

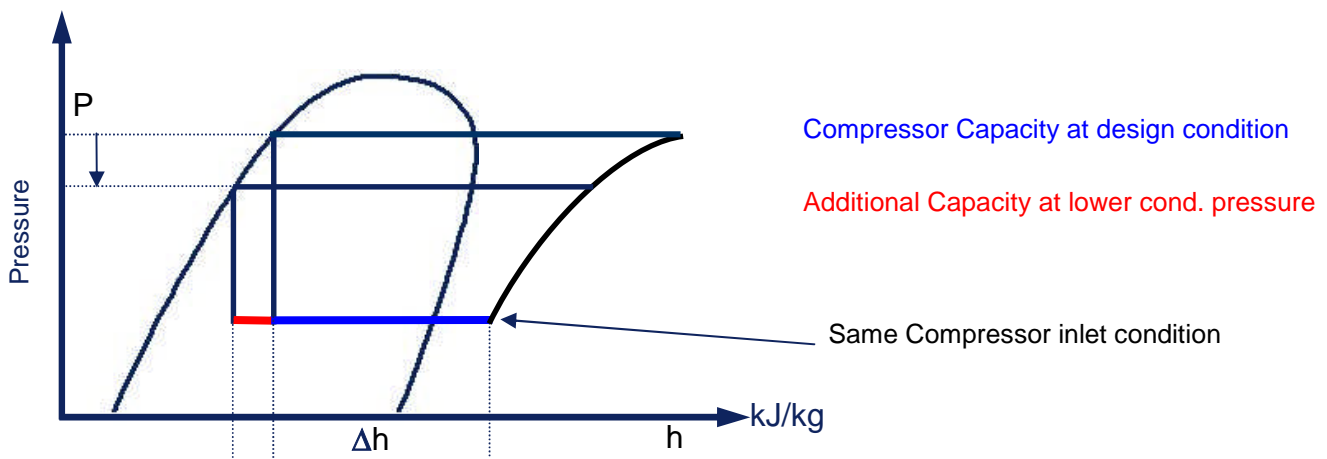
DWM COPELAND SEMI-HERMETIC COMPRESSORS CAPACITY CONTROL

1 Compressor Capacity Modulation for Air Conditioning & Refrigeration Systems

1.1 Capacity Control

Compressors in the higher capacity range need some form of capacity control to accommodate varying refrigeration load. The capacity control kit supplied by DWM Copeland will reduce the refrigeration capacity along with a similar proportional reduction in Power Input. This ensures optimum performance even in part load.

Capacity control is also required when the condensing pressure falls with a drop in ambient air temperature. The compressor suction condition, refrigerant volume and mass flow rate will remain unchanged. The capacity will increase due to the increase in Δh , along with the increase in volumetric efficiency, see the pH chart below.



1.2 Methods of Capacity Control

There are many methods of capacity control for Semi-Hermetic compressors but DWM Copeland use the “Blocked Suction method” and for the D3D Over Re-expansion method known as Moduload.

Note: Oil circulation in systems with capacity control is more critical

Advantages

- Reduces the starting frequency of the compressors
- Ensure satisfactory operation with optimal capacity data
- Energy cost saving even at partial-load

Disadvantages

- Motor is less cooled (refrigerant flow reduced)
- Restriction of the application range
- Oil circulation is more critical

2 DWM Copeland Semi-Hermetic S Series Models Capacity Control

For 4S, 6S and 8S cylinder compressors a mechanical capacity control is available.

Be aware that capacity controlled operation changes the application range of the compressor.

2.1 Capacity Control

The 4S, 6S & 8S compressors have an internal capacity control, they work on the principle of blocking the suction gas passage to two or more cylinders. They require the use of a special cylinder head and a control valve with solenoid coil. These items may be ordered installed at the factory or in a kit form for later installation.

The suction port of the valve plate will be closed by a control piston (blocked suction). To prevent transport damage the solenoid valve is supplied loose and the cylinder head is fitted with a shipping plate, therefore the shipping plate with gasket must be removed and the solenoid valve with new gasket mounted.

Do not put the compressor into operation with the shipping plate this could result in erratic operation of the control piston and inadequate cooling capacity.

2.1.1 Inactive Capacity Control

These compressors can be ordered with inactive capacity control. There is a gasket under the shipping plate that allows operation on 100% capacity. To convert to active capacity control all that is needed is to fit the solenoid valve with the active gasket instead of the shipping plate.

