



# Replacement Guidelines Service Compressors for 4&6 Cylinder S-Series and Discus (D4D, D4S, D6D, D6S)



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## 1 Introduction

Service compressors are especially offered to replace the Discus and S-Series 4- and 6-cylinder compressors, without installation modification. The positions of the suction and discharge are the same. Service compressors are different from the Stream compressors by dimensions (for 1:1 replacement), and do not have CoreSense™ technology.

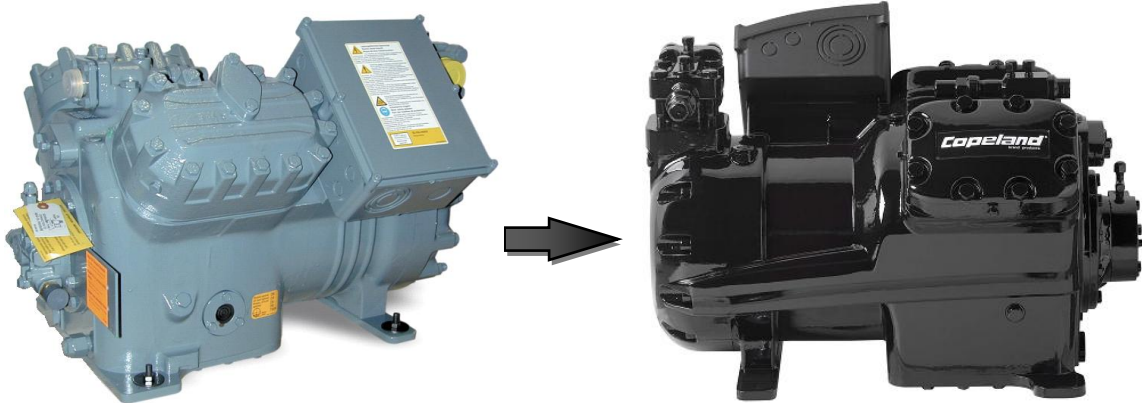
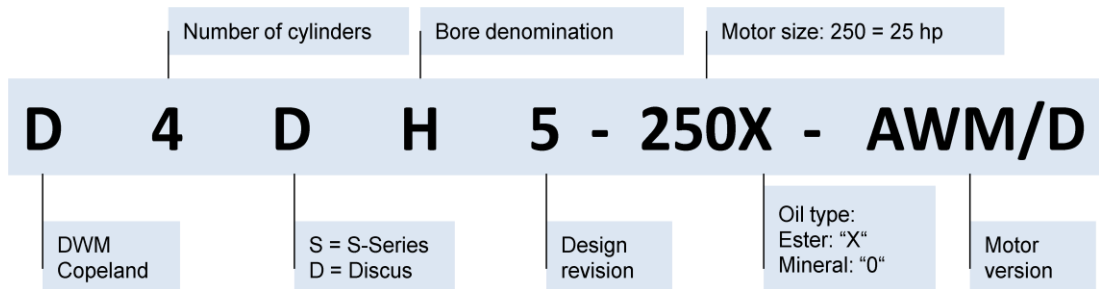


Figure 1

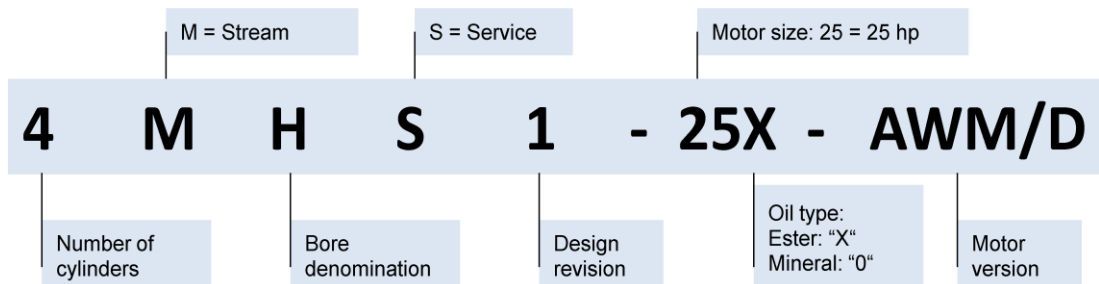
**NOTE:** The shut off valves are not part of the standard delivery of Service compressors.

## 2 Nomenclature

### 2.1 Discus and S-Series compressors



### 2.2 Service compressors



### 3 Nameplate

The nameplate is similar to the other Copeland™ brand products semi-hermetic compressor nameplates. The nameplate position for Service compressors is below the oil pump.

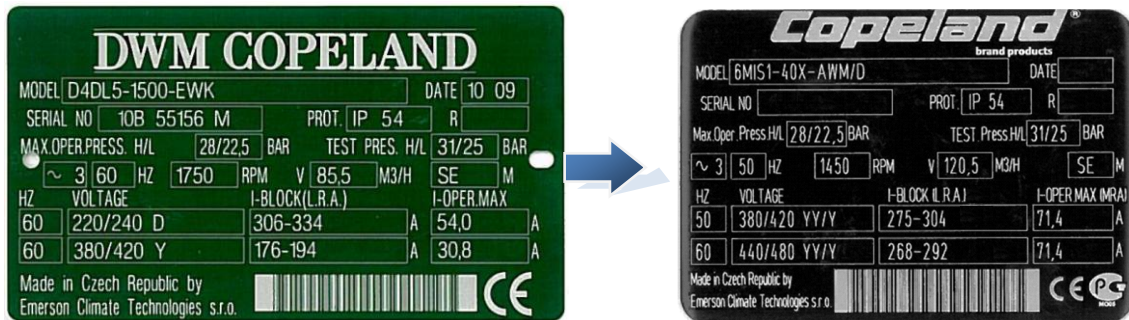


Figure 2

### 4 Ident numbers

Table 1 below indicates the ident numbers of Service compressors in the AWM/D motor version.

Service Compressors			
Model	Ident	Model	Ident
4MFS1-13X	5013549	6MLS1-27X	5014188
4MAS1-22X	5013469	6MHS1-35X	5013947
4MLS1-15X	5013787	6MMS1-30X	5014268
4MHS1-25X	5013629	6MIS1-40X	5014020
4MMS1-20X	5013867	6MTS1-35X	5014348
4MIS1-30X	5013709	6MJS1-45X	5014100

Table 1

Other motor versions are available: EWL, EWK, EWM/D, AWC, AWR, AWX, AWY.

Service compressors can also be delivered filled with mineral oil in motor versions AWM/D and EWK.

### 5 Technical comparisons

#### 5.1 Performance – Cross reference tables

##### 5.1.1 Capacity – R404A refrigerant

S-Series			Discus			Service Compressor		
Description	Capacity kW	Power Input kW	Description	Capacity kW	Power Input kW	Description	Capacity kW	Power Input kW
D4SA-200X	27.49	12.65	D4DA-200X	30.21	12.54	4MAS1-22X	32.73	13.72
D4SH250X	35.09	16.42	D4DH-250X	38.58	16.28	4MHS1-25X	38.45	16.24
D4SJ-300X	42.81	19.33	D4DJ-300X	46.60	19.88	4MIS1-30X	42.77	18.02
D6SA-300X	41.80	19.10						
D6SH-350X	54.01	24.40	D6DH-350X	56.56	24.17	6MHS1-35X	55.59	23.65
D6SJ-400X	62.74	28.89	D6DJ-400X	68.07	29.56	6MIS1-40X	64.64	27.61
D6SK-500X	73.10	34.21				6MJS1-45X	72.4	31.24

Medium temperature: -10°C / 45°C / 20°C / 0K

Table 2: Medium temperature

S-Series			Discus			Service Compressor		
Description	Capacity kW	Power Input kW	Description	Capacity kW	Power Input kW	Description	Capacity kW	Power Input kW
D4SF-100X	8.85	6.76	D4DF-100X	9.67	6.77	4MFS1-13X	10.66	7.43
D4SL-150X	11.92	8.62	D4DL-150X	13.08	9.06	4MLS1-15X	13.32	9.02
D4ST-200X	14.44	10.17	D4DT-220X	16.24	11.20	4MMS1-20X	15.08	10.10
D6SF-200X	13.50	9.59				4MLS1-15X	13.32	9.02
D6SL-250X	17.59	12.72	D6DL-270X	19.03	13.54	6MLS1-27X	19.03	13.34
D6ST-320X	21.30	15.46	D6DT-320X	23.6	16.38	6MMS1-30X	22.73	15.69
D6SU-400X	26.59	18.68				6MTS1-35X	25.57	17.43

Low temperature: -35°C / 40°C / 20°C / 0K

**Table 3: Low temperature R404A**

### 5.1.2 Capacity – R134a refrigerant

S-Series			Discus			Service Compressor		
Description	Capacity	Power Input kW	Description	Capacity	Power Input kW	Description	Capacity	Power Input kW
D4SF-100X	16.30	7.16	D4DF-100X	17.25	6.96	4MFS1-13X	18.91	7.60
D4SA-100X	17.05	6.88	D4DA-100X	17.65	6.83			
D4SL-150X	21.30	9.05	D4DL-150X	22.80	9.12	4MLS1-15X	22.86	8.97
D4SH-150X	19.70	8.47	D4DH-150X	20.80	8.64			
D4ST-200X	25.70	10.85	D4DT-220X	27.80	11.10	4MMS1-20X	25.24	9.92
D4SJ-200X	25.80	11.10	D4DJ-200X	26.40	10.95			
D6SF-200X	25.10	10.60						
D6SL-250X	32.00	13.75	D6DL-270X	33.30		6MLS1-27X	32.27	12.99
D6SH-200X	30.80	13.60	D6DH-200X	33.40	13.50			
			D6ST-300X	38.20	16.60	6MMS1-30X	38.18	15.30
D6ST-320X	38.30	16.55	D6DT-320X	40.40	16.40			
D6SJ-300X	36.40	16.15	D6DJ-300X	39.50	16.65			
D6SU-400X	46.10	19.95				6MTS1-35X	43.07	17.3
D6SK-400X	42.10	18.65						

