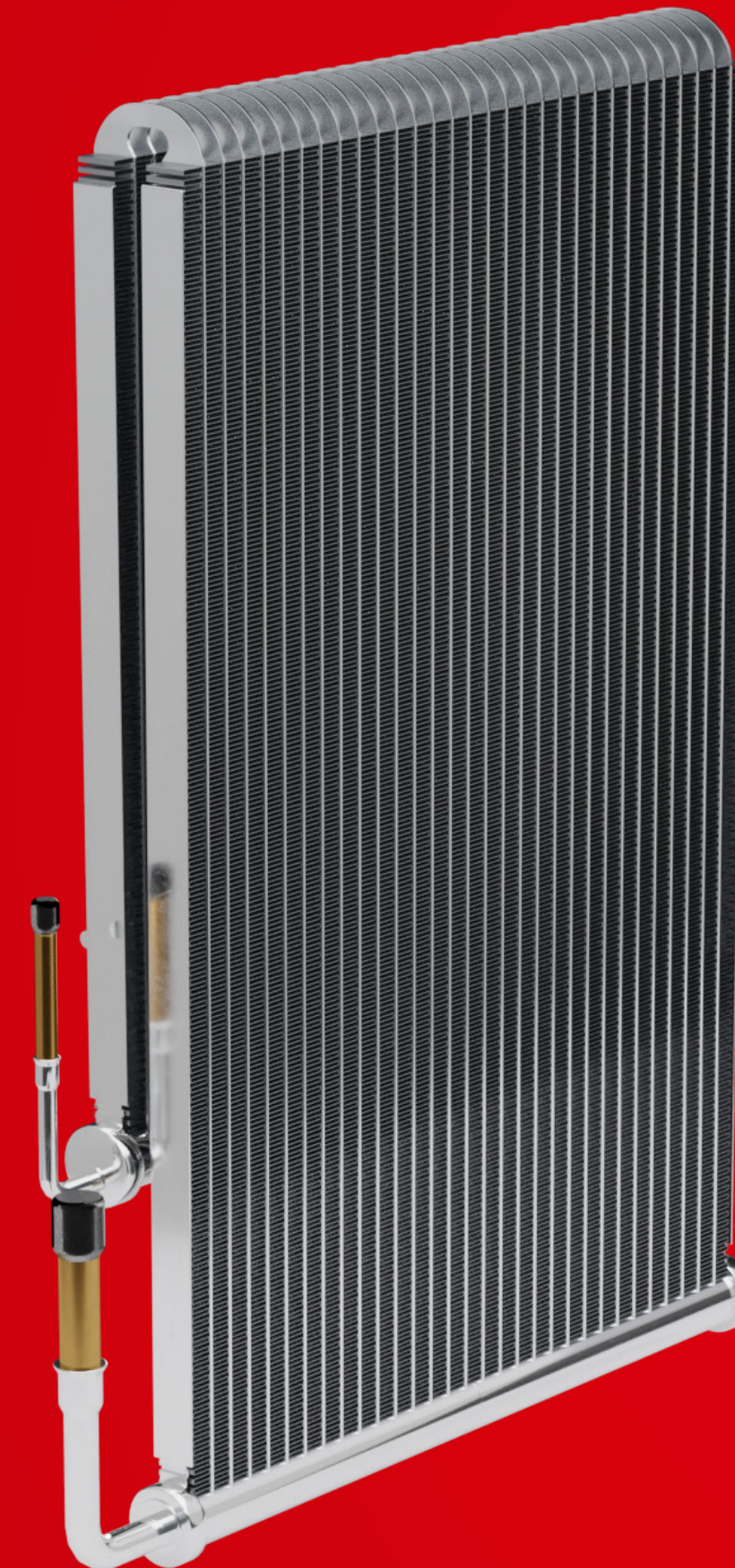
- Angle-free bending for compact design and easy installation

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)



Tube connection technology

Connection design can adapt to fit the installation space

Multi-circuit design

The flexible iMCHE can be designed with multi-inlet/outlet to fit to multi-circuit systems

Flexible coil structure

iMCHE can be configured in "L"-shapes and "C"-shapes to fit the installation footprint

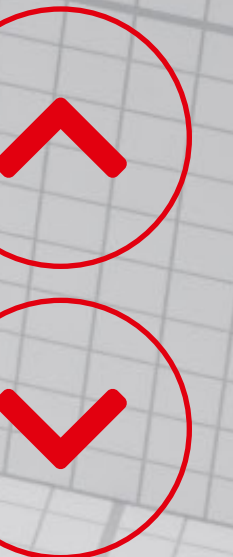
Brazed tube & fin joint to reduce the heat resistance. Greater refrigerant-side and air-side heat transfer efficiency with lower hold-up volumes and refrigerant charge

