

# Tangible heat exchanger savings Just eight steps away!

MicroChannel Heat Exchangers

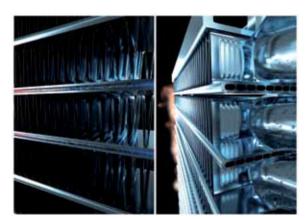


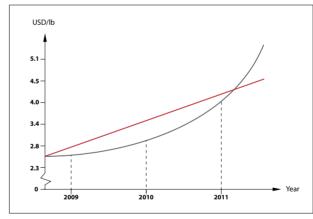


## NEW TIMES, NEW CHALLENGES

How are you responding to today's economic and environmental challenges as a manufacturer? The needs of the cooling systems you produce are evolving rapidly, requiring you to shrink costs, energy consumption and carbon footprint. The regulations you face demand it – necessitating more and more ambitious performance goals - and your customers will not settle for less.

It is a matter of growing public and competitive urgency to have more efficient and sustainable cooling in our homes, offices, and industrial and commercial applications.





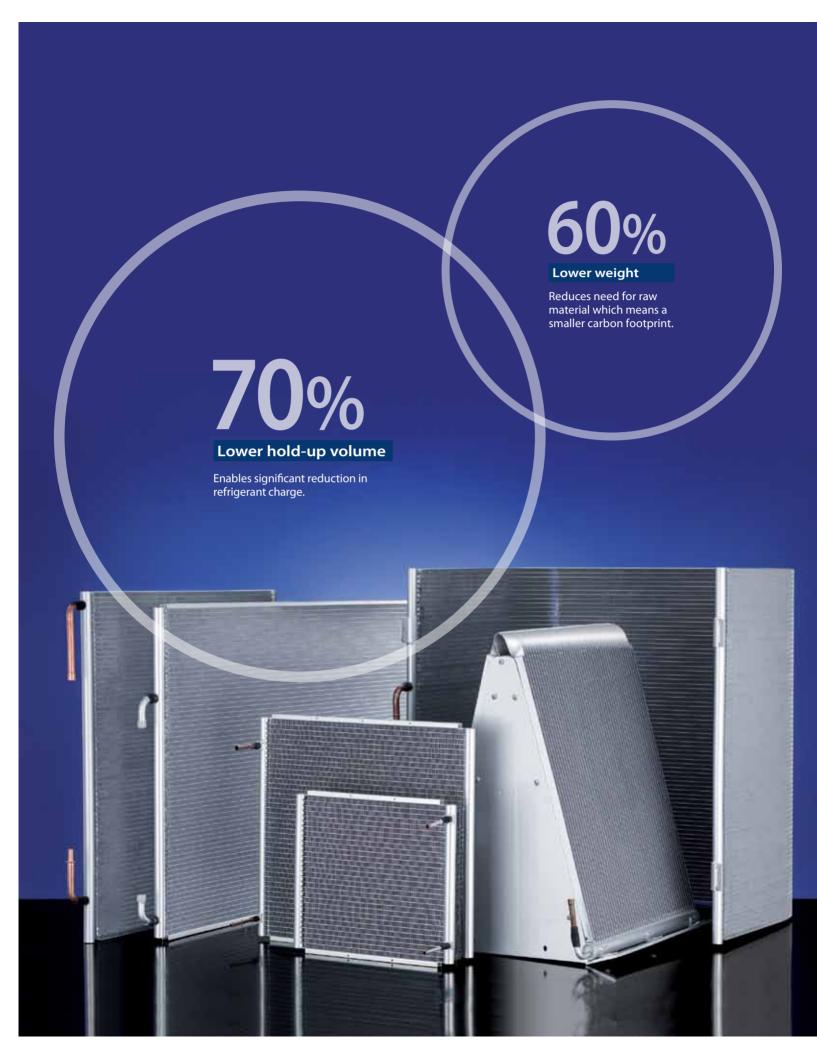
This graph shows the rising purchase price (excluding taxes) of the refrigerant R410A over the last three years.

#### **CHOOSE A RELIABLE GLOBAL SUPPLIER**

At the heart of your refrigeration and air conditioning systems is the heat exchanger, so it's important to choose the right product from the right supplier. Danfoss is a stable, global company with a strong customer focus and a long term commitment to the heat exchanger business. Our MicroChannel Heat Exchangers (MCHEs) address the critical issues of more efficient heat transfer, materials reduction and simplification, refrigerant reduction, longer life, smaller space requirements and lower weight.

