ENGINEERING
TOMORROW

Immediate and **steady** savings With **MPHE** for chillers

Micro Plate Heat Exchangers

€40

Savings per chiller

Using a MPHE in a typical air-cooled 160 kW chiller.

www.danfoss.com

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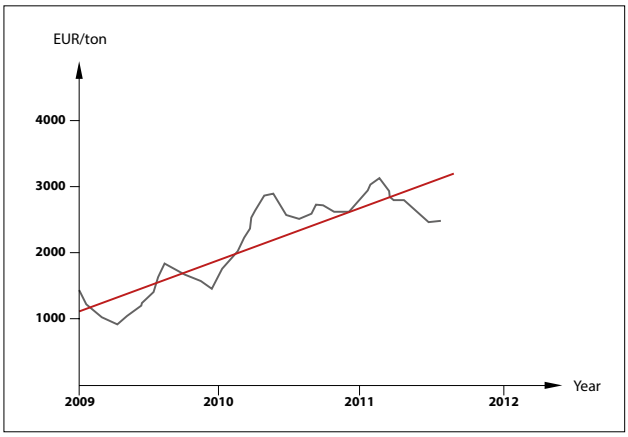
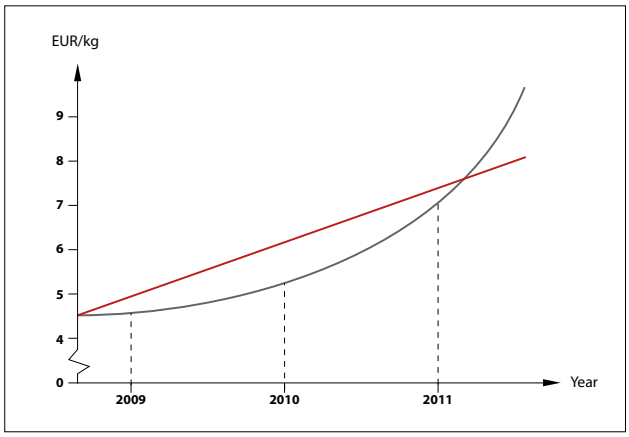
NEW WORLD, NEW CHALLENGES



The price of stainless steel has risen steeply over the last three years, and this trend is predicted to continue. This has had a dramatic affect on chiller production costs.



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

Being able to breathe cool, fresh air improves our quality of life. These days, it is more of an expectation than a luxury, and the demand for cooling systems in homes, offices and commercial buildings is growing globally.

For manufacturers, this means strong demand, but also fierce cost competition. Tomorrow's high-performing systems need to be built in a smarter, cheaper way. Better utilization of resources, more efficient performance and reductions in refrigerant use are all important goals.

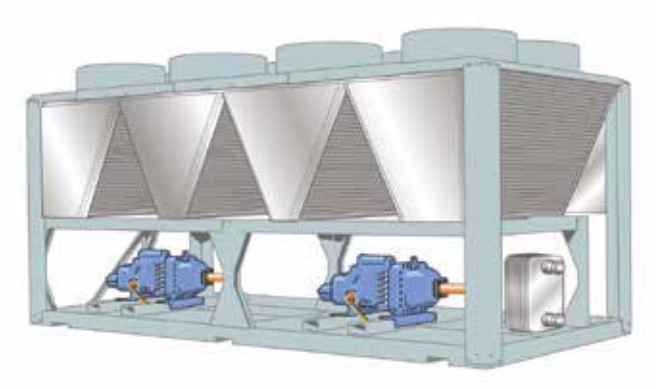
But the central issue is heat transfer. To build the next generation of chillers, we all need heat exchangers which transfer heat more efficiently. The rest follows naturally. With our new MPHEs, Danfoss leads the way.

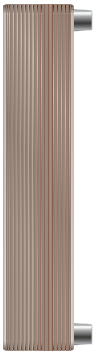
21%

Lower hold-up volume

Enables significant reduction in refrigerant charge.

SMARTER HEAT TRANSFER WITH MPHEs





To help our customers meet the challenges of today's chiller business, Danfoss introduces the innovative Micro Plate Heat Exchanger (MPHE) with its revolutionary plate design.

