

ENGINEERING
TOMORROW

Danfoss

Application Guide

Scroll compressors **DSF090 to DSF530**

Single and manifold, 50-60 Hz - R32



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Safety and warnings

Danfoss compressors are designed and manufactured according to the state of the art and to valid European and US regulations. Particular emphasis has been placed on safety and reliability. Related instructions are highlighted with the following icons:

 This icon indicates instructions to avoid safety risk.

 This icon indicates instructions to avoid reliability risk.

The purpose of this guideline is to help customers qualify compressors in the unit. You are strongly advise to follow these instructions. For any deviation from the guidelines, please contact Danfoss Technical Support. In any case, Danfoss accepts no liability as a result of the improper integration of the compressor into the unit by the system manufacturer.

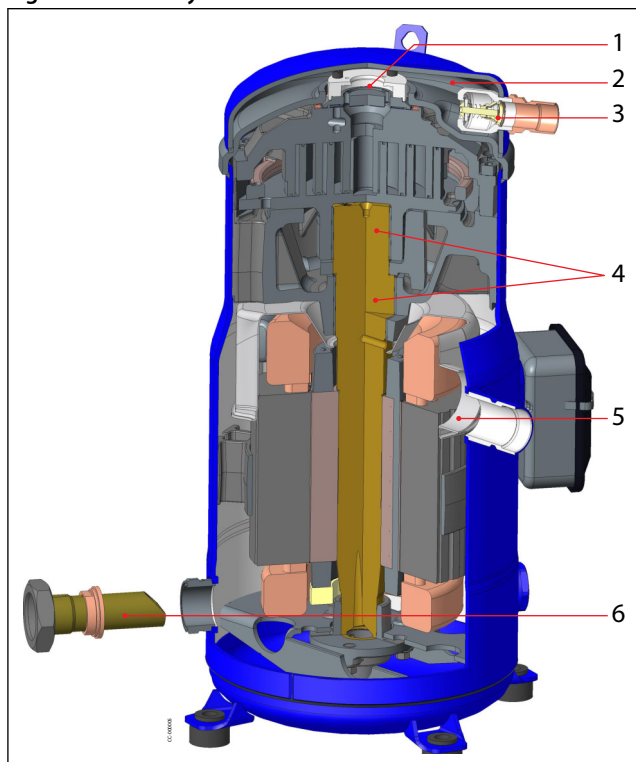
Introduction

Product description

DSF series scroll compressor benefit from an improved design to achieve the highest efficiency and increased life time.

Cut Away DSF090-200

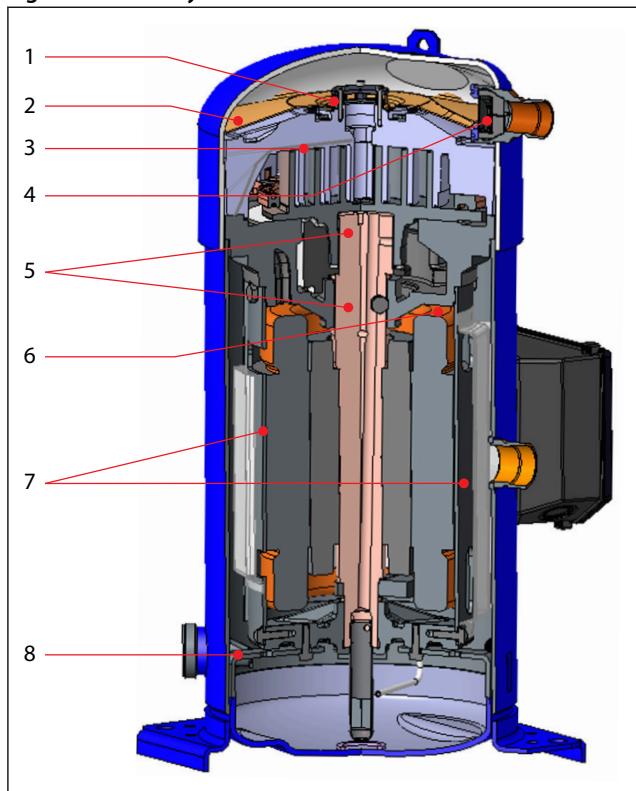
Figure 1: Cut Away DSF090-200



- | | |
|---|--|
| 1 | Intermediate discharge valves (IDVs) increase seasonal efficiency |
| 2 | Heat shield lowers the heat transfer between discharge and suction gas and the sound level |
| 3 | Internal Non Return Valve (INRV) prevents excessive leak rate from high pressure side |
| 4 | Lead free polymer bearings improve behavior under poor lubrication conditions |
| 5 | Patented motor cap for optimal motor cooling and higher resistance to liquid slugging |
| 6 | Organ pipe masters oil circulation in manifold configuration. |

Cut away DSF 270-530

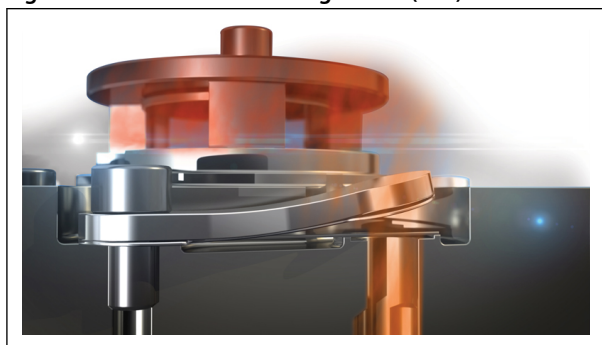
Figure 2: Cut Away DSF 270-530



- | | |
|---|--|
| 1 | Intermediate discharge valves (IDVs) increase seasonal efficiency |
| 2 | Heat shield lowers the heat transfer between discharge and suction gas and the sound level |
| 3 | Integrated discharge gas temperature protection (DGT) |
| 4 | Internal Non Return Valve (INRV) prevents excessive leak rate from high pressure side |
| 5 | Lead free polymer bearings improve behavior under poor lubrication conditions |
| 6 | Patented motor cap for optimal motor cooling |
| 7 | Patented gas path flow with gas intake design induce higher resistance to liquid slugging |
| 8 | Organ pipe masters oil circulation in manifold configuration. |

How do IDVs work?

Figure 3: Intermediate Discharge Valve (IDV)



Danfoss Intermediate Discharge Valves (IDVs) are located close to the discharge side of the compressor. They reduce excessive compression of refrigerant under part-load conditions while maintaining the same cooling capacity. The IDVs open when discharge pressure falls below the built-in optimization point. They adapt the effort of the motor to the varying load and pressure conditions in the system, thus reducing the effort of the motor and its electrical consumption and improving the system's seasonal energy efficiency.

