

SRC-W & SW series compressors

Additional cooling

(WA-11-03-E)

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11. Additional cooling

11.1 Oil cooling

Hard operating conditions (high condensation and/or low evaporation) require the oil cooling. The application limits with each refrigerant have to be considered (consult the application limits). With the oil Total Fina Elf Lunaria SK 100 (standard with R22) the discharge gas temperature has to be maintained under 80 °C. With the oils CPI CP 4214 150 and DEA SE 170 the maximum limit is 100 °C. Anyway, this limit is different according to the different applications (consult Refcomp).

Additional cooling by direct liquid injection is possible with limitations due to risk of excessive oil dilution (maximum cooling capacity has to be 10% of total refrigerating capacity) . In this case only the lubricants CPI 4214 150 and CASTROL SW 220 HT EU can be used thanks to their viscosity properties.

11.2 Operating conditions to be considered for the oil cooling

- refrigerant type
- evaporating /condensing temperature
- suction gas superheat
- part load operation
- ECO operation

The oil cooler must be thermostatically controlled, according to the following logic, see Table A:

	Sensor position	Temperature Setting [°C] (nominal)	Temperature Setting [°C] (maximum)
Temperature regulator oil cooler	DISCHARGE GAS LINE	30K > Tc max	80
By-pass valve	DISCHARGE GAS LINE	20K > Tc max	70

Table A: Temperature setting for oil cooling

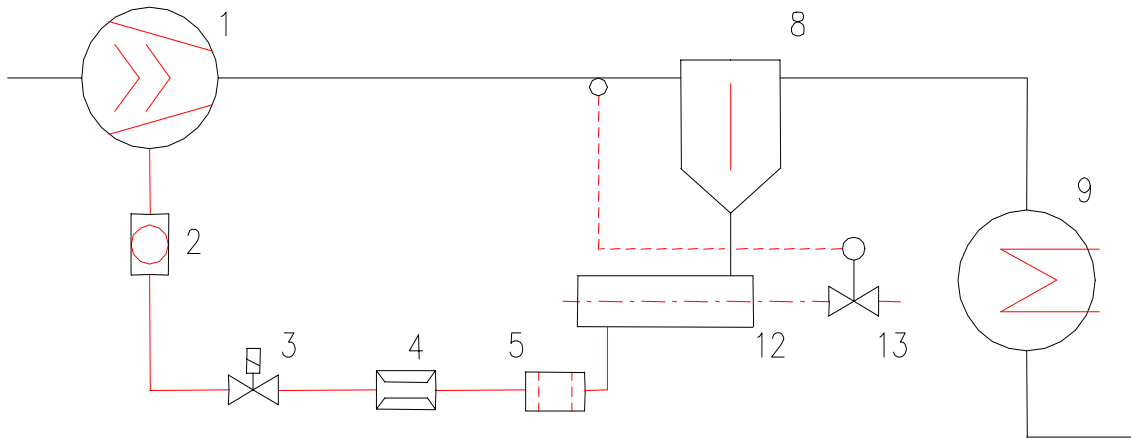
11.3 General recommendation about oil cooler

- installation near to the compressor
- installation under the level of oil separator/compressor
- oil pressure drop < 0.5 bar during normal operation
- oil solenoid valve in the oil line close to the compressor to avoid flooding during off periods
- oil line shut-off valve recommended for service purposes
- oil by-pass around the oil cooler or possible heating of oil cooler if there are the cooling conditions : oil temperature in the oil cooler near to 20 °C or oil volume in the cooler and pipelines more than 25 litres. In fact in this two situations the oil flow drop are too much.

11.4 Examples of oil cooler application

WATER COOLED OIL COOLER

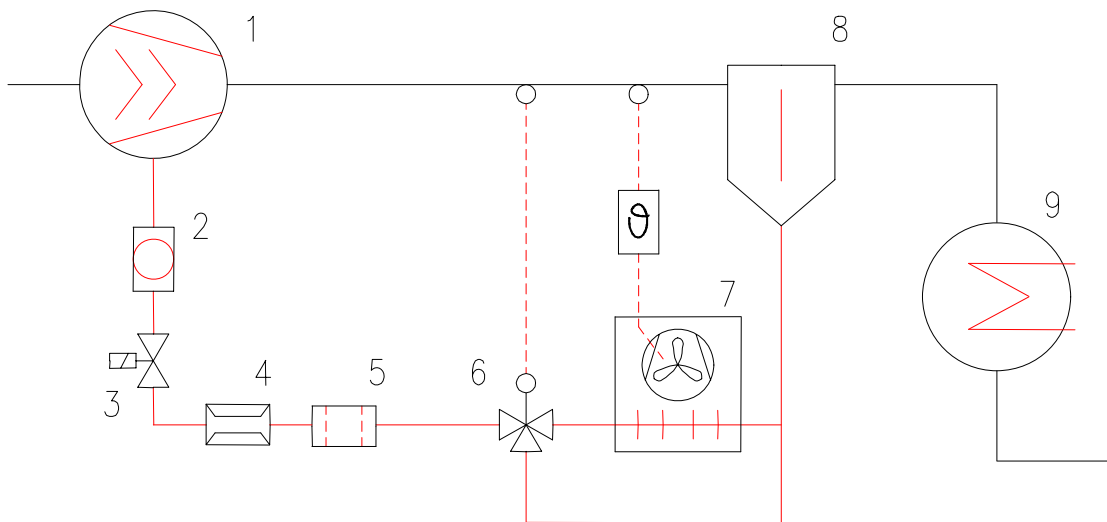
Temperature control by means of thermostatic water regulator (temperature setting up to 100 °C). In the position 13 there is a temperature regulator for oil cooler.