New plate design

In place of the traditional BPHE herringbone pattern, our new MPHEs have an indented surface. This apparently minor change leads to a major improvement in heat transfer. And as we shall see, it enables a series of other important efficiency gains, which result in significant and steady savings for you. How is this possible?

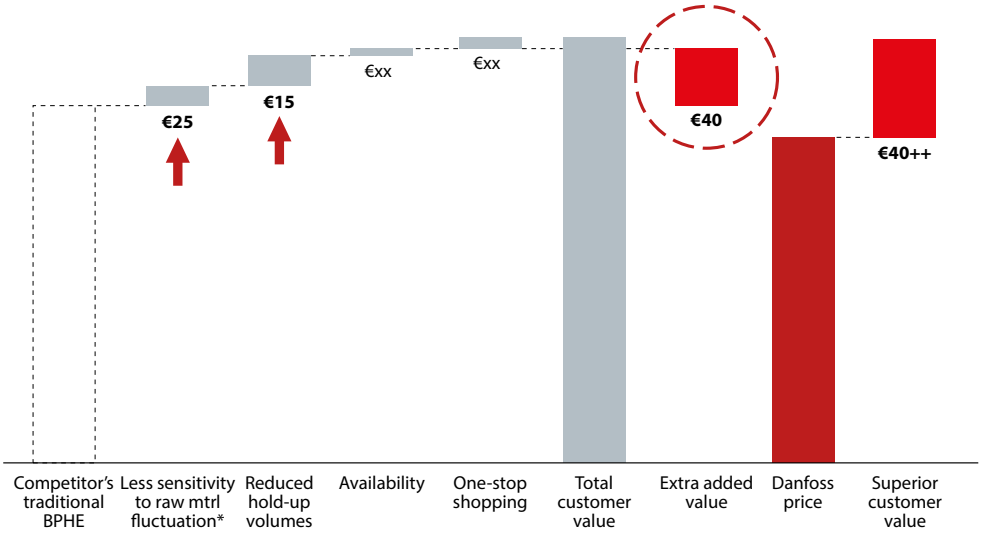
Resource efficiency

For a start, MPHEs can be made smaller and more compact. This means they use less raw material, which not only lowers initial costs but also makes your business less sensitive to price fluctuations. Secondly, MPHEs require a smaller refrigerant charge. Besides the obvious environmental benefits, this cuts costs and, once again, reduces sensitivity to changes in price.

Steady savings in an unpredictable world

By minimizing the use of raw materials and refrigerants, while maximizing efficiency, our MPHEs save you money right away and, at the same time, they protect your business from the worst effects of price fluctuations. For these and many other reasons, using Danfoss MPHEs in your chiller applications helps to stabilize your business and facilitates the development of more efficient and environmentally friendly cooling systems.

SAVE €40 PER CHILLER!



Your MPHE savings, your profit – Per 160 kW B/W R410A chiller. *Based on increase in alloy adjustment factor (AAF316) in 2010-2011.

To find out exactly how much you can save by using MPHEs instead of BPHEs, we took a closer look at one sample product: an air-cooled chiller with 160 kW cooling capacity using R410A refrigerant, 12-7 °C water temperature, and a water pressure loss of maximum 50 kPa. Starting with a BPHE and an MPHE with the same purchase price, we examined how raw material price rises between 2010 and 2011 affected the manufacturer's costs. Our calculations were based on the assumption that heat exchangers were purchased continually.