Product identification

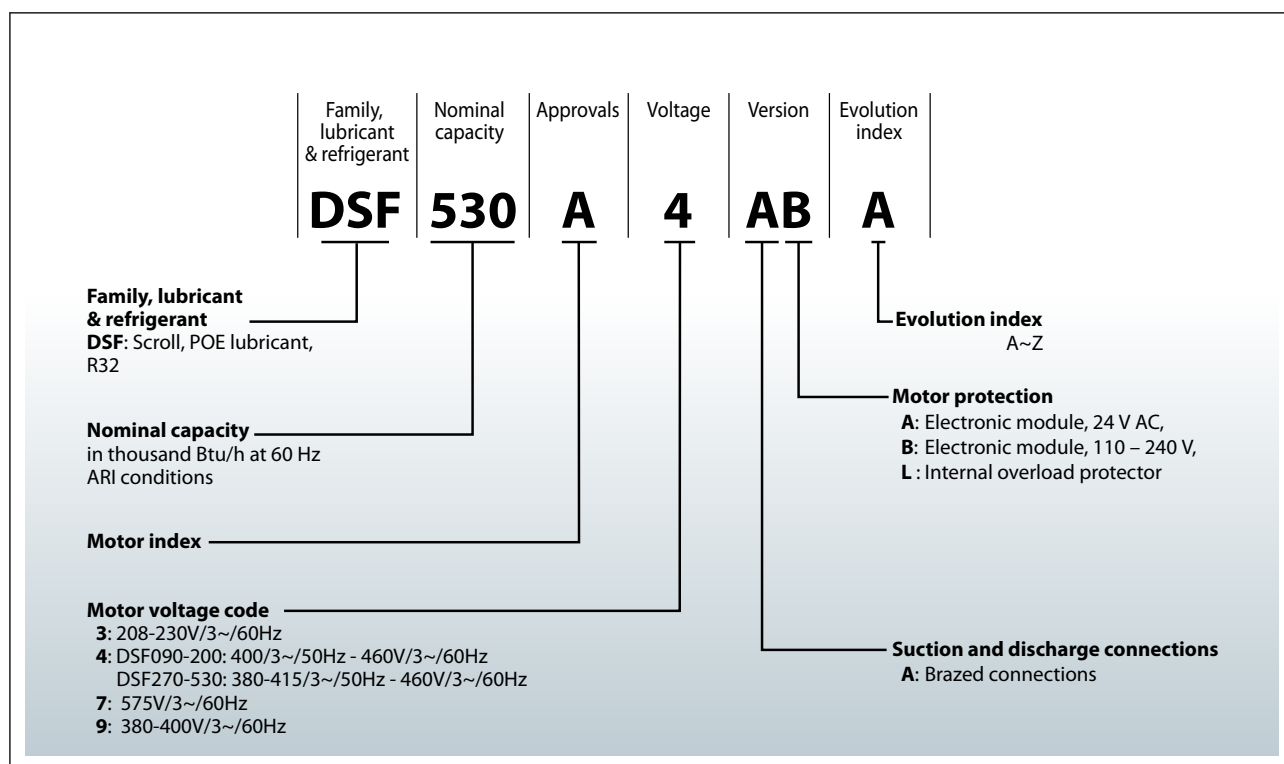
Name Plate

Figure 4: Name Plate

1	Model no : DSF485A4ABA	1	Model number
2	Serial no : ZQ1109974321	2	Serial number
3	CE	3	Approvals
4	Refrigerant: R32	4	Refrigerant
5	380-415V 3~ 50Hz 460V 3~ 60 Hz LR 343 A MAX OPER.92 A	5	Supply voltage, Starting current & Maximum operating current
6	LP side 31,2 bar HP side 48,7 bar	6	Housing service pressure
7	Lubricant: 185 SL	7	Factory charged lubricant

Nomenclature

Danfoss scroll compressor DSF for R32 is available as single compressor and can be assembled in tandem or trio combinations. The example below presents the compressor nomenclature which equals the technical reference as shown on the compressor nameplate. Code numbers for ordering are listed in section [Ordering](#).



Compressors serial number

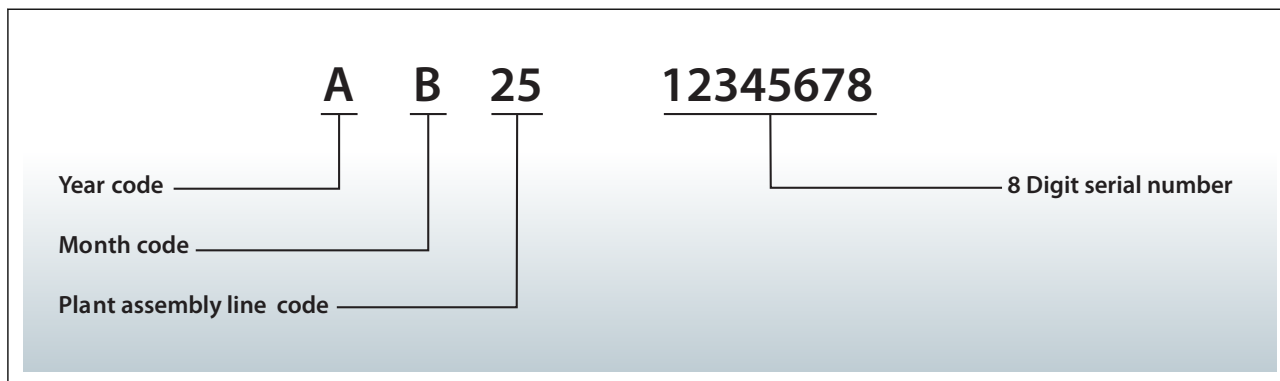




Table 1: Serial number code legend table

Year code		Month code		Plant assembly line code	
Year	Code	Month	Code	Plant	Code
1990, 2010	A	January	A	Trévoux, France	11
1991, 2011	B	February	B		
1992, 2012	C	March	C		
1993, 2013	D	April	D	Wuqing, China	25
1994, 2014	E	May	E		
1995, 2015	F	June	F		
1996, 2016	G	July	G		
1997, 2017	H	August	H		
1998, 2018	J	September	J		
1999, 2019	K	October	K		
2000, 2020	L	November	L		
2001, 2021	M	December	M		
2002, 2022	N				
2003, 2023	P				
2004, 2024	Q				
2005, 2025	R				
2006, 2026	S				
2007, 2027	T				
2008, 2028	U				
2009, 2029	V				

Certificates, declarations, and approvals

DSF scroll compressors comply with the following approvals and certificates.
Certificates are listed on: [Documentation for Commercial Compressor | Danfoss](#)

Table 2: Approval and certificates

Approval and certificates	Certification logo	Models
CE0062 or CE0094 (European Directive)		All DSF models
UL (Underwriters Laboratories)		All DSF models
Other approvals / certificates		Contact Danfoss

Low voltage directive 2014/35/EU

Table 3: Low voltage directive 2014/35/EU

Products	DSF models
Declaration of conformity	Contact Danfoss

Machines directive 2006/42/EC

Table 4: Machines directive 2006/42/EC

Products	DSF models
Manufacturer's declaration of incorporation	Contact Danfoss

Pressure equipment directive 2014/68/EU

Table 5: Pressure equipment directive 2014/68/EU

Products	DSF090-200	DSF270-325	DSF485-530
Refrigerant fluids	Group 1	Group 1	Group 1
Category PED	III	III	III
Maximum / Minimum temperature (Low side) - Ts	-35°C < Ts < 53°C -31°F < Ts < 127°F	-35°C < Ts < 51°C -31°F < Ts < 125.6°F	
Maximum allowable pressure (Low side) - Ps	32.7bar(g) / 474psig	31.2 bar(g) / 452 psig	
Maximum allowable pressure (High side) - Ps	48.7 bar(g) / 706 psig		
Declaration of conformity	Contact Danfoss		

Internal free volume

Table 6: Internal free volume

Products	Internal free volume without oil					
	Low pressure side		High pressure side		Total	
	litre	cu.inch	litre	cu.inch	litre	cu.inch
DSF090-100	11.7	714	0.7	43	12.4	757
DSF115-175	13.6	830	0.7	43	14.3	873
DSF200	13.9	848	0.7	43	14.6	891
DSF270	27.5	1678	2.9	177	30.4	1855
DSF325	27.1	1654	2.8	171	29.9	1825
DSF485	28.5	1739	3.9	238	32.4	1977
DSF530	28.5	1739	3.9	238	32.4	1977

Refrigerants

General information

When choosing a refrigerant, different aspects must be taken into consideration:

- Legislation (now and in the future)
- Safety
- Application envelope in relation to expected running conditions
- Compressor capacity and efficiency
- Compressor manufacturer recommendations & guidelines

Additional points could influence the final choice:

- Environmental considerations
- Standardisation of refrigerants and lubricants
- Refrigerant cost
- Refrigerant availability

R32

R32 is a pure HFC refrigerant with a zero Ozone Depletion Potential (ODP=0) and a low Global Warming Potential (GWP: 677/AR5; 675/AR4).

R32 leads to higher discharge temperatures than R410A but it offers higher cooling capacities and better efficiencies compared to R410A.

R32 is classified A2L with low flammability properties. Please refer to European regulations and directives about the use of refrigerant of the A2L safety group (EN378, EN60335). Outside Europe refer to the local regulation

Technical specification

50-60 Hz data, Single compressor

Table 7: 50-60 Hz data, Single compressor

Model	Swept volume		Displacement (50 Hz) ⁽¹⁾		Displacement (60 Hz) ⁽²⁾		Oil charge		Net weight ⁽³⁾	
	cm ³ /rev	cu.in/rev	m ³ /h	cu.ft/h	m ³ /h	cu.ft/h	dm ³	oz	kg	lbs
DSF090	81.3	4.96	14.2	500	17.1	603	3.0	102	58	128
DSF100	88.4	5.39	15.4	544	18.6	657	3.0	102	58	128
DSF115	103.5	6.32	18	636	21.8	770	3.3	113	64	141
DSF130	116.9	7.13	20.3	717	24.6	869	3.3	113	64	141
DSF155	133	8.12	23.1	816	27.9	985	3.3	113	67	148
DSF175	151.7	9.26	26.4	932	31.9	1127	3.3	113	69	152
DSF200	170.3	10.39	29.6	1045	35.8	1264	3.6	123	71.5	158
DSF270	227.6	13.89	39.6	1398	47.8	1688	6.1	206	114	251
DSF325	276.2	16.85	48.1	1699	58.0	2048	6.1	206	117	258
DSF485	407.2	24.85	70.9	2502	85.1	3005	6.1	206	176	388
DSF530	442.6	27.01	77	2719	92.9	3281	6.1	206	176	388

