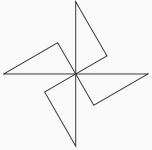


Bring ideas to life
VIA University College



DES M1

Control and performance

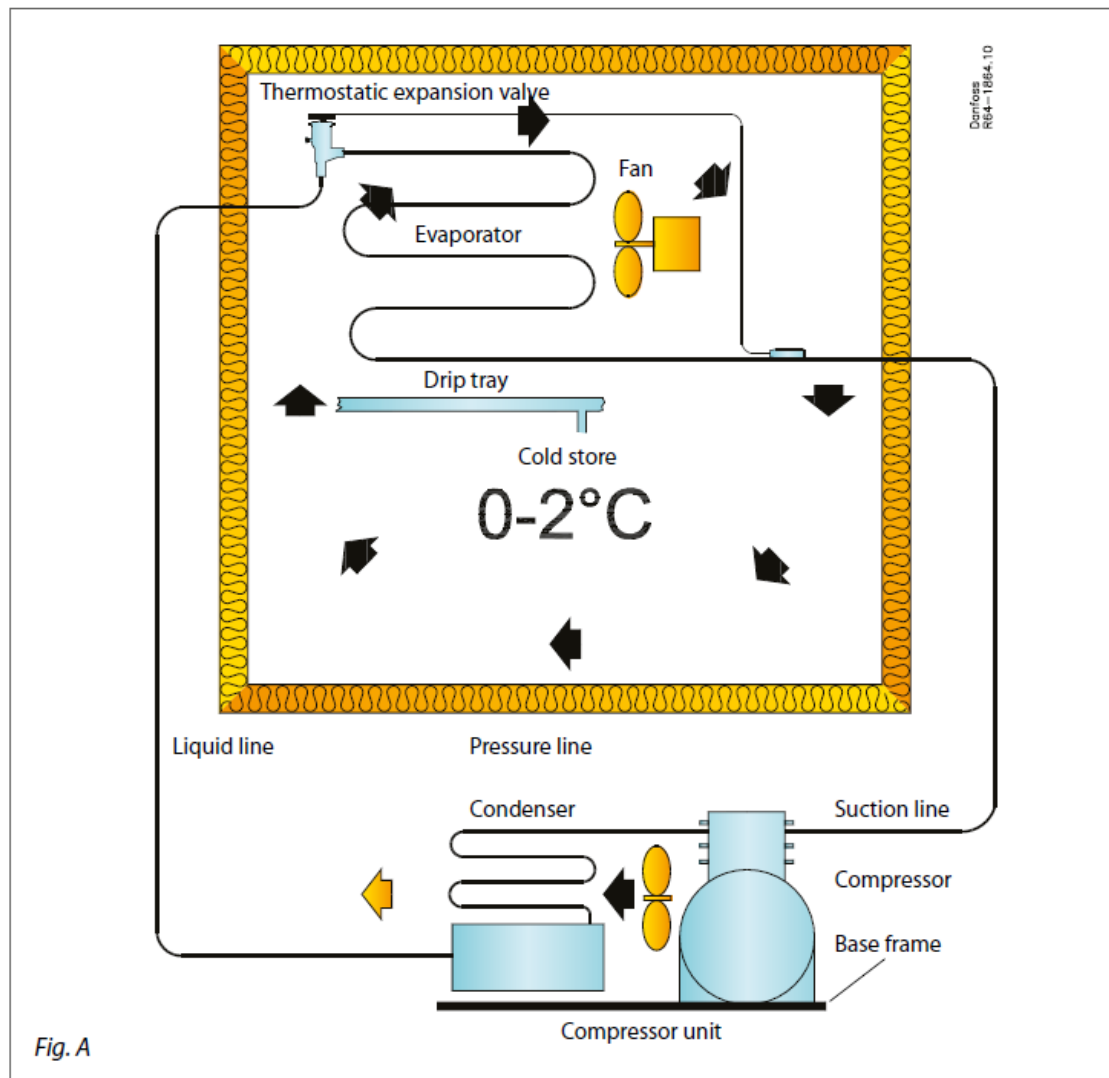
Lecture 5

Feedback on handin 2

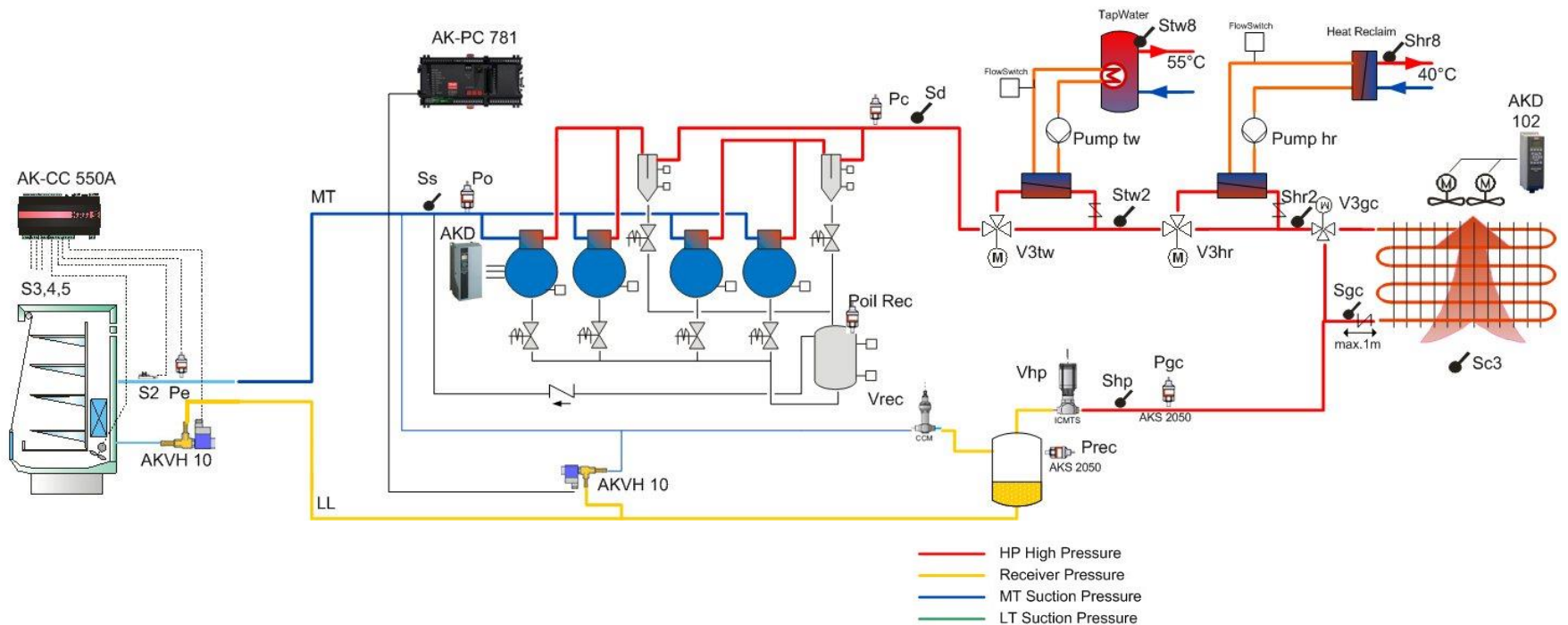
Expansion valve

Control of refrigeration systems

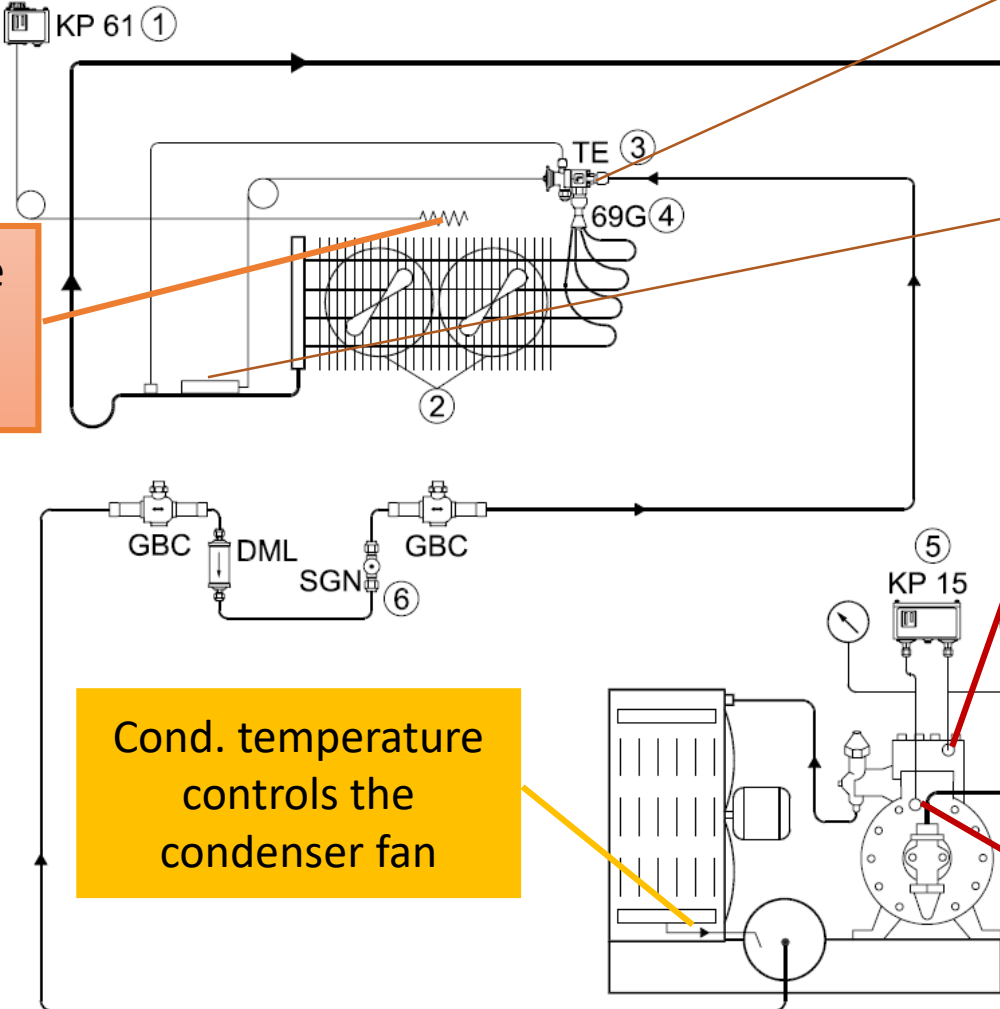
Automation and control



- Trans critical CO2 application incl.
 - Compressor with speed control
 - Oil management
 - High Pressure control incl. Gas Cooler
 - Heat Reclaim