Impact on manufacturing costs

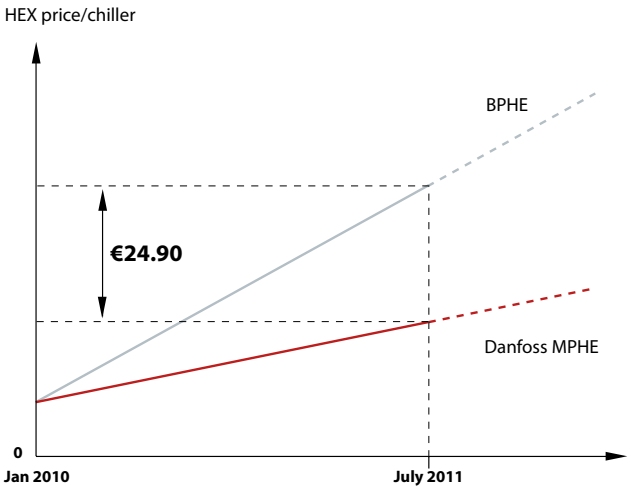
With raw material prices rising fast, how would the raw material surcharge affect you as a manufacturer during this period? We discovered that by buying our compact, lightweight MPHEs as opposed to BPHEs, you could have saved €25 per chiller.

But that's not all. Reducing refrigerant hold-up volumes by 21% also greatly reduces the cost of filling your heat exchanger with refrigerant. Using MPHEs instead of BPHEs you would save €15 per unit, based on current prices. In the future, refrigerant prices may have an even greater impact on your total costs and the savings potential may be even greater.

Today, the total cost advantage of using MPHEs instead of BPHEs adds up to an astonishing €40 per unit! This calculation does not take carbon and other environmental taxes into account, so, in reality, your savings could be even higher. We recommend that you investigate the environmental taxes in the countries where you do business and factor these into your own calculations.

See how costs are reduced by using the new MPHE technology instead of traditional BPHEs in your chillers. We made a direct comparison and here are the results.

Results overview	BPHE	MPHE	DIFFERENCE ABSOLUTE	DIFFERENCE RELATIVE
Weight, kg	69.2	47.2	22.0	-32%
Refrigerant hold-up volume, l	13.9	11.0	2.9	-21%



32% lower weight reduces purchase costs and gives greater price stability so you save € 24.90.

Raw material savings (kg)

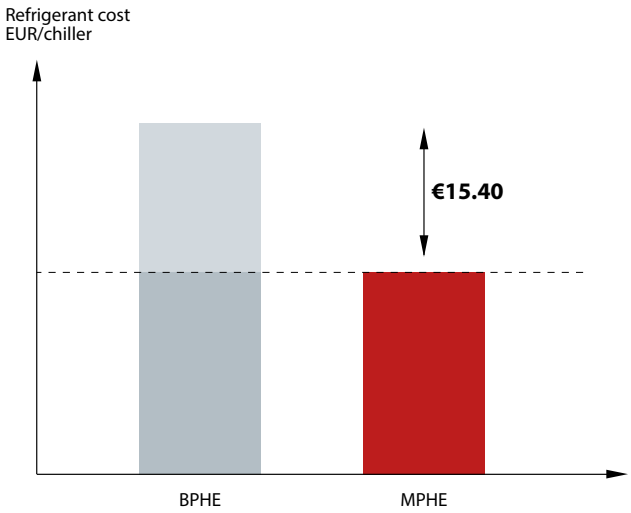
BPHE SS316	69.2 kg
MPHE SS316	47.2 kg
Difference, kg	22.0 kg

Price increase/kg (EUR)

Alloy Adjustment Factor (AAF316)	
Jan 2010	1589
July 2011	2719
EUR/ton increase	1130
EUR/kg increase	1.13

Total savings per chiller (EUR/chiller)

(Weight difference) x Price increase 22.0 kg x EUR 1.13/kg = **€ 24.90**



21% lower hold-up volume reduces purchase costs and gives greater price stability so you save € 15.40.

Refrigerant purchase savings (kg)