⁽¹⁾ Displacement at nominal speed: 2900 rpm at 50 Hz

⁽²⁾ Displacement at nominal speed : 3500 rpm at 60 Hz

⁽³⁾ Net weight with oil charge

Performance data

R32 50-60 Hz, Single compressor

Table 8: 50-60 Hz R32, Single compressor

Model		Nominal tons 60Hz	Nominal cooling capacity		Power input	COP	E.E.R.
		TR	W	Btu/h	kW	W/W	Btu/h/W
50 Hz	DSF090	7.5	19958	68096	6.69	2.99	10.19
	DSF100	8.5	21940	74860	7.13	3.08	10.50
	DSF115	10	26349	89904	8.31	3.17	10.82
	DSF130	11	29421	100384	9.19	3.20	10.93
	DSF155	13	33772	115232	10.51	3.21	10.97
	DSF175	15	39172	133655	12.07	3.24	11.07
	DSF200	16.5	43329	147838	13.53	3.20	10.92
	DSF270	22.5	59030	201416	17.98	3.28	11.20
	DSF325	27	71480	243897	21.50	3.33	11.35
	DSF485	40	107102	365443	31.67	3.38	11.54
60 Hz	DSF530	44	116998	399209	34.27	3.41	11.65
	DSF090	7.5	26938	91911	8.68	3.10	10.59
	DSF100	8.5	29362	100182	9.38	3.13	10.67
	DSF115	10	34923	119157	10.79	3.24	11.04
	DSF130	11	39465	134653	12.24	3.22	11.00
	DSF155	13	45215	154273	13.82	3.27	11.16
	DSF175	15	51618	176121	15.70	3.29	11.22
	DSF200	16.5	57717	196932	17.63	3.27	11.17
	DSF270	22.5	78270	267065	23.69	3.30	11.27
	DSF325	27	95210	324866	28.54	3.34	11.38
	DSF485	40	144600	493390	42.12	3.43	11.71
	DSF530	44	156300	533311	45.6	3.43	11.70

NOTE:

TR: Ton of Refrigeration,

COP: Coefficient Of Performance

EER: Energy Efficiency Ratio

Standard rating conditions for 50Hz: Evaporating temperature: 5°C (41°F), Condensing temperature: 50°C (122°F), Superheat: 10K (18°F), Subcooling: 0K (0°F)

Standard rating conditions for 60Hz: Evaporating temperature: 7.2°C (45°F), Condensing temperature: 54.4°C (130°F), Superheat: 11.1K (20°F), Subcooling: 8.3K (15°F)

Subject to modification without prior notification.

Data given for motor code 4 compressor with above conditions



For regular updates and detailed capacities, please refer to [Coolselector®2](#).

Tandem and trio performances

The impact of manifolding on compressor performances depends widely of the customer system itself. Therefore, it would be unrealistic to provide data that corresponds accurately to a particular system. In first approach, to support compressors selection at full load, the manifold performances can be considered as the sum of capacities of the compressors composing the manifold. For better accuracy, the customer should integrate the appropriate weighing coefficients according to his system very pressure drops and part load levels.

Sound and vibration data

Typical sounds and vibrations in systems can be broken down into the following three categories:

- Sound radiation (through air)
- Mechanical vibrations (through parts and structure)
- Gas pulsation (through refrigerant)

The following sections focus on the causes and methods of mitigation for each of the above sources.

Compressor sound radiation

For sound radiating from the compressors, the emission path is air and the sound waves are travelling directly from the machine in all directions.

Sound levels for compressors running alone as follows:

Table 9: Compressor sound radiation

Compressor model	50 Hz		60 Hz		Acoustic hood code no.
	Sound power, dB(A)	Attenuation, dB(A)	Sound power, dB(A)	Sound power, dB(A)	
DSF090	74	4	77	4	Body 120Z0490 Top 120Z0493
DSF100	76	4	79	4	Body 120Z0490 Top 120Z0493
DSF115-175	78	4	81	5	Body 120Z0491 Top 120Z0493
DSF200	80	5	83	6	Body 120Z0492 Top 120Z0493
DSF270	83	4	86	4	120Z0768
DSF325	83	4	86	4	
DSF485	89	4	92	4	
DSF530	89	4	92	4	

NOTE:

Sound power and attenuation are given at ARI conditions, measured in free space.

For compressors running simultaneously

The global sound level of “n” identical compressors is:

$$L_{\text{GLOBAL}} = L_i + 10 \log_{10} n$$

Example for the trio

$$\text{DSF810T} = 3 \times \text{DSF270}$$

$$L_{\text{DSF270}} = 83\text{dB(A)}$$

$$L_{\text{DSF810T}} = 83 + 10 \log_{10} 3 = 87.8\text{dB(A)}$$

The global sound level of “n” different compressors with respectively L_i sound level is:

$$L_{\text{GLOBAL}} = 10 \log_{10} \left(\sum_{i=1}^n 10^{0.1 L_i} \right)$$

Example for the tandem

$$\text{DSF1180T} = \text{DSF325} + \text{DSF325} + \text{DSF530}$$

$$L_{\text{DSF325}} = 83\text{dB(A)}, L_{\text{DSF530}} = 89\text{dB(A)}$$

$$L_{\text{DSF1180T}} = 10 \log_{10} (10^{0.1 \times 83} + 10^{0.1 \times 83} + 10^{0.1 \times 89}) = 90.8 \text{ dB(A)}$$

Mechanical vibrations

A compressor generates some vibrations that propagate into the surrounding parts and structure. The vibration level of a DSF compressor alone does not exceed 120 µm peak to peak for DSF090 to DSF200, and 154µm peak to peak for DSF270 to DSF530.. However, when system structure natural frequencies are close to running frequency, vibrations are amplified due to resonance phenomenon.

A high vibration level is damageable for piping reliability and generates high sound levels.

Operating envelope data

The **Operating envelope data** for DSF scroll compressors guarantees reliable operations of the compressor for steady-state operation.

Steady-state operation envelope is valid for a suction superheat within 5K to 10K range at nominal Voltage.