#### WE MAKE IT EASY FOR YOU!

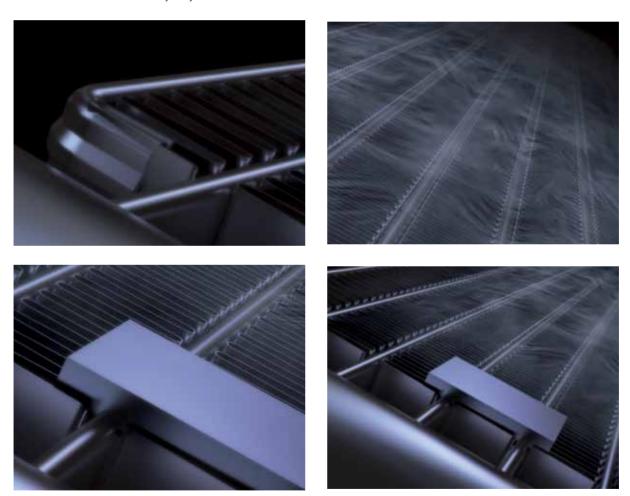
All Danfoss' products are backed by unrivalled HVAC expertise, and we maintain a deep-rooted, responsive local presence all over the world - ensuring that you get the heat exchangers you need with unparalleled ease and convenience. Whether you buy off-the-shelf products or follow our proven product development process, we have "the kit to fit" your needs!



### PAY LESS PER UNIT

#### THE PRECISE BENEFITS OF RAW MATERIAL REDUCTION

Thanks to their compact design and lightweight aluminum alloy construction, our MCHEs are on average 60% lighter and use less raw material compared to fin-and-tube heat exchangers. This translates into better margins for you and affordability for your customers. An added benefit of the elimination of other metals is that Danfoss MCHEs are optimally recyclable. And since aluminium prices are stable, our MCHEs reduce uncertainty in your cost forecasts.



#### THE VALUE OF REFRIGERANT CHARGE REDUCTION

Your customers will save money every time they recharge the refrigerant in their chiller or air conditioner, because systems with Danfoss MCHEs require on average 30% less refrigerant than those with fin-and-tube heat exchangers. Our MCHEs are compatible and optimized to work with all standard refrigerants. Moreover, by reducing the amount charge, MCHEs reduce the inherent risk of flammability or toxicity seen in natural refrigerants.

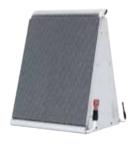


## A NEW GENERATION OF MARKET-BEATING SOLUTIONS

Danfoss' MCHEs offer big advantages over traditional fin-and-tube heat exchangers for cooling solutions. They can improve the COP of a chiller by 10%, reduce refrigerant use by 30% and lighten its coil weight by two-thirds.







Our MCHE models
- A-shape, C shape and
Slab coil - are suitable for
all kinds of applications.

The high performance and compact design of our MCHE contributes to the achievement of higher SEER (Seasonal Energy Efficiency Ratio) and EER (Energy Efficiency Ratio) ratings. So it's no surprise that MCHEs are rapidly gaining ground. By 2017, their share of the global heat exchanger market is expected to grow from 3% to as much as 40%. Don't miss this chance to be part of the next generation of energy-efficient solutions!

#### **MORE EFFICIENT HEAT TRANSFER**

When you choose Danfoss MCHEs, your customers will benefit in lots of ways. They'll save money and reduce their environmental impacts as a direct result of the MCHE's high heat transfer area to channel volume ratio.

#### **LESS REFRIGERANT**

Systems with MCHEs typically require 30% less refrigerant than those with fin-and-tube heat exchangers of equal transfer capacity. Hold-up volume is reduced on average by 70%. Besides being good news for the environment, this means lower purchase costs and, in many cases, lower refrigerant taxes.

#### **FEWER AND SIMPLER MATERIALS**

Our MCHEs are made of 100% aluminium which offers clear, well-documented advantages: it's a widely available, light weight metal that trades at stable prices. This feature adds further savings and increases convenience when it comes to recycling.

