

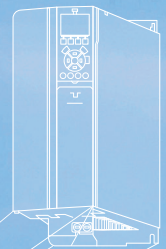
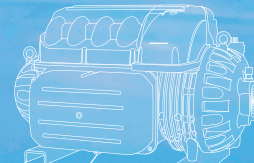
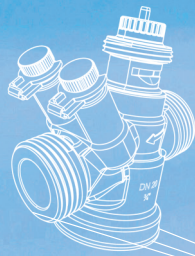
ENGINEERING
TOMORROW



Commercial Building Solutions | Asia Pacific Region

Advancing **Energy Efficiency** and **Indoor Comfort** in Tomorrow's Green Buildings

Achieve
Net Zero
carbon emissions
in buildings



[APRCommercialBuilding.danfoss.com](https://www.danfoss.com/APRCommercialBuilding)

Engineering tomorrow's commercial buildings

The world stands on the verge of a sustainable transformation. Today, we have proven reliable solutions to meet many of our climate, urbanization, and food challenges, and we are just getting started. Driven by the power of an electrified society and fueled by the opportunities of going digital, Danfoss is dedicated to engineering solutions that can unleash the potential of tomorrow.

Across the globe, our sustainable, smart technologies power industries and cities, secure a reliable food supply, and create healthier, more comfortable indoor climates. At the same time, we're developing solutions that integrate renewables into tomorrow's smart energy systems, where on- and off-highway machinery and shipping are powered by hybrid and electric motors.

This is where the transformation starts – in the way we heat, cool, connect, and feed a growing population.

Together with our customers, we help make a greener and better future a reality. Together, we are engineering tomorrow.

The buildings of today are responsible for 40% of global energy use and nearly half of all city-wide emissions. At Danfoss, we are engineering energy efficient and digital solutions, that enable buildings of the future to be more sustainable and reduce emissions, without compromising on comfort. This is where a new generation of buildings starts.

Commercial buildings need to maintain a precise balance between dynamic growth and sustainable management. Whether it's hotels, offices, supermarkets or other public spaces, building technology must adapt to market needs, regulations, and certificates – all while ensuring a safe and comfortable environment for the people that use them.

Whether you need heating and cooling systems, building management systems, or elevator and escalator transport, Danfoss products and solutions can help you save considerable energy, reduce emissions, and lower costs.

The number of people choosing to live in cities in Southeast Asia is increasing at an impressive rate and this expanding urban population needs new places to live, work and shop.

Together with new government initiatives for sustainable building practices, this means that the demand for reliable, energy efficient solutions has never been higher.

As a global leader in these technologies, Danfoss is perfectly positioned to help you make the most of these opportunities.

A Quest for Perfection in Data Centers

NEXTDC is a market leader enabling business transformation through innovative data center outsourcing solutions, connectivity services and infrastructure management software. It provides enterprise-class colocation services to local and international organizations. In July 2012, its M1 Melbourne data center — a 15MW hyperscale colocation facility — went live.

NEXTDC is committed to sustainability and renewable energy, so it was no surprise when the M1 data center received a 4.5-star NABERS (National Australian Built Environment Rating Systems) rating in 2016 for incredible building performance. This excellent rating was reflective of NEXTDC's decision to install Smardt Chillers using Danfoss Turbocor oil free compressor technology.

But that wasn't enough. They improved their systems even more, receiving a 5-star NABERS rating in 2019. The M1 data center became the first to ever receive 5 stars in Australia. Because of this reputation, maintaining and continuing its sustainable, efficient systems are essential to upholding its core business values and maintaining its 100% uptime guarantee for its customers.

Yet, that begs the question - how can you improve something that's already top-rated?

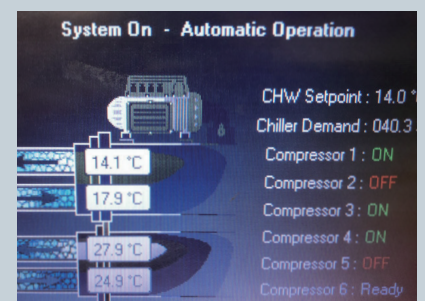
Test for the best

NEXTDC consulted with the Smardt Chiller Group, a longtime OEM partner of Danfoss, to help them further improve the efficiency of their cooling system. When they expanded in 2016, they added three additional Smardt chillers to maintain maximum efficiency of their M1 Facility.

In applications like data centers, the cooling system typically has a high number of run hours in order to protect the servers that generate quite a bit of heat on a 24/7 basis. This is quite different from traditional.