Medium temperature: -10°C / 45°C / 20°C / 0K

**Table 4: Medium temperature R134a**

Discus			Service Compressor		
Description	Capacity	Power Input kW	Description	Capacity	Power Input kW
D4DA-200X	31.60	9.21	4MAS1-22X	34.56	10.13
D4DH-250X	38.70	12.10	4MHS1-25X	39.93	12.10
D4DJ-300X	46.80	15.00	4MIS1-30X	43.67	13.22
D6DH-350X	57.00	18.05	6MHS1-35X	57.00	17.82
D6DJ-400X	67.70	22.20	6MIS1-40X	64.73	20.46
			6MJS1-45X	72.60	23.00

High temperature: +5°C / 50°C / 10K / 0K

**Table 5: High temperature R134a**



## 5.1.3 Capacity – R407C refrigerant

S-Series			Discus			Service Compressor		
Description	Capacity	Power Input kW	Description	Capacity	Power Input kW	Description	Capacity	Power Input kW
D4SA-200X	43.20	13.80	D4DA-200X	44.50	13.45	4MAS1-22X	47.80	15.40
D4SH250X	53.90	17.55	D4DH-250X	56.80	17.65	4MHS1-25X	56.25	17.85
D4SJ-300X	63.90	21.60	D4DJ-300X	63.60	22.60	4MIS1-30X	62.71	19.78
D6SA-300X	61.40	20.70				6MHS1-35X	80.64	25.93
D6SH-350X	78.10	27.00	D6DH-350X	84.10	26.70	6MIS1-40X	93.25	30.48
D6SJ-400X	95.10	32.30	D6DJ-400X	97.40	32.60	6MJS1-45X	106.04	34.46
D6SK-500X	114.00	38.10						

High temperature: +5°C / 50°C / 10K / 0K

**Table 6: High temperature R407C**

## 5.1.4 Capacity – R22 refrigerant

S-Series			Discus			Service Compressor		
Description	Capacity kW	Power Input kW	Description	Capacity kW	Power Input kW	Description	Capacity kW	Power Input kW
D4SA-200X	27.30	11.25	D4DA-2000	29.30	11.05	4MAS1-22X	32.30	12.15
D4SH250X	34.90	14.30	D4DH-250X	37.10	14.45	4MHS1-25X	37.40	14.55
D4SJ-300X	40.60	16.95	D4DJ-300X	43.60	17.55	4MIS1-30X	40.30	16.20
D6SA-300X	39.40	17.05				6MHS1-35X	54.41	21.49
D6SH-350X	50.50	22.10	D6DH-350X	55.4	21.9	6MIS1-40X	62.80	24.80
D6SJ-400X	58.80	25.80	D6DJ-400X	64.4	26.4	6MJS1-45X	68.50	28.10
D6SK-500X	71.30	29.80						

Medium temperature: -10°C / 45°C / 20°C / 0K

**Table 7: Medium temperature R22**

S-Series			Discus			Service Compressor		
Description	Capacity kW	Power Input kW	Description	Capacity kW	Power Input kW	Description	Capacity kW	Power Input kW
			D4DF-100X	7.79	5.79	4MFS1-13X	8.59	6.38
D4SL-150X	9.68	7.82	D4DL-150X	11.55	8.44	4MLS1-15X	11.65	8.51
D4ST-200X	11.15	8.86	D4DT-220X	13.90	10.00	4MMS1-20X	12.80	9.25
D6SL-250X	13.65	11.80	D6DL-270X	14.95	11.80	6MLS1-27X	14.71	11.61
D6ST-320X	16.05	13.40	D6DT-320X	18.70	14.40	6MMS1-30X	17.70	13.67
D6SU-400X	21.20	16.90				6MTS1-35X	19.85	15.32

Low temperature: -35°C / 40°C / 20°C / 0K

**Table 8: Low temperature R22**

**NOTE:** Since Service compressors can have different capacities, it is advised to check if the system components (condensers, expansion valve etc...) are compliant with the replacement compressor.

### 5.1.5 Electrical values (current) – R404A refrigerant

S-Series					Discus					Service Compressor				
Description	Current A		MOC A	LRA A	Description	Current A		MOC A	LRA A	Description	Current A		MOC A	LRA A
	LT	MT				LT	MT				LT	MT		
D4SF-100X	<b>12.31</b>	21.59	27.1	105	D4DF-100X	<b>12.62</b>	21.19	26.8	105	4MFS1-13X	<b>12.83</b>	20.81	25.8	105
D4SA-200X		23.75	31.6	175	D4DA-200X	<b>16.21</b>	23.19	32.5	175	4MAS1-22X	<b>16.45</b>	22.42	30.3	175
D4SL-150X	<b>17.15</b>	28.80	35.6	156	D4DL-150X	<b>17.86</b>	28.23	35.3	156	4MLS1-15X	<b>18.23</b>	27.59	33.9	156
D6SF-200X	<b>19.29</b>	32.42	38.4	175						4MHS1-25X	<b>21.18</b>	29.08	39.2	199
D4SH250X		29.99	42.4	199	D4DH-250X	<b>20.86</b>	29.95	41.5	199	4MMS1-20X	<b>21.82</b>	33.25	40.9	175
D4ST-200X	<b>20.13</b>	34.24	42.4	175	D4DT-220X	<b>21.41</b>	33.95	42.8	175	4MIS1-30X	<b>22.93</b>	33.61	46.7	221
D4SJ-300X		33.71	48.3	221	D4DJ-300X	<b>22.61</b>	34.41	52.5	221	6MLS1-27X	<b>26.06</b>	41.30	51.9	199
D6SA-300X		33.27	49.5	221						6MHS1-35X	<b>31.36</b>	44.01	60.5	304
D6SL-250X	<b>25.10</b>	43.32	56.5	199	D6DL-270X	<b>26.28</b>	42.14	53.70	199	6MMS1-30X	<b>32.68</b>	49.29	60.7	255
D6SH-350X		45.09	63.6	304	D6DH-350X	<b>30.78</b>	44.75	63.50	304	6MIS1-40X	<b>30.71</b>	44.89	57.6	304
D6ST-320X	<b>31.06</b>	51.74	62.9	255	D6DT-320X	<b>32.11</b>	50.22	62.20	255	6MTS1-35X	<b>32.68</b>	49.29	60.7	255
D6SJ-400X		51.14	75.3	304	D6DJ-400X	<b>34.60</b>	52.18	83.00	304	6MJS1-45X	<b>35.32</b>	50.95	70.5	304
D6SU-400X	<b>37.70</b>	62.27	78	304										
D6SK-500X		62.57	89.4	393										

Low temperature: -35°C / 40°C / 20°C / 0K

Medium temperature: -10°C / 45°C / 20°C / 0K

Table 9: Electrical values

## 5.2 Qualified refrigerants and oils

Service compressors are designed for use with the same refrigerants as Discus and S-Series compressors: R404A, R507, R407C, R134a, R22.

Both generations of compressors are designed to work either with ester oil or mineral oil. The oil pump and oil circulation in Service compressors is similar as in Discus and S-Series compressors.

Qualified refrigerants	R22	R404A, R507, R407C, R134a, R22
Copeland™ brand products standard oils	Suniso 3 GS	Emkarate RL 32 3MAF
Servicing oils	Shell 22-12 Suniso 3 GS Fuchs Reniso KM 32 Capella WF 32	Emkarate RL 32 3MAF Mobil EAL Arctic 22 CC

Table 10: Qualified refrigerants and oils



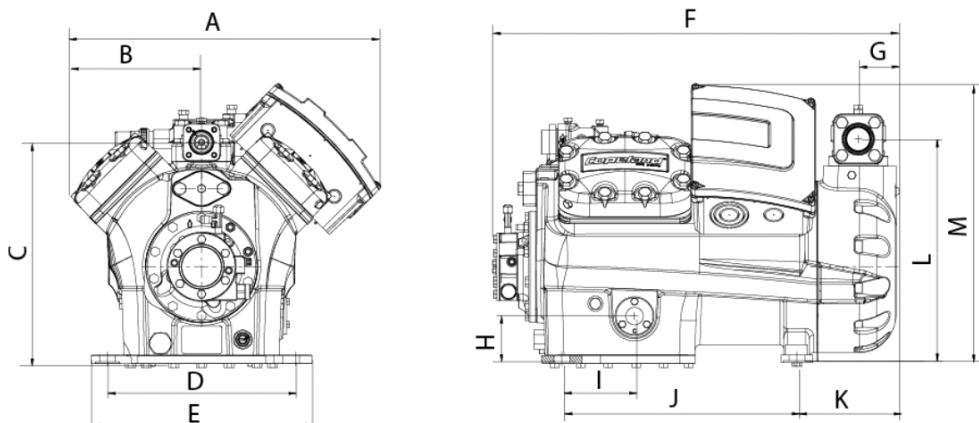
## 6 Dimensions

The following drawings show the position of the suction and discharge valves as well as the sight glass and the terminal box.

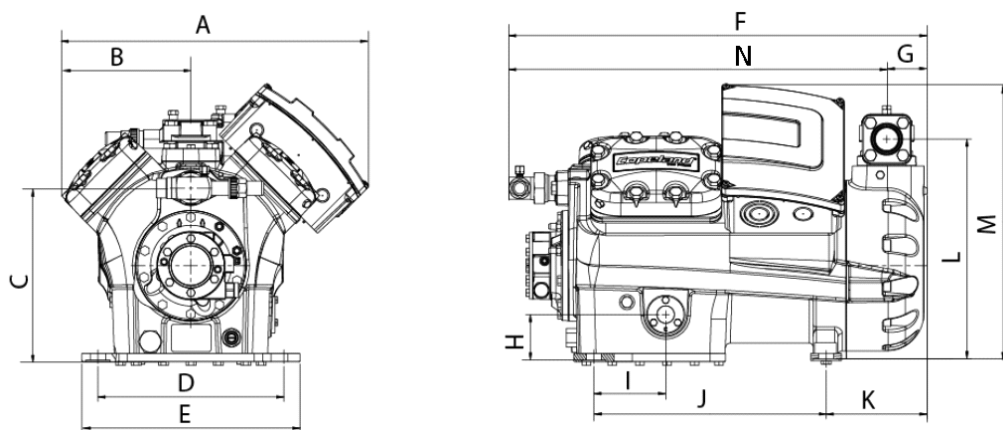
The footprint of Service compressors is the same as Discus, S-Series and compressors from most other manufacturers for easy replacement.