#### LESS SPACE, LESS WEIGHT

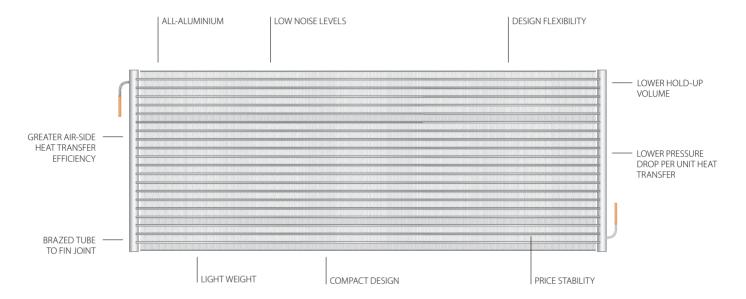
Danfoss MCHEs' high efficiency and compact size makes it possible for your customers to build smaller and lighter products. This reduces transport and inventory costs along the value chain, as well as enabling greater freedom in product design.

#### **ENDURANCE AND LONG LIFE**

On top of all this, you and your customers get to enjoy our MCHEs for much longer. Their aluminium construction minimises galvanic corrosion, which lengthens their life and postpones the need for costly replacements!

## DRIVING MCHE TECHNOLOGY

At Danfoss, we continually drive MCHE technology forward on all fronts - examining and optimising every single detail of the heat exchanger's design to improve its cost efficiency and performance. By changing this one small component, you can reduce energy consumption, improve environmental performance and achieve many other important advantages!



**OPTIMISED TUBES:** Danfoss' engineers have designed the refrigerant-carrying tubes to optimise heat transfer, allowing for more compact but equally effective cooling solutions.

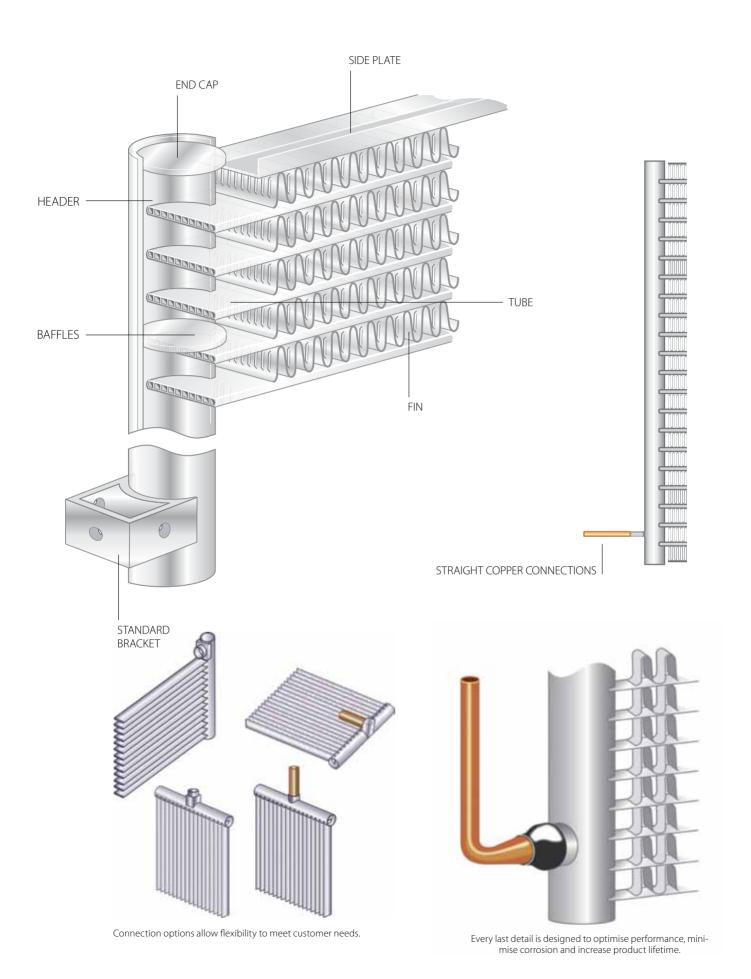
**SMARTER FINS:** Our innovative louvered fin design maximises surface area and tube contact, successfully reducing the air-side pressure drop, improving efficiency, and reducing noise.

**OPTIMAL-VELOCITY HEADERS AND BAFFLES:** In combination with baffles, MCHE headers control the flow of refrigerant and optimize its velocity in all phases. Our headers are designed to minimize refrigerant volume without causing extra pressure drop.