Automation and control Principle, main components



Room temperature controls the evaporator fan

Expansion valve feeds the evaporator

Evaporator outlet temperature controls the expansion valve

High pressure cuts compressor out (protection)

Cond. temperature controls the condenser fan

Low pressure controls the compressor (control/protection)

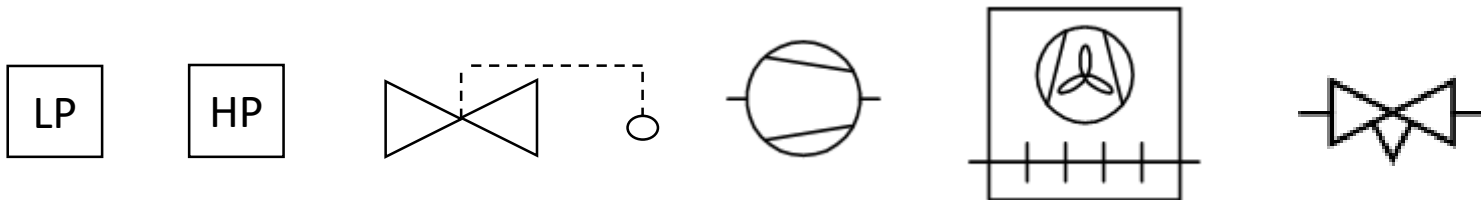
Control exercise

4-5 persons

Make a simple drawing of the demo system including (5 minutes per group to study demo system):

