

UNLOADED START FOR SEMI-HERMETIC COMPRESSORS

With direct starting the motor of a compressor is switched directly into the mains by means of a switch. The resulting breakaway starting current amounts, to multiple times the rated motor current (operating maximum), without consideration being given to transient phenomena. In the case of high-powered motors the breakaway starting currents become so large that they lead to disruptive voltage dips in the mains.

The compressors that are subject to current limitation must therefore by all means be equipped with starting load reduction to guarantee perfect starting even when the voltages amount to less than approximately 85% of the voltage on the nameplate.

Unloaded start is not available for 2-stage Copeland® compressors.

1 DLH, D2* & D3*

For DLH, D2* and D3* compressors an external unloaded start device is available. When ordered it will be delivered mounted to the compressor. Only the coil of the solenoid valve has to be connected, and the non-return valve must be fitted according to instructions given in Chapter 3.

1.1 Retrofit kit for DLH & D2S

The kit consists of:

- 2 x Gasket, flange suction side **(1)**
- 2 x Gasket, flange discharge side **(2)**
- 1 x Piping assembly with valve body **(3)**
- 1 x Solenoid coil
- 2 x Hexagonal screw, suction side 1/2" – 13 UNC x 2 1/4"
- 2 x Hexagonal screw, discharge side 5/16" – 18 UNC x 2"

The check valve NRV 22S is not part of the retrofit kit; it must be ordered separately.

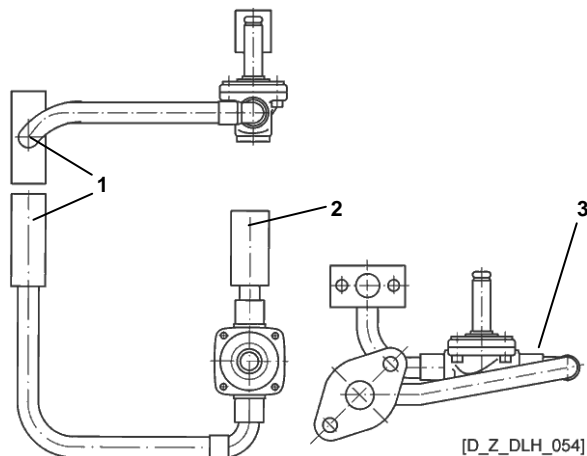
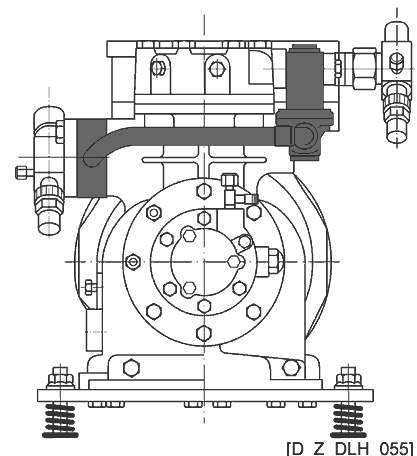


Figure 1



1.2 Retrofit kit for D2S, D3D and D3S

Unloaded start consists of a very short bypass line that connects the high-pressure side of the compressor to the suction side. A solenoid valve is installed in this bypass line.

When the compressor is switched on, the solenoid valve opens the bypass line and holds it open during the starting phase. The refrigerant vapour is short-circuited without any significant increase in pressure, and the motor is unloaded.

After completion of the starting procedure, ie, after energizing of the second part-winding or changeover from star to delta or short-circuiting of starting resistors, the solenoid valve is de-energized closing off the bypass line.

A Non-Return Valve (NRV) must be installed in the discharge line to prevent the refrigerant from flowing back from the condenser to the suction side using the bypass line as shown in the drawings below.

The kit consists of the following parts:

- 1 x Pipe assembly and valve body (1)
- 1 x Rotalock stub (2)
- 1 x Rotalock seal (3)
- 1 x Gasket - flange to cylinder head (4)
- 1 x Gasket - flange to Rotalock valve (4)
- 1 x Solenoid valve coil (5)
- 1 x Check valve
- x Screws $\frac{1}{2}$ " – 13 UNC X $2\frac{3}{4}$ "

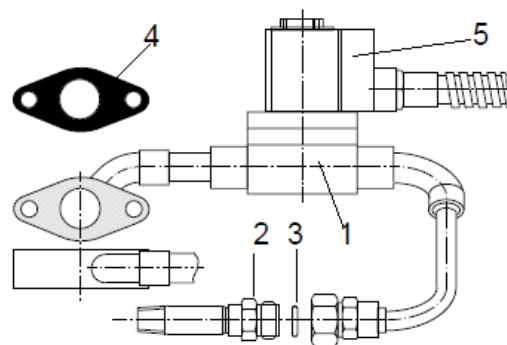


Figure 2

Mounting

Remove plug (13) and fit the Rotalock stub. Remove the Rotalock flange (DL) adapter from the cylinder head, discard the gasket and clean the gasket surfaces. Fit the pipe and valve assembly using the gaskets and mounting hardware supplied in the kit. Fit the discharge line check valve as shown in the drawing. Leak-check thoroughly.

