

ENGINEERING  
TOMORROW

*Danfoss*

Danfoss components for hydrocarbon refrigeration

Leapfrog to a **long-term solution**  
with Danfoss' **wide product**  
**portfolio** for hydrocarbons

**Zero**

ODP and negligible  
GWP when using  
hydrocarbons.

[www.danfoss.com/hydrocarbons](http://www.danfoss.com/hydrocarbons)

# Energy efficient, environmentally friendly and safe hydrocarbons

Hydrocarbons have excellent thermodynamic properties, and in this respect they are as good as or better than HFC or HCFC refrigerants in most applications. When they are used responsibly and relevant norms are followed, hydrocarbons can be employed in a variety of refrigeration and air conditioning applications. Hydrocarbons can deliver high energy efficiency and have zero ODP and negligible GWP.

Hydrocarbons are very energy-efficient and climate-friendly refrigerants with very limited impact on global warming, and no impact on the ozone layer.

Hydrocarbons have been used in household refrigeration and some speciality applications for many years, and are now entering other applications, for instance display cabinets and large chillers.

Since hydrocarbons are flammable, safety always needs to be considered when designing, building and servicing systems.

Danfoss has extensive experience in working with flammable refrigerants and has raised the bar for safety by ensuring that every Danfoss component complies with the requirements for flammable refrigerants in the relevant safety standards.

All components for hydrocarbons comply with the requirements in the Pressure Equipment Directive (PED) (97/23/EC) fluid group I (flammable/toxic media).

## Relevant norms & standards when working with hydrocarbon refrigerants

### > ATEX 94/9/EC Directive

Specifies the requirements for equipment intended for use in potentially explosive atmospheres (both electrical and mechanical) Organisations in EU must follow the directive to protect employees from explosion risk in areas with an explosive atmosphere

### > Pressure Equipment Directive 97/23/EC (PED)

The directive provides a legislative framework for pressurised equipment and assemblies

### > EN378 1-4

EN378 defines “best practice” for design, operation and maintenance. It is a harmonised standard, which ensures that all essential requirements in the PED are fulfilled.

### > ISO 5149 1-4

The international safety standard, defines “best practices” very similarly to EN378, but without referring to EU law

### > IEC 60335: International Standard

Specifies all requirements for small hermetically sealed household appliances (supports the EU Low Voltage Directive (2006/95/EC). It deals with the safety of electrical appliances for household and similar purposes

# Refrigeration Controls

## Thermostatic expansion valves type TU and TC with fixed orifice

- › Thermostatic expansion valves regulate the injection of refrigerant liquid into evaporators
- › Bi-flow function
- › Capacities from 0,5 kW up to 28 kW (R290)
- › Max. working pressure 34 bar for TU and 45.5 bar for TC
- › Stainless steel, hermetically tight solder version
- › Bimetal connections for fast and safe soldering
- › Laser welded, stainless steel power element/capillary tube
- › Connections:  
Inlet: 1/4", 3/8" and 1/2"  
Outlet: 3/8", 1/2" and 5/8"
- › Internal and external pressure equalization
- › Adjustable and non adjustable superheat setting

## Expansion valves type TGE

- › Thermostatic expansion valves designed for fluorinated refrigerants
- › Bi-flow with expansion in both directions
- › Capacities up to 130 kW (R290)
- › Head pressure independent
- › Balance port (BP)
- › Max. working pressure 46 bar
- › Laser welded, stainless steel power element/capillary tube
- › Inlet 5/8" or 7/8", outlet 7/8"
- › External pressure equalization
- › Adjustable superheat setting

## Electric Expansion Valve type CCME 10-30

- › Precise positioning for optimal control of liquid injection
- › High reliability and precision
- › Capacities up to 180 kW (R290)
- › Max. working pressure 90 bar and MOPD up to 50 bar
- › Internal and external corrosion resistant design
- › Combined stainless steel butt weld/solder connections for installation in copper piped system as well as steel piped system
- › UL recognition

## Solenoid valves type EVR

- › Direct or servo operated solenoid valve especially designed for liquid, suction, and hot gas lines
- › Media temperatures up to 100 °C
- › Solder connections up to 7/8"
- › Extended ends for soldering make installation easy. It is not necessary to dismantle the valve when soldering
- › Wide choice of coils for a.c.
- › Safe mounting with screw-on system
- › MOPD up to 21 bar

## Shut-off valves type BML

- › Manual shut-off valve for installation in liquid, suction and hot gas lines
- › Connections size up to 22 mm (7/8") ODF
- › Capacities ( $K_v$ ) 0.3 -2.9 m<sup>3</sup>/h