Outstanding part-load performance

iMCHE is designed for maximizing heat transfer area utilization at part-load

Asymmetrical design

Different parameters applied to optimize part loading for each circuit





Danfoss Heat Exchangers

Chillers & free cooling

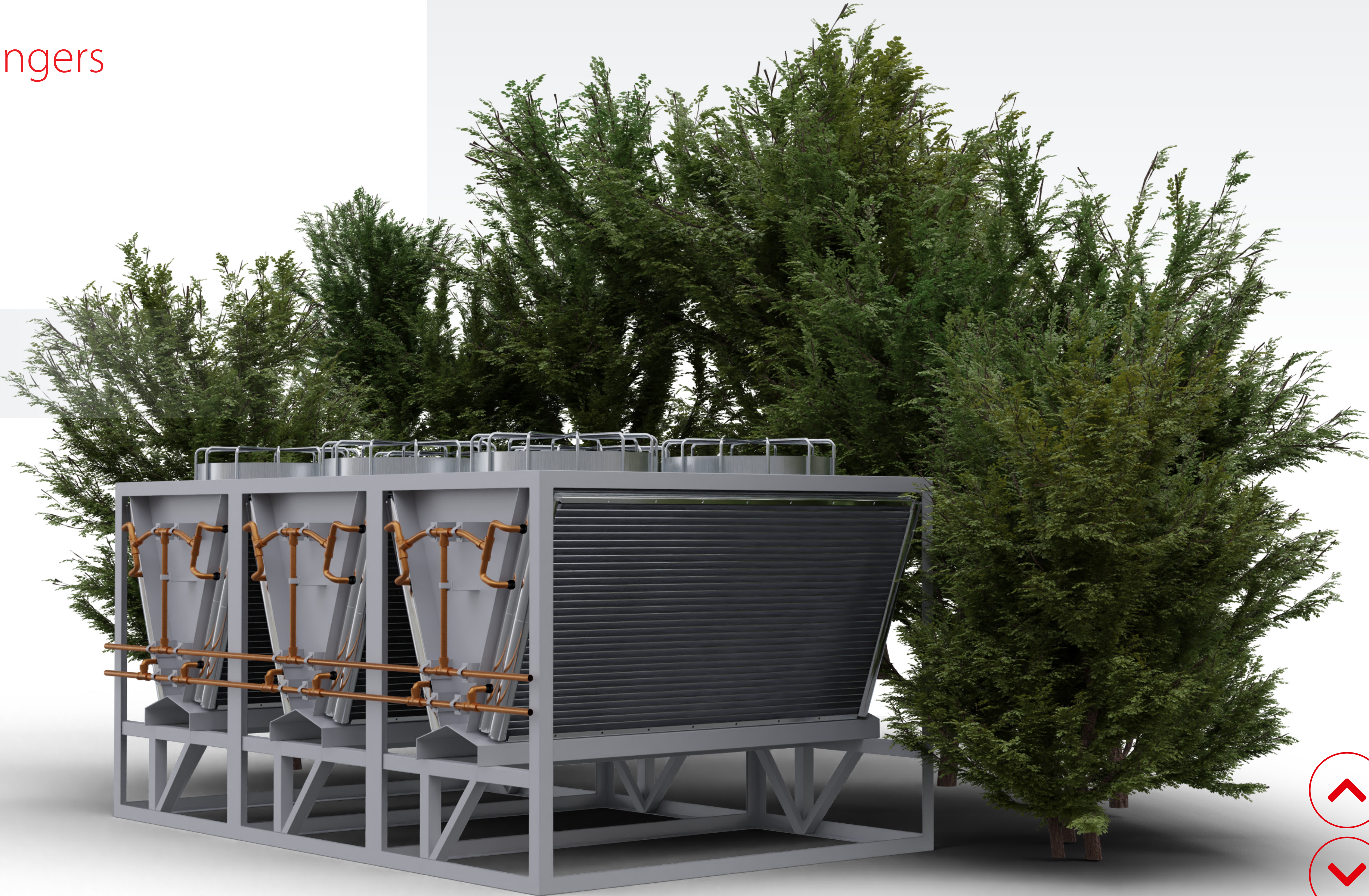
Micro channel heat exchangers

Watch the video
MCHEs for data center free cooling



This section is about the **following topics:**

- • • Air cooled chillers



Chillers & free cooling

Micro channel heat exchangers

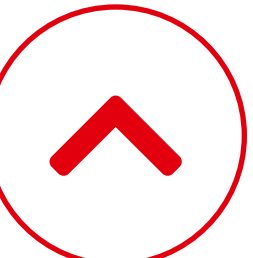
An air to water chiller is a type of HVAC system that uses air as the primary source of cooling and transfers that cooling to water, which is then used to cool a building or process. Air to water chillers are commonly used in commercial, industrial, and institutional settings, such as hospitals, universities,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



	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)