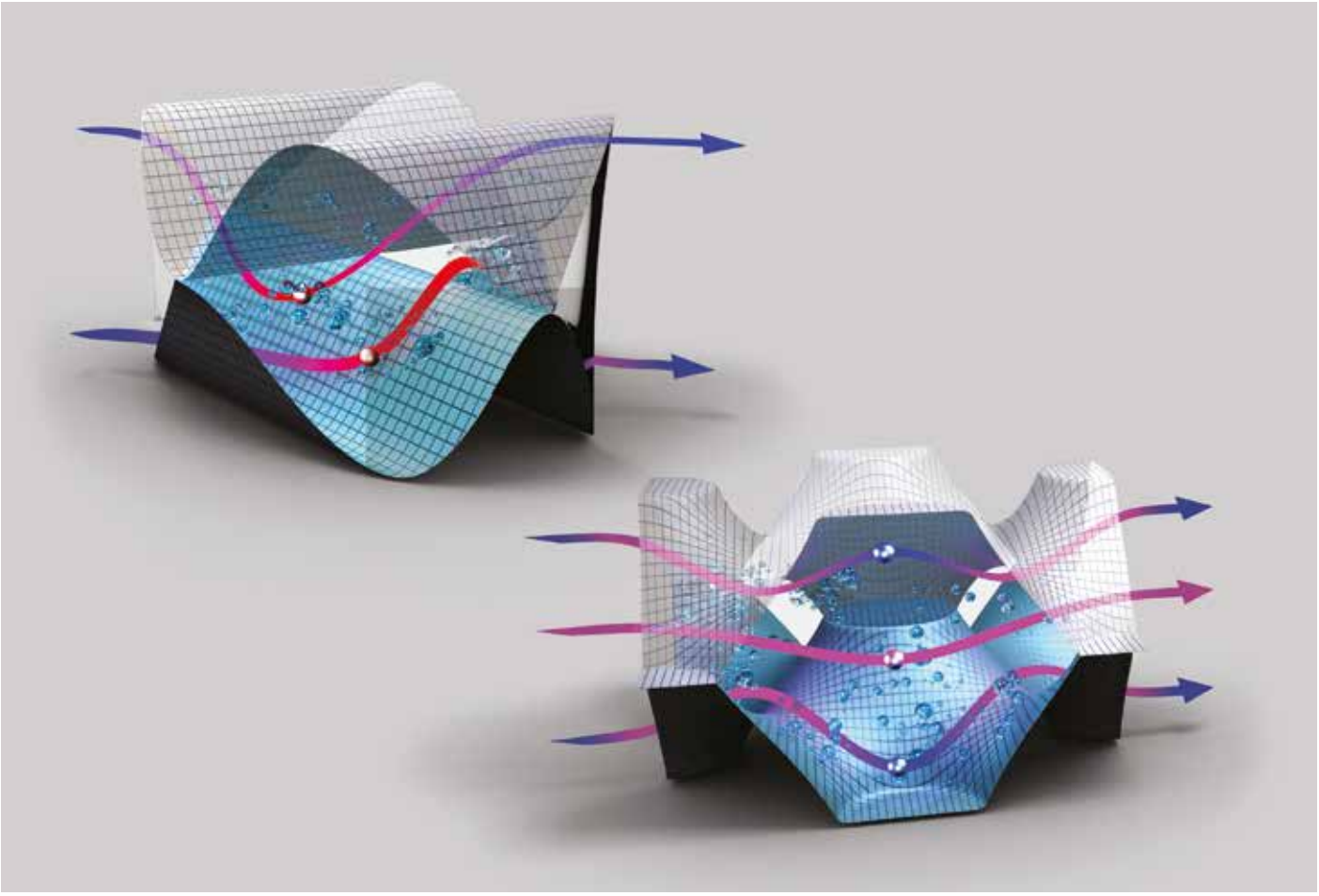
BPHE system	13.9 l
MPHE system	11.0 l
Difference, l	2.9 l
Difference, kg (R410A)	1.54 kg
Cost R410A	EUR 10/kg
Saving 1.54 x 10 =	**€ 15.40**

Additional savings

Cost of CO_2 compliance	0
Refrigerant taxes	0

Environmental taxes are not included in our calculation (figures based on purchase price only). To factor in further savings from a smaller refrigerant charge, consider the legislation which applies in your market.

€24.90 plus €15.40 means a total saving per chiller of €40.30.