### 6.1 Dimensions of 4M\*S compressors

#### ▪ 4MAS, 4MHS, 4MIS



#### ▪ 4MFS, 4MLS, 4MMS

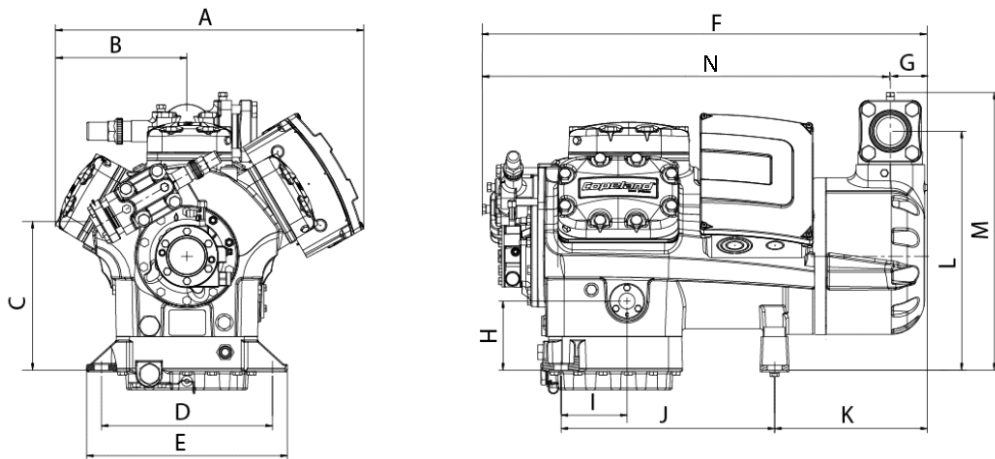


	4MAS	4MHS	4MMS	4MIS	4MFS	4MLS
A	503					
B	212					
C	357			282		
D	305					
E	358					
F	658	670		718	686	
G	67					
H	74.5					
I	118					
J	381					
K	166	179		198	166	
L	360	376			360	
M	449					
N				633.5	602	

Table 11: 4M\*S compressor dimensions in mm

**NOTE:** The dimensions are given with shut off valves which are not part of the standard delivery.

## 6.2 Dimensions of 6M\*S compressors



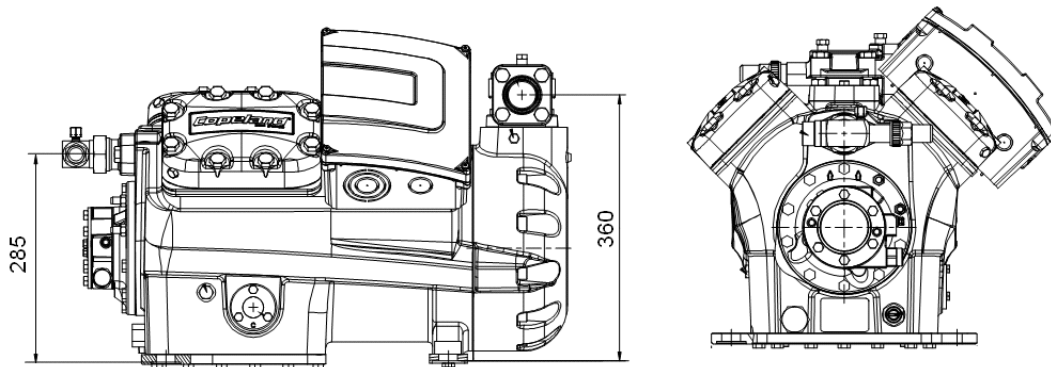
	6MLS1	6MIS	6MMS	6MJS	6MTS	6MHS
A	552					
B	234					
C	276.6	327		266	256	276.6
D	305					
E	358					
F	738	757	738	794		757
G	66					
H	73.2	123.7				73.2
I	118					
J	381					
K	217	236	217	273		236
L	376	427				376
M	445		496			447
N	719.5	738.5	719.5	739.1	672.6	738.5

Table 12: 6M\* compressor dimensions in mm

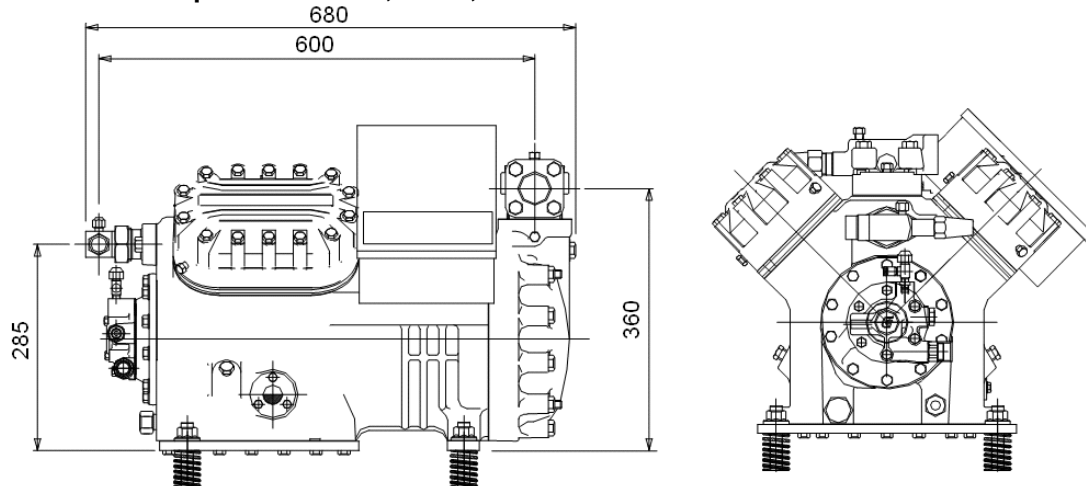
## 6.3 Shut off valve position

The position of the suction and discharge valves of Service compressors is the same as for S-Series and Discus compressors. There is no need for changing the piping configuration.

- **Service compressors 4MAS, 4MAFS, 4MLS**



- Disc compressors D4DA, D4DF, D4DL



## 6.4 Comparison of dimensions

S-Series				Discus				Service Compressor			
Description	Length	Width	Height	Description	Length	Width	Height	Description	Length	Width	Height
D4SF-100X	680	485	495	D4DF-100X	680	535	495	4MFS1-13X	686	503	450
D4SA-200X	650	485	495	D4DA-200X	650	535	495	4MAS1-22X	658	503	450
D4SL-150X	680	490	495	D4DL-150X	680	535	495	4MLS1-15X	686	503	450
D6SF-200X	740	540	490					4MHS1-25X	670	503	450
D4SH250X	670	490	495	D4DH-250X	670	535	495	4MMS1-20X	670	503	450
D4ST-200X	700	490	495	D4DT-220X	700	535	495	4MIS1-30X	718	503	450
D4SJ-300X	690	515	495	D4DJ-300X	690	535	495				
D6SA-300X	740	540	490	D6DL-270X	740	580	490	6MLS1-27X	738	552	445
D6SL-250X	740	540	490					D6DH-350X	760	580	490
D6SH-350X	760	540	490	D6DT-320X	740	580	535	6MMS1-30X	738	552	496
D6ST-320X	740	540	545	D6DJ-400X	760	580	545	6MIS1-40X	757	552	496
D6SJ-400X	760	565	545					6MTS1-35X	794	552	496
D6SU-400X	740	540	545					6MJS1-45X	794	552	496
D6SK-500X	770	570	539								

Table 13: Comparison of dimensions in mm

## 7 Operating envelopes

The operating envelopes for R404A are shown in the diagrams below:

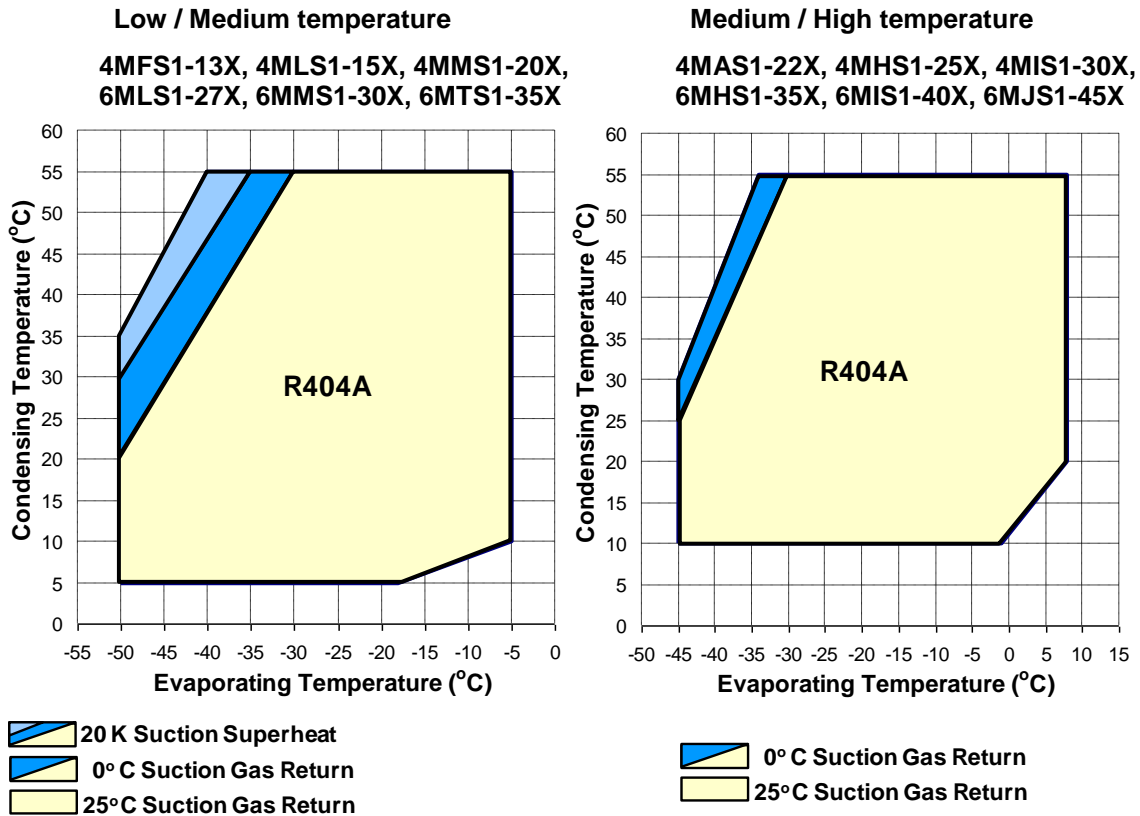


Figure 3

**NOTE:** For application envelopes with other refrigerants, please refer to Copeland brand products Selection Software at [www.emersonclimate.eu](http://www.emersonclimate.eu).