Danfoss engineers developed a solution that could **operate efficiently in low-lift conditions**, and also worked with **Smardt** to validate this new solution.

CHW In Temp : 17.8 °C
 CHW Out Temp : 14.0 °C
 Evaporator Split : 03.8 %k
 Total Input Power : 110.5 kW
 Total Input Amps : 0177 A
 * CHW Flow Rate : 73.3 l/sec
 * Refrigeration kW's : 116 kW/r



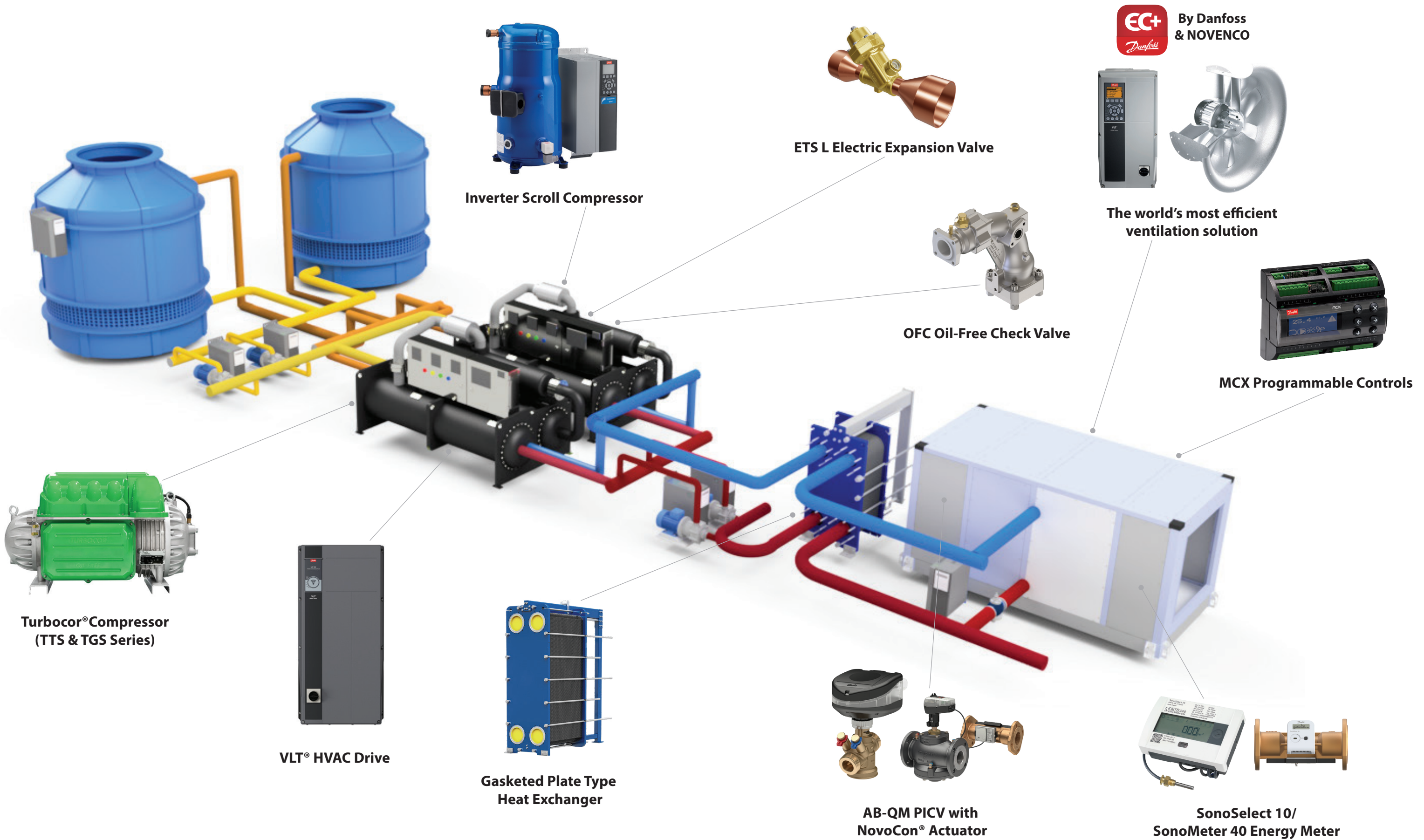
NABERS



NABERS, or **National Australian Built Environment Rating System**, provides simple, reliable and comparable sustainability measurements for hotels, shopping centers, apartments, offices, data centers and more.