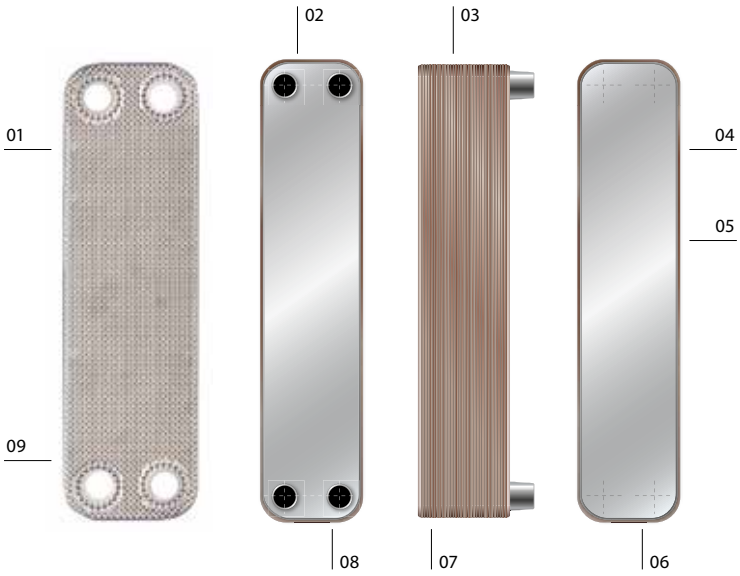


Compared with a traditional BPHE, with its three-dimensional flow, the innovative MPHE has a two-dimensional flow with a more uniform velocity which enhances heat transfer.

Overview of MPHE plates with the new channel pattern. The construction is based on existing heat exchanger technology and well-proven production methods.

FLEXIBLE AND INNOVATIVE DESIGN

A quantum leap in heat exchanger design



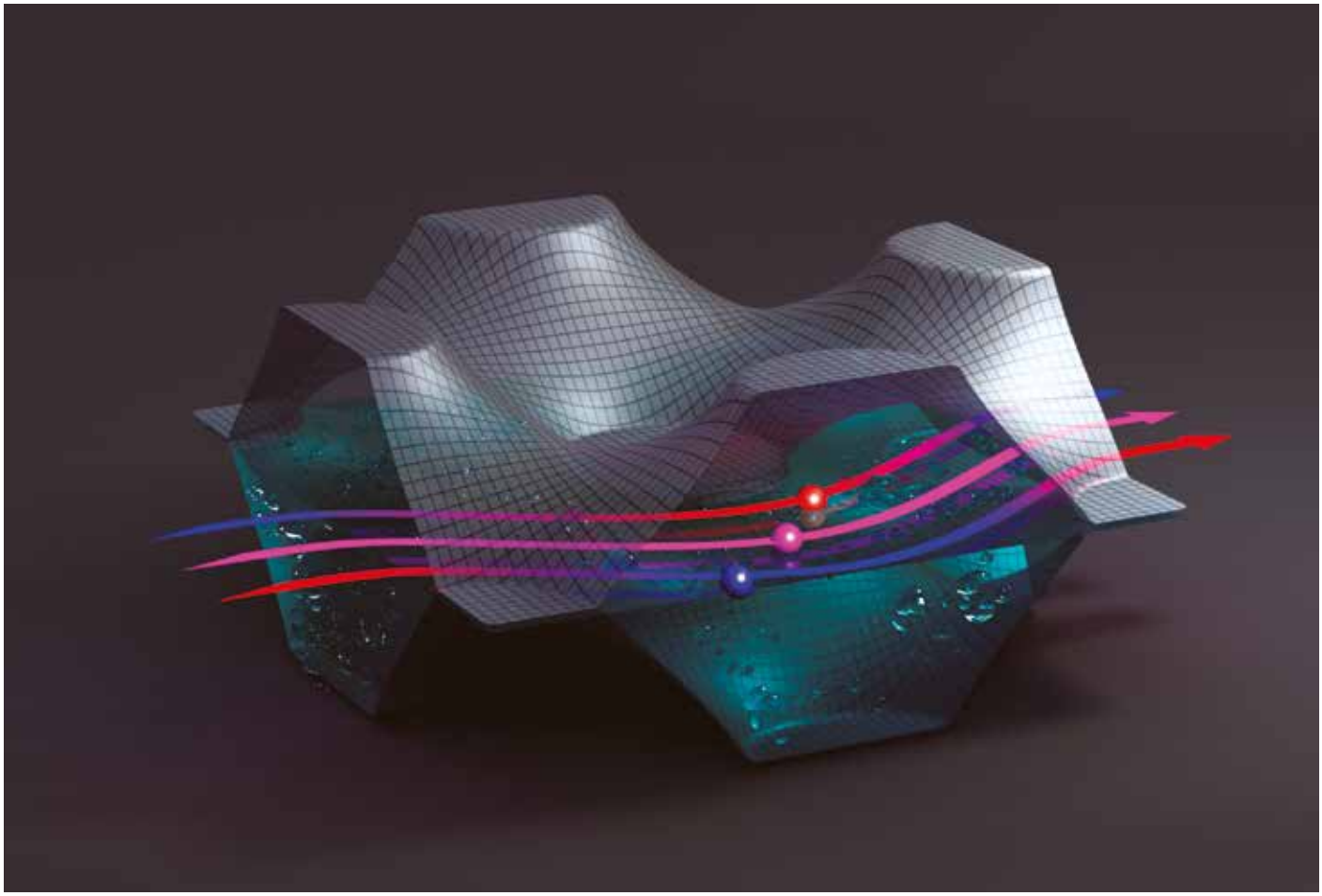
01	Enhanced heat transfer	06	Verified strong design
02	High seasonal performance factor	07	Compact design
03	Stronger, lighter and slimmer	08	Higher working pressures
04	Small carbon footprint	09	Focus on chillers
05	Five-product platform		