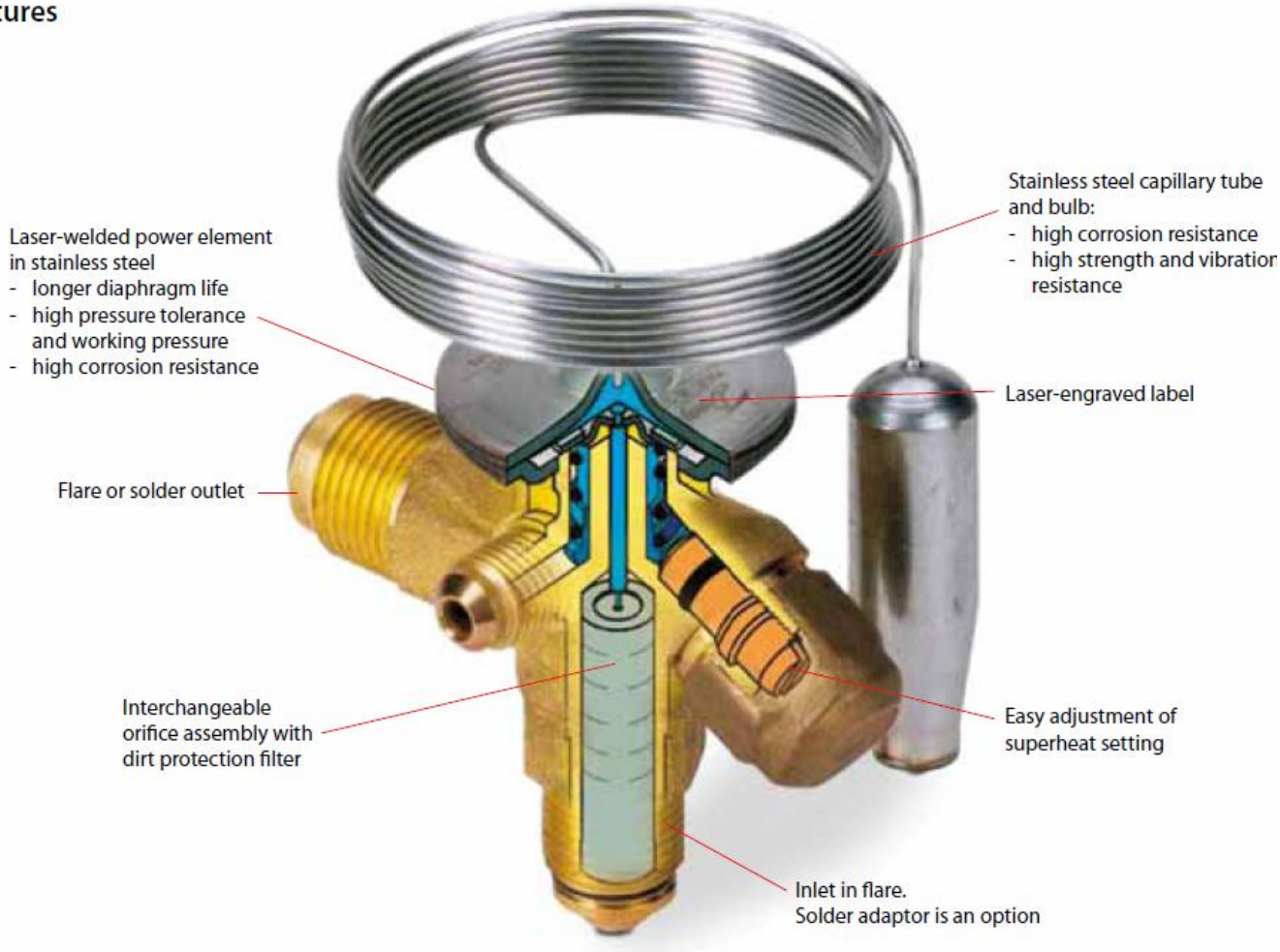
- thermostatic expansion valve
- temperature (pressure) regulator
- low and high pressure control for compressor

Use these symbols:



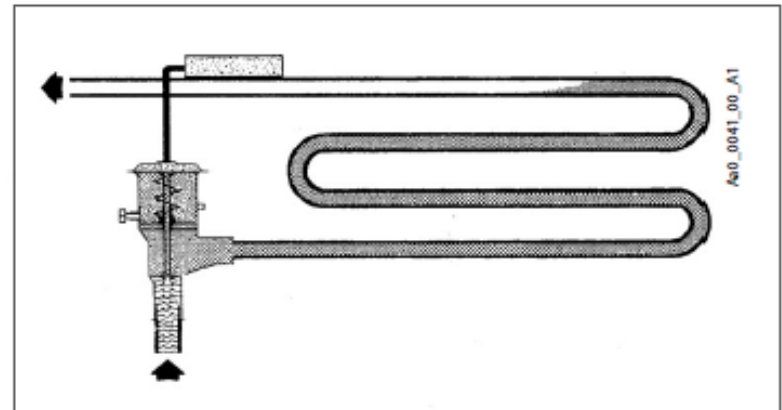
Thermostatic expansion valve

Features



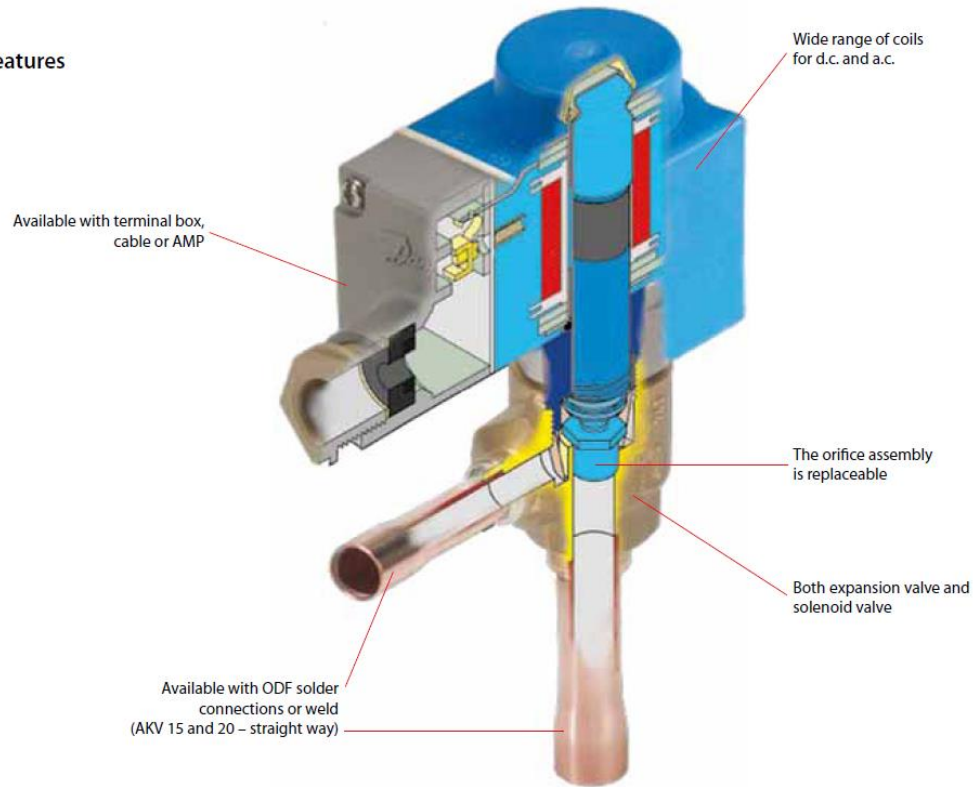
Thermostatic expansion valve feeds a evaporator

This figure shows an evaporator fed by a thermostatic expansion valve. A small amount of liquid is contained in a part of the bulb. The rest of the bulb, the capillary tube and the space above the diaphragm in the valve housing is charged with saturated vapour at a pressure corresponding to the temperature at the bulb. The space under the diaphragm is in connection with the evaporator and the pressure is therefore equal to the evaporating pressure.



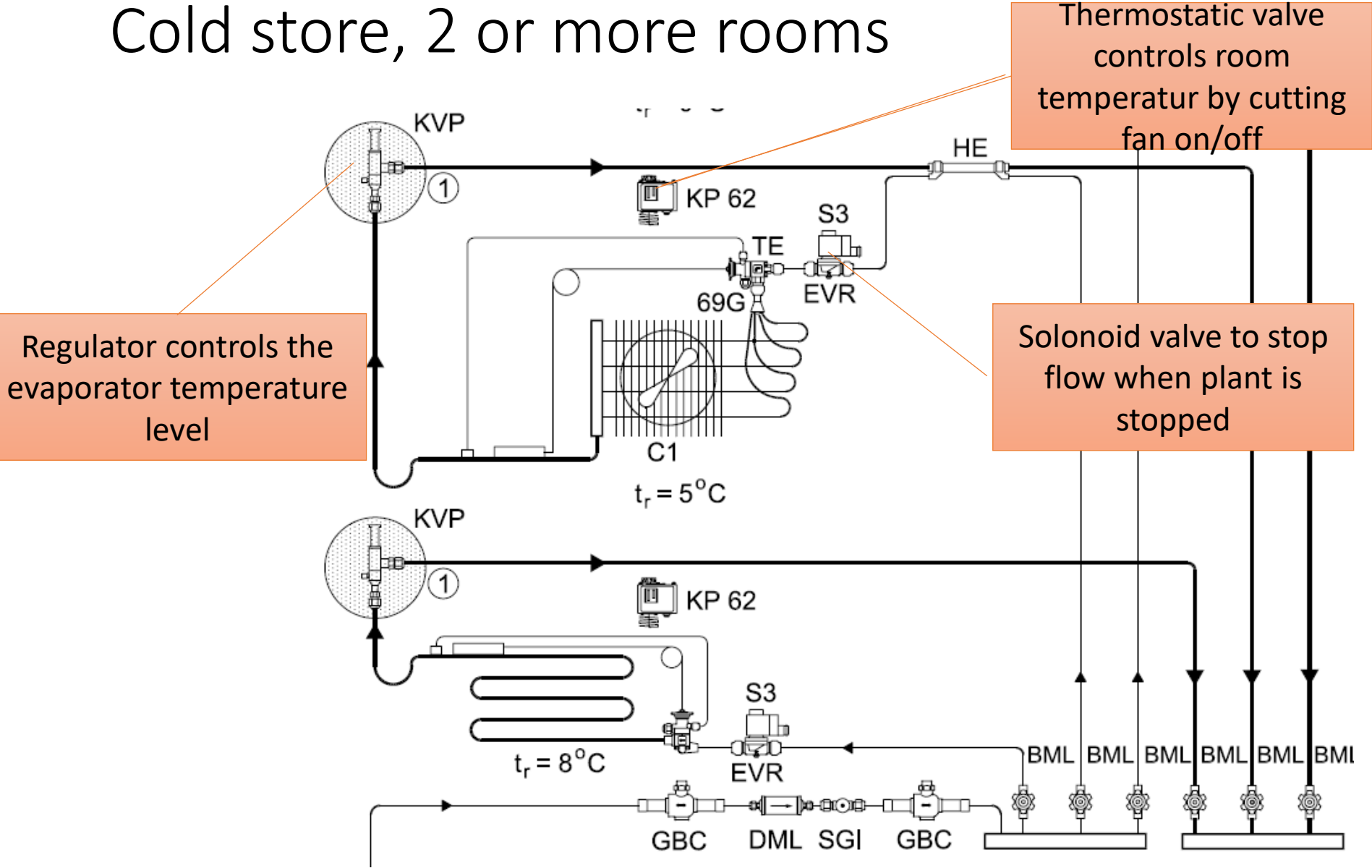
Expansion /solenoid valve (PWM type)