Chillers & free cooling

Danfoss INNOVATION: V-coil

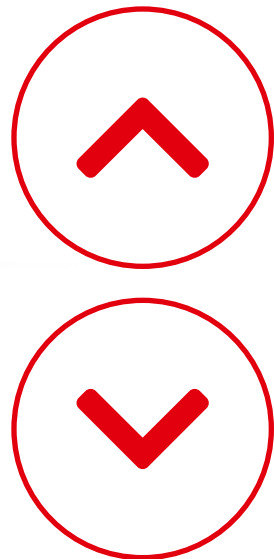
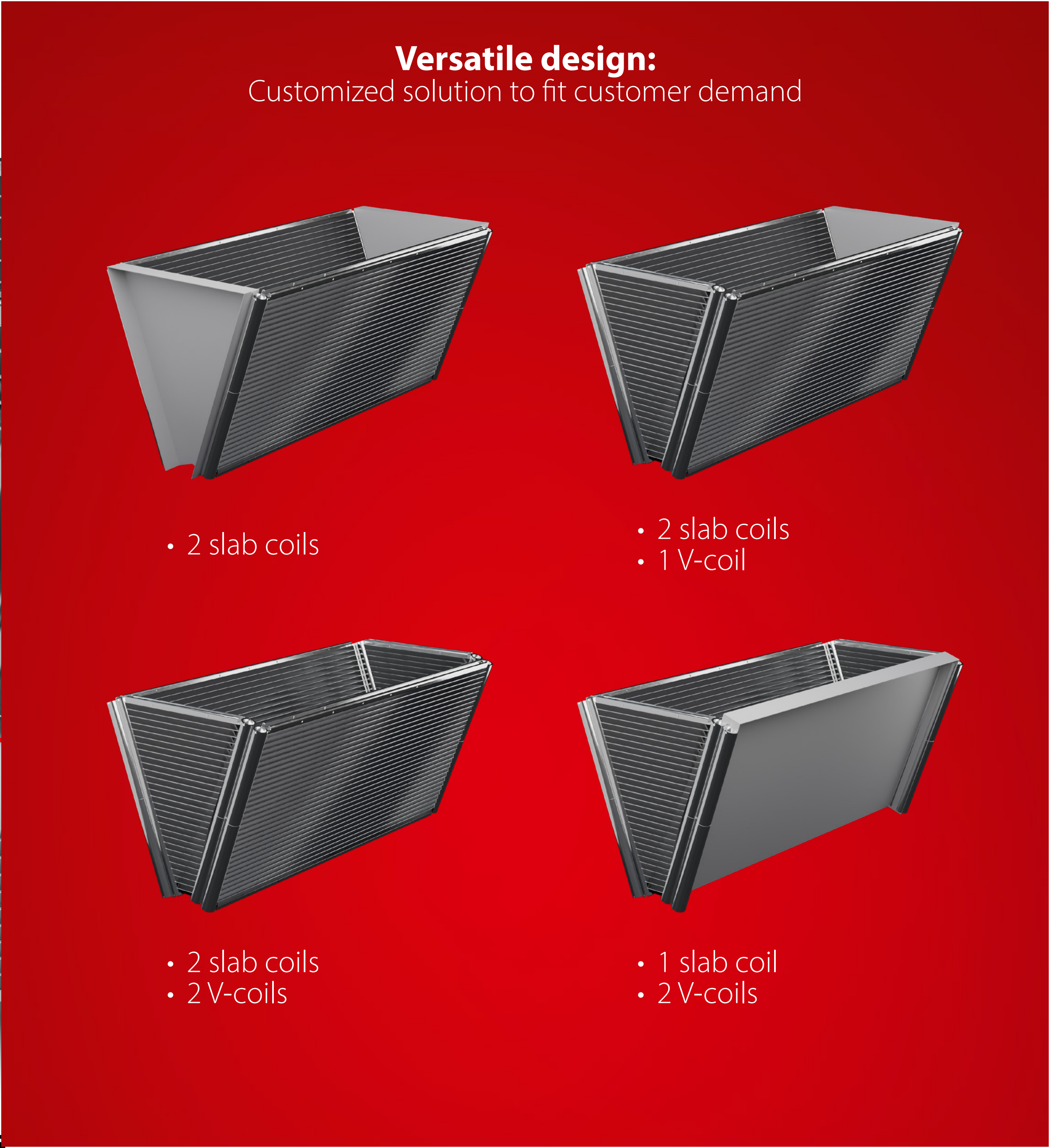
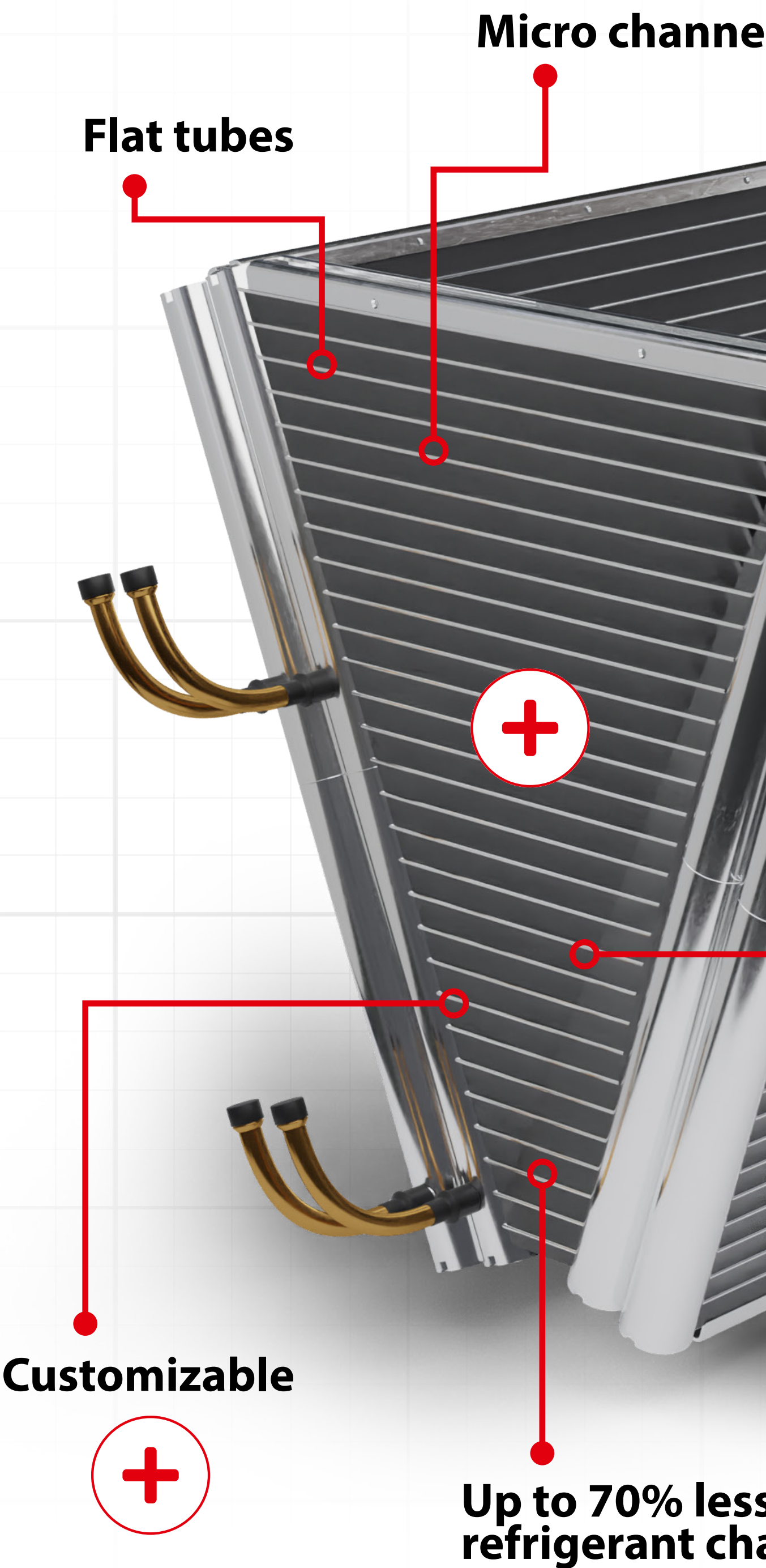
V-coil for chiller / RTU