Much like the efficiency star ratings used for appliances, NABERS provides a rating from one to six stars for a building's efficiency, taking energy, water, waste and indoor environment into account.

Enhance air **quality** and interior **comfort**, every step of the way



VLT® HVAC Drive FC 102

Designed to deliver high reliability and lower total cost of ownership a cross chillers, Air Handling Units (AHU), pumps, cooling towers and ventilation fans, VLT® HVAC Drive FC 102 is a solution dedicated for the HVAC system.

- Plug & play IP55 Variable Frequency Drives (VFD) with disconnect switch.
Lower cost as no need for additional panels or cabinet
- Optimized for building automation systems with best-in-class efficiency standards
- Versatility to operate between temperatures ranging from -25 °C to 50 °C
- Compatible with IM, PM, SynRM, AC and PM multi-motor applications
- Capability to troubleshoot through remote LCP thus ensuring ease of operations
- Adaptable to new and existing buildings and suitable for new and rewind motors



Danfoss NOVENCO EC+ Solution

Danfoss-NOVENCO EC+ offers the world's most efficient ventilation solution that utilizes motor independent high efficiency Danfoss VLT® HVAC Drive FC 102 and high efficiency NOVENCO's ZerAx® fans. The ventilation solution has the potential to save up to 50% energy vis-a-vis traditional DIDW fan systems.

Danfoss-NOVENCO EC+ is significantly more superior to traditional EC Fan Systems delivering up to 30% better wire-to-air efficiency. 20% lower footprint of the AHUs utilizing Danfoss-NOVENCO EC+ compared to traditional EC Fan driven AHUs allows building owners to utilize their commercial spaces more efficiently. Robustness, reliability, integration ease, lower sound levels and the highest wire-to-air efficiency makes Danfoss-NOVENCO EC+ the most preferred and safe choice to deliver on sustainability agenda.



By Danfoss
& NOVENCO



The world's most efficient
ventilation solution

Danfoss Harmonics Solutions

Danfoss Harmonic Solutions have been designed and engineered to minimize the impact of the harmonics created and to allow the electrical equipment to perform at their maximum efficiency. Based on critical factors such as grid, application, regulations (IEEE19, IEC, GS/4) and total cost of ownership, Danfoss Harmonic Solutions offer 2 distinct sets of solutions - Passive and Active.

Passive Solutions

- VLT® 12-pulse drives
- VLT® AHF filters

Key features - Robust | Energy Efficient | Tested & Proven | Adaptable to retrofit applications

Active Solutions

- VLT® Advanced Active Filter (AAF)
- VLT® Low Harmonic Drives

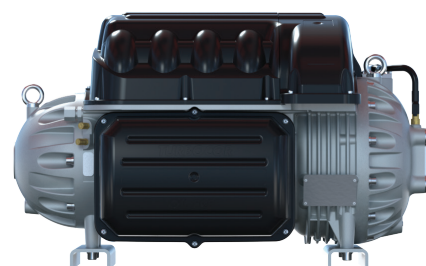
Key features - Compact & light | Lowest cost of ownership | Compliant with PCC installation | Independent of load & grid | Adaptable to retrofit applications



Danfoss Turbocor® Compressors (TTS & TGS Series)

Danfoss Turbocor® compressors, the pioneer of oil-free compressor technology for HVAC, offer unparalleled performance vs traditional designs.

- Oil free magnetic bearings ensure no performance degradation over the life of the compressor
- Compact size and low-weight allowing OEMs and contractors to utilize the space effectively
- Exceptional low-noise operation with no vibration, eliminating the need for additional acoustic mitigation
- Designed to deliver outstanding efficiencies at full and part-load operations leading to lower total cost of ownership
- Standard variable frequency drive to reduce power consumption at low load conditions
- Reduced in-rush current at start-up using soft start module
- Oil free magnetic bearings eliminate the need for expensive oil management systems and reduces periodic maintenance requirements
- Designed for use in a wide range of operating conditions including comfort cooling, heat recovery, heat pumps and low temperature process applications
- Optimized for use with R134a and low GWP refrigerants HFO1234ze, R513A and R515B



Gasketed Plate Type Heat Exchangers

Designed to maximize the performance and boost the output of the HVAC system, Danfoss plate type heat exchangers combine dependable technology and efficient design to provide increased output for the same amount of energy and to enable operations with lower supply temperatures and minimized pressure drop.