2.1.2 Normal Operation (Full load)

When the solenoid coil is not energised the top of the unloader piston is vented to suction pressure allowing the piston to be lifted by means of a spring. The compressor draws gas from all cylinders and reaches full cooling capacity.

2.1.3 Capacity Controlled Operation (Part load)

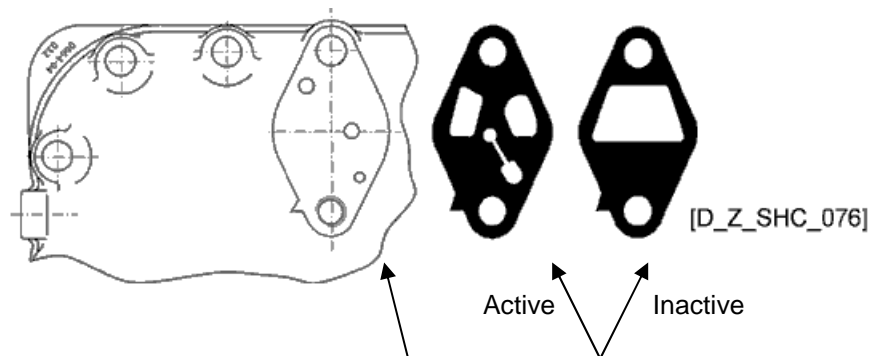
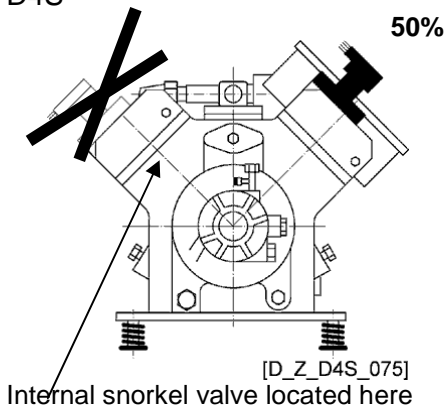
When the solenoid coil is energised the top of the unloader piston is forced down with discharge gas pressure thereby blocking the suction gas passage into the cylinders thus enabling the compressor to run with reduced capacity.

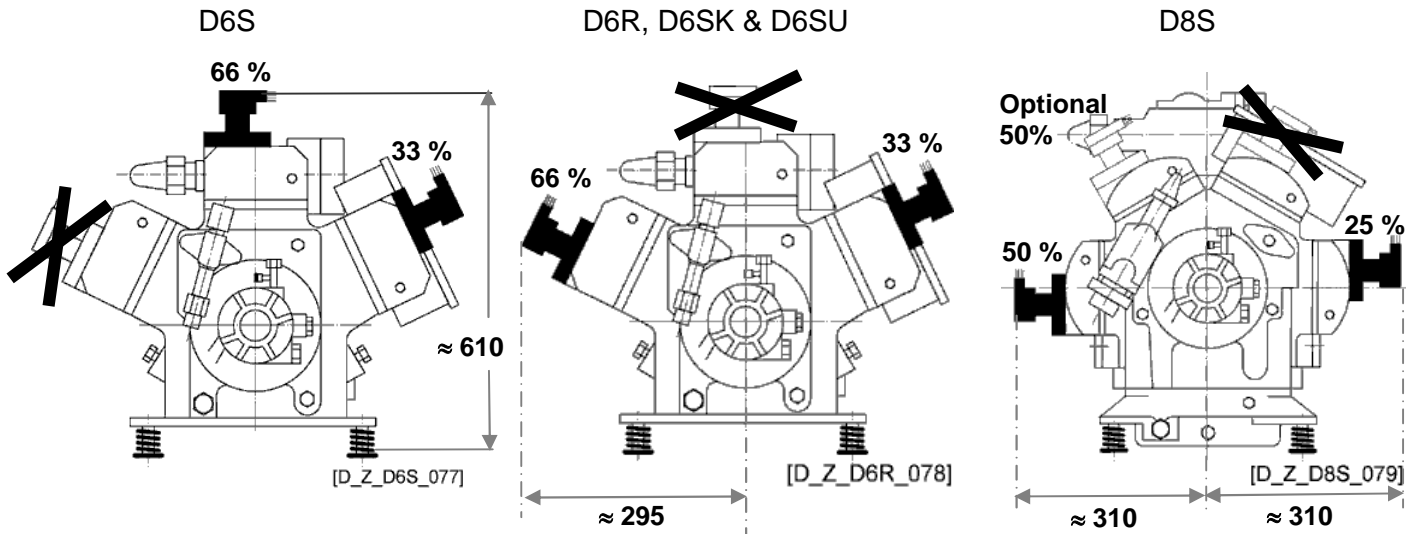


Gasket - Cylinder head for capacity control – Internal view – External view

2.1.4 Position of Capacity Control

D4S





Capacity control must be fitted in the following positions:

- D4S 50% terminal box side
- D6SK 1st step 33% terminal box side
- D6SK 2nd step 66% lower cylinder head on discharge valve side
- D6S 1st step 33% terminal box side
- D6S 2nd step 66% upper cylinder head
- D8S 1st step 25% lower cylinder head on terminal box side
- D8S 2nd step 50% lower cylinder head on discharge valve side

Retrofit Kit includes:

- 1 x Cylinder head for capacity control
- 1 x Gasket kit
- 1 x Solenoid valve assembly (No 703 RB 001)
- 2 x Mounting screws

Voltages of the solenoid valve coil:

- 24V D.C.
- 24V / 1~ / 50 / 60 Hz
- 208-240V / 1~ / 50 / 60 Hz
- 120V / 1~ / 50 / 60 Hz

Protection class: IP 55 (evaluation according to IEC 34)

Selection of Capacity Control

D4S - D8S

R 22

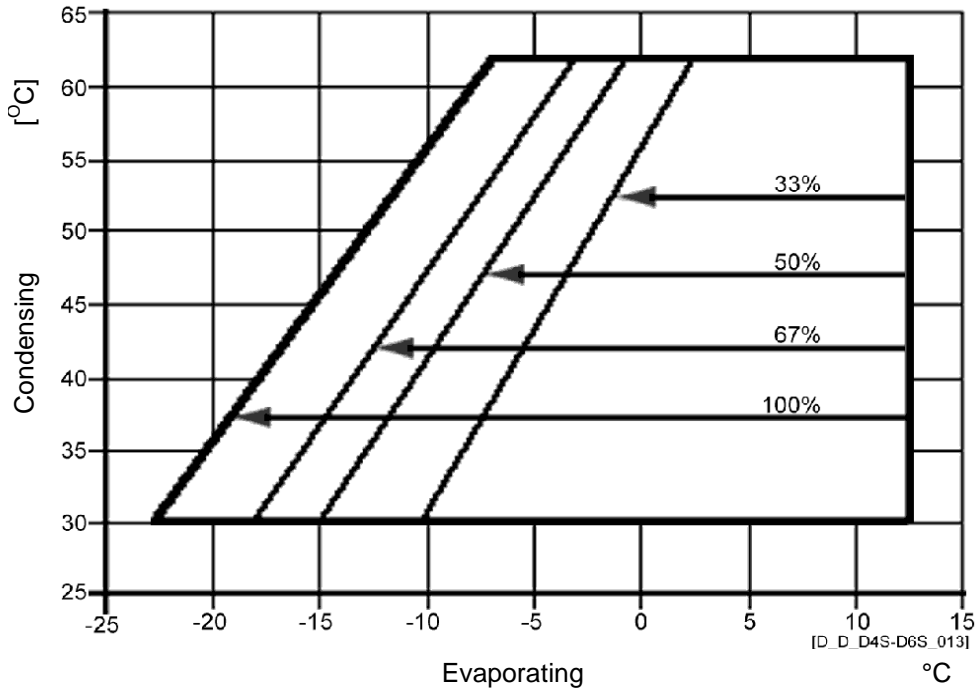
Compressor	Number of Cylinders with Capacity Control	Capacity Regulating Step			Remaining Refrigeration Capacity % (average values)	Remaining Power Input % (average values)	Diagram No
		0	1	2			
					Application Range		
					H / M	H / M	
D4SA-2000	2	100%	50%		51	53	1
D4SH-2500	2	100%	50%		51	53	
D4SJ-3000	2	100%	50%		51	53	
D6SA-3000	2 / 4	100%	66%	33%	67/34	68/34	
D6SH-3500	2 / 4	100%	66%	33%	67/34	68/34	
D6SJ-4000	2 / 4	100%	66%	33%	67/34	68/34	2A
D8SH-5000	2 / 4	100%	75%	50%	76/53	79/57	
D8SJ-6000	2 / 4	100%	75%	50%	76/53	79/57	
D8SK-7000	2 / 4	100%	75%	50%	76/53	79/57	

Application limit: see data sheets and application diagrams
 H = high temperature
 M = medium temperature

2.2 Application Range – R22

2.2.1 D4SA / H / J & D6SA / H / J

Diagram 1 Suction gas temperature 25 °C



2.2.2 D8SH / J

Diagram 2A Suction gas temperature 25°C