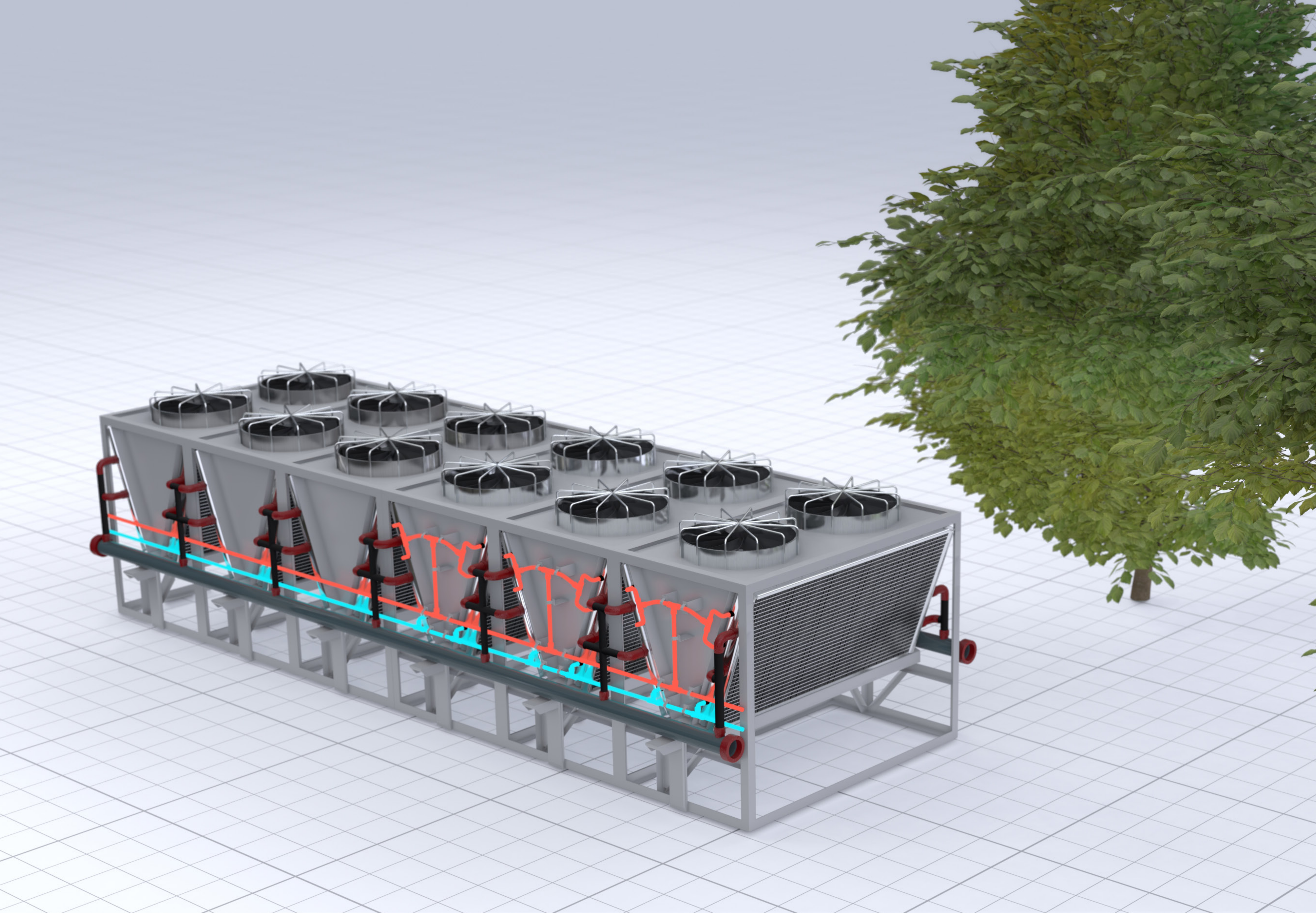
Features:

- 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





Summer configuration >

Fall/spring configuration >

Winter configuration >

Summer configuration

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

Energy savings



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.



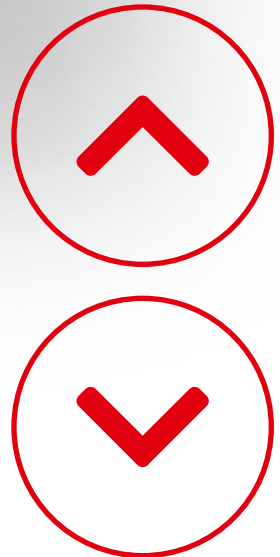


Residential AC

Micro channel heat exchangers

This section is about the **following topics:**

- • • Central air conditioners
- • • Ductless mini-split AC (only for condenser)





Residential AC

Micro channel heat exchangers

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.

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.

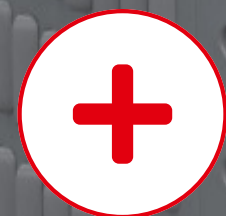
Environmentally friendly: MCHEs typically use less refrigerant than traditional heat exchangers, which can reduce the overall environmental impact of the AC system.

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.

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.