## 8 Motor

### 8.1 Motor current characteristics

For correct sizing of electrical protection devices and wire diameters use the values shown in **Table 14** below:

S-Series				Discus				Service Compressor						
Description	Current A		MOC A	LRA A	Description	Current A		MOC A	LRA A	Description	Current A		MOC A	LRA A
	LT	MT				LT	MT				LT	MT		
D4SF-100X	<b>12.31</b>	21.59	27.1	105	D4DF-100X	<b>12.62</b>	21.19	26.8	105	4MFS1-13X	<b>12.83</b>	20.81	25.8	105
D4SA-200X		23.75	31.6	175	D4DA-200X	<b>16.21</b>	23.19	32.5	175	4MAS1-22X	<b>16.45</b>	22.42	30.3	175
D4SL-150X	<b>17.15</b>	28.80	35.6	156	D4DL-150X	<b>17.86</b>	28.23	35.3	156	4MLS1-15X	<b>18.23</b>	27.59	33.9	156
D6SF-200X	<b>19.29</b>	32.42	38.4	175	D4DH-250X	<b>20.86</b>	29.95	41.5	199	4MHS1-25X	<b>21.18</b>	29.08	39.2	199
D4SH250X		29.99	42.4	199	D4DT-220X	<b>21.41</b>	33.95	42.8	175	4MMS1-20X	<b>21.82</b>	33.25	40.9	175
D4ST-200X	<b>20.13</b>	34.24	42.4	175	D4DJ-300X	<b>22.61</b>	34.41	52.5	221	4MIS1-30X	<b>22.93</b>	33.61	46.7	221
D4SJ-300X		33.71	48.3	221						6MLS1-27X	<b>26.06</b>	41.30	51.9	199
D6SA-300X		33.27	49.5	221	D6DL-270X	<b>26.28</b>	42.14	53.70	199	6MHS1-35X	<b>31.36</b>	44.01	60.5	304
D6SL-250X	<b>25.10</b>	43.32	56.5	199	D6DH-350X	<b>30.78</b>	44.75	63.50	304	6MMS1-30X	<b>32.68</b>	49.29	60.7	255
D6SH-350X		45.09	63.6	304	D6DT-320X	<b>32.11</b>	50.22	62.20	255	6MIS1-40X	<b>30.71</b>	44.89	57.6	304
D6ST-320X	<b>31.06</b>	51.74	62.9	255	D6DJ-400X	<b>34.60</b>	52.18	83.00	304	6MTS1-35X	<b>32.68</b>	49.29	60.7	255
D6SJ-400X		51.14	75.3	304						6MJS1-45X	<b>35.32</b>	50.95	70.5	304
D6SU-400X	<b>37.70</b>	62.27	78	304										
D6SK-500X		62.57	89.4	393										

**Low temperature:** - 35°C / 40°C / 20°C / 0K

**Medium temperature:** -10°C / 45°C / 20°C / 0K

Table 14: Motor current characteristics

**NOTE:** The MOC and LRA values for S-Series and Discus compressors are given for compressors built from 2006 onward. For older compressors, motor values might be different. Please check the values printed on the original compressor nameplate.

## 8.2 Motor codes

Service compressors use the same motor codes as S-Series and Discus compressors.

- Star-delta motor (Y/Δ) – Code E
- Part-winding motor (YY/Y) – Code A

Motor Code	Power Supply	Nominal Voltage	Start Connection	DOL Connection
AWM	380-420 V/3~/50Hz	400	YY/Y	Y
EWL	220-240 V/3~/50Hz	230	Y/DELTA	DELTA
EWL	380-420 V/3~/50Hz	400		Y
EWM	380-420 V/3~/50Hz	400	Y/DELTA	DELTA
AWR	220-240 V/3~/50Hz	230	YY/Y	Y
AWY	500-550 V/3~/50Hz	525	YY/Y	Y
AWD	440-480 V/3~/60Hz	460	YY/Y	Y
EWK	220-240 V/3~/60Hz	230	Y/DELTA	DELTA
EWK	380-420 V/3~/60Hz	380		Y
EWD	440-480 V/3~/60Hz	460	Y/DELTA	DELTA
AWC	208-230 V/3~/60Hz	230	YY/Y	Y
AWX	380 V/3~/60Hz	280	YY/Y	Y

Table 15: Motor version explanation

## 8.3 Motor protection INT69TM-2



### IMPORTANT

**Different source for power supply and contact 11-14! Module malfunction!** Use the same potential for power supply and the switch contact of the control loop (11-14).

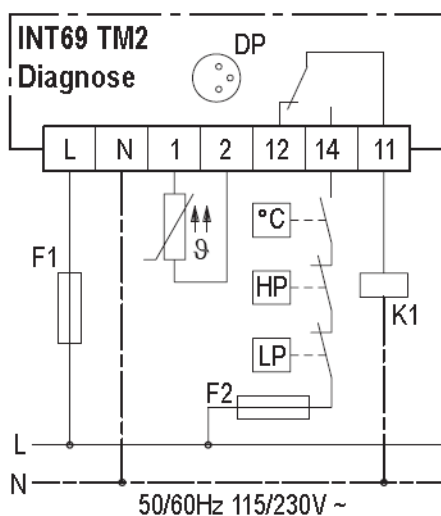


Figure 4

The maximum test voltage for thermistors is 3V.

The total resistance of the thermistor chains on a cold compressor should be  $\leq 1800 \Omega$ .

The motor in Service compressors uses a new generation INT69TM-2 thermistor protection which has the same main features as the previous one.

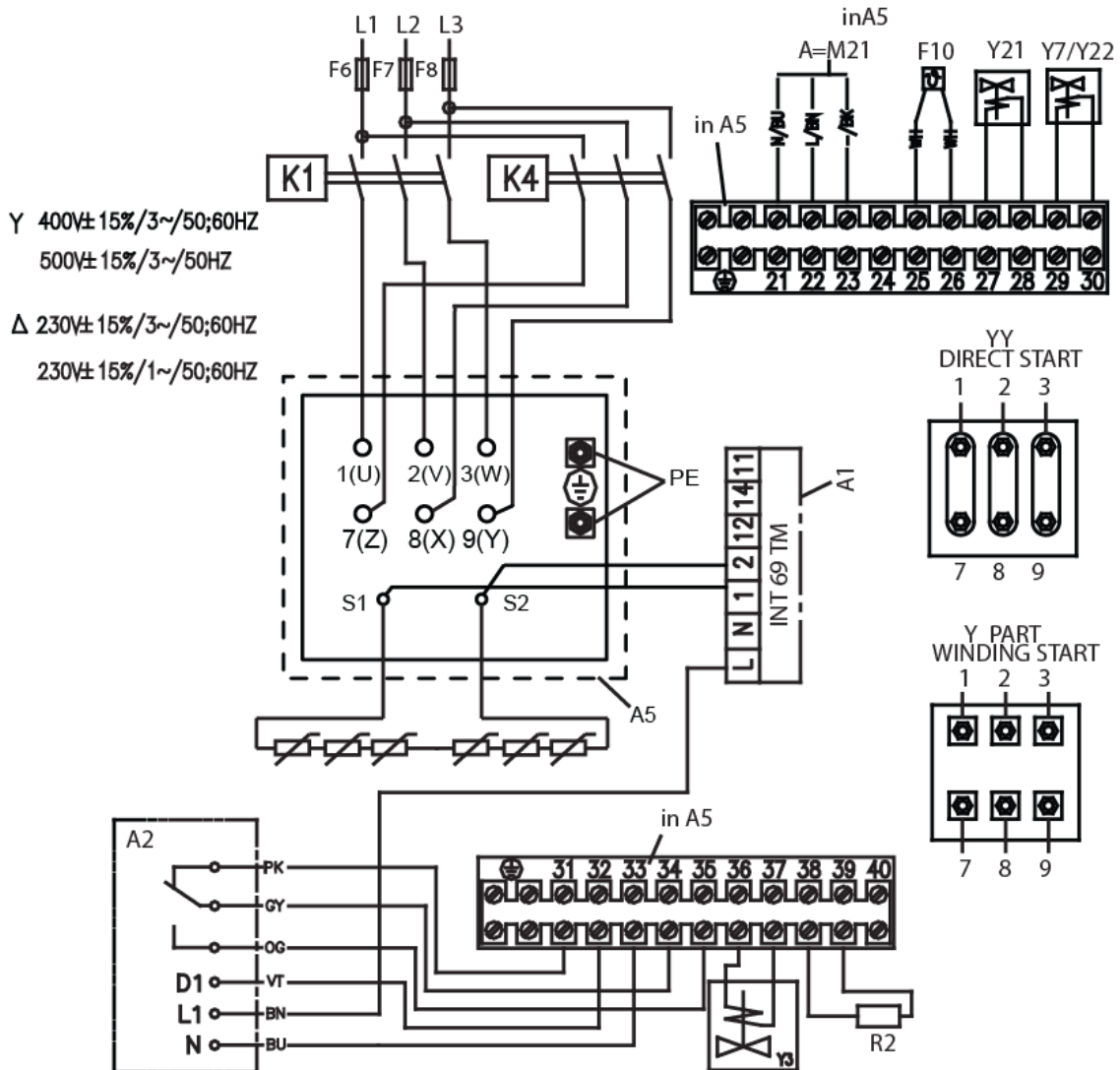
The temperature-dependent resistance of the thermistor (also PTC-resistance) is used to sense the winding temperature. Two chains of 3 thermistors, each connected in series are embedded in the motor windings in such a manner that the temperature of the thermistors can follow with little inertia.

