Better chillers – from the inside out

Strict regulations, a competitive marketplace, and the need to optimize system costs compel you to update your chiller designs. Building chillers with Danfoss products and solutions enables you to optimize energy efficiency, reduce development time, and obtain reliable performance for multiple chiller platform types and uses.

Smart technology in up to 70% of the chiller value reduces development costs

danfoss.com
Climate change regulations, new demands for energy efficiency, higher expectation of comfort levels, and pressure to reduce overall cost of ownership drive current development in a competitive HVAC marketplace. With Danfoss, you have a business partner who understands the complexity of your business and supports you with the most in-depth expertise of solutions for chiller systems.

**Meet the Future Head-on, with Danfoss at your side**

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**Combat Climate Change**
Synthetic refrigerants like HFCs and HCFCs have a high global warming potential (GWP).

By using climate-friendly Danfoss components that utilize the R1234ze, R32, and R452B low-GWP refrigerant, you contribute to global efforts to make our planet cleaner. Synthetic refrigerants like HFCs and HCFCs have a high global warming potential (GWP).

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**Maximize Energy Efficiency**
The building sector represents about 40% of global energy use in regions like Europe and the USA and heating and comfort cooling a large part of it. To reduce the global warming impact and lower operating costs, you need new technologies that can maximize energy efficiency. Our technologies for chillers help you meet new regulations and achieve the best energy efficiency with your products.

**GWP<7**
with chillers featuring Danfoss technologies using R1234ze

**Up to 40% lower energy consumption in chillers**

**Promote Dependable Infrastructure**
As the global population continues to grow, energy use is expected to rise by one third by 2035. The introduction of variable speed technology in air conditioning and heat pump systems presents an opportunity for significant reduction of inrush current and can smartly modulate the electric load to the exact need to limit peaks of demand.

**70% lower start current with Danfoss variable speed technology enhances grid reliability**

**Help Meet Increasing Global Food Demand**
An estimated global population of 10 billion people in 2035 means that food needs to be delivered more safely and efficiently. Process chillers provide the support farmers need to grow a greater variety of vegetables in larger quantities, and help them adapt to the different stages of farming to increase quality and turnover.

**+/-0.3°C**
temperature and humidity setting guarantees a safe growing and storage process

**A revolution in the A/C market**
Driven by the global need to reduce CO2 emissions, new legislation around the world is requiring air conditioning systems with higher energy performance as well as non-ODP (Ozone Depletion Potential) and lower GWP (Global Warming Potential) refrigerants.

In addition to conforming to strict new standards, next-generation systems need to meet the challenges of complex applications, increased energy efficiency, and varied climates, while also providing flexibility and a high level of comfort and reliability.

Increasing population, rising expectations of comfort, and a high penetration of IT technologies are putting pressure on electric grids, and driving up overall energy consumption and utility peak loads. In parallel, as building designs and functionalities evolve, chiller systems must adapt to meet these new demands. Examples include modern office architecture with large windows, as well as new development or renovation of hospitals, hotels, museums, or data centers, where air conditioning is critical.

**A global overview of regulations**

**Central & South America**
- **Legislation:** ASHRAE 60.1 for rooftops and chillers / DOE for rooftops
- **Building codes:** ENERGY STAR® Green Building Index, Net Zero Building ENERGY 2019

**USA**
- **Legislation:** ASHRAE 60.1 for rooftops
- **Building codes:** ENERGY STAR® Green Building Index, Net Zero Building ENERGY 2019

**Europe**
- **Legislation:** Regulation 517/2014 (F-Gas) Regulation 353/2015 / Ecodesign ENER Lots 1 and 3
- **Building codes:** ENERGY STAR® Green Building Index, Net Zero Building LEED

**Middle East**
- **Saudi Arabia:** 2663-2014
- **Regulation 517/2014 (F-Gas) Regulation 353/2015**
- **Building codes:** Energy Efficiency