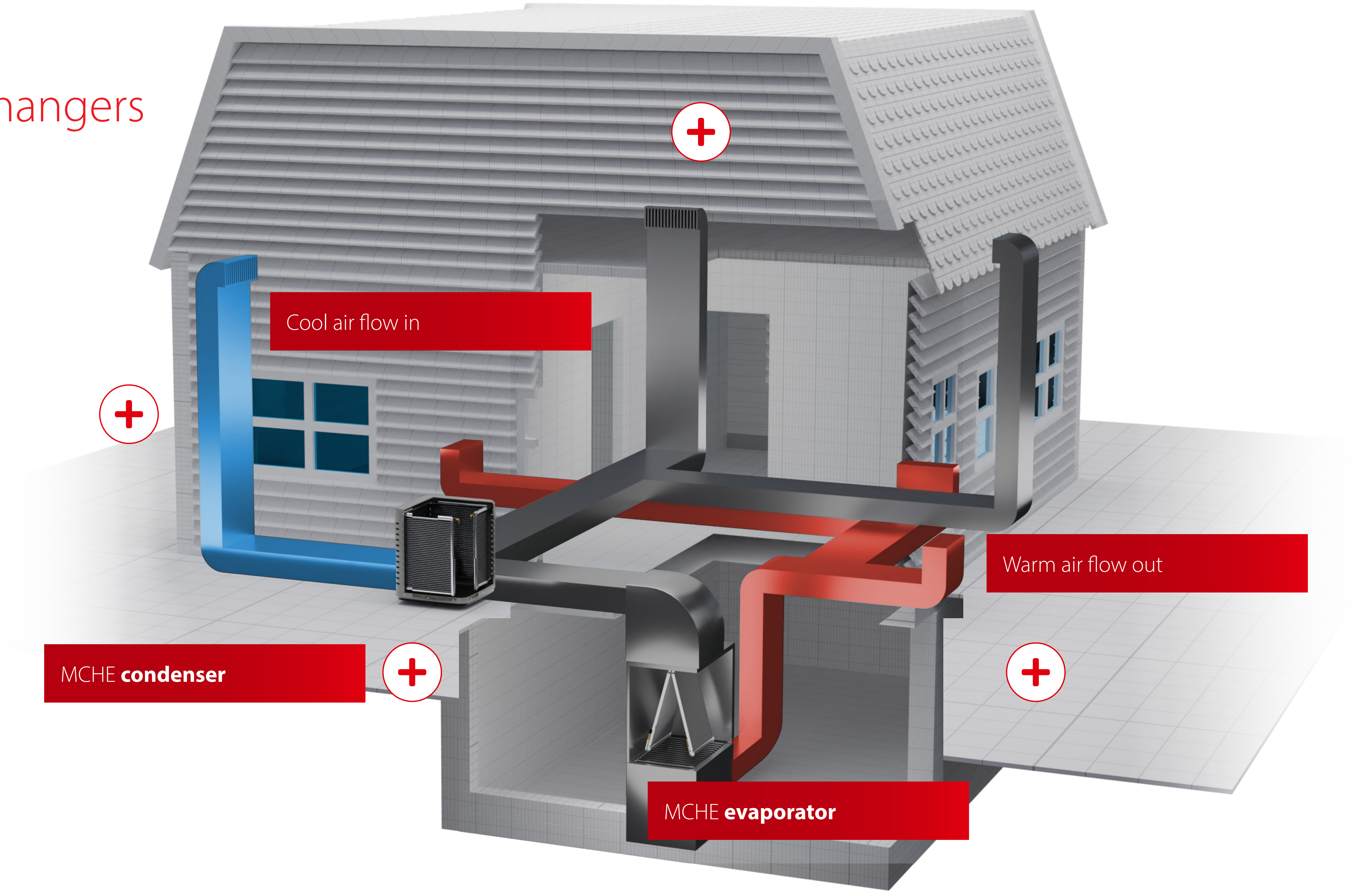
Reduced refrigerant charge: MCHEs can operate with a lower refrigerant charge compared to traditional heat exchangers. This reduces the risk of refrigerant leaks, which can result in lower maintenance costs and improved safety.