Operating envelope

Figure 5: Operating envelope R32 DSF090 to DSF130

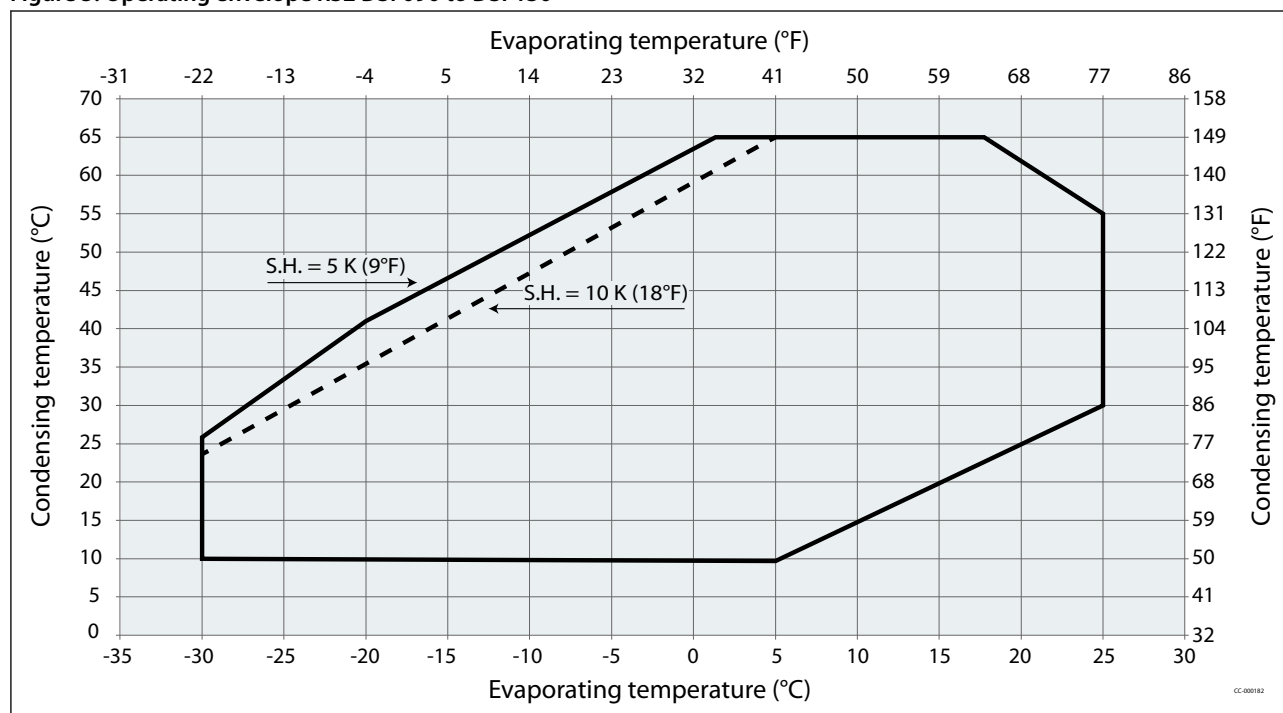


Figure 6: Operating envelope R32 DSF155 to DSF200

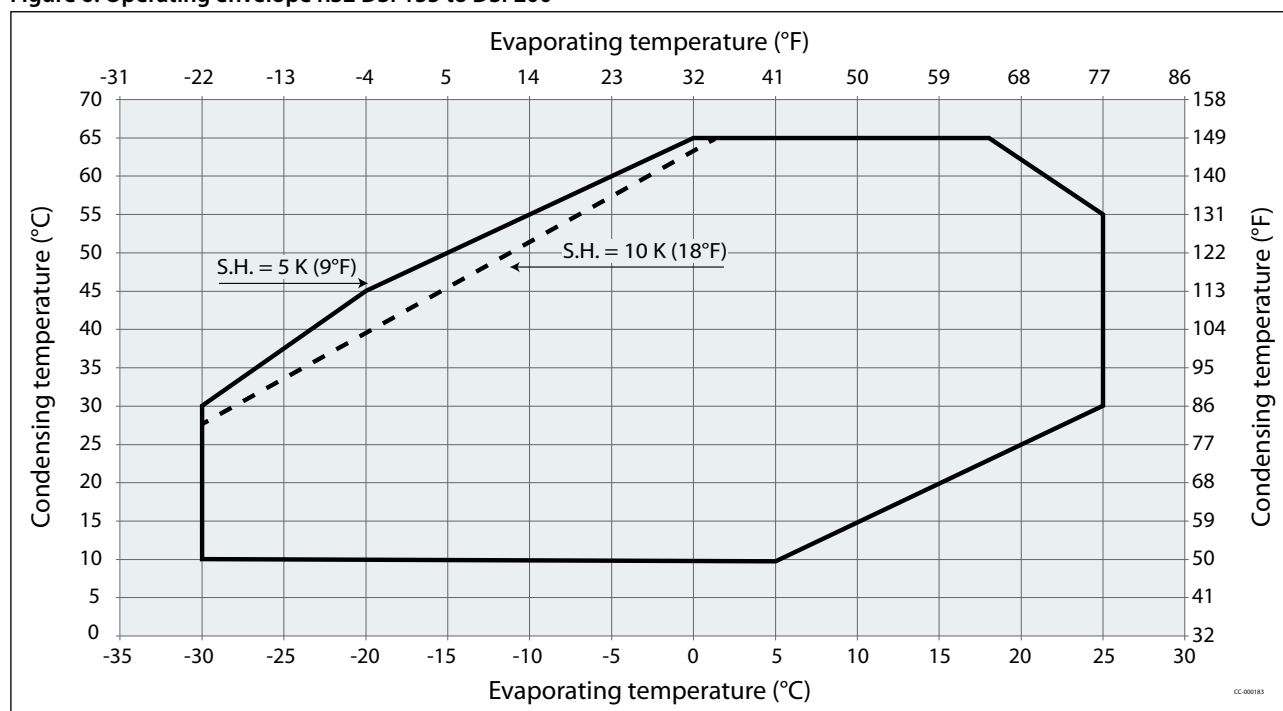
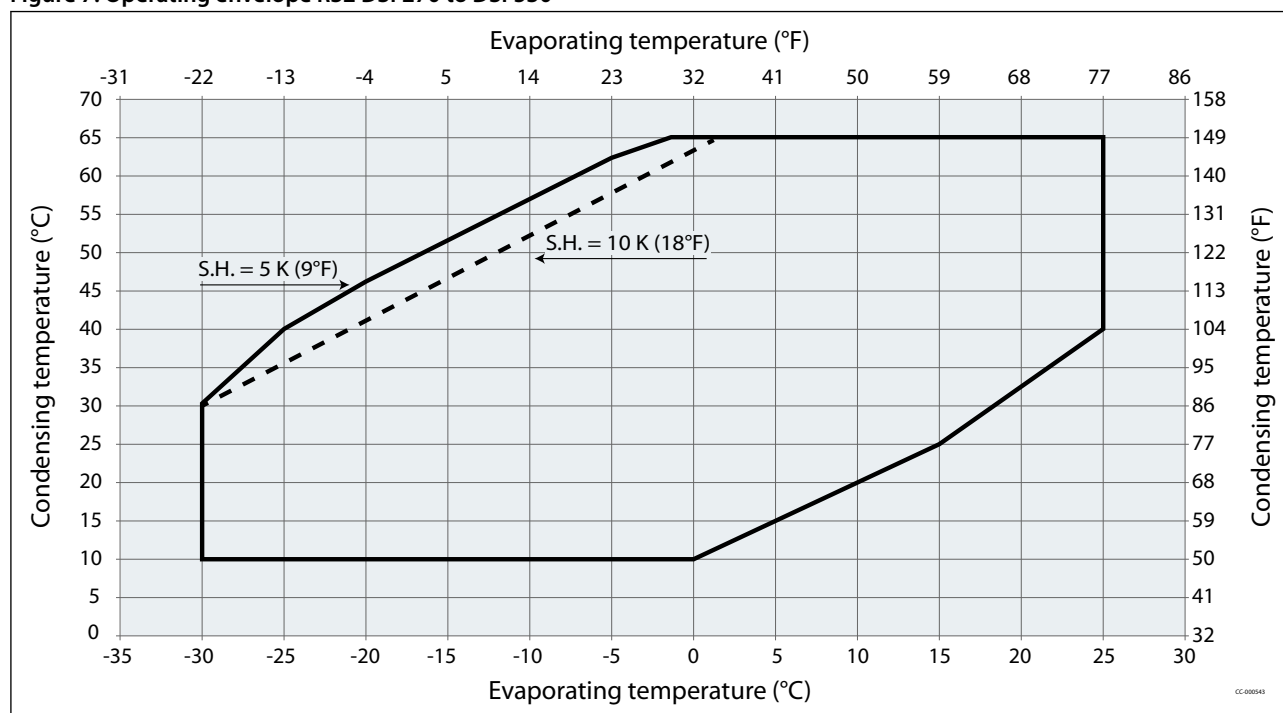


Figure 7: Operating envelope R32 DSF270 to DSF530



Pressure settings

Table 10: Pressure settings

Pressure settings		R32
Working range high side	bar(g)	10 – 43
	psig	145 – 624
Working range low side	bar(g)	1.7 – 15.9
	psig	25 – 231
Maximum high pressure safety switch setting	bar(g)	44.4
	psig	645
Minimum low pressure safety switch setting	bar(g)	1.5
	psig	22
Minimum low pressure pump-down switch setting	bar(g)	1.5 bar below nominal evap. pressure with minimum of 1.7 bar(g)
	psig	22 psi below nominal evap. pressure with minimum of 25 psig

High and low pressure protection

⚠ Low-pressure (LP) and high-pressure (HP) safety switches must never be bypassed nor delayed and must stop all the compressors.

LP switch auto restart must be limited to 5 times within 12 hours.

⚠ HP safety switch must be reset manually.

Depending on application operating envelope, you must define HP and LP limits within operating envelope and pressure setting table above.