- Largest portfolio of plate type heat exchangers, which can match any thermal requirements
- Heat exchangers designed based on EN13445 (PED 2014/68/EU), ASME sec VIII, Div. 1, local design rules and certified as per AHRI Standard 400
- Optimized plate pattern ensures best distribution of the media along plate which results in heat recovery enhancement and close temperature approach
- Connections sizes from DN 25 to DN 700 encompassing a wide range of flow rates
- Capability to handle working pressures up to 40 bar and equipped with plates of different patterns and pressing depths



Inverter Scrolls VZH – 3rd generation with IDVs

3rd generation Danfoss inverter scrolls VZH feature an Interior Permanent Magnet (IPM) Motor, Intermediate Discharge Valves (IDVs) and dedicated variable speed drive deliver an unmatched blend of efficiency, precision, design flexibility and reliability.

The Danfoss inverter scrolls ranging from 4 to 26TR (52TR when used in hybrid tandems at full speed) in one circuit has extended operating map to fit more applications especially IT Cooling, Rooftops, Chillers and Heat Pumps.

IDVs mechanically reduce excessive compression of refrigerant under part-load conditions while maintaining the same cooling capacity. This reduces the effort of the motor and its electrical consumption thus improving the system's seasonal energy efficiency. IDV technology enhances system efficiency by 10-12% on average in Water cooled chillers and by 8-10% in Rooftops and 6-8% in Air cooled chillers.

13 to 26 TR models are already qualified for use with R410A and low GWP refrigerants like R454B and R452B, while the full range will be qualified for LGWP refrigerants within 2022.

**Over
30%**
energy savings with
VZH inverter scroll
compressors



Scroll Compressors Manifold Configurations

Several compressors can be installed in a single system to provide flexible modulated cooling capacity. This approach extends capacity and performance while maintaining design and applied costs at competitive levels. Danfoss IDV technology on top further enhances energy efficiency under part load conditions.

Danfoss expertise in manifold design enables Danfoss to provide even and uneven manifold configurations from 5 to 150TR in a single circuit. For example, a system with six manifold compressors in two circuits offers capacity modulation from 17% to 100%. This enables higher part-load efficiency compared to screw technology in a system of equivalent capacity.

Danfoss goes through a full set of lab qualification tests in order to provide reliable solutions for piping strength, oil balancing, sound and vibrations.

Fixed Speed scroll range DSH has been qualified with R410A and low GWP refrigerants like R454B and R452B, while fixed speed scroll range DSF is qualified with low GWP refrigerant R32 for 50Hz/380-400V applications.

Manifolding solutions
**Ready for
Lower GWP**
refrigerants R452B,
R454B and R32



AB-QM PICV with NovoCon® Actuator

Danfoss AB-QM PICV with NovoCon digital actuators are designed to provide high-accuracy pressure independent flow control and exchange valuable data with a BMS system via BACnet or Modbus bus communication.

They establish the perfect connection between superior hydronic HVAC system performance and smart building automation solutions.

Due to its control accuracy, remote functionality, built in energy management, and flow monitoring features, this product facilitates accelerates the commissioning process, allows easy and predictive maintenance, improves indoor comfort and increases energy savings.

MID certified flow sensors and temperature sensors can directly be connected to the NovoCon® actuator giving you highly precise and valuable insights in energy consumption and can be used to spot problems with inefficiencies in the energy transfer process. In some buildings it can also be used for a fair allocation of energy costs.

*It has been certified as Green Building Product by Singapore Green Building Council.



Ultrasonic Energy Meters

Danfoss ultrasonic energy meter offers a number of distinct advantages compared with conventional mechanical energy metering solutions.

Long life time

Ultrasonic energy meters have no moving parts meaning that there is nothing to wear out - result: ultrasonic energy meters maintain the same high level of accuracy permitting several re-verification and little to no maintenance during their lifetime.

Improved accuracy

Because of a higher measurement frequency, low pressure losses and a high dynamic range, ultrasonic meters provide more reliable data even with low flow rates or poor quality water.

Long battery life

Ultrasonic technology offers low power consumption. This enables ultrasonic energy meters to operate reliably for a longer period than mechanical meters.

Advanced diagnostic functions

SonoSelect™ energy meters offer state-of-the-art diagnostic features – so far only known from process industry meters. Many systems claim to have “diagnostics” when this often means little more than displaying an error code. In contrast, SonoSelect™ features genuine diagnostics with accurate traceability and fast error identification and correction.



Motorized Control Valves

Danfoss Motorized Control Valves (MCV) for HVAC, central cooling/heating systems and district cooling/heating systems ensure stable and accurate control of water, glycol mixtures and steam. This in turn improves temperature control and reliability while increasing the energy efficiency of the system. All of which adds up to enhanced comfort for the end-user.