How often do you see a quantum leap in industrial design? It's certainly not every day. In the world of heat exchangers, it's not even every decade. The same basic heat exchanger model has been in use since the 1970s.

Now, thanks to Danfoss' revolutionary MPHE, things are changing fast. The new channel geometry of our MPHEs improves the flow across the plate and the utilization of the surface area, leading to a more uniform flow velocity. This enhances heat transfer and enables greater efficiency in chiller applications with a narrow temperature approach.

Enhanced heat transfer combined with a highly resource-efficient design (economical use of raw materials and low refrigerant charge) makes our MPHE technology an excellent route to improved chiller performance and lower environmental impact.

New channel plate pattern – verified technology.

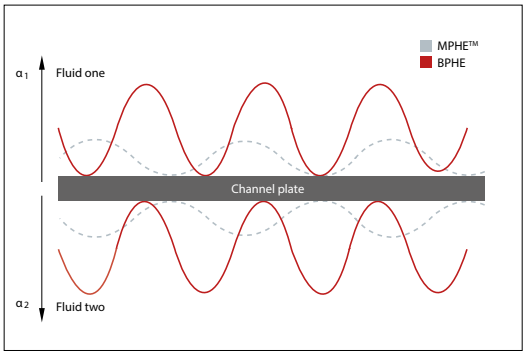


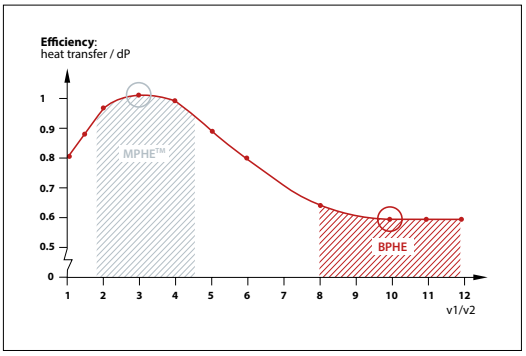
In close-up, we can see how the MPHE design gives a more uniform channel velocity. Additionally, the plates have a broad, flat brazing area compared with BPHEs, which reduces stress and gives you a more robust heat exchanger.

PUT IT ALL TOGETHER, AND WHAT DO YOU GET?

ENHANCED HEAT TRANSFER

The enhanced heat transfer of our C-range MPHEs leads to an increase in efficiency in your cooling systems, which in turn leads to a reduction in energy consumption and accompanying cost savings. And of course, the more efficient your chillers are, the more attractive they will be to your customers.