Features



Automation and control

Cold store, 2 or more rooms

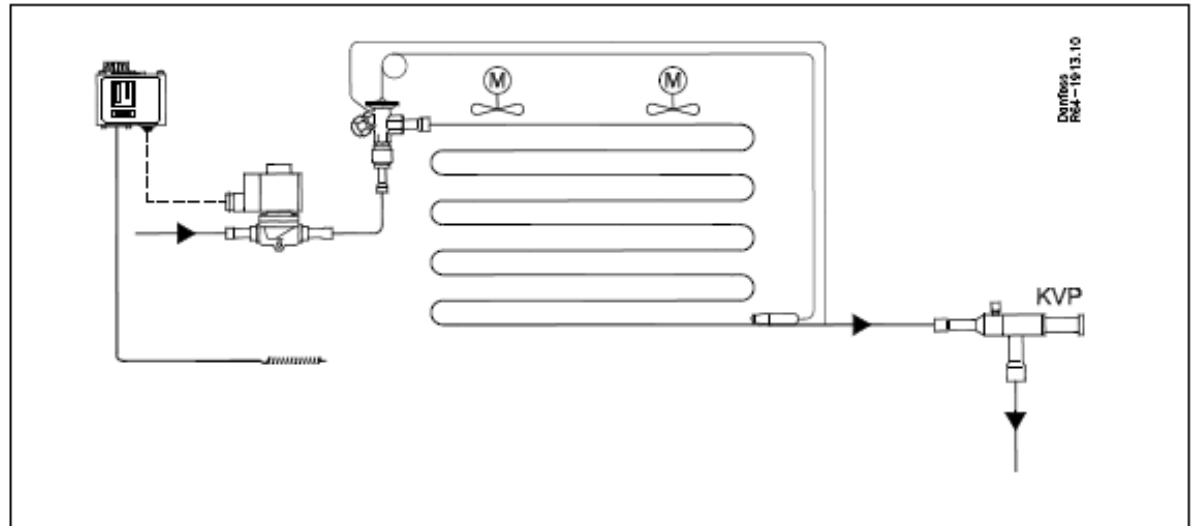


Suction pressure

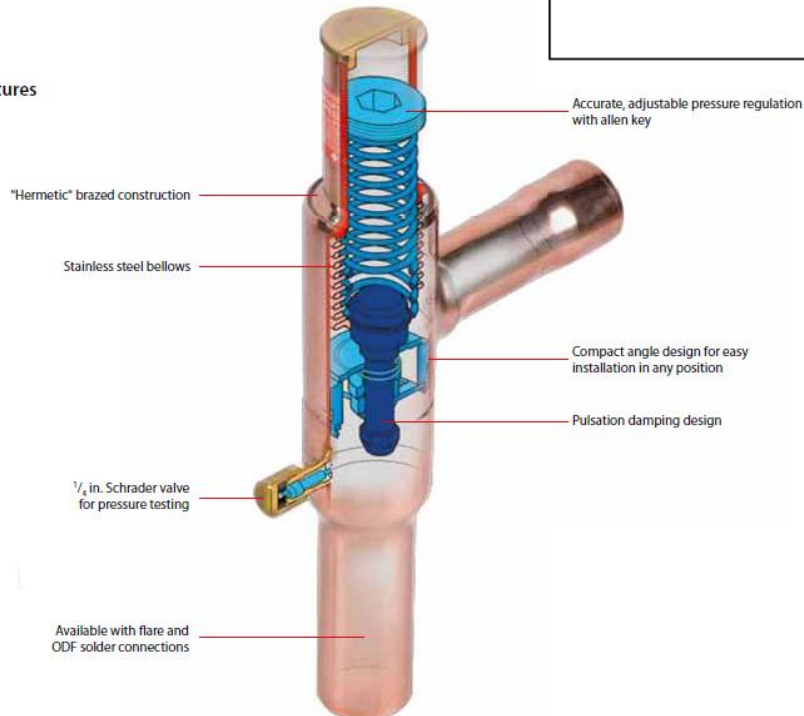


KVP Evaporator pressure regulator

The KVP is mounted in the suction line after the evaporator pressure and thereby a constant surface temperature on. By throttling in the suction line, the amount of refrigerant