**DAMAGE-RESISTENT SIDE PLATES:** Our side plates create stronger, more damage-resistant units while providing additional installation and sealing options. Coils may be slid into a duct or chamber from the side using the C channels as a guide. Or, the C channels can be drilled at assembly to accept a variety of fasteners. The sides of the C provide a good sealing surface to minimize air leakage.

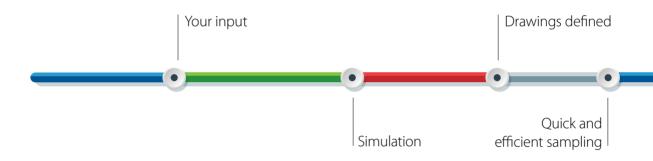
**FLEXIBLE PRE-DRILLED BRACKETS:** Our square brackets are predrilled to allow mounting from any side using standard fasteners and grommets, which accommodate thermal expansion during operation.

**WIDE CHOICE OF CONNECTIONS:** Our standard and block connections of all types facilitate smart, space-saving piping solutions. Ask a Danfoss expert about for example coil mirroring, straight copper connections, and straight drain connections.



## THE DANFOSS CUSTOMER PROCESS – 8 SIMPLE STEPS TO A NEW PRODUCT!

Our tried and tested customer process gives you all the flexibility and support you need to develop the next generation of competitive, resource efficient cooling systems. Based on extensive experience around the world, our process has been refined to provide you with more reliable, more durable heat exchangers, and to underpin the success of your brand.



#### Step 1 – Your input

Using a structured format, we explore your requirements and the key drivers of your business, such as efficiency improvements or cost reduction.

#### Step 2 – Simulation

Using the latest simulation techniques, we identify the ideal heat exchanger for your application. Different avenues are analysed and compared until we find the exact solution to fit your needs.

#### Step 3 – Drawings defined

You are involved in every step of the process. We study the technical drawings of the proposed solution together from different angles and discuss possible modifications.

#### Step 4 – Quick and efficient sampling

We've developed a structured way of working to make sure you get the samples you need as quickly and efficiently as possible. No unnecessary waiting around; no vital time lost in the urgent business of product development. What's more, you can follow the sample process every step of the way.

#### Step 5 – Product verification

We run a whole battery of tests on the samples produced, as well as providing full support for your



Product verification

Production test

Customer field testing

The ramp-up plan

testing process. No matter where you are, our engineers are on hand to assist with both methodology and evaluation questions.

#### Step 6 – Production test

When we start up production, our R&D department, quality assurance teams and production engineers follow a rigorous programme of quality checks to make sure we get everything right from the beginning. Any issues are dealt with before increasing the scale of production.