Dimensions

Single compressors

Figure 8: Outline drawing number 1

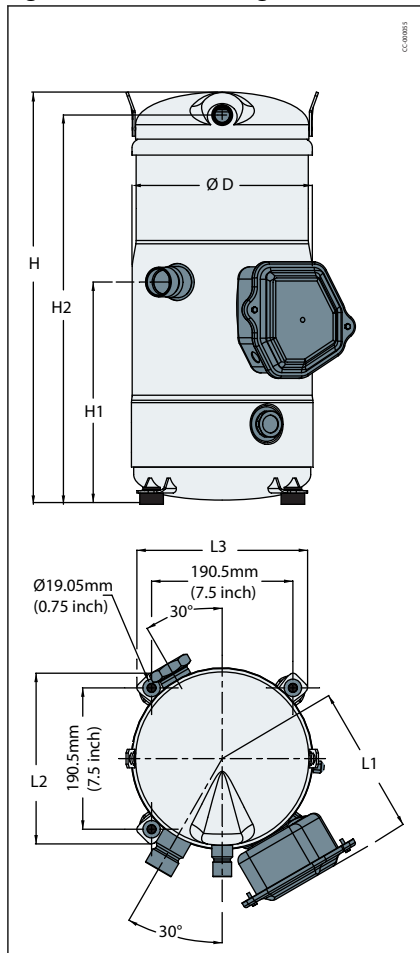


Figure 9: Outline drawing number 2

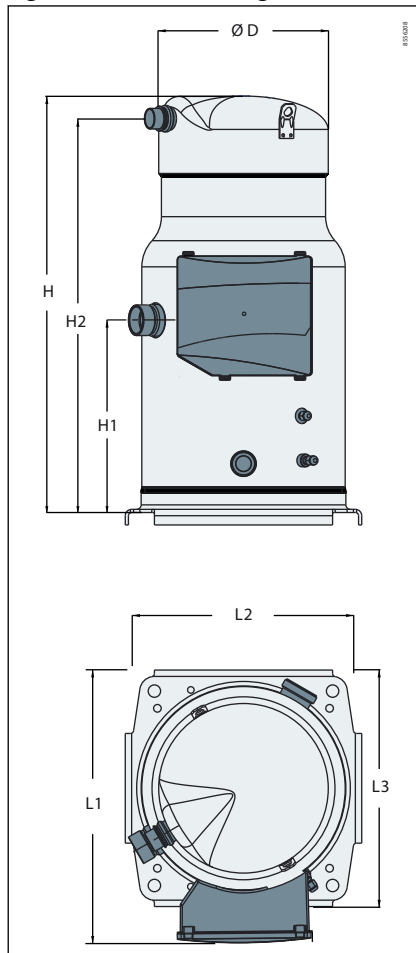


Figure 10: Outline drawing number 3

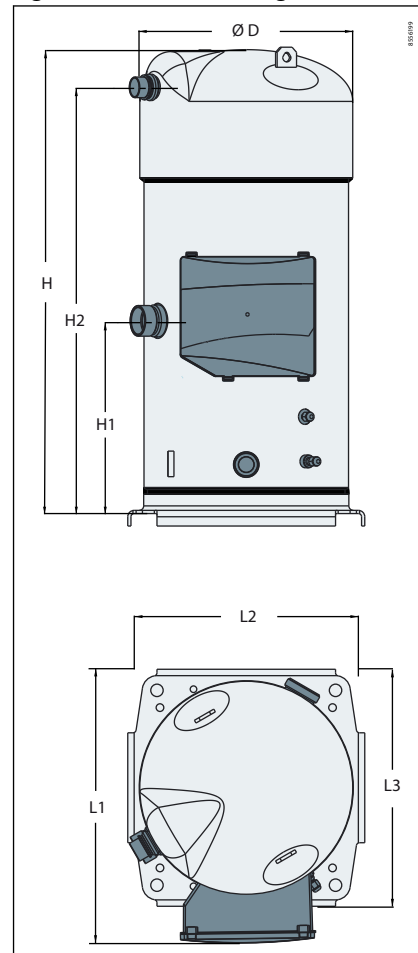


Table 11: Single compressor

Compressor model	Motor voltage code	D		H		H1		H2		L1		L2		L3		Outline drawing no.
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	
DSF090-100	3, 4, 7, 9	243	9.57	485	19.09	235	9.25	451	17.76	180	7.09	230	9.06	230	9.06	1
DSF115-175	3 ⁽¹⁾ , 4, 7, 9	243	9.57	542	21.34	278	10.94	509	20.04	180	7.09	230	9.06	230	9.06	
DSF115-175	3	243	9.57	542	21.34	278	10.94	509	20.04	201	7.91	230	9.06	230	9.06	
DSF200	3, 7, 9	243	9.57	558	21.97	299	11.77	524	20.63	201	7.91	230	9.06	230	9.06	
DSF200	4	243	9.57	558	21.97	299	11.77	524	20.63	180	7.09	230	9.06	230	9.06	
DSF270	3, 4, 7, 9	266	10.47	653	25.71	302	11.87	618	24.33	427	16.81	371	14.61	371	14.61	2
DSF325	3, 4, 7, 9	266	10.47	653	25.71	302	11.87	618	24.33	427	16.81	371	14.61	371	14.61	
DSF485	3, 4, 7, 9	333	13.11	726	28.58	302	11.87	667	26.26	429	16.89	371	14.61	371	14.61	
DSF530	3, 4, 7, 9	333	13.11	726	28.58	302	11.87	667	26.26	429	16.89	371	14.61	371	14.61	3