LIGHTWEIGHT BUT STRONG

Our new MPHEs are up to 40% lighter than traditional BPHEs. However, thanks to their innovative design and broad flat brazing surfaces, this weight reduction has been achieved without compromising on strength.

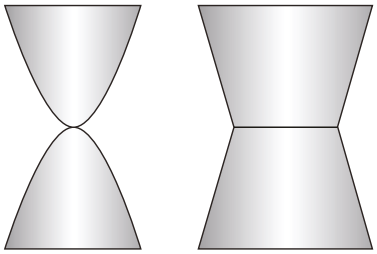


PLATE DESIGN FREEDOM

The MPHE channel plate pattern allows greater flexibility in application design. Varying the number, size and placement of indentations enables MPHEs to be fine-tuned to provide optimal heat transfer and minimal pressure loss in all kinds of cooling applications.

IMPROVED UTILIZATION OF RAW MATERIALS

Since MPHEs transfer heat more efficiently, a more compact model gives you the same performance compared with other technologies. The result is better utilization of raw materials, which reduces costs and improves price stability over time.

WELL-KNOWN PRODUCTION METHODS

The new MPHEs are based on proven technology and manufactured using reliable, well-known production methods.

REDUCED HOLD-UP VOLUMES

MPHEs have a small hold-up volume, which means cost savings, better price stability and a greener product profile. Furthermore, the minimal use of refrigerants reduces the need for F-gas inspections and in some cases eliminates it completely.

SMALLER CARBON FOOTPRINT

Compared with herringbone BPHEs, MPHEs have up to 40% lower carbon footprint. This is in part due to the efficient use of raw materials in their construction, but also to the lower refrigerant charge.

SO MANY SAVINGS

32%

Lighter

Lower costs and lower price sensitivity thanks to efficient use of raw materials.

MPHEs are designed to deliver the best possible performance using the minimum of resources. The result is a series of improvements which give you immediate and long-term savings.

4%

Smaller surface area

Thanks to the new plate design, you get the same results using a smaller heat transfer area.