## Check valves type NRV and NRVH

- › Non-return valves for liquid, hot-gas and suction lines
- › NRVH with stronger spring to avoid resonance problems with compressors connected in parallel
- › Connections size up to 22 mm (7/8") ODF
- › Capacities ( $K_v$ ) 0.56 -5.5 m<sup>3</sup>/h

## Filter driers type DCL and DML

- › Protects refrigeration and air-conditioning systems from moisture, acids and solid particles
- › Connections size up to 22 mm (7/8") ODF
- › Capacities up to 100 kW

## Sight glasses, types SGP X, SGP I and SGP N

- › Sight glasses for monitoring condition and moisture content of refrigerant in liquid lines and the flow in oil return lines
- › SGP I for R290, R600 and R600a, and SGP N for R1270.
- › Connections size up to 22 mm (7/8") ODF





# Refrigeration Controls

## Differential pressure switches type RT 260 AE and RT 262 AE

- › Connection G 3/8A + welded nipple Ø6.5/10 mm
- › Regulating range 0.1 to 4 bar

## Differential pressure switches type MP 55E

- › Protects refrigeration compressors against low lubricating oil pressure
- › Wide regulating range (ΔP 0.3 to 4.5 bar)
- › Connections ¼" ODF

## Pressure switches type RT-E

- › Connection G 3/8A + welded nipple Ø 6.5/10 mm
- › Range RT 5E: 4 to 17 bar
- › Regulating ranges available from -0.8 bar as minimum up to 30 bar as maximum

## Thermostat type RT-E

- › 2 m capillary tubes
- › Range -5°C to 30°C
- › High temperature versions available up to 250°C

## Pressure switches type KP-E

- › Protects against excessively low suction or high discharge pressure
- › The high pressure switches are equipped with failsafe double bellows, and low pressure switches with reduced bellow travel to enhance life time
- › Manual and automatic reset available
- › Regulating ranges -0.2 to 7.5 bar and 8 to 32 bar
- › Connection ¼" ODF

## Pressure Transmitters type AKS

- › Designed for precise and energy optimised control
- › Factory calibrated, no adjustment necessary
- › Effective moisture protection for harsh environments
- › Wide variety of voltage and current outputs available
- › Wide variety of pressure ranges available

## Electronic Refrigeration Controllers type ERC

- › Manages all energy consuming parts in the refrigeration appliance
- › Designed to cut energy consumption
- › IP rated body for high moisture resistance
- › Internationally approved hardware (CE, UL, GOST, and many more)
- › For use in all climates, indoors as well as outdoors
- › IECEx approved for use with hydrocarbon refrigerants
- › Can be used on all light commercial applications

## Pressure operated Water Valves, types WVFX, WVO and WV5

- › Maintains stable condensing pressure in systems with water cooled condensers
- › Precise control without setting drift.
- › Double sealing between the refrigerant and the water line
- › Water valves can be used together with a double walled heat exchanger and water circuit in such a system does not need to be considered as part of the installation for flammable refrigerants (EN378-1:2008, clause 4.4.2.2)
- › Insensitive to water pulsating pressure
- › Insensitive to dirt
- › Wide operating range
- › Complete flow range from 1.4 – 300 m<sup>3</sup>/h

## Crankcase pressure regulator, type KVL

- › KVL protects the compressor motor against overload during start-up after long standstill periods or after defrost periods
- › Refrigeration system can operate under large load variations
- › Very easy adjustment of the set point.
- › Product quality is maintained throughout a long operating lifetime

## Condensing pressure regulator, type KVR

- › Maintains a constant and sufficiently high condensing pressure even in low ambient and low load conditions
- › Stainless steel bellows gives a very long operating life
- › Easy and accurate adjustment with Allen key
- › ¼" Schrader valve for pressure gauge connection

## Hot gas bypass regulator, type KVC

- › Protects the compressor against too low suction pressure
- › Keeps suction pressure above the compressor's minimum pressure limit
- › Adapts the compressor capacity to the actual evaporator load
- › Proportional regulation
- › Hermetic design

## Evaporator pressure regulator, type KVP

- › Protects against too low evaporator temperature
- › Maintains desired humidity in the cold room
- › Guarantees longer storage time and reduced food spoilage
- › Food is kept at the highest possible quality level by minimizing dehydration

# Micro Plate and MicroChannel Heat Exchangers

## Micro Plate Heat Exchangers

Micro Plate Heat Exchangers (MPHE) have a smaller hold-up volume compared with competing traditional BPHE (Brazed Plate Heat Exchanger) technologies, with the clear benefit of reduced refrigerant charge in hydrocarbon-based applications. MPHE products are dedicated not only to specific applications but also to different duties within them:

### Chillers

- › Dedicated C-range for chillers
- › Internal volume reduced by 25 % compared with standard BPHE
- › Full coverage across all applicable chiller solutions capacities
- › Evaporators and condensers
- › Efficient operation at full and part load
- › Rugged and reliable for long service with minimal maintenance
- › Minimal use of materials
- › Small footprint

### Heat pumps

- › Dedicated H-range for heat pumps
- › Wide heating capacity range
- › Evaporators and condensers
- › Efficient operation at low heat flux and close temperature approaches, assuring high COP and seasonal efficiency
- › Rugged and reliable for long service with minimal maintenance
- › Minimal use of materials
- › Small footprint
- › Internal volume reduced by 40 % compared with standard BPHE



## MicroChannel Heat Exchangers

MicroChannel Heat Exchangers (MCHE) have hold-up volumes as much as 70 % lower compared with competing technologies. The clear benefits of high efficiency, low refrigerant charge, compactness and reliability are available from dedicated models across a wide range of applications, featuring:

- › Low air-side pressure loss saves on fans and energy
- › All-aluminium construction for durability and 100 % recyclability
- › Working temperature up to 125 °C
- › Working pressure up to 45 bar
- › Catalogue units available for:
  - Commercial air conditioning 11-51 kW
  - Condensing units 2-5 kW
  - Air dryers 3-7 kW
  - Cabinet cooling 2-5 kW
  - Cold rooms 2-12 kW
- › Custom designs available on request



# Compressors and Condensing Units for R290

# DC BD Compressors for R290 and R600a

## Running with R290 for light commercial refrigeration in LMBP applications

- › Such as bottle coolers and vending machines, water and beer coolers, display freezers and display cases.
- › Small dimensions make compact cabinets
- › Low sound emission
- › Reduced installation and running costs

## Fix speed Compressors and Condensing Units range

- › Available in T, N, SC platforms (3-21 cm<sup>3</sup>)
- › Application at high ambient temperature possible
- › High appliance and system robustness at rough operating conditions
- › Insensitive towards unstable electric power supply
- › Prewired and ready to braze Condensing Units

## Variable Speed SLV15CNK.2 Compressor and Controller

- › Variable speed 2000 – 4000 rpm, with permanent magnet motor
- › Intelligent controller for whole appliance will save up to 40% energy
- › Monitor system performance, intelligent controller for ultimate control and alarm management, HACCP compliance easy
- › Built-in data logging function allows food quality and safety
- › Protection: current, speed, temperature; electronic thermostat

## Running with R290 or R600a for stationary LMBP applications, freezers and solar powered systems

- › Such as ice cream freezers and boxes, pharmaceutical applications up to 200 litres
- › 10-45 V and 12-24 V DC
- › Electronic control unit with built-in speed control, thermostats signal, thermal protection, safety against destructive battery discharge, electronic thermostat and fan speed control on selected models via the software "Tool4Cool®"
- › Complete R600a compressor range is also available through Danfoss sales network



Compressors for R600a



Compressors and condensing units for R290

## Danfoss Refrigerant Policy Statement

Danfoss encourages the further development and use of low-GWP refrigerants to help slow – and ultimately reverse – the process of global warming while helping to ensure continued global well-being and economic development along with the future viability of our industry. We will enable our customers to achieve these refrigerant goals while continuing to enhance the energy efficiency of refrigeration and air conditioning equipment.

Danfoss will proactively develop products for low-GWP refrigerants, both natural and synthetic, to fulfil customers' needs for practical and safe solutions without compromising energy efficiency.

Danfoss will lead and be recognized in the development of natural refrigerant solutions. In the case of hydrocarbons, ammonia and carbon dioxide, we will focus on solving the challenging application difficulties related to flammability, toxicity, corrosiveness and extreme pressures, while enabling cost competitive and highly energy-efficient systems.

Danfoss will also develop and support products for low-GWP synthetic refrigerants, particularly for those applications where natural refrigerant solutions are not yet practical or economically feasible.

Furthermore, Danfoss supports the establishment of a global regimen (such as the Montreal Protocol) to phase down emissions of high-GWP refrigerants.

In recognition of the fact that HFC refrigerants enable safe, energy efficient products with positive societal benefits, HFCs should be controlled separately from undesired waste by-products of power plants, factories, automobiles, etc., by means of a knowledgeable global governance system and infrastructure. A practical cap and phase down schedule must be established to facilitate product transitions, to avoid severe market disruption or volatile prices during the transition period, and to provide for long-term production of very small quantities of HFCs for critical needs.

*For questions and more information please contact your local Danfoss sales office.*