⁽¹⁾ DSF115-130

Tandem assemblies

Figure 11: Outline drawing number 1

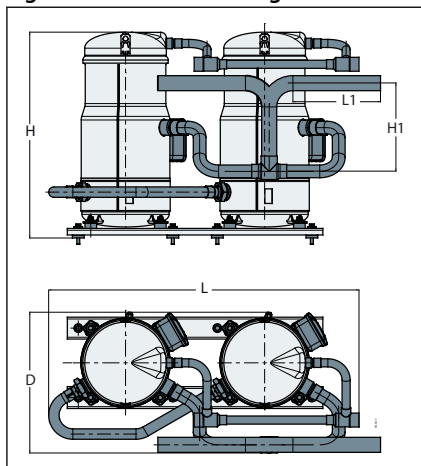


Figure 12: Outline drawing number 2

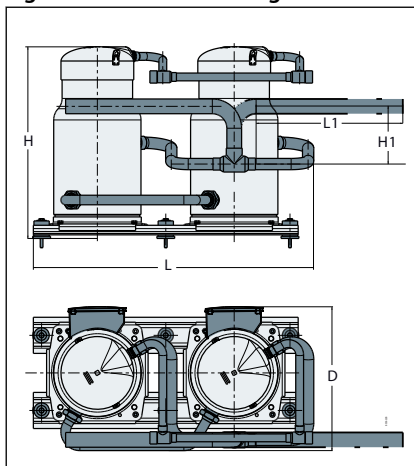


Figure 13: Outline drawing number 3

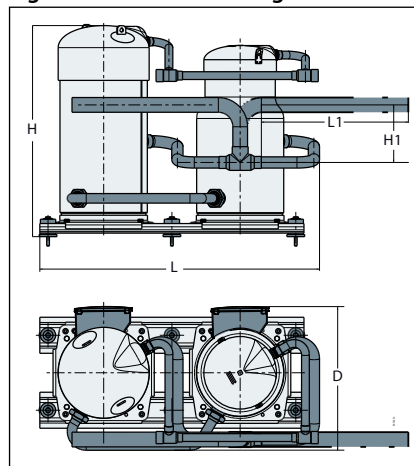


Figure 14: Outline drawing number 4

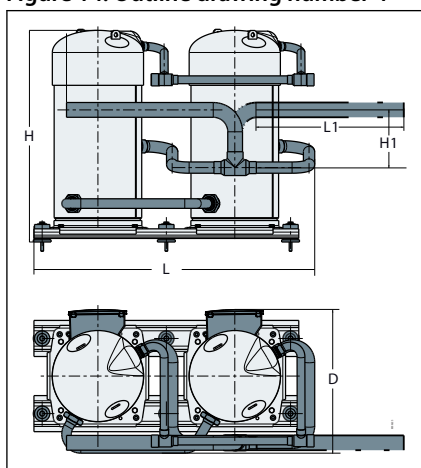


Figure 15: Outline drawing number 5

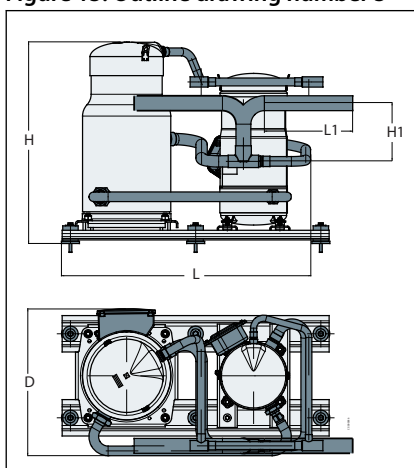


Table 12: Tandem assemblies

Tandem model	Motor voltage code	Composition Cp1 + Cp2	L		D		H		L1		H1		Outline drawing number	
			mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		
DSF180E	3, 4, 7, 9	DSF090+DSF090	850	33.46	384	15.12	507	19.96	240	9.45	242	9.53	1	8560144
DSF200E	3, 4, 7, 9	DSF100+DSF100	850	33.46	384	15.12	507	19.96	240	9.45	242	9.53	1	8560144
DSF230E	3, 4, 7, 9	DSF115+DSF115	850	33.46	384	15.12	565	22.24	240	9.45	242	9.53	1	8560145
DSF260E	3, 4, 7, 9	DSF130+DSF130	850	33.46	384	15.12	565	22.24	240	9.45	242	9.53	1	8560145
DSF215U	3, 4, 7, 9	DSF100+DSF115	850	33.46	386	15.2	565	22.24	240	9.45	242	9.53	1	8560189
DSF230U	3, 4, 7, 9	DSF100+DSF130	850	33.46	386	15.2	565	22.24	240	9.45	242	9.53	1	8560189
DSF255U	4, 7, 9	DSF100+DSF155	850	33.46	386	15.2	565	22.24	240	9.45	242	9.53	1	8560189
DSF255U	3	DSF100+DSF155	850	33.46	428	16.85	565	22.24	240	9.45	242	9.53	1	8560189
DSF275U	4, 7, 9	DSF100+DSF175	850	33.46	386	15.2	565	22.24	240	9.45	242	9.53	1	8560189
DSF275U	3	DSF100+DSF175	850	33.46	428	16.85	565	22.24	240	9.45	242	9.53	1	8560189
DSF285U	4, 7, 9	DSF130+DSF155	850	33.46	386	15.2	565	22.24	240	9.45	242	9.53	1	8560168
DSF285U	3	DSF130+DSF155	850	33.46	428	16.85	565	22.24	240	9.45	242	9.53	1	8560168
DSF300U	3, 7, 9	DSF100+DSF200	850	33.46	428	16.85	580	22.83	240	9.45	242	9.53	1	8560190
DSF300U	4	DSF100+DSF200	850	33.46	386	15.2	580	22.83	240	9.45	242	9.53	1	8560190
DSF305U	4, 7, 9	DSF130+DSF175	850	33.46	386	15.2	565	22.24	240	9.45	242	9.53	1	8560168
DSF305U	3	DSF130+DSF175	850	33.46	428	16.85	565	22.24	240	9.45	242	9.53	1	8560168
DSF310E	4, 7, 9	DSF155+DSF155	850	33.46	384	15.12	565	22.24	240	9.45	242	9.53	1	8560145
DSF310E	3	DSF155+DSF155	850	33.46	428	16.85	565	22.24	240	9.45	242	9.53	1	8560145
DSF315U	3, 7, 9	DSF115+DSF200	850	33.46	428	16.85	580	22.83	240	9.45	242	9.53	1	8560167
DSF315U	4	DSF115+DSF200	850	33.46	386	15.2	580	22.83	240	9.45	242	9.53	1	8560167
DSF330U	4, 7, 9	DSF155+DSF175	850	33.46	386	15.2	565	22.24	240	9.45	242	9.53	1	8560168
DSF330U	3	DSF155+DSF175	850	33.46	428	16.85	565	22.24	240	9.45	242	9.53	1	8560168

Tandem model	Motor voltage code	Composition Cp1 + Cp2	L		D		H		L1		H1		Outline drawing number	
			mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		
DSF331U	3, 7, 9	DSF130+DSF200	850	33.46	428	16.85	580	22.83	240	9.45	242	9.53	1	8560167
DSF331U	4	DSF130+DSF200	850	33.46	386	15.2	580	22.83	240	9.45	242	9.53	1	8560167
DSF350E	4, 7, 9	DSF175+DSF175	850	33.46	384	15.12	565	22.24	240	9.45	242	9.53	1	8560145
DSF350E	3	DSF175+DSF175	850	33.46	428	16.85	565	22.24	240	9.45	242	9.53	1	8560145
DSF355U	3, 7, 9	DSF155+DSF200	850	33.46	428	16.85	580	22.83	240	9.45	242	9.53	1	8560167
DSF355U	4	DSF155+DSF200	850	33.46	386	15.2	580	22.83	240	9.45	242	9.53	1	8560167
DSF375U	3, 7, 9	DSF175+DSF200	850	33.46	428	16.85	580	22.83	240	9.45	242	9.53	1	8560167
DSF375U	4	DSF175+DSF200	850	33.46	386	15.2	580	22.83	240	9.45	242	9.53	1	8560167
DSF400E	3, 7, 9	DSF200+DSF200	850	33.46	428	16.85	580	22.83	240	9.45	242	9.53	1	8560146
DSF400E	4	DSF200+DSF200	850	33.46	386	15.2	580	22.83	240	9.45	242	9.53	1	8560146
DSF400X	3, 4, 7, 9	DSF130+DSF270	903	35.55	533	20.98	731	28.78	359	14.13	211	8.31	5	8560169
DSF470X	3, 4, 7, 9	DSF200+DSF270	903	35.55	533	20.98	731	28.78	359	14.13	211	8.31	5	8560170
DSF500X	3, 4, 7, 9	DSF175+DSF325	903	35.55	533	20.98	731	28.78	359	14.13	211	8.31	5	8560169
DSF525X	3, 4, 7, 9	DSF200+DSF325	903	35.55	533	20.98	731	28.78	359	14.13	211	8.31	5	8560170
DSF540E	3, 4, 7, 9	DSF270+DSF270	1025	40.35	527	20.75	701	27.6	535	21.06	211	8.31	2	8556228
DSF595U	3, 4, 7, 9	DSF270+DSF325	1025	40.35	527	20.75	701	27.6	535	21.06	211	8.31	2	8556228
DSF650E	3, 4, 7, 9	DSF325+DSF325	1025	40.35	527	20.75	701	27.6	535	21.06	211	8.31	2	8556228
DSF800U	4, 7, 9	DSF270+DSF530	1025	40.35	546	21.5	774	30.5	535	21.06	211	8.31	3	8556207
DSF800U	3	DSF270+DSF530	1025	40.35	563	22.17	774	30.5	535	21.06	211	8.31	3	8556207
DSF970E	4, 7, 9	DSF485+DSF485	1025	40.35	546	21.5	774	30.5	640	25.2	211	8.31	4	8556205
DSF970E	3	DSF485+DSF485	1025	40.35	563	22.17	774	30.5	640	25.2	211	8.31	4	8556205
DSF855U	4, 7, 9	DSF325+DSF530	1025	40.35	546	21.5	774	30.5	640	25.2	211	8.31	4	8556220
DSF855U	3	DSF325+DSF530	1025	40.35	563	22.17	774	30.5	640	25.2	211	8.31	4	8556220
DSF1060E	4,7,9	DSF530+DSF530	1025	40.35	553	21.77	774	30.5	640	25.2	211	8.31	4	8556205
DSF1060E	3	DSF530+DSF530	1025	40.35	563	22.17	774	30.5	640	25.2	211	8.31	4	8556205

NOTE:

Tandems to be achieved by assembly of individual compressors.

By convention, the last letter of tandems designation have been set to help to discern easily which type of manifold we are considering.