Residential AC

Micro channel heat exchangers





Danfoss Heat Exchangers

Data center solutions

Micro channel heat exchangers

Watch the video
MCHEs for data center free cooling

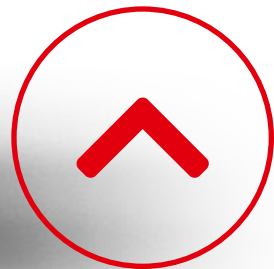
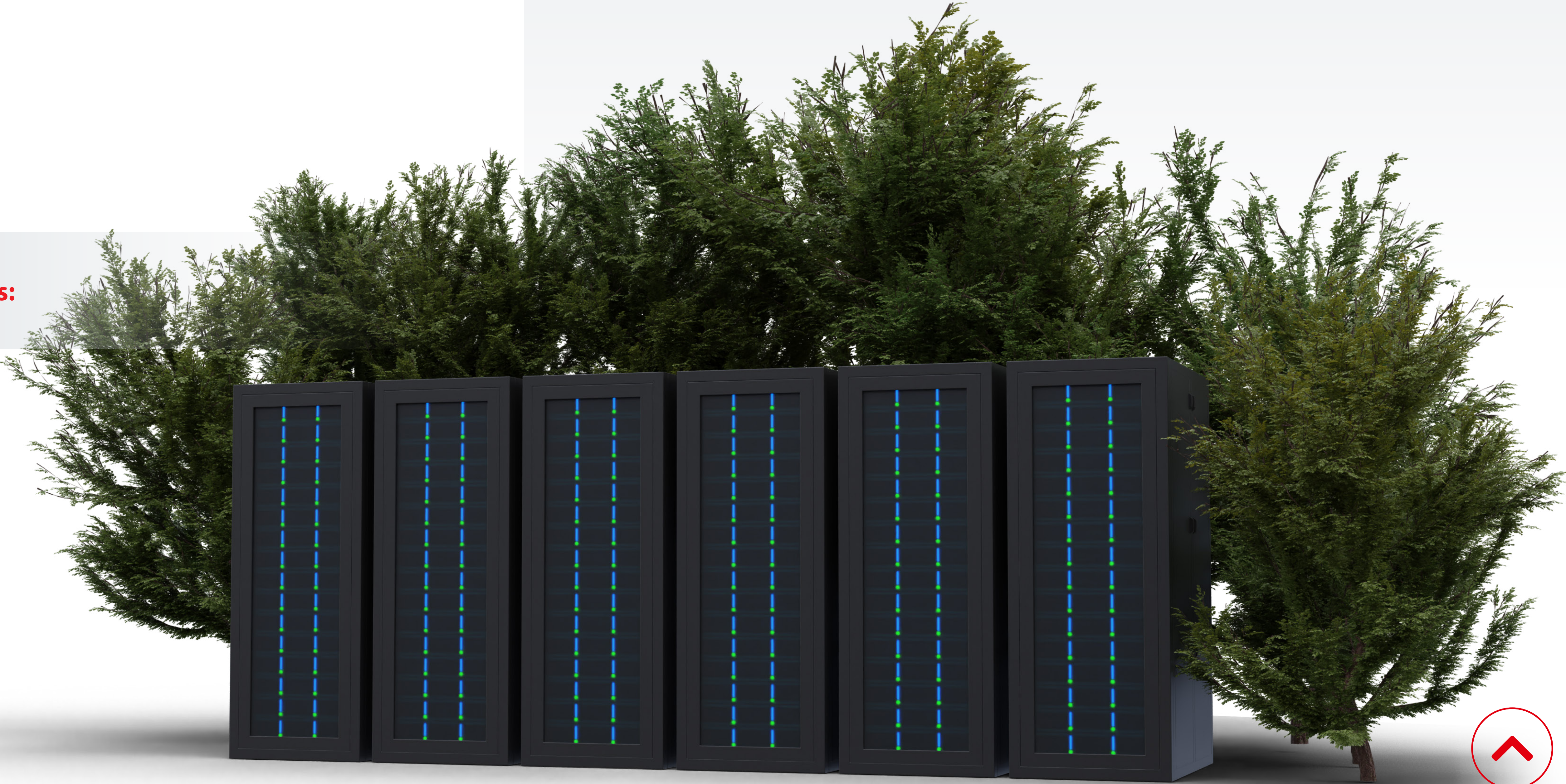


Watch the video
Danfoss data center solutions



This section is about the **following topics:**

- • • Room cooling
- • • Row cooling
- • • Rack cooling
- • • Air-to-water chillers
- • • Dry coolers





Danfoss Heat Exchangers

Data center solutions

Micro channel 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.

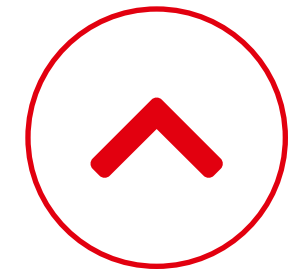
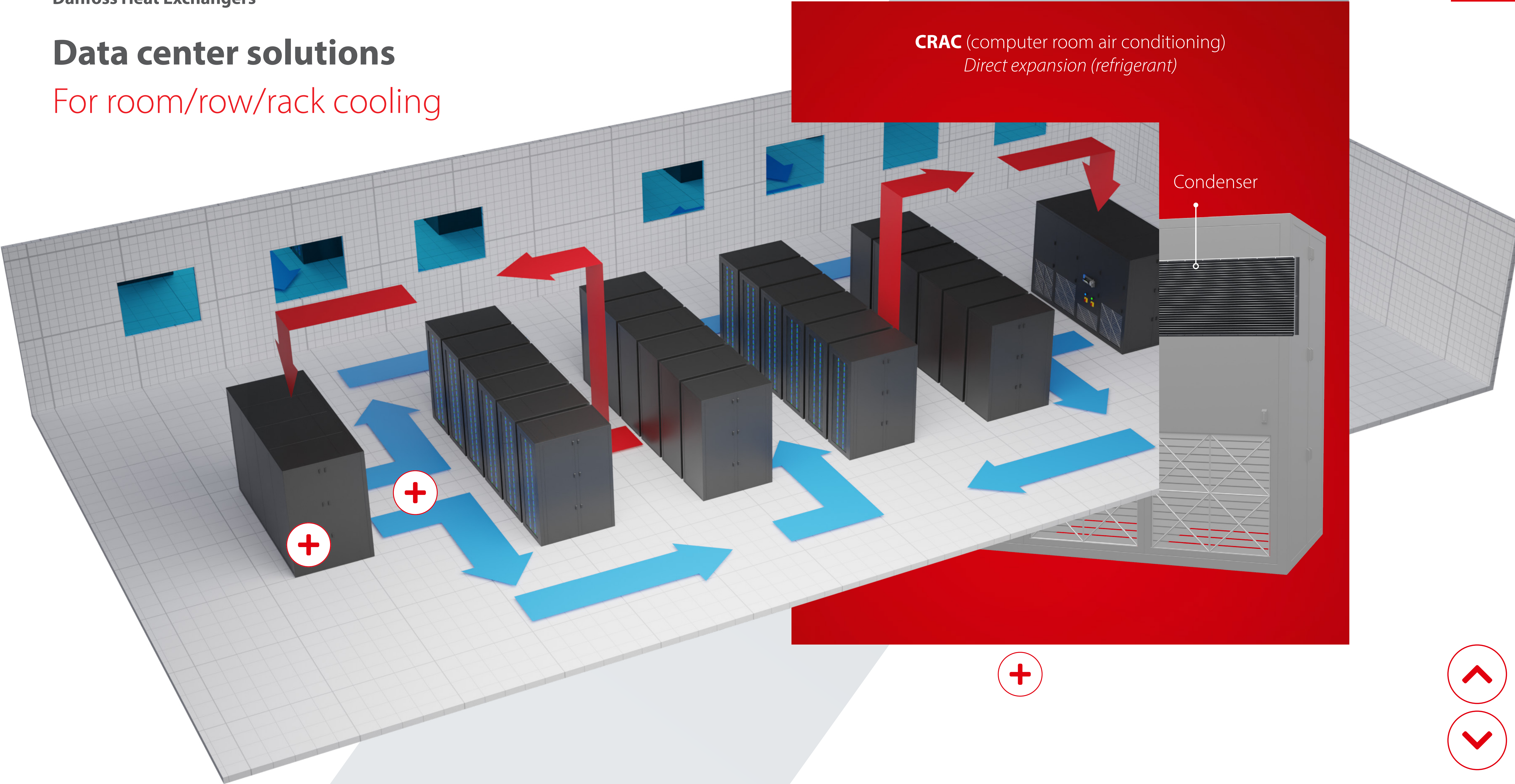
Not only is energy efficiency seriously diminished—with lots of resources spent on keeping the temperature down—but the risk of servers overheating rises rapidly.