Features



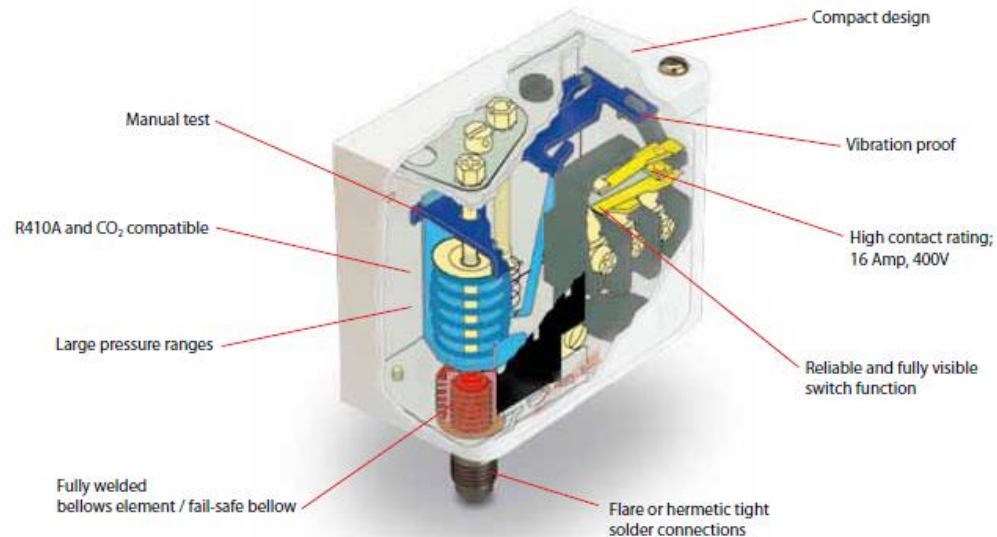
Low and high pressure control



KP: excellent operation and easy installation

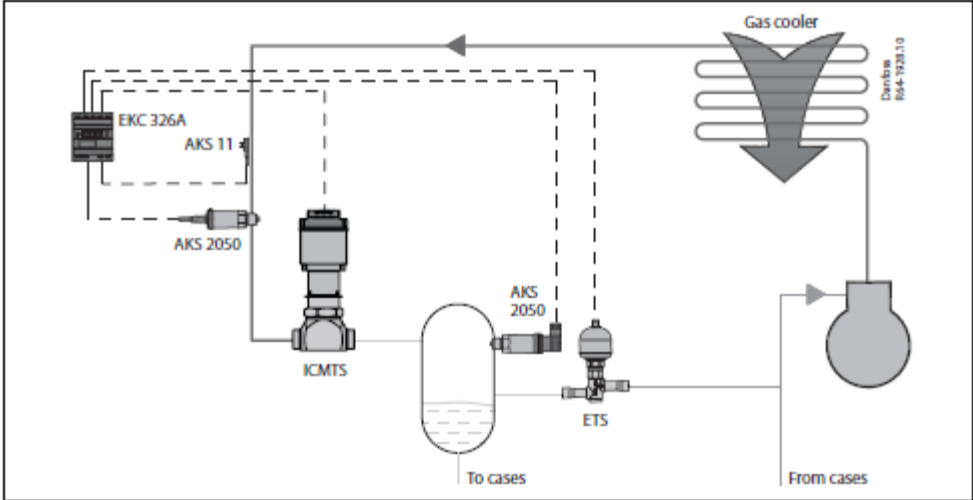
KP pressure controls are designed to protect refrigeration systems from excessively high discharge pressures, excessively low suction pressures, to start/stop compressors or to operate fans of aircooled condensers. KP thermostats with adsorption charge are the optimum choice for frost protection of chillers. The enhanced contact system for 16 Amp makes it possible to operate electrical motors up to 2 kW directly, without the use of contactors.

Features



Gas cooler control

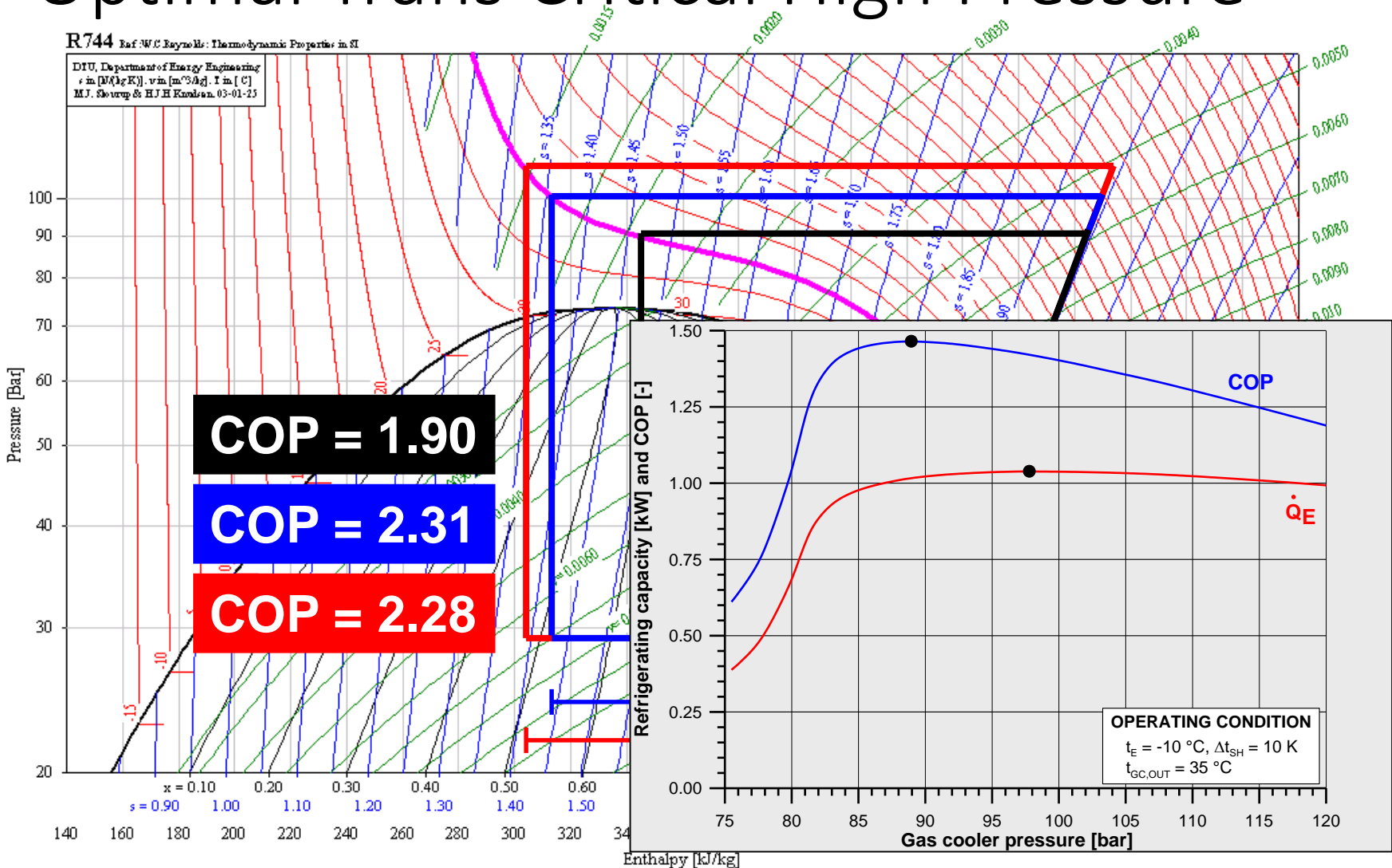
ICMTS Application



Optimal Trans Critical High Pressure

R744 Ref. W.C. Reynolds: Thermodynamic Properties in SI

DTU, Department of Energy Engineering
 ϵ in [kJ/kgK], v in [m³/kg], T in [°C]
 M.J. Skovrup & H.J.H. Knudsen, 03-01-25



Pressure gauge



Figure 9.5 Refrigeration pressure gauge (Star Instruments)

Compressor protection against liquid hammer

Damage prevention...