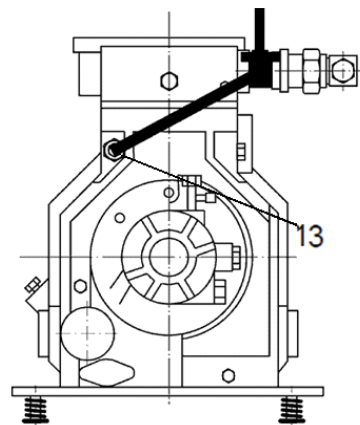


Figure 3

2 4M*, 6M*, D4D – D6D and D4S – D8S

4-, 6- and 8-cylinder compressors use an internal unloaded start system.

When a compressor is ordered with unloaded start, it is supplied with a special cylinder head and control piston fitted. A special valve plate is also installed on Discus and Stream models.

The control valve and the coil are supplied loose; they must be fitted before the compressor is put into operation.

The unloaded start is factory-fitted as shown in the illustrations on the next pages.

In theory unloaded start can be fitted on any cylinder bank. However the options available are more limited when the compressor is fitted with capacity control. Capacity control must be fitted on specified banks only.

Coils with the following voltage variants (+10% DC, +10% - 15% AC) are available for the solenoid:

Voltage	50 Hz	60 Hz	DC
220V	x	x	-
110V	x	x	-
24V	x	x	x

2.1 Retrofit kit for 4M* – 6M*, D4D – D6D and D4S – D8S

The kit consists of:

1 x Control valve with coil

2 x Hexagon cap screw ½” – 13 UNC x 1”

1 x Gasket for valve flange (see Fig. 5)

1 x Cylinder head for unloaded start

1 x Gasket cylinder head

1 x Complete valve plate for Discus and Stream compressors

1 x Gasket valve plate

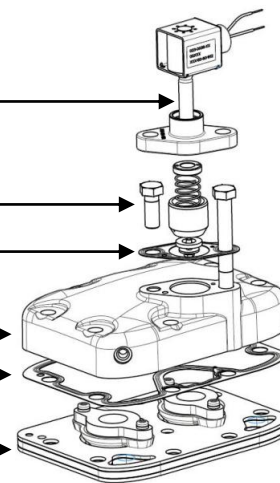


Figure 4

The check valve is not part of the retrofit kit; it must be ordered separately.

Mounting

Since capacity control devices may only be applied to specific banks of 4-, 6-, and 8-cylinder compressors, the unloaded start device is factory-mounted on one of the other cylinder banks (as shown in Fig.5).

If capacity control is omitted the unloaded start can also take another position if necessary.

NOTE: The position of the unloaded start device differs from that of the previous compressor D6R.

4M*, D4*

6M*, D6*

D8*

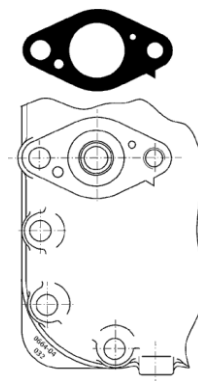
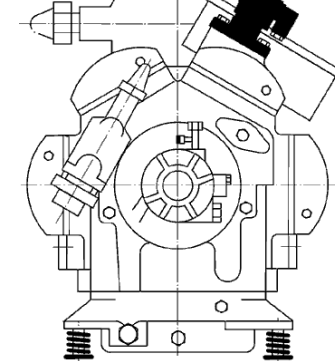
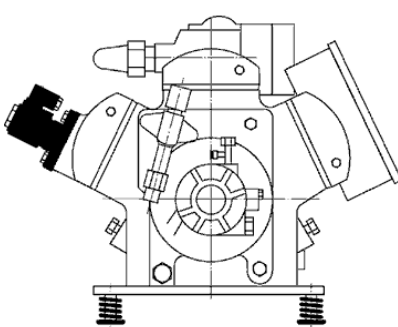
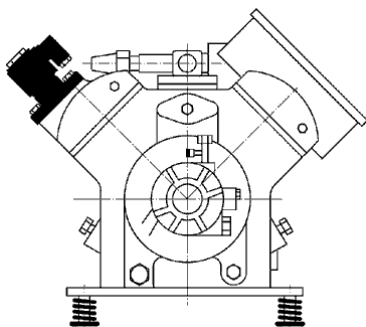
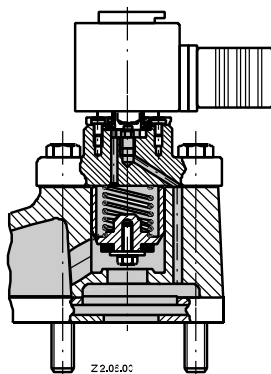
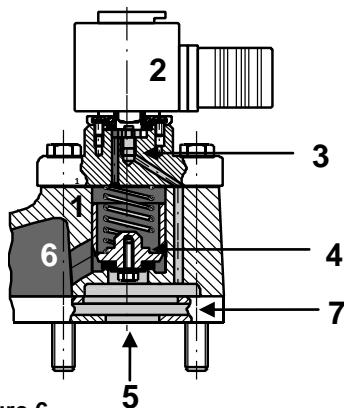