Data center solutions

For room/row/rack cooling



Data center solutions

For room/row/rack cooling



Data center solutions

For room/row/rack cooling



Data center solutions

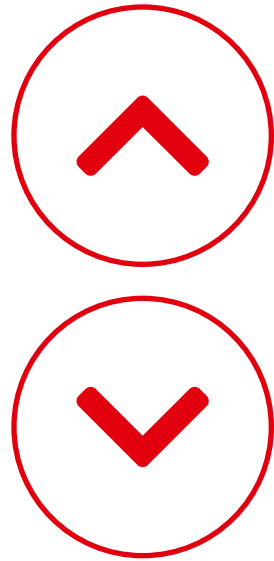
For room/row/rack cooling



Thermosiphon, free cooling
(water/glycol, refrigerant)

Condenser

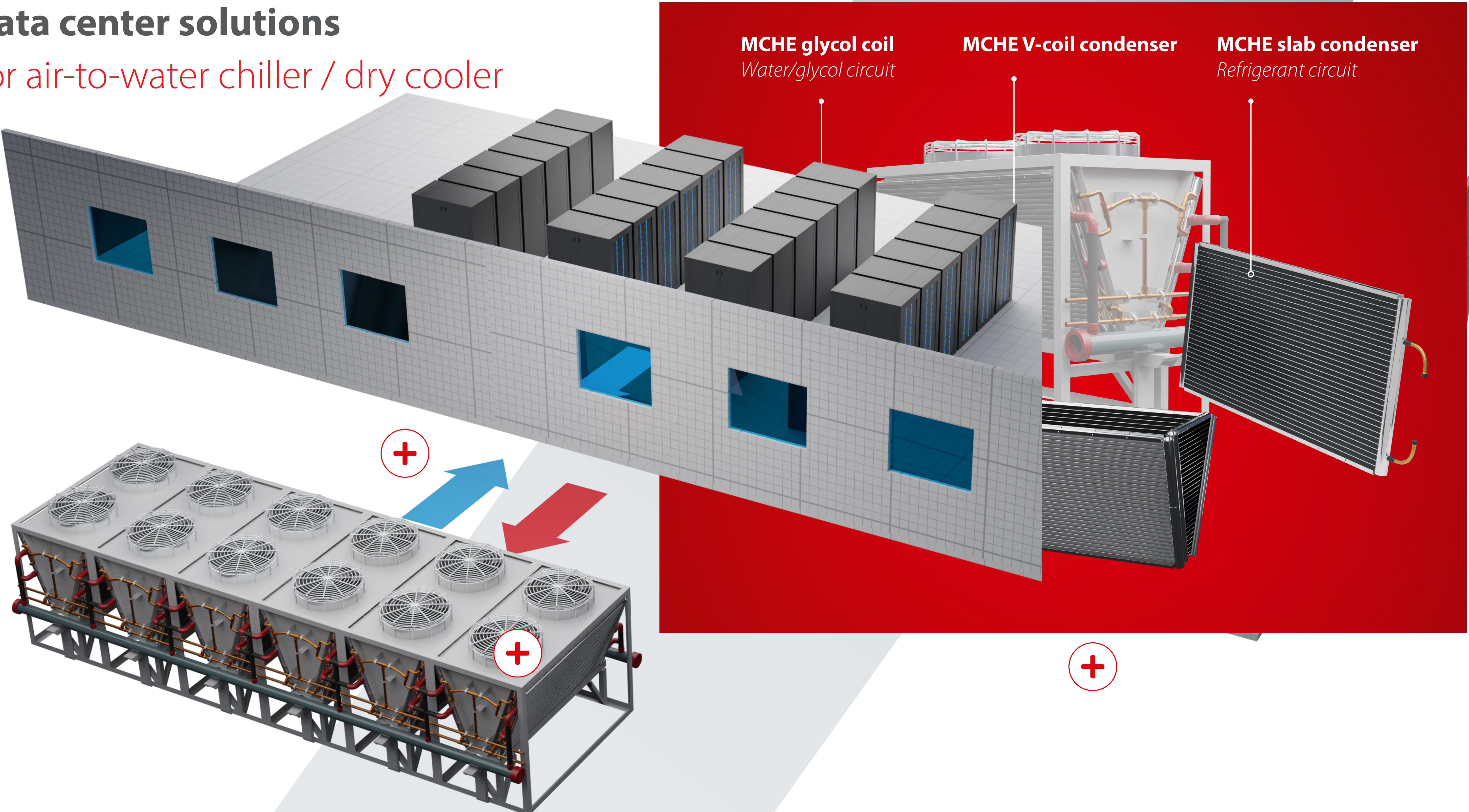
Evaporator





Data center solutions

For air-to-water chiller / dry cooler





Danfoss Heat Exchangers

Refrigeration

Micro channel heat exchangers

This section is about the **following topics:**

- • • Remote condensing units





Refrigeration

Micro channel 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. It cool down and condense the refrigerant vapor into liquid 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 large industrial units used in food and manufacturing processes.