Excellent control performance

The control capabilities of the MCV range are based on different characteristics, including split characteristics for DHW applications using heat exchangers, as well as linear and logarithmic characteristics. This means that even the most difficult control requirements in district heating/cooling can be met.

Easy handling and installation

Danfoss MCVs are easy to handle, easy to operate and easy to understand. Quick connection to actuator and valve is enabled by a threaded coupling, which also allows for rotation after mounting. External LED visualization and signaling save time and effort during installation and commissioning of MCVs.

Increased reliability and operational safety

All new products feature built-in thermic and overload protection of the electromotor. This radically reduces the risk of operational failure in either the valve or the system as a whole.



Manual Balancing Valves

Danfoss manual balancing valves designed to secure a constant flow verification. It is applied in numerous HVAC systems, like fan coil units (FCU), air handling units (AHU), fan coils, chilled panels, manifolds and central cooling/heating applications like boiler stations/chiller plant rooms. It can also be used as flow verification and shut-off valve for pressure controllers, or as constant flow by-pass balancing in air handling units.

Advantages of the Danfoss Manual Balancing Valves:

- 100% shut-off function for service and repair
- Compact valve with excellent flow characteristics
- Easy readable digital scale
- High flow rates
- Locking of pre-setting
- Measuring orifices for easy verification of the flow

Due to the static hydronic balancing principle used, Danfoss manual balancing valves are recommended in constant flow systems.

To balance variable flow systems and achieve better indoor comfort and energy efficiency, it is recommended to use a dynamic balancing solution.

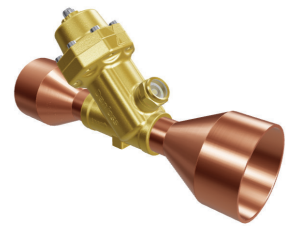
For example, Danfoss ASV differential pressure controllers and corresponding partner valves, or **Danfoss AB-QM Pressure Independent balancing and Control Valves (PICV) with corresponding actuator.**



ETS Large Electric Expansion Valves

Designed to stand a higher minimum operating pressure drop than previous models, the new ETS valves offer a high serviceability and are compatible with low and medium-density HFC and HFO refrigerant blends, including A2L options. The new ETS are for large chiller and heat pump applications.

- Easy serviceability: no need to remove the valve body from the system if service is ever required
- Refrigerant compatibility: with all common refrigerants including some new ones.
- Linear and S curves available: flexibility to meet application optimal load requirements
- Direct replacement of existing models



Thermostatic Expansion Valves

Danfoss' range of Thermostatic Expansion Valves are designed to ensure a precise control of the injection of refrigerant liquid into the evaporators. They also protect the compressor motor against liquid refrigerant entering it.

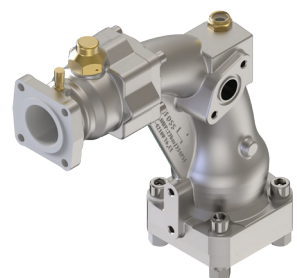
- Equipped with double diaphragm resulting in increased operating cycles and an enhanced product life
- Available as complete valves (fixed orifice) or parts programme, i.e with separate valve body and orifice assemblies
- Laser-welded stainless steel power element for longer diaphragm life, high pressure tolerance & working pressure and better corrosion resistance



OFC Oil-Free Check Valves

OFC is an innovative discharge solution developed that incorporates a damp nozzle check valve, a stop valve and diffuser functions. OFC valves can improve system efficiency, reliability and reduce complexity for oil free chillers & heat pumps.

- Higher system efficiency
- Higher compressor and system reliability
- Reduced complexity in design, inventory, installation and service
- Low sound, better customer perception, higher comfort
- Additional version without BV to solve customer's pipe work constraint



MCX Programmable Controls

Compliant to open standards, universal MCX controllers provide ultimate software control, thus helping tailor the performance of the air conditioning system to exact requirements.

- Modular hardware architecture, from stand-alone MCX controller, to more complex system
- Easy to program using the C programming language and graphical programming tool, it provides versatility and freedom compared to proprietary systems
- Connections to peripheral equipment via open standard protocols enabling easy integration with electromechanical components and building management systems thus enabling complete control over applications such as chillers & AHUs
- Enables remote access and control through internet/intranet or via modem or MODBUS over Ethernet
- A wide range of control modules and accessory modules that create a cost effective solution



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