An electronic module is required which switches a control relay, depending on the thermistor resistance. The module INT69TM for two chains with a 5-min time delay is installed in the terminal box to which the thermistors are connected.

**NOTE:** For more information please refer to Application Guideline D6.3.4 “Semi-hermetic Compressors” sur [www.emersonclimate.eu](http://www.emersonclimate.eu).

## 8.4 Wiring diagrams

### 8.4.1 4M\*S, 6M\*S compressors – Part Winding Start AW\*



#### Legend:

A1 ..... INT69TM motor protection  
A2 ..... Oil pressure switch  
A5 ..... Terminal box compressor  
CCH.... Crankcase heater  
F6 ..... Fuse for control circuit  
F7 ..... Fuse for control circuit  
F8 ..... Fuse for control circuit  
F10 ..... Thermal protection switch M21

K1..... Contactor M1  
K4..... Contactor M1 for second part winding  
M21 ..... Fan motor/condenser  
R2..... Crankcase heater  
Y21..... Solenoid valve capacity control 1  
Y22..... Solenoid valve capacity control 2  
Y3..... Solenoid valve unloaded start

Figure 5



## 8.4.2 4M\*S, 6M\*S compressors – Star Delta EW\*

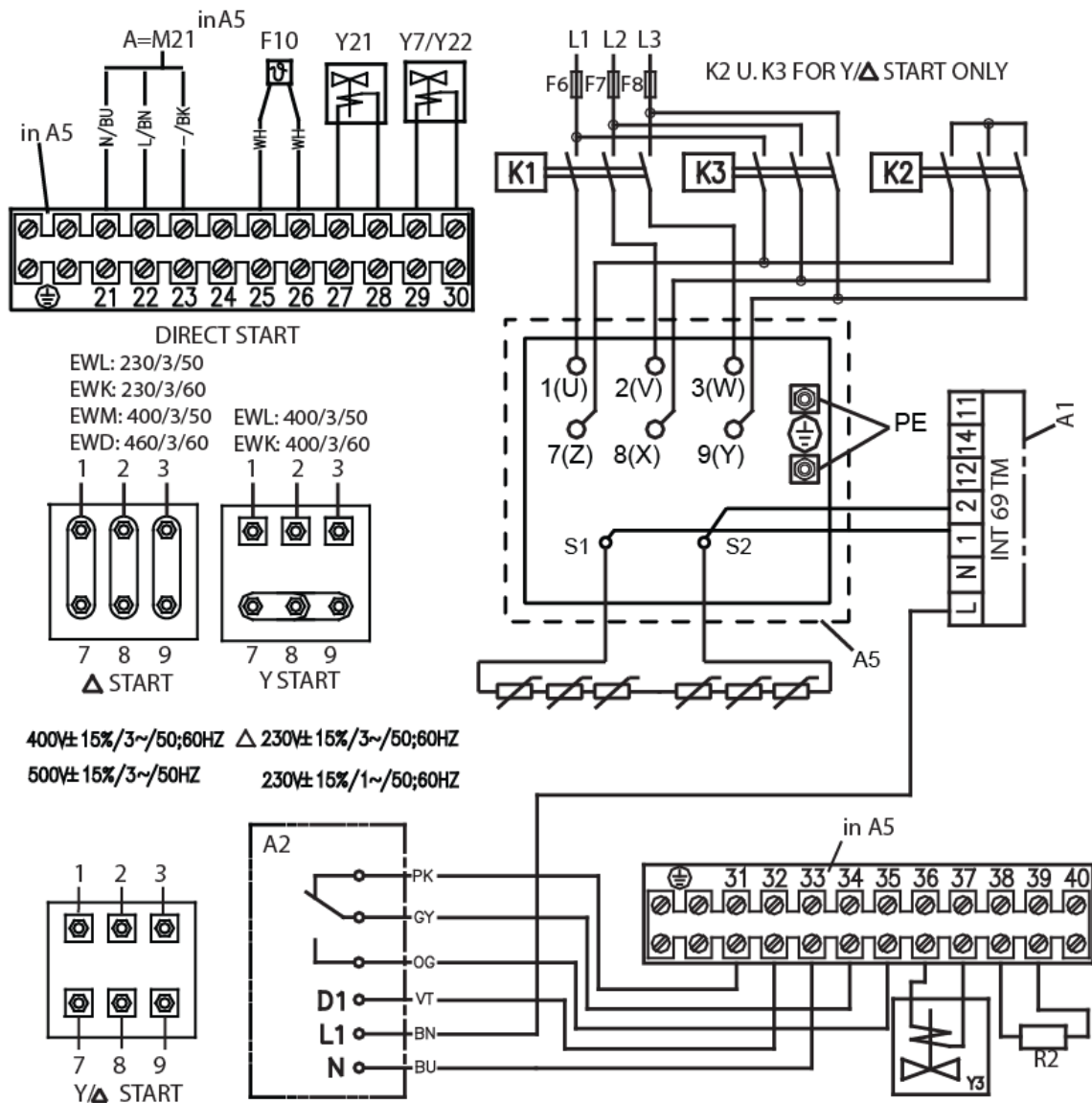


Figure 6

## 9 Terminal box

The terminal box rating is IP67.

The electrical characteristics of Discus and Service compressors are very close. Therefore, motor protections (fuses, contactors) will be the same for both compressor generations.

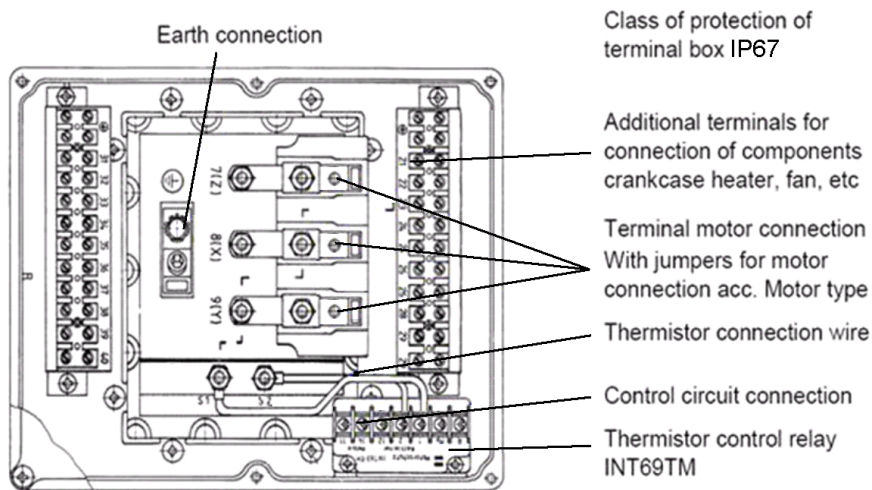


Figure 7

Only 2 studs are used for the PTC cable connectors. Connection is done without nuts, by means of “flag” connectors.