Picture 11-A: Schematic layout of water oil cooler

AIR COOLED OIL COOLER

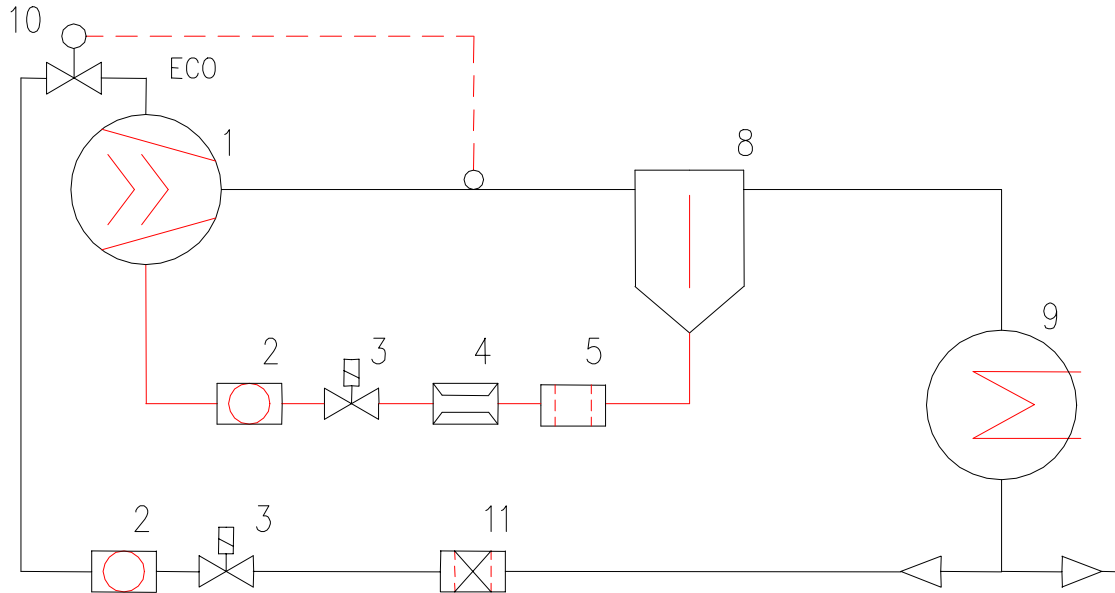
Temperature control by means of thermostatic switching in or out or stepless speed control of the cooler fans (temperature setting up to 100 °C). In the position 6 there is a by pass solenoid valve that should have a modulating control function thermostatically controlled with high sensitivity and an effective temperature range less than 10 K).



Picture 11-B: Schematic layout of air oil cooler

DIRECT REFRIGERANT INJECTION

A relatively simple and cheap way to provide additional cooling is a liquid injection at intermediate pressure. When the additional cooling capacity exceeds 10% of the compressor cooling capacity, it is recommended to use oil cooling only. The injection of too much refrigerant can lead to oil dilution and to a consequent loss of lubricant properties.



Picture 11-C: Schematic layout of liquid injection

Key

- | | |
|--------------------------|--|
| 1) Compressor | 8) Oil separator with heater and level control |
| 2) Sight glass | 9) Condenser |
| 3) Solenoid valve | 10) Liquid injection valve |
| 4) Oil flow switch | 11) Drier filter |
| 5) Oil filter | 12) Water cooled oil cooler |
| 6) Mixing valve | 13) Regulation valve |
| 7) Air cooled oil cooler | |

11.4.1 Liquid injection with expansion valve

It is recommended to use only specially designed expansion valves which react according to the discharge temperature (e.g. Danfoss TEAT20, Alco series 935-101-B, Sporlan Y1037). The valve sensor must be fitted on the discharge line, that should be carefully cleaned at the contact point, at approx. 10-20 cm from the discharge shut-off valve, coated with heat transfer paste and fixed with adequate pipe clamps (thermal expansion). To ensure a bubble free liquid supply to the injection valve, the connection should be made on a horizontal section of the liquid line and the pipe should at first lead downwards. The injection valve should be fitted 15-20 cm above the injection point, line connection directly downward, and should be fixed to the compressor (so as the solenoid valve) to avoid vibration breaks. To prevent oil migration and damage to the components due to hydraulic peaks, the injection line should at first be run upwards from the injection port.

The injection intermediate pressure - to select the expansion valve - is about 1.5-3.5 bar (R22, R404A) above suction pressure. It is recommended not to oversize the valve to avoid the injection of an excessive amount of liquid.

The injection line must be provided with a solenoid valve (open when the compressor is running), a sight glass and a fine filter (max 25 µm) since the injection port leads directly to the rotor profiles. The compressor should be equipped with a liquid injection connection adapter (special accessory - consult RefComp);

To use a calibrated orifice instead of an expansion valve consult RefComp