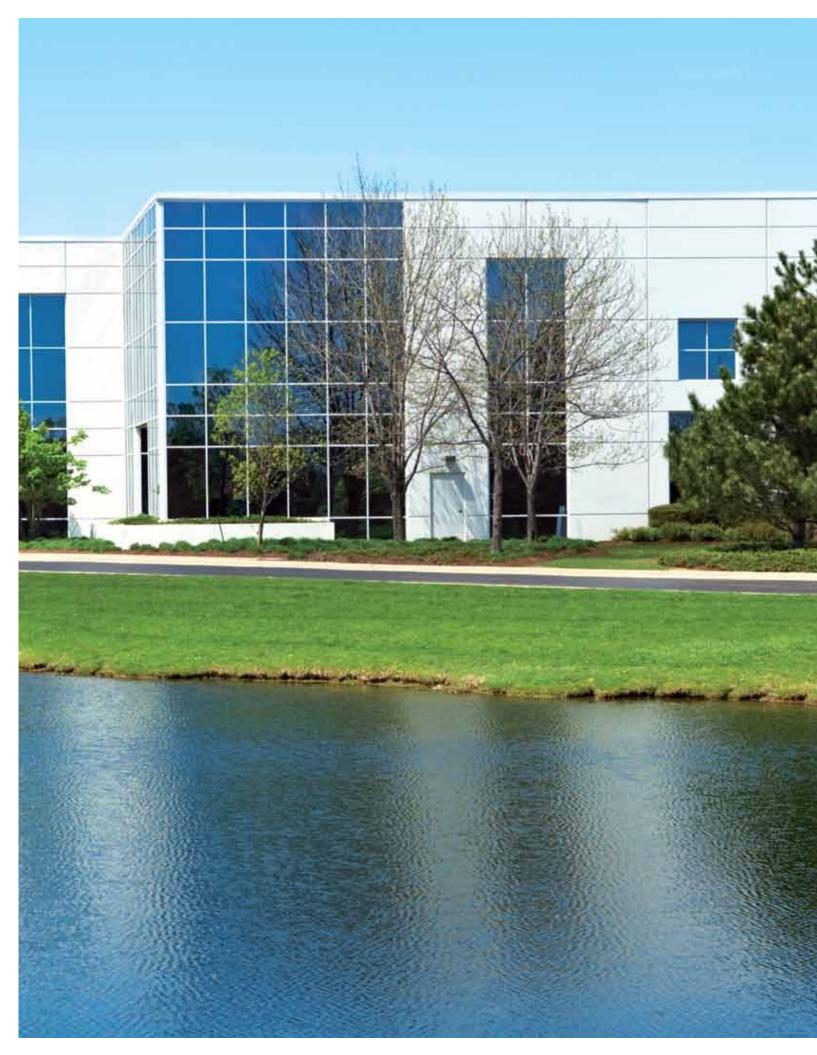
#### Step 7 – Customer field testing

If you are introducing a totally new product, you will undoubtedly want to carry out field trials in limited volumes. Once again, Danfoss engineers are on hand to provide technical support and help you collect accurate data.

#### Step 8 - The ramp-up plan

Once all tests are complete and the new product has been verified in the field, it's time to scale up manufacturing to required volumes. Together we make decisions about the timing, quantities needed, production schedules, inventory control and other critical manufacturing issues.

When all this is done, we're ready to roll!





## MANUFACTURING, THE DANFOSS WAY

Being easy to do business with means taking responsibility every step of the way, systematically eliminating the pressures you face. It includes manufacturing to world-class standards of quality and reliability. This is how we ensure that every unit of the heat exchanger you choose for your application performs at the level and your customers expect.



Danfoss MCHE factory in Monterrey, Mexico. In operation since 1995.



Danfoss MCHE factory in Haiyan, China. Production started 2011.



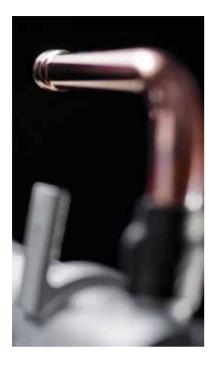


#### **GLOBAL DELIVERIES**

Danfoss MCHEs are produced in our two brand-new factories in China and Mexico. These two production locations and their combined capacity ensure that we can always deliver as promised, even in the face of bad weather, port strikes, material supply interruptions and other unpredictable factors.

#### **MEETING AND EXCEEDING QUALITY STANDARDS**

Because MCHEs must often perform in very challenging environments, in addition to careful design and material selection, quality control procedures have to be followed in every step of the production process. The entire supply chain is quality-certified to ISO 9001 (and TS16949, as of 2011) and the external components used in our products are approved by third parties.







## **GET STARTED TODAY!**

As a Danfoss customer, you get so much more than a physical product. We willingly share our expertise and broad experience of both the HVAC and refrigeration businesses. This understanding of the business gives us a major advantage over competitors, enabling us to apply MCHE technology to the areas we know best.

#### WE HELP YOU STAY A STEP AHEAD

We can see beyond the current industry landscape and interpret the direction of development in the years to come. Using our MCHEs, you can build systems that meet not only today's but also tomorrow's demands for greater resource and energy efficiency.

#### WHY NOT VISIT A FACTORY?

We welcome you to our production sites. In fact, we see this kind of face to face contact as an excellent opportunity to get to know you better and to demonstrate how we put your needs in focus. Both existing and prospective customers are invited to a day of presentations, discussions and interactive sessions where we hope to learn as much as you do!

To find out more about a factory tour, take a look at our website or talk to your local Danfoss representative.

#### **GET IN TOUCH!**

Our global reach makes it possible for Danfoss to provide a level of customer support which few heat exchanger suppliers can match. Whatever kind of advice or support you need – technical, commercial or other – feel free to call a Danfoss representative!







### A NATURAL CHOICE – HEAT EXCHANGERS

Our revolutionary MicroChannel heat exchanger technology enables us to meet customer demands for clear, core savings and a better environmental performance. Our focus on customer solutions means we can identify the best way to help you meet current and future challenges – environmental, economic, legal or political – and help you develop your business.

Address

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