**Arab Emirates:** 5010-5:2014
- **Legislation:** UAE 5010-5:2014
- **Building codes:** LEED

**Asia & Oceania**
- **Building codes:** Greenmark, Green Building Index, Net Zero Building LEED

**China**
- **Legislation:** GB 19577 for Chillers
- **Building codes:** Greenmark, Green Building Index, Net Zero Building LEED

**60-80%**
of current air conditioning systems will not comply with the new standards and need to be redesigned.

**Up to 40%**

... opens up new opportunities

As it stands, 60-80% of current air conditioning systems will not comply with the new standards and need to be redesigned. Original Equipment Manufacturers are increasingly being challenged to provide integrated solutions with superior reliability and efficiency that are easy to install and maintain. Danfoss innovations and technical expertise support you to build better chillers from the inside out and take up the challenge of improving part-load efficiency and maintaining full-load performance while keeping development time, and resulting costs at competitive levels.

(3) Source Danfoss – Simulation based on Eurovent database and European draft for Ecodesign ENER LOT 21 Tier 2 level
A chiller for every situation

Energy consumption is a key driver for building owners when it comes to chillers. Depending on the building size, type, and use, as well as the surrounding climate, you need different options for your chiller designs to provide the most value to your customers and differentiate yourselves in the market. We have solutions for chiller needs in a multitude of contexts, from mid-size office buildings that are in operation 10 hours per day, 5 days a week, to data centers and large hospitals that operate 24 hours per day, all year long.

Regardless of the building your chiller system is designed to fit, Danfoss has the widest portfolio of products and technology options to help it perform reliably and efficiently.

Our solutions match the needs of the building owners

3 key drivers for chillers:
- Building Size
- Energy Intensity and number of operating hours over the year
- Energy Cost

Looking for: Initial cost ($/Ton)
Meet minimum energy efficiency at the lowest cost.

Looking for: Return On Investment ($ Savings/Year)
Maximize energy efficiency at the best cost.

Next-generation technology for your next generation of chillers

Danfoss technology helps you keep up with shifting global regulations and stay competitive with low lifecycle costs. Here’s how:

Redesign at minimal cost
By using Danfoss scroll compressors with IDV technology, either fixed-capacity or inverter-driven, in combination with our innovative electric expansion valves and heat exchangers, you will be able to offer a chiller system meeting the latest energy requirements with minimal redesign costs.

Go oil-free for maximum efficiency
Oil-free turbo chillers have been proven to deliver the best efficiencies in demanding applications. They also deliver additional benefits for both building owners and end users, which include low maintenance costs, a space-efficient design, and minimal noise levels. After pioneering the oil-free technology with our Turbocor® compressor, Danfoss now offers a wide portfolio of components that have been tested and approved for use in oil-free systems and strengthens reliability of oil-free chillers.
Building a higher standard for energy efficiency

Smart technology in up to 70% of the chiller configuration to maximize efficiency

Electronic Controls
AB-QM® pressure independent control valves have a 3-year payback on complete building installation

Energy Savings
Micro Plate Heat Exchangers deliver a hold up volume of 35% less

Part-load Efficiency
Intermediate Discharge Valves (IDV) inside the scroll and variable speed fans improve efficiency, and built-in technology adapts to varying pressure ratios and delivers higher part-load efficiency (up to 14%)"
Your source for chiller solutions

With up to 70% of products for chillers in our portfolio, we offer a powerful combination of expertise and product options that will enhance your chiller designs, and increase your bottom line.

Compressors

Danfoss compressor technologies and models are designed to fit a large selection of chiller systems and cooling capacities. You can choose among Danfoss scroll compressors with or without IDVs, Danfoss inverter scrolls, or Danfoss TurboTec® compressors — each one helps you maximize the efficiency of your designs and gives you flexibility to redesign and upgrade as you see fit.

Danfoss compressors range from 3 to 400TR and offer the widest technology options to address new regulations.