U : Uneven tandem

E : Even tandem

X : Crossplatform (medium-large) tandem

Trio assemblies

Figure 16: Outline drawing number 6

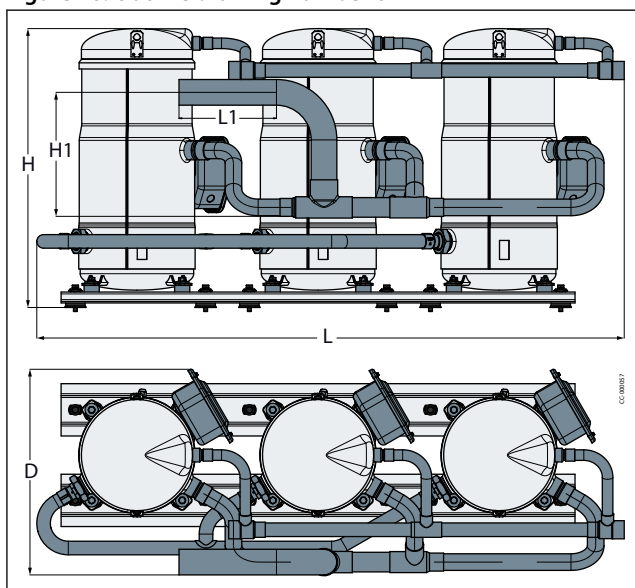


Figure 17: Outline drawing number 7

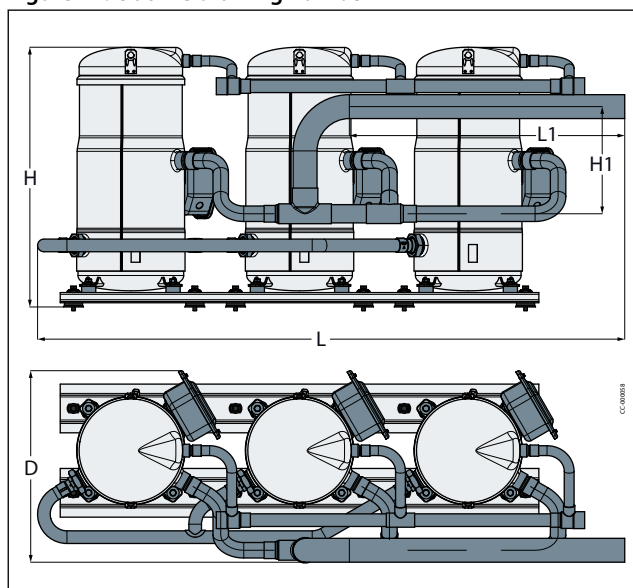


Figure 18: Outline drawing number 8

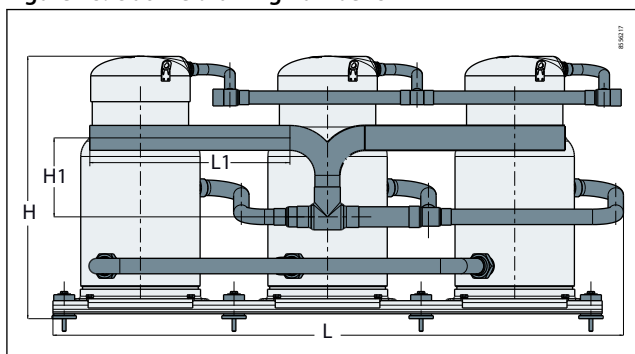


Figure 19: Outline drawing number 9

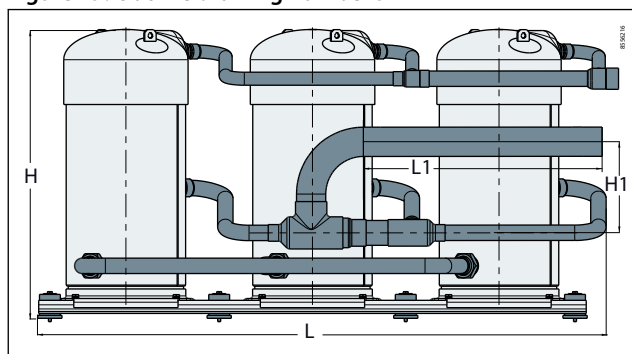


Table 13: Trio assemblies

Trio model	Motor voltage code	Composition	L		D		H		L1		H1		Outline drawing number	
			mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		
DSF465T	4, 7, 9	3 x DSF155	1230	48.4	402	15.8	571	22.5	205	8.1	242	9.5	6	8560172
			1326	52.2	402	15.8	571	22.5	622	24.5	242	9.5	7	8560172
DSF465T	3	3 x DSF155	1230	48.4	433	17	571	22.5	205	8.1	242	9.5	6	8560172
			1326	52.2	433	17	571	22.5	622	24.5	242	9.5	7	8560172
DSF525T	4, 7, 9	3 x DSF175	1230	48.4	402	15.8	571	22.5	205	8.1	242	9.5	6	8560172
			1326	52.2	402	15.8	571	22.5	622	24.5	242	9.5	7	8560172
DSF525T	3	3 x DSF175	1230	48.4	433	17	571	22.5	205	8.1	242	9.5	6	8560172
			1326	52.2	433	17	571	22.5	622	24.5	242	9.5	7	8560172
DSF 600T	3, 7, 9	3 x DSF200	1236	48.7	433	17	587	23.1	205	8.1	242	9.5	6	8560171
			1326	52.2	433	17	587	23.1	622	24.5	242	9.5	7	8560171
DSF 600T	4	3 x DSF200	1236	48.7	404	15.8	587	23.1	205	8.1	242	9.5	6	8560171
			1326	52.2	404	15.8	587	23.1	622	24.5	242	9.5	7	8560171
DSF810T	3, 4, 7, 9	DSF270+DSF270+DSF270	1467	57.76	543	21.38	701	27.6	535 min	21.06	211	8.31	8	8556217
DSF975T	3, 4, 7, 9	DSF325+DSF325+DSF325	1467	57.76	543	21.38	701	27.6	535 min	21.06	211	8.31	8	8556217
DSF1180T	3, 4, 7, 9	DSF325+DSF325+DSF530	1467	57.76	573	22.56	774	30.5	535 min	21.06	211	8.31	8	8556310
DSF1180T	3	DSF325+DSF325+DSF530	1467	57.76	590	23.23	774	30.5	535 min	21.06	211	8.31	8	8556310
DSF1385T	3, 4, 7, 9	DSF530+DSF530+DSF325	1520	59.84	573	22.56	774	30.5	640 min	25.19	244	9.61	9	8556314
DSF1385T	3	DSF530+DSF530+DSF325	1520	59.84	573	22.56	774	30.5	640 min	25.19	244	9.61	9	8556314
DSF1590T	3, 4, 7, 9	DSF530+DSF530+DSF530	1520	59.84	573	22.56	774	30.5	640 min	25.19	244	9.61	9	8556216
DSF1590T	3	DSF530+DSF530+DSF530	1520	59.84	590	23.23	774	30.5	681 min	26.77	244	9.61	9	8556216

NOTE:

Trio to be achieved by assembly of individual compressors.

Mechanical connections

Connection details

Table 14: Connection details







Connection Details		DSF090-100	DSF115-200	DSF270-325	DSF485-530
Suction connection		Brazed 1"1/8	Brazed 1"3/8	Brazed 1"5/8	Brazed 1"5/8
Discharge connection		Brazed 7/8"	Brazed 7/8"	Brazed 1"1/8	Brazed 1"3/8
Oil sight glass		Threaded (1"1/8 – 18 UNEF)			
Oil equalization connection		Rotolock 1"3/4		Rotolock 2"1/4	
Oil drain connection		None	None	Female ¼" Flare incorporating a Schrader valve	
Low pressure gauge port (Shrader)		Male ¼" Flare incorporating a Schrader valve			
Outline drawing		1	1	2	2

Figure 20: Outline drawing 1

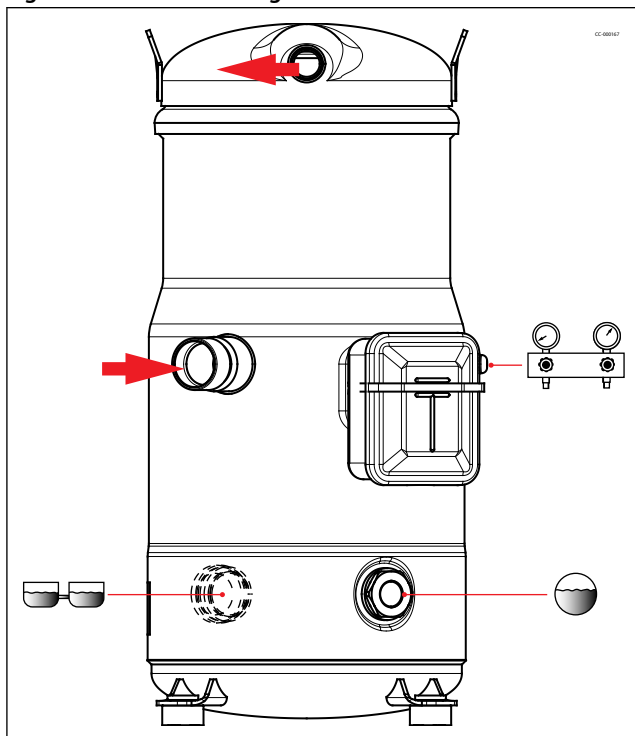
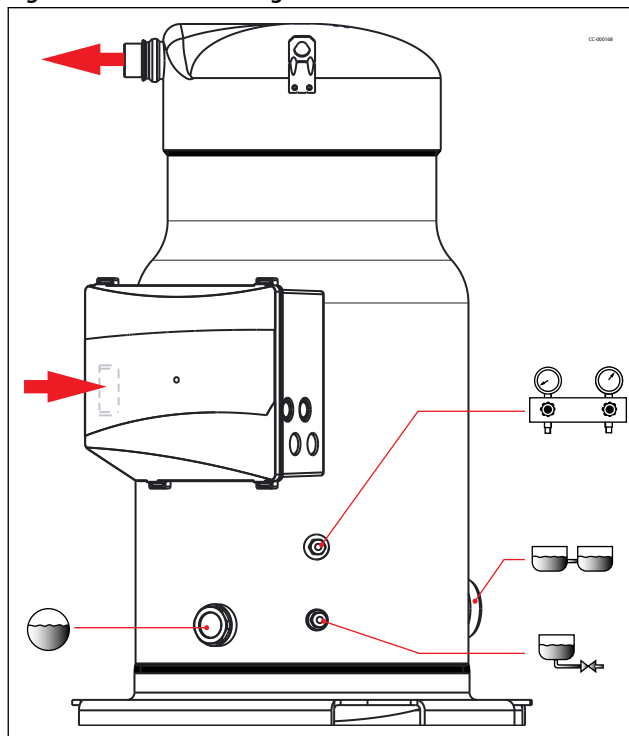


Figure 21: Outline drawing 2



Design compressor mounting

General requirements

Compressors used in single applications must be mounted with flexible grommets.

Compressors used in parallel applications must be mounted with rigid spacers onto rails (or directly on rails according to compressor models) and the manifold assembly must be mounted with flexible grommets onto the frame.