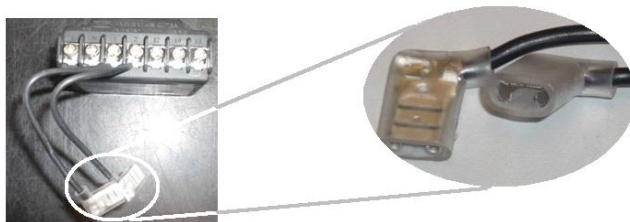


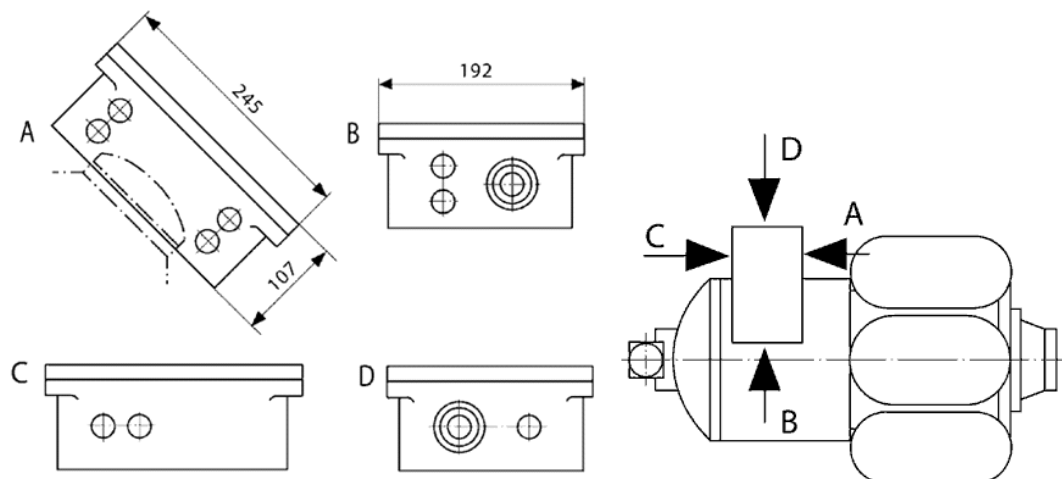
Figure 8

### 9.1 Terminal box dimensions

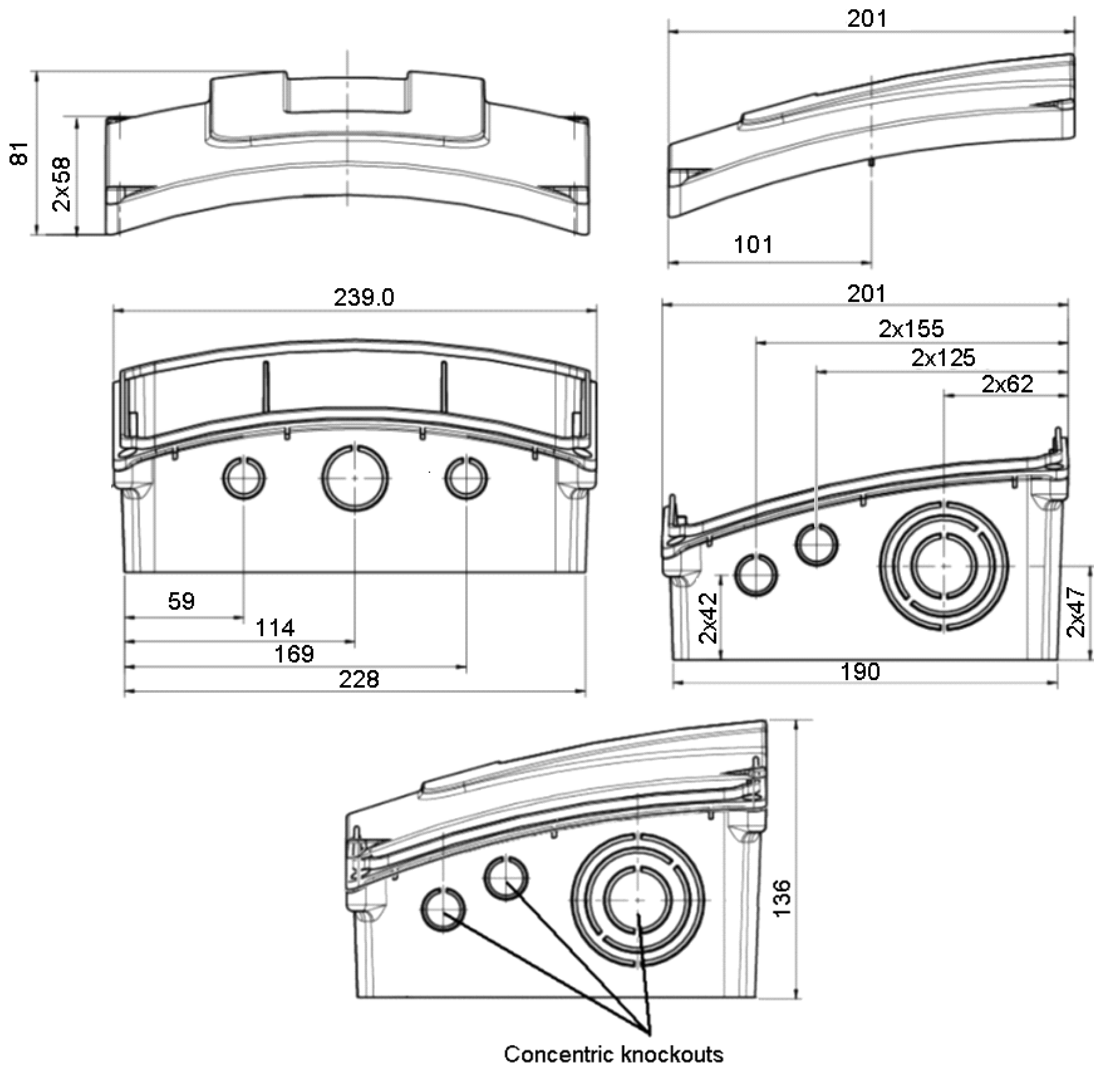
Discus / S-Series			Service Compressor		
Length	Width	Height	Length	Width	Height
245	192	107	239	201	136

Table 16: Terminal box dimensions in mm

#### 9.1.1 Discus and S- Series terminal box



**9.1.2 Service compressor terminal box**



**NOTE:** The terminal box cover must be closed when removing the knockouts.

**9.1.3 Terminal box internal parts**

**Discus / S-Series**



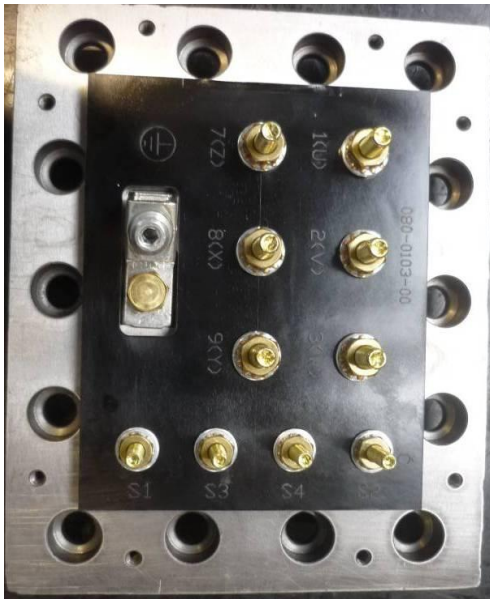
**Service compressor**



**Figure 9**

### 9.1.4 Terminal plate

Discus / S-Series



Service compressor

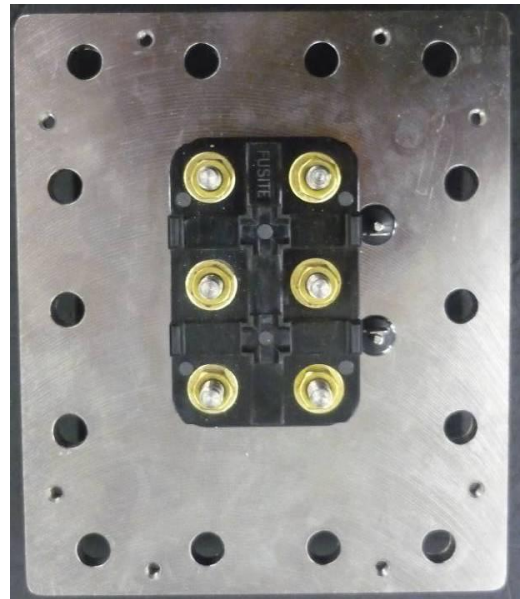


Figure 10

### 9.1.5 Grounding at Service compressor Terminal plate

If grounding is needed, the grounding screw can replace one of the terminal plate bolts. Remove one periphery bolt off the terminal plate and replace it with the grounding screw nut and washer like shown on the photos hereunder:

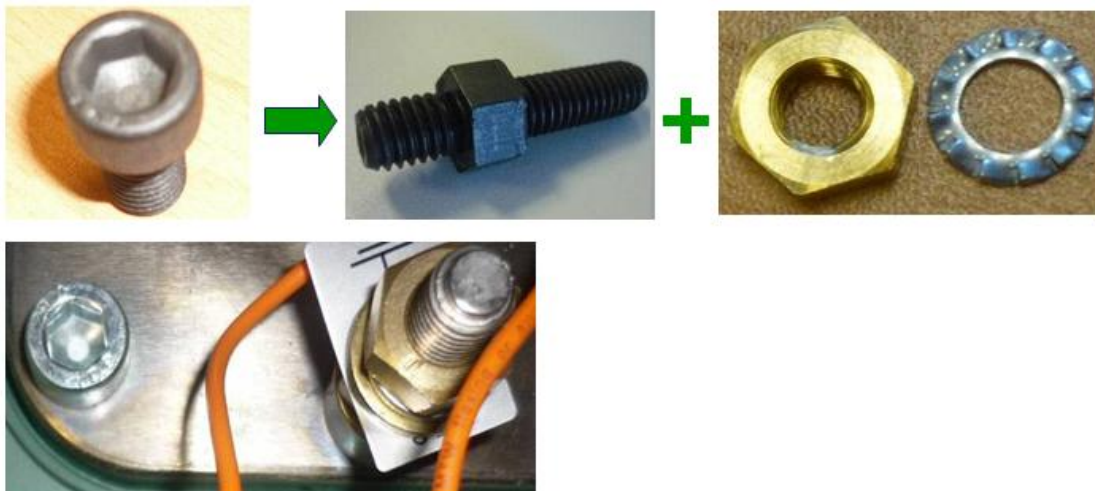


Figure 11

## 10 Oil label sticker

The oil level should be minimum at the bottom of the sight glass and maximum  $\frac{1}{4}$  of the sight glass. However, for operation with active oil management, mid-sight glass level is allowed.

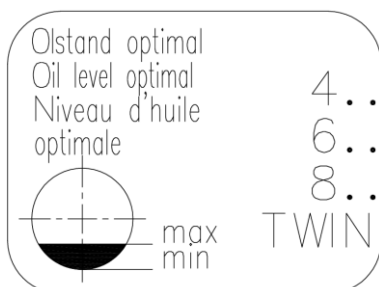


Figure 12



## 11 Accessories

### 11.1 Standard delivery Service compressors

- Blind flanges (instead of shut off valves)
- With rubber spacers instead of mounting parts
- INT69TM motor protection
- OPS sensor fitted in the oil pump
- Gasket pack for shut off valves
- Filled with oil
- With neutral gas charge
- Black paint

### 11.2 Shut off valves

Service compressors are delivered without shut off valves and with blind flanges.

The shut off valves can be recovered from the replaced model and installed on the Service compressor.

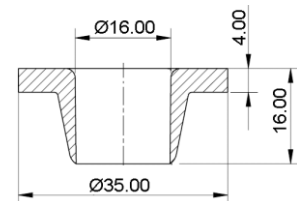
The position of the shut off valves on the Service compressor is the same as on old compressors. Therefore there is no need to change the pipe configuration.

### 11.3 Mounting parts

Service compressors are delivered with rubber spacers.

Discus/S-Series spring mounting parts are compatible with Service compressors, as well as Stream ones.

Special mounting feet are delivered for compressor model 6MJS (corresponding to D6SK-500X).

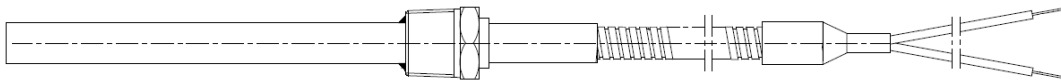


### 11.4 Crankcase heater

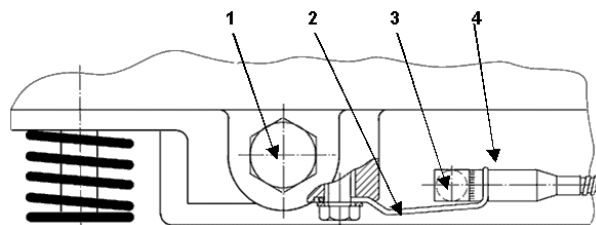
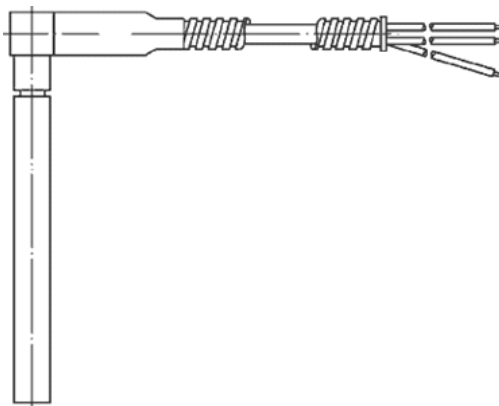
Service compressors use the same crankcase heater element. The crankcase heater values are given in **Table 17** below.