AC Drives

Danfoss AC Drives work in combination with chiller compressors, condenser/evaporator fans and water pumps to adapt capacity to actual demand. Variable Speed control enables tremendous energy savings and minimizes Total Cost of Ownership by reducing wear and tear as well as maintenance costs on components and systems.

Danfoss Extensive portfolio of AC Drives dedicated for chiller compressors, fans and pumps incl. low harmonic AFE drives and medium voltage drives ranges from 0.55kW to 7MW

Heat Exchangers

Maximizing the heat transfer in your condenser or evaporator is critical to achieving the highest efficiency possible within your chiller system. We are continuously expanding the range of our heat exchangers and also offer economizers with built-in controls to increase the capacity and energy efficiency of your chillers.

The technology in our Micro Channel and Micro Plate Heat Exchangers helps to make a difference in terms of energy consumption and refrigerant charge.

Electronics and sensors

Danfoss has an extensive range of electronic controls and sensors developed to monitor and optimize the operation of your chiller systems.

Solutions range from a basic valve driver to a complete system controller capable of monitoring and controlling fans, pumps, valves and compressors as needed. Danfoss electronic systems put the power of our components directly in your hands.

Use the Danfoss MCR programmable controller for maximum flexibility and the Danfoss EKE superheat controller with temperature and pressure sensors to fine tune any chiller’s output to your desired specifications.

System Protectors

When your customers purchase one of your chillers, they want to know that their investment is secure. Our line of driers, check valves, ball valves, and other system protectors are designed to perform under the most strenuous operating conditions and protect your equipment from potential failures.

Danfoss system protectors have been thoroughly tested in our labs & in the field in order to guarantee trouble-free operation during your system’s lifetime.

Valves

Choosing the right valve for your system ensures you get the optimal superheat flow just right, meaning your chiller will ensure the desired comfort and cool it’s supposed to. Danfoss has a wide assortment of valves, giving you the ability to choose the right one for your system’s need.

From our TGE valve to the ETS Colibri line, Danfoss has extensive experience in thermostatic and electric valves with proven track records of performance, quality, and durability.
### Conditions:
- Cooling capacities in Tons @ AHRI 60Hz, in kW @ EN12900

<table>
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<th>Refrigerants</th>
<th>Min</th>
<th>Max</th>
<th>Manifold (in TR / circuit)</th>
<th>Min</th>
<th>Max</th>
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<td>50</td>
<td>13/4.2</td>
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<td>1 000+</td>
<td>200</td>
<td>1 200</td>
<td>3 000+</td>
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</tbody>
</table>

| **Condenser**         |     |     |                           |     |     |                           |
| MCH                   |     |     |                           |     |     |                           |
| Manifold              | 1   | 170 | -                         | 3.5 | 405  | -                         |

| **Evaporator**        |     |     |                           |     |     |                           |
| MPHE Condensor*       | 1   | 170 | -                         | 3.5 | 405  | -                         |

| **Expansion devices** |     |     |                           |     |     |                           |
| Thermostatic Expansion Valve TGE |     |     |                           |     |     |                           |
| R410A                 | 3.5 | 52  | 12                        | 182                         |
| R134a                 | 1.5 | 29  | 6                         | 102                         |

| **Discharge Line**    |     |     |                           |     |     |                           |
| Check Valves NRV/NRVH | 0.5 | 54.6 | 1.8                      | 191                         |
| Check Valves NRV/NRVH | 0.3 | 34.4 | 1.16                     | 121                         |

| **Ball Valves GBC**   |     |     |                           |     |     |                           |
| High Pressure Switch  |     |     |                           |     |     |                           |
| Safety / ACB          |     |     |                           |     |     |                           |
| Pressure sensor AKS   |     |     |                           |     |     |                           |
| Temperature Sensor AKS|     |     |                           |     |     |                           |

| **Liquid Line**       |     |     |                           |     |     |                           |
| Sight Glass SGP       |     |     |                           |     |     |                           |
| Solenoid Valve EVR    |     |     |                           |     |     |                           |

| **Suction Line**      |     |     |                           |     |     |                           |
| Low Pressure Switch   |     |     |                           |     |     |                           |
| ACB                   |     |     |                           |     |     |                           |
| Pressure sensor - AKS |     |     |                           |     |     |                           |
| Temperature Sensor AKS|     |     |                           |     |     |                           |

| **Control Panel**     |     |     |                           |     |     |                           |
| System Controller MCH |     |     |                           |     |     |                           |
| EKE 1 Superheat Controller |     |     |                           |     |     |                           |