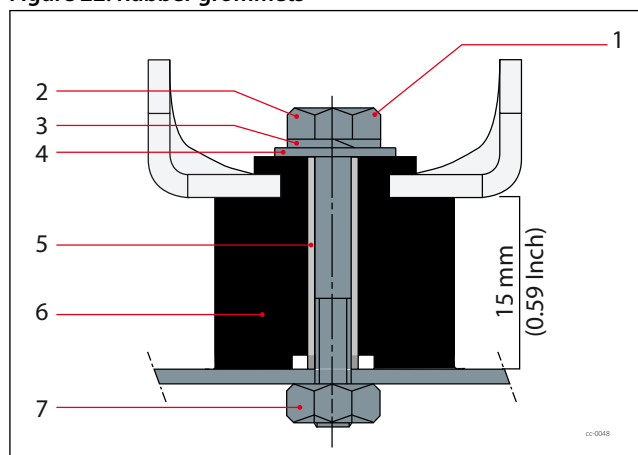
During operation, the maximum inclination from the vertical plane must not exceed 3 degrees.

Single requirements DSF090-200 mounting

Compressors DSF090-200 are delivered with rubber grommets and steel mounting sleeve used to isolated the compressor from the base frame.

The grommets must be compressed until contact between the flat washer and the steel mounting sleeve is established. The required bolt size for the DSF090-200 compressors is HM8-40. This bolt must be tightened to a torque of 15Nm.

Figure 22: Rubber grommets



1	Tightening torque 15 Nm
2	HM 8 bolt (4 pcs)
3	Lock washer (4 pcs)
4	Flat washer (4 pcs)
5	Steel mounting sleeve (4 pcs)
6	Rubber grommet (4 pcs)
7	Nut (4 pcs)

Part 2, 3, 4, 5, 6 and 7 are delivered along with compressor

Single requirements, DSF270-325-485-530 mounting

To be used in single applications, an additional accessory including flexible grommets is necessary kit 8156138.

The grommets must be compressed until contact between the flat washer and the steel mounting sleeve is established. The required bolt size for the DSF compressors is HM8-55. This bolt must be tightened to a torque of 21 Nm.

Figure 23: Rubber grommets from kit 8156138

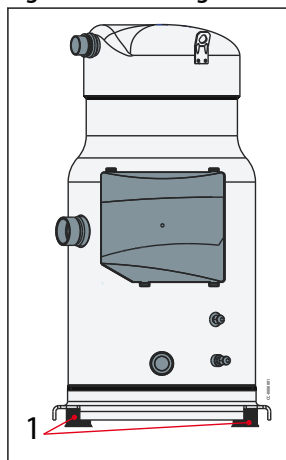
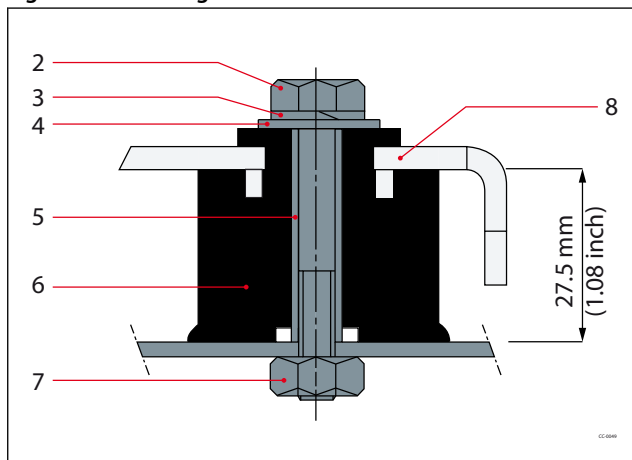


Figure 24: Rubber grommets



1	Rubber grommets from kit 8156138	5	Steel mounting sleeve
2	HM 8 bolt	6	Rubber grommet
3	Lock washer	7	Nut
4	Flat washer	8	Compressor base plate

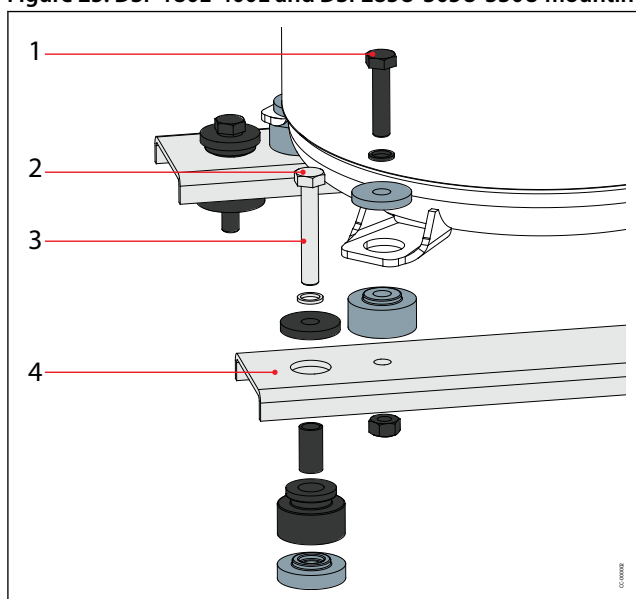
Manifolding requirements DSF 180E-400E and DSF285U-305U-330U mounting




The compressors must be mounted with rigid mounting spacers on rails. Rubber grommets and spacers must be installed below the rails.

The rigid mounting spacers are included in tandem accessory kits. The rubber grommets are supplied with compressor.

For more details about parallel mounting feet, please see parallel unit outline drawing.

Figure 25: DSF 180E-400E and DSF285U-305U-330U mounting



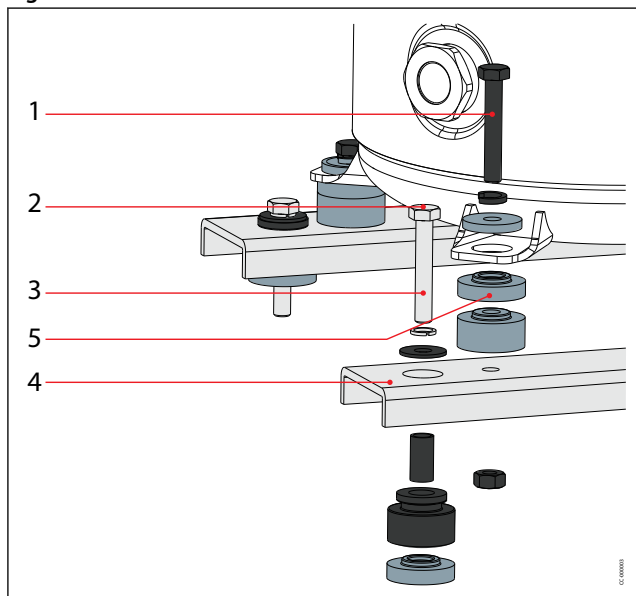
1	Tightening torque 15Nm
2	Not supplied $\Phi 8 \times 75 \text{mm}$ 0.31x2.95inch
3	Tightening torque 15Nm
4	4mm (0.16 inch) thickness
	Supplied with the compressor
	Included in manifolding kit
	Not supplied

Manifolding requirements DSF 215U-230U-255U-275U-300U-315U-331U-355U-375U mounting

The compressors must be mounted with rigid mounting spacers on rails. Rubber grommets and spacers must be installed below the rails.

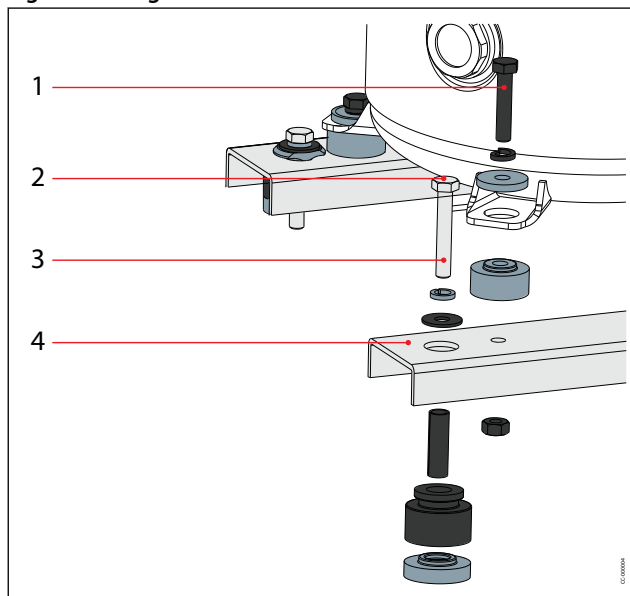
The rigid mounting spacers are included in tandem accessory kits. The rubber grommets are supplied with compressor.

Figure 26: Smaller model of tandem



1	Tightening torque 15Nm
2	Not supplied HM8mm 0.31 inch
3	Tightening torque 15 Nm
4	4mm (0.16 inch) Thickness

Figure 27: Larger model of tandem






5	Additional rigid spacer (Refer to table below)
	Supplied with the compressor
	Included in manifolding kit
	Not supplied