...with HBCP compressor protection!



Based on continuous monitoring of the suction gas quality the HBCP features:

- The sensor protects the compressor against damage in the event of liquid hammer from the system.

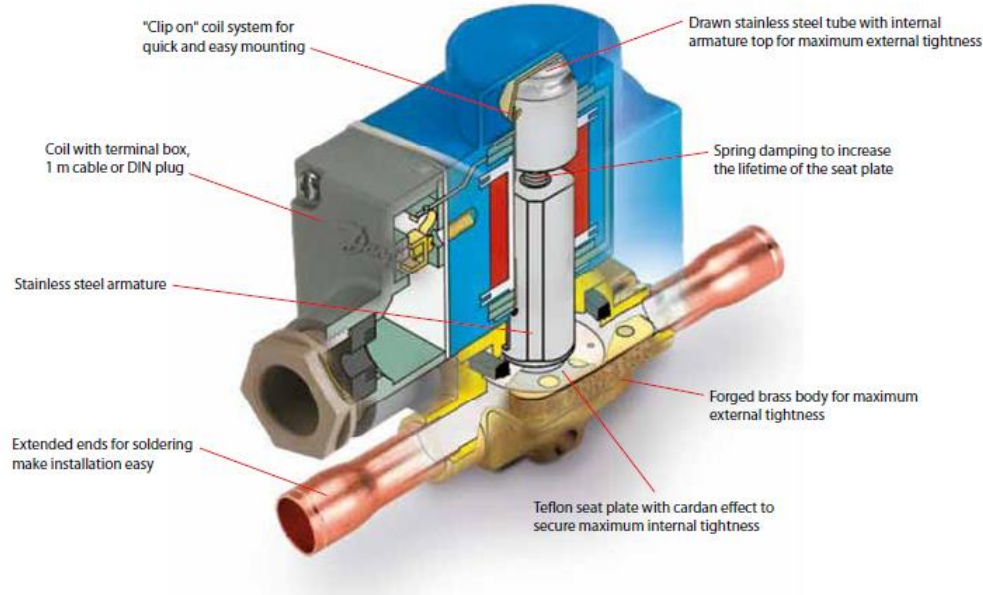
Solenoid valve



EVR: high reliability and flexibility

EVR valves are direct or servo-operated solenoid valves for liquid, suction and hot gas lines. They are suitable for condensing units and power packs in all refrigeration, freezing and air conditioning applications and are compatible with fluorinated refrigerants, including high-pressure refrigerants such as R410A (EVRH). The valves can be delivered as normally open and normally closed valves as well as with or without manual operation.

Features



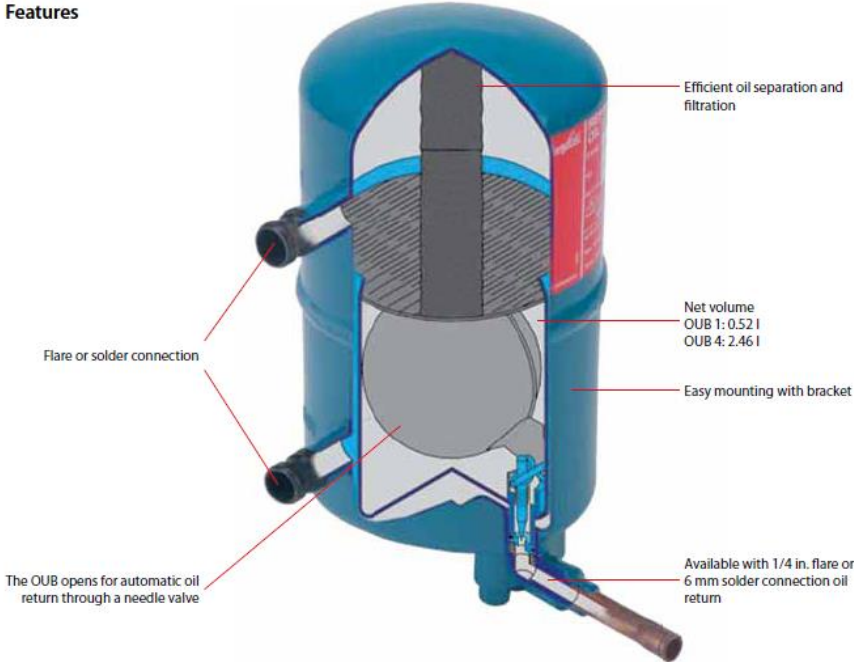
Oil separator



OUB: The easy way for oil return

The oil separator type OUB is for use in all refrigeration plant where the compressor lubricating oil must be returned direct to the compressor oil sump under all operating conditions. In this way lubricating oil from the compressor is prevented from circulating with the refrigerant in the refrigeration system itself.