In compressors that are equipped with a deep oil sump, the heater element is inserted into a special chamber and fixed to the compressor body.

- 100 Watt heater element - If recovered from old compressor add heat sink paste.



- 200 Watt heater element



1. Magnetic plug
2. Securing piece
3. Heater element 200W
4. Deep oil sump

S - Series	CCH	Discus	CCH	Service comp.	CCH	
D4SF-100X	100W	D4DF-100X	100W	4MFS1-13X	100W	
D4SA-200X		D4DA-200		4MAS1-22X		
D4SL-150X		D4DL-150X		4MLS1-15X		
D4SH-250X		D4DH-250X		4MHS1-25X		
D4ST-200X		D4DT-220X		4MMS1-20X		
D4SJ-300X		D4DJ-300X		4MIS1-30X		
D6SL-250X		D6DL-270X		6MLS1-27X		
D6SH-350X		D6DH-350X		6MHS1-35X		
D6SF-200X		D6DT-320X		6MMS1-30X		200W
D6SA-300X		D6DJ-400X		6MIS1-40X		
D6ST-320X		6MTS1-35X				
D6SJ-400X		6MJS1-45X				
D6SU-400X						
D6SK-500X	200W					

Table 17: Crankcase heaters

## 11.5 Oil pressure control

The oil pressure switch breaks the control circuit when the pressure difference between the oil pump outlet and the crankcase is too low. The switch must be properly adjusted and tamper-proof. If the oil differential pressure drops below the minimum acceptable value the compressor will be stopped after a 120 seconds delay. After having solved the problem the control has to be reset manually.

Proper oil pressure safety control with an approved switch is a condition of warranty!

Specifications for electro-mechanical oil pressure switches are as follows:

- Cut-out pressure: 0.63 ± 0.14 bar
- Cut-in pressure: 0.9 ± 0.1 bar
- Time delay: 120 ± 15 sec.

**NOTE:** The oil pressure switches used in Discus or S-Series compressors are also compliant with Service compressors.

The following oil pressure switches can be delivered as accessories:

- Electronic oil pressure switch OPS2
- Mechanical oil pressure switch ALCO FD113 ZU

### 11.5.1 Oil pressure switch OPS2 / OPS1

The OPS sensor is delivered standard with Service compressor.

The OPS2 switch from Discus S-Series can be used on Service compressor.

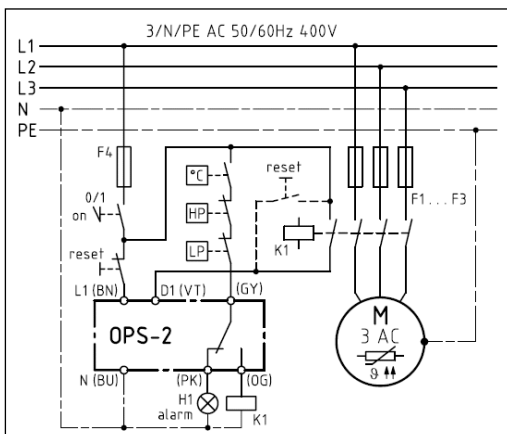


Figure 13

#### Wiring:

Brown (BN) = Power supply input

Violet (VIO) = Running signal from the compressor

Grey (GR) = Input changeover contact from the daisy chain

Orange (OG) = Output changeover contact linked to the compressor contactor

Pink (PK) = Output changeover contact linked to the alarm

Blue (BU) = Power supply output

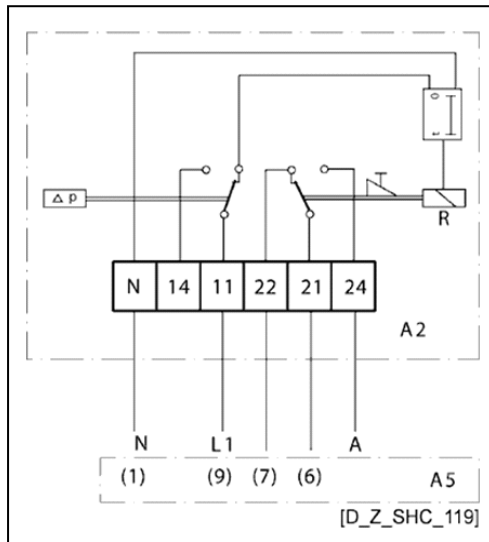


**NOTE:** For more information on OPS2 please refer to Technical Information D7.8.3 “DWM Semi-hermetic Compressor - Oil Pressure Differential Switch OPS2” available on [www.emersonclimate.eu](http://www.emersonclimate.eu).

### 11.5.2 Oil pressure switch – Alco FD113ZU (A22 – 057)

Specifications for electro-mechanical oil pressure switches are as follows:

- Cut-out pressure: 0.63 ± 0.14 bar
- Cut-in pressure: 0.90 ± 0.1 bar
- Time delay: 120 ± 15 sec
- Protection class: IP30



#### Legend:

- 11 ..... Voltage connection
- 21 ..... Control voltage connection
- 22 ..... Control circuit
- 24 ..... Alarm connection
- A2 ..... Oil pressure switch
- A5 ..... Compressor terminal box
- R ..... Relay
- N ..... Neutral connection
- t ..... Time delay

Figure 14

## 11.6 Liquid injection

Liquid injection systems (DTC and Demand Cooling) were used for applications with R22 at low evaporating temperatures.

**NOTE:** R22 is no longer allowed for new refrigeration systems in Europe. Only recycled R22 is allowed for maintenance until 2015. From 1<sup>st</sup> January 2015, R22 supply will be forbidden.

Changing a compressor on an installation could be an opportunity to exchange R22 for a longer term refrigerant and at the same time to discard the liquid injection system.

### 11.6.1 DTC (Discharge Temperature Control)

The DTC liquid Injection used on S-Series cannot be used on Service compressors. The Demand Cooling system will be an alternative.

### 11.6.2 Demand Cooling

“Demand Cooling” as the term implies, means liquid refrigerant injection on demand.

Demand Cooling was required for R22 operation of Discus compressors at low temperature.

On 4-cylinder Service compressors, the nozzles, temperature sensor, Demand Cooling module and bracket, valve and coil from a D4D can be reused. The bracket and tubing should be changed.

The Demand Cooling kit cannot be recovered from 6-cylinder compressors; the Demand Cooling kit of a Stream compressor should be used instead.

### 11.7 Capacity control

Service compressors use the same principle for capacity control as Discus and S-Series compressors.

The capacity control kit (valve plate, cylinder head, control valve, gaskets, bolts) or control valve from a Discus or S-Series compressor cannot be recovered to install on a Service compressor. Capacity control should be ordered as an accessory (already assembled together with the compressor) or as a separate upgrade kit.

### 11.8 Unloaded start

Service compressors use the same principle for unloaded start as S-Series and Discus compressors.

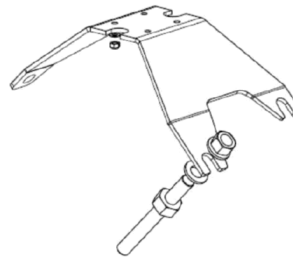
The unloaded start kit or control valve from a Discus or S-Series compressor cannot be recovered to install on a Service compressor. The unloaded start should be ordered as an accessory (already assembled together with the compressor) or as a separate upgrade kit.

### 11.9 Additional fan

The fan can be recovered from the old compressor, but the mounting parts will have to be changed. The fan mounting kit has to be ordered separately.

Service compressor models do not have any studs for fan. Studs are part of the fan mounting kit.

Stream Mounting kit Fan	
Description	Ident
4M*	3011694
6M*	3011718



## 12 Spare parts

### 12.1 Common spare parts

Many parts are common to Service compressors and the Discus and S-Series equivalent compressors:

- Shut off valves
- Suction screen and gasket
- Oil pump with OPS sensor
- Oil sight glass
- Oil screen, magnetic plug
- Stator cover and gasket
- Terminal plate
- Relief valve
- Oil and gas check valve
- Bottom plate and gasket
- Piston rings

### 12.2 Specific spare parts

A few main parts are different and not interchangeable between Discus and S-Series, and Service compressors:

- Valve plates and valve plate gaskets
- Pistons and connecting rods
- Cylinder heads
- Stator cover gasket
- Crankshaft

Spare parts for Discus, S-Series and Service compressors can be selected with the spare parts software at <http://parts.emersonclimate.eu/IP1/>.

## 13 Service compressor in parallel operation

### 13.1 Service compressor in parallel operation with active oil management systems

The Service compressor sight glass design and position are the same as on previous models (D4S, D4D, D6S & D6D). Therefore it is possible to keep the existing oil management systems in a rack when replacing a compressor by a Service compressor. Service compressor acceptable oil levels are the same as for previous models - typically half sight glass level is optimum, levels between  $\frac{1}{4}$  and  $\frac{3}{4}$  of sight glass are acceptable.

### 13.2 Service compressor in parallel operation with passive oil management systems

Selecting a Service compressor according to the cross reference in this guideline for the replacement of an S-Series or Discus model in a Tandem combination will ensure about the same behaviour of the Service compressor in terms of oil distribution compared to the replaced models. Internal testing confirmed that the oil and gas-equalization as per DWM Copeland documentation recommendations is satisfactory for a 2-compressor application (Twin and parallel operation in rack), even if both compressors are equipped with blocked suction capacity control.

Note that restrictions at part load mode can be due to minimum required oil return caused through low velocities in the piping system. It is expected that replacement Service compressor can handle same capacity steps like installed before. The design of the sight glasses on Service compressor and forerunner models (D4S, D4D, D6S & D6D) remains the same. Therefore it is possible to keep existing adapters for connection to compressor body at sight glass position in a rack when replacing a compressor by a Service compressor.

### 13.3 Service compressor trio operation

For trio applications, it is expected that the Service compressor will perform like forerunner models in terms of gas and oil equalization. However, Emerson Climate Technologies cannot exclude that modifications of existing passive oil management systems are required or that an active oil management system is the only successful solution.