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.

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.

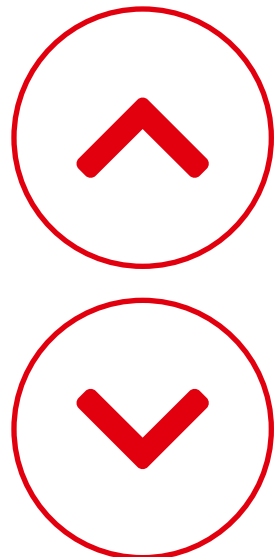
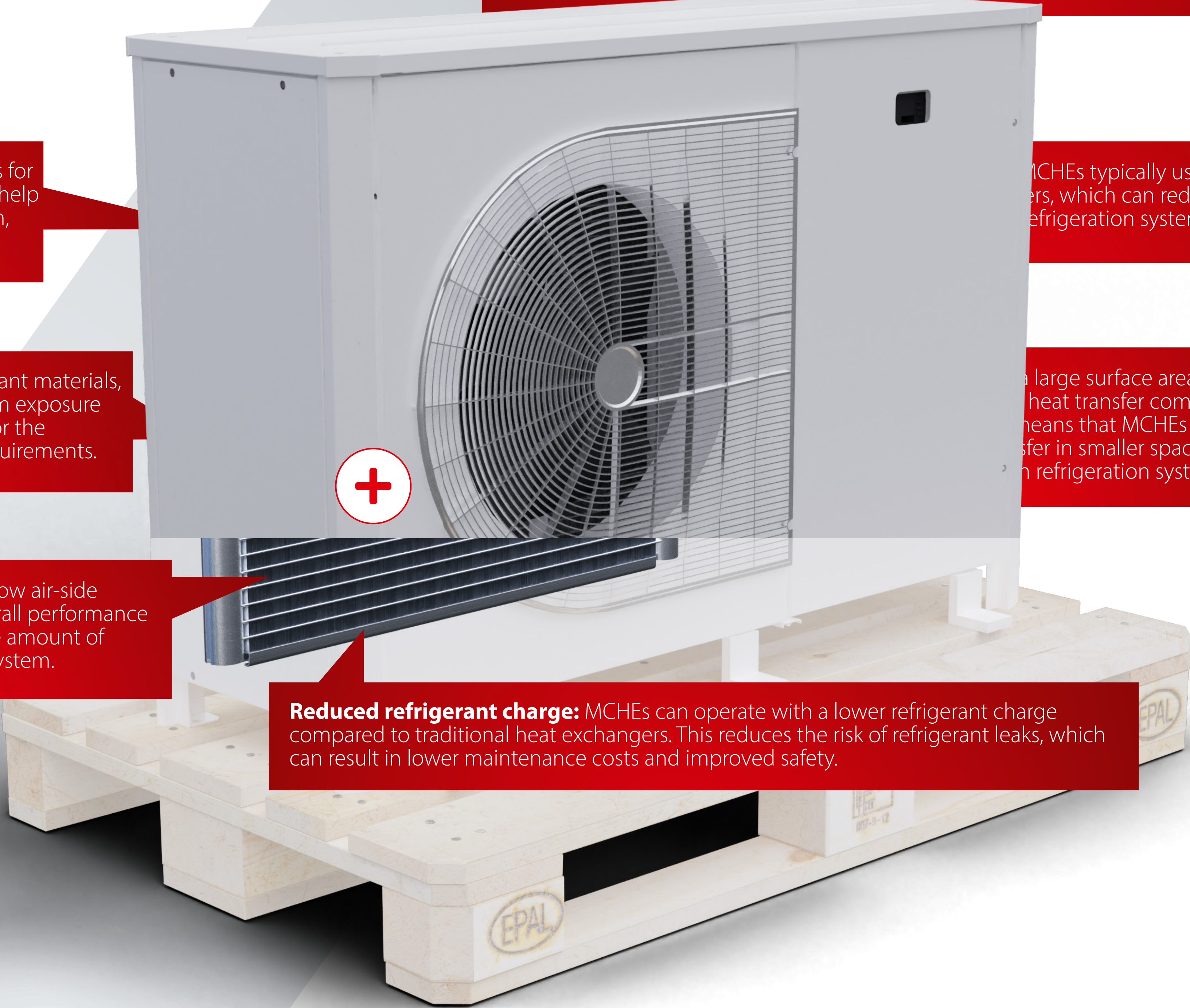
Improved performance: MCHEs have a low air-side pressure drop, which can improve the overall performance of the refrigeration system by reducing the amount of energy required to move air through the system.

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.

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.

MCHEs typically use less refrigerant than traditional heat exchangers, which can reduce the overall size and weight of the refrigeration system.

MCHEs have a large surface area-to-volume ratio, which means that MCHEs can provide more heat transfer in smaller spaces, making them ideal for use in refrigeration systems.





Refrigeration

Application overview



Vehicle refrigeration equipment

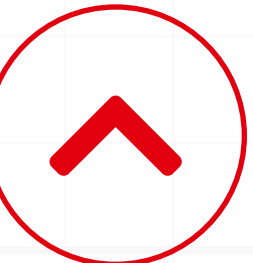
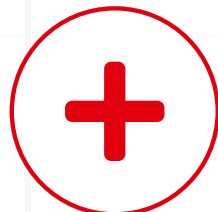
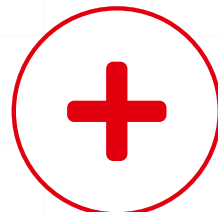
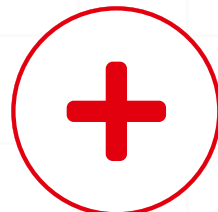
Ice machines

Ice cream machines

Supermarket cabinets

Refrigeration storerooms

Kitchen freezers



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