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### Range overview

**For Air and Water-Cooled chillers**

#### Conditions:
- Refrigerants: R410A, R32, R452B, R454B, **R32**
- Manifold (in TR / circuit): Min 1, Max no limit
- Manifold (in kW / circuit): Min 3.5, Max no limit

| Refrigerants          | Compression | Condenser | Evaporator | Expansion devices | Discharge Line | Ball Valves GBC | Electric Expansion Valve ETS-C (Colibri) | Condenser | Evaporator | Expansion devices | Discharge Line | Ball Valves GBC | Electric Expansion Valve ETS-C (Colibri) | Condenser | Evaporator | Expansion devices | Discharge Line | Ball Valves GBC | Electric Expansion Valve ETS-C (Colibri) | Condenser | Evaporator | Expansion devices | Discharge Line | Ball Valves GBC | Electric Expansion Valve ETS-C (Colibri) |
|-----------------------|-------------|-----------|------------|------------------|---------------|----------------|------------------------------------------|-----------|------------|------------------|---------------|----------------|------------------------------------------|-----------|------------|------------------|---------------|----------------|------------------------------------------|-----------|------------|------------------|---------------|----------------|------------------------------------------|-----------|------------|------------------|---------------|----------------|------------------------------------------|
| **Compressor**        | Scrolls     | MCH       | MPHE Condensor* | Thermostatic Expansion Valve TGE | Check Valves NRV/NRVH | Ball Valves GBC | Electric Expansion Valve ETS-C (Colibri) | R410A     | 1.5        | 29               | 6             | 102            | 191                          | R410A     | 0.9        | 106             | 7             | 370          | 350                          | R410A     | 0.85       | 100             | 3             | 350          | 350                          |
| **Condenser**         | R410A/R134a | 1         | 170        | 3.5              | 52             | 12             | 182                        | R134a     | 1          | 170             | -             | 3.5           | 405            | R410a                 | 0.5        | 54.6       | 1.8              | 191           | 7            | 370                          | R134a     | 0.85       | 100             | 3             | 350          | 350                          |

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### Danfoss Application Development Centers

For Danfoss, designing environmentally conscious products and working towards a more sustainable use of resources are key issues we address through innovation, research, and teamwork. To drive progress in this area, we’ve invested in building Application Development Centers (ADC) all over the globe. Because of our worldwide presence, our engineers are keenly aware of industry trends on both a global and local level. However, another benefit of the ADC is that we get to work hand-in-hand with our customers to find new solutions.

When we work together to combine your expert knowledge of chiller systems with our deep understanding of components, we’re able to push the envelope of what can be achieved, resulting in better chiller technology.

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* Danfoss ADCs are today located in:
  - China - Haiyan and Wuqing, Denmark - Nordborg, India - Oragadam, USA - Baltimore and Tallahassee

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For more information about refrigerant qualification programs and product selection, please contact Danfoss and refer to Coolselector.
Let’s talk

At Danfoss, we believe that long-term business relationships start with a conversation.

- To understand your situation
- To learn how we can meet your needs
- To give you confidence in our solutions

So contact your local Danfoss representative – and let’s talk.

Access our online services 24/7

You can find many helpful resources on our website, including product catalogues, educational and training programs, downloadable manuals and apps, and troubleshooting tools.

Danfoss online self-services

- Chillers: Chillers.danfoss.com
- Product selection: Coolselector.danfoss.com
- Learning platform: Learning.danfoss.com