Features



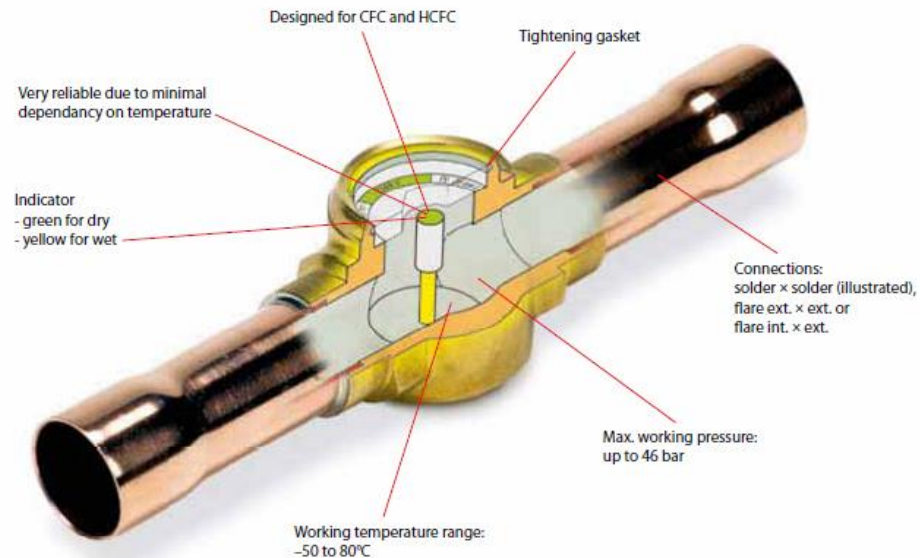
Sight glass



SGN/H, SGR, SGRN/H: secure optimal protection

Sight glasses are mostly installed in the liquid line between the filter drier and the expansion valve to monitor the condition of the refrigerant. The SGR is mainly used to indicate the condition of the refrigerant as well as the liquid level in the receiver or the oil level in the compressor and has no moisture indicator. The SGN/H and SGRN/H are equipped with sensitive indicators that reflect a colour, depending on the moisture content in the refrigerant.

Features



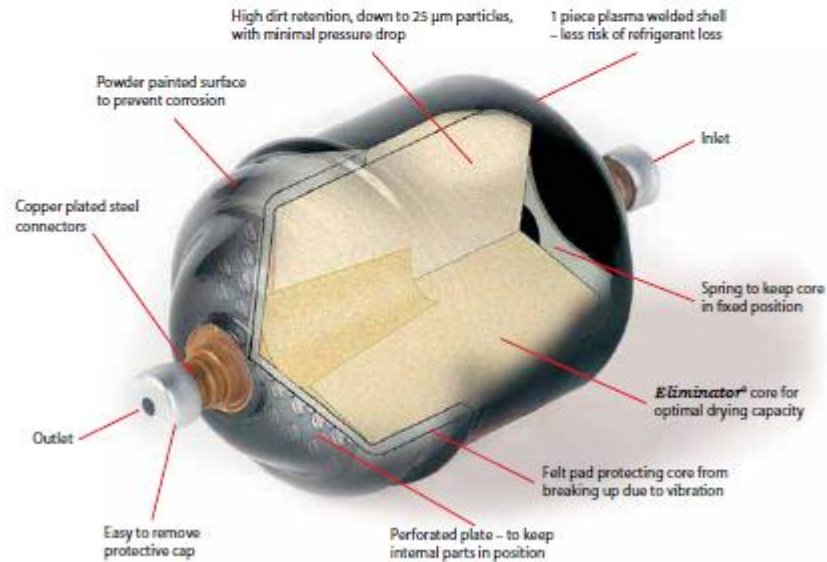
Filter dryer



DML: Excellent protection of your refrigeration system

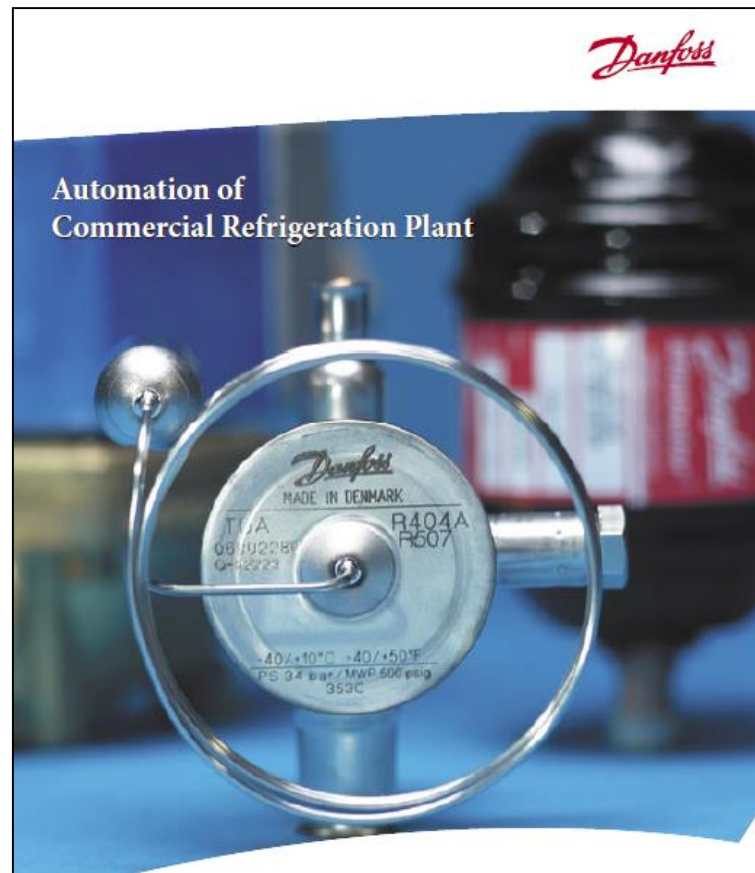
The DML liquid line filter driers protect refrigeration and air conditioning systems from moisture, acids and solid particles. The 100% solid molecular sieve core, assures a high drying capacity and avoids acid formation in the system.

Features



Automation and control

- More details for the mini project



Groupwork 2

Exercises

Refrigeration Circuit 4

Refrigeration Control 1

Solve exercises in group, finalize before next lesson (in group or individually). Prepare to present your solutions.