Figure 5

2.2 Unloaded start operation on 4M*, D4D, 6M*, D6D, D8D

A. Standard operation

B. Unloaded start operation



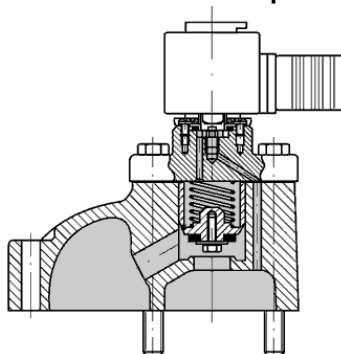
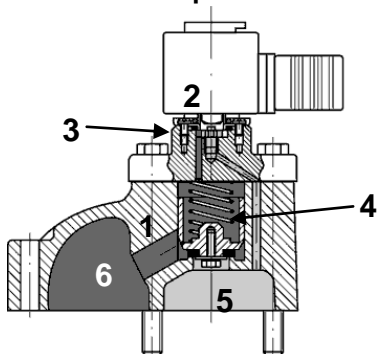
- 1 Special cylinder head
- 2 Solenoid
- 3 Valve
- 4 Spring-loaded control piston
- 5 Suction side
- 6 High side in the cylinder head
- 7 Valve plate

Figure 6

2.3 Unloaded start operation on D4S, D6S, D8S*

A. Standard operation

B. Unloaded start operation

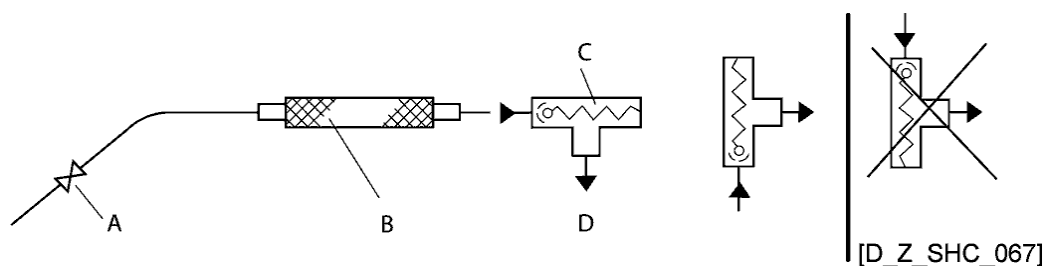


- 1 Special cylinder head
- 2 Solenoid
- 3 Valve
- 4 Spring-loaded control piston
- 5 Low side in the cylinder head
- 6 High side in the cylinder head

Figure 7

3 Non-Return Valve (NRV)

3.1 Mounting position of the Non-Return Valve



- A Compressor shut-off valve
- B Vibration absorber
- C Non-Return Valve
- D To condenser

[D_Z_SHC_067]

Figure 8

A Non-Return Valve must be installed in the discharge line to prevent the refrigerant from flowing back from the condenser to the suction side using the by-pass line.

3.2 Non-Return Valve selection

The check valves must be selected according to the table below and must be mounted as shown in **Figure 8**.

This selection facilitates quiet operation over a wide application range without chattering noises caused by gas pulsation. If noise should occur during normal or partial load operation, it is necessary to match the check valve to the operating conditions.

Compressor	Non- Return Valve	Non- Return Valve for Twin or // operation
DLHA / D2S / D2D	NRV 22S Ø 22	NRVH 22S Ø 22
D3DA-500/50X		
D4S, D4D except J 4MA, 4MH, 4MI, 4MJ 4MF, 4ML, 4MM, 4MT		
D6SF, D6SL D6DL, D6DT 6MI, 6MJ, 6MM, 6MT		
D3S, other D3D	NRV 28S Ø 28	NRVH 28S Ø 28
D4SJ, D4DJ, 4MA, 4MH, 4MI, 4MJ 4MF, 4ML, 4MM, 4MT		
D6SA, D6SH D6SJ, D6DH, D6DJ 6MI, 6MJ, 6MK 6MM, 6MT, 6MU		
D8DL, D8DT		
D6SK, D6ST D6SU, 4MK, 4MU, 6MK, 6MU	NRV 35S Ø 35	NRVH 35S Ø 35
D8SH, D8SJ, D8SK, D8DH, D8DJ		

NOTE: The Non-Return Valve (NRVH) for Twin / parallel compressor operation has a stronger spring than the NRV for single compressor operation.