For applications with more than 3 compressors only active oil management systems are recommended.

## 14 Replacement on a Twin

In case a compressor fails on a Twin made of two Discus or S-Series compressors, a replacement with a Service compressor is possible.

### 14.1 Twin description

Twin compressors consist of two single compressors of the same designation, which are connected motor end to motor end joined by means of a common suction chamber with one suction shut-off valve and suction filter.

The Twin compressors are mounted on two parallel “U” shaped rails. The compressor and frame are secured by using rubber pads to reduce stress, which may occur during the installation of the Twin compressors.

### 14.2 Replacement of compressor on a Twin

The connection part between the 2 compressors is the suction chamber.

When assembling a Discus or S-Series compressor together with a Service compressor, the foot level of the Service compressor will be 4 mm lower than the previous compressor position. Besides, the mounting parts used on the old compressor will not fit the Service compressor.

Thinner rubber pads will have to be used under the feet of the Service compressor in order to have the body at the same level as the suction chamber.

Thinner rubber pads can be delivered alone, or together with the other Twin mounting parts (thick rubber pads, rubber spacers, washers, bolts, etc...).

- Only thinner rubber pads for one compressor:
  - as an option: variation N°5405871 (order together with the compressor)
  - as a kit N°3207775
  - to be ordered if the mounting part kit has been recovered from the former compressor
- Thinner rubber pads can be delivered with the other mounting part components:
  - as an option: variation to be ordered together with the compressor:
    - N°5405837 for deep oil sump models 6MMS, 6MIS, 6MTS, and 6MJS
    - N°5405826 for other models with a flat bottom plate
  - as a kit:
    - N°3199507 for deep oil sump models 6MMS, 6MIS, 6MTS, and 6MJS
    - N°5405826 for other models with a flat bottom plate
  - to be ordered if the mounting part kit has not been recovered from the former compressor

#### 14.2.1 Replacement on Discus or S-Series Twin manufactured from March 1991 onwards

##### 14.2.1.1 Parts needed

For replacing a Discus or S-Series compressor on a tandem manufactured since March 1991 the following parts are needed:

- 1 x special mounting part kit (see above chapter 14.2)
- 1 x gasket between Service compressor and suction chamber N°2882802
- 1 x gasket between compressor and discharge valve

**14.2.1.2 Replacement procedure:**

- 1 Disconnect the power supply, close the 3 shut off valves of the Twin.
- 2 Recover gas from the compressors and remove as much oil as possible.
- 3 Un-torque and remove the suction shut-off valve bolts.
- 4 Un-torque and remove the bolts of the defective compressor discharge valve.
- 5 Un-torque and remove the bolts and nuts that maintain the suction chamber to the defective compressor.
- 6 Un-torque and remove the mounting rubber bolts of the defective compressor.
- 7 Remove the valves and bolts.
- 8 Hang and lift the compressor with a lifting rope and/or using lifting eyes.
- 9 Remove the defective compressor and its rubber pads.
- 10 Remove the gas holding charge of the Service compressor.
- 11 Remove the Service compressor suction cover.
- 12 Put in position the thin rubber pads, install the Service compressor on the mounting parts.
- 13 Put the gasket between the suction chamber and the new compressor.
- 14 Tighten the suction cover bolts and nuts to the new compressor (tightening torque 68-79 Nm).
- 15 Install the discharge valve with a new gasket and tighten the screws to 53-84 Nm.
- 16 Add the second rubber pad and tighten the mounting bolts; the nuts should be tightened to the rubber surface without rubber deformation to keep efficient operation of the rubber. The maximum applicable torque without rubber deformation is 50 Nm.

**14.2.2 Replacement on Discus or “R” Twin manufactured before March 1991**

Old models manufactured before 1991 used to have a different gas circulation around the stator, that is to say a different suction chamber configuration. The suction chambers used before 1991 are not compliant with the present Service compressors.

**14.2.2.1 Suction chamber**

Due to the change in the motor cooling, a new suction chamber TWIN is necessary. This chamber has by-pass slots that the previous suction chamber does not have. Therefore it is not allowed to use the previous suction chamber with compressors with by-pass bodies. However compressors that still have the holes in the rotor can use the new suction chamber.

When replacing one compressor of a TWIN with the old suction chamber it is also necessary to replace the suction chamber for a new one.

The following table will help to identify the specific parts that need to be changed for such a replacement.

Old Twin before March 1991		New Suction Chamber	Gasket Suction chamber / Compressor	Gasket Suction chamber / Shut off valve
D44F – 2000 D44A – 2000 D44A – 4000 D44H – 3000 D44L – 3000	D44DF – 2000 D44DA – 2000 D44DA – 4000 D44DH – 3000 D44DL – 3000	2887603	2 x 2882802	2880862
D44H – 5000 D44T – 4400 D44J – 4000 D44J – 6000 All D66*	D44DH – 5000 D44DT – 4400 D44DJ – 4000 D44DJ – 6000 All D66D*	2887590	2 x 2882802	2880873

Table 18

**14.2.2.2 Replacement procedure:**

- 1 Disconnect the power supply, close the 3 shut-off valves of the Twin.
- 2 Recover gas from the compressors and remove as much oil as possible.
- 3 Un-torque and remove the suction shut of valve bolts.
- 4 Un-torque and remove the bolts of the defective compressor discharge valve.
- 5 Un-torque the bolts and nuts that maintain the suction chamber to the 2 compressors.
- 6 Un-torque and remove the mounting rubber bolts of the damaged compressor.
- 7 Remove be valves and bolts.
- 8 Hang and lift the compressor with a lifting rope and/or using lifting eyes.
- 9 Remove the damaged compressor and its rubber pads.
- 10 Remove the suction chamber and the gaskets.
- 11 Install a new gasket on remaining compressor.
- 12 Install the new suction chamber on the "old" compressor (tightening torque 68-79 Nm).
- 13 Remove the gas holding charge of the Service compressor.
- 14 Remove the service compressor suction cover.
- 15 Put in position the thin rubber pads.
- 16 Install the service compressor on the mounting parts.
- 17 Put the gasket between the suction chamber and the new compressor.
- 18 Tighten the suction cover bolts/nuts to the new compressor (tightening torque 68-79 Nm).
- 19 Recover the suction screen from the chamber, clean it and install it in the new suction chamber.
- 20 Install the suction valve with a new gasket and tighten the screws to 104 to 164 Nm.
- 21 Install the discharge valve with a new gasket and tighten the screws to 53-84 Nm.
- 22 Add the second rubber pad and tighten the mounting bolts; the nuts should be tightened to the rubber surface without rubber deformation to keep efficient operation of the rubber. The maximum applicable torque without rubber deformation is 50 Nm.





#### BENELUX

Deltakade 7  
NL-5928 PX Venlo  
Tel. +31 77 324 02 34  
Fax +31 77 324 02 35  
benelux.sales@emerson.com

#### UK & IRELAND

Unit 17, Theale Lakes Business Park  
Reading, Berkshire RG7 4GB  
Tel: +44 1189 83 80 00  
Fax: +44 1189 83 80 01  
uk.sales@emerson.com

#### BALKAN

Selska cesta 93  
HR-10 000 Zagreb  
Tel. +385 1 560 38 75  
Fax +385 1 560 38 79  
balkan.sales@emerson.com

#### GERMANY, AUSTRIA & SWITZERLAND

Senefelder Str. 3  
DE-63477 Maintal  
Tel. +49 6109 605 90  
Fax +49 6109 60 59 40  
ECTGermany.sales@emerson.com

#### SWEDEN, DENMARK, NORWAY & FINLAND

Pascalstr. 65  
DE-52076 Aachen  
Tel. +49 2408 929 0  
Fax +49 2408 92 95 28  
nordic.sales@emerson.com

#### CZECH REPUBLIC

Hajkova 2747/22  
CZ-13000 Prague 3  
Tel. +420 271 035 628  
Fax +420 271 035 655  
Gabor.Boszormenyi@emerson.com

#### FRANCE, GREECE & MAGHREB

8, Allée du Moulin Berger  
FR-69134 Ecully Cédex  
Tel. +33 4 78 66 85 70  
Fax +33 4 78 66 85 71  
mediterranean.sales@emerson.com

#### EASTERN EUROPE & TURKEY

Pascalstr. 65  
DE-52076 Aachen  
Tel. +49 2408 929 0  
Fax +49 2408 929 525  
easterneurope.sales@emerson.com

#### UKRAINE

Kurenevskiy lane, 12, build. A, office 302  
UA-04073 Kiev  
T +38 044 492 99 24 Ext. 232  
F +38 044 492 99 28  
Andrey.Gladchenko@emerson.com

#### ITALY

Via Ramazzotti, 26  
IT-21047 Saronno (VA)  
Tel. +39 02 96 17 81  
Fax +39 02 96 17 88 88  
italy.sales@emerson.com

#### POLAND

Szturmowa 2  
PL-02678 Warsaw  
Tel. +48 22 458 92 05  
Fax +48 22 458 92 55  
poland.sales@emerson.com

#### ROMANIA

Tel. +40 374 13 23 50  
Fax +40 374 13 28 11  
Ancuta.Ionescu@Emerson.com

#### SPAIN & PORTUGAL

C/ LLull, 321 (Edifici CINC)  
ES-08019 Barcelona  
Tel. +34 93 412 37 52  
Fax +34 93 412 42 15  
iberica.sales@emerson.com

#### RUSSIA & CIS

Letnikovskaya 10, Bld. 2, floor 5  
RU-115114 Moscow  
Tel. +7 495 981 98 11  
Fax +7 495 981 98 16  
ECT.Holod@emerson.com

#### MIDDLE EAST & AFRICA

PO Box 26382  
Jebel Ali Free Zone - South, Dubai - UAE  
Tel. +971 4 811 81 00  
Fax +971 4 886 54 65  
mea.sales@emerson.com

For more details, see [www.emersonclimate.eu](http://www.emersonclimate.eu)

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Emerson Climate Technologies - European Headquarters - Pascalstrasse 65 - 52076 Aachen, Germany  
Tel. +49 (0) 2408 929 0 - Fax: +49 (0) 2408 929 570 - Internet: [www.emersonclimate.eu](http://www.emersonclimate.eu)

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