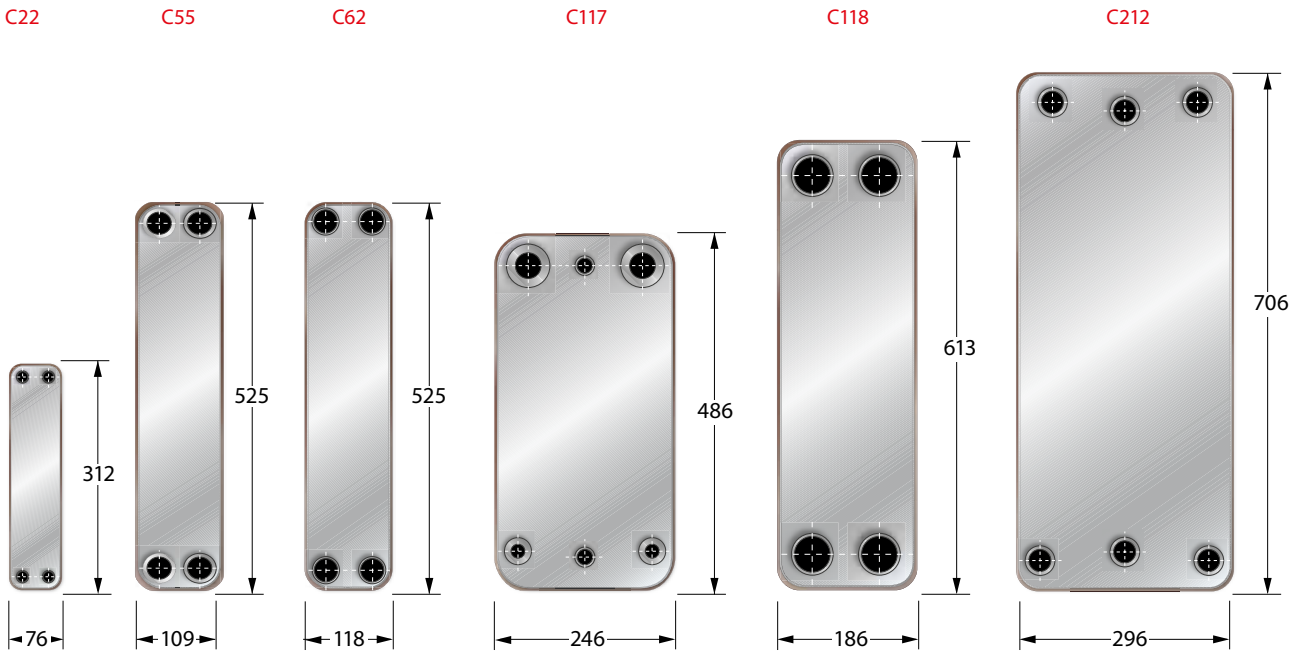
A WHOLE PRODUCT FAMILY

You can find an MPHE for nearly every application across the 3 kW to 550 kW capacity range. Our MPHE products are all based on our new product platform, which is designed to make your product development and production leaner.

Fully tested and certified

All the MPHEs showcased in this brochure are thoroughly tested and verified in our fully equipped laboratories in Asia and Europe, which enable us to challenge the boundaries and establish innovative new trends. They are also fully compliant with regulations such as PED and UL, guaranteeing consistently high performance, reliability and safety.

Our production plants are ISO 9000/14000 certified, enabling us to guarantee the durability, sustainability and safety of all our products.



BASELINE	Evaporators	C22-E	C55-E	C62-E	C117-ED	C118-E	C212-E/-ED
	Capacity, kW	3-30	20-65	30-90	100-250	70-200	200-550
	Design pressure, max	30 bar	30 bar	30 bar	30 bar	30 bar	30 bar
	Condensers	C22-C	C55-C	C62-C	C117- CD	C118-C	C212-C/-CD
	Capacity, kW	3-30	20-65	30-90	100-250	70-200	200-550
	Design pressure, max	30 bar	30 bar	30 bar	30 bar	30 bar	30 bar
L-LINE FOR R410A	Evaporators	C22 L-E	C55 L-E	C62 L-E	C117 L-ED	C118 L-E	C212 L-E/-ED
	Capacity, kW	3-30	20-65	30-90	100-250	70-200	200-550
	Design pressure, max	45 bar	45 bar	45 bar	45 bar	45 bar	45 bar
	Condensers	C22 L-C	C55 L-C	C62 L-C	C117 L-CD	C118 L-C	C212 L-C/-CD
	Capacity, kW	3-30	20-65	30-90	100-250	70-200	200-550
	Design pressure, max	45 bar	45 bar	45 bar	45 bar	45 bar	45 bar
N-LINE FOR R134a	Evaporators						C212 N-E/-ED
	Capacity, kW						200-550
	Design pressure, max						30 bar
	Condensers						C212 N-C/-CD
	Capacity, kW						200-550
	Design pressure, max						30 bar

WE´RE ALWAYS ON YOUR SIDE

We stand by the efficiency, quality and reliability of all our heat exchanger products, MPHEs included. And we're always available to explore their integration into a new customer's products. By offering you the lowest costs and the greatest possible price stability we make it easier for you to focus on the vital task of developing and producing tomorrow's energy-efficient chillers.

And remember, Danfoss has all the components you need. Consider buying one other component from us, besides MPHEs, and you can enjoy numerous cost efficiencies. One less order to place, one less delivery to manage – all these advantages combine to give an impressive reduction in your overall costs, and, at the same time, reduce the carbon footprint of your product.

Let's sit down together and look at all the savings that working with Danfoss can bring to your business!

€10,000

Annual savings

When you reduce the number of suppliers by just one.

ENGINEERING
TOMORROW

CHANGING AN INDUSTRY

We offer the heat exchangers our customers have always asked for. Danfoss' Micro Plate technology, along with our market-oriented approach, simplifies life for every customer. At the same time, our innovative technology promises clear, core savings and a cleaner environment. Our sharp focus on customer solutions means we can help our customers grow, and make a difference in situations where energy efficiency and the climate challenge are critical issues.

Address

DKQB.PB.310.E5.02_Sep2014

Produced by Malmøresund, www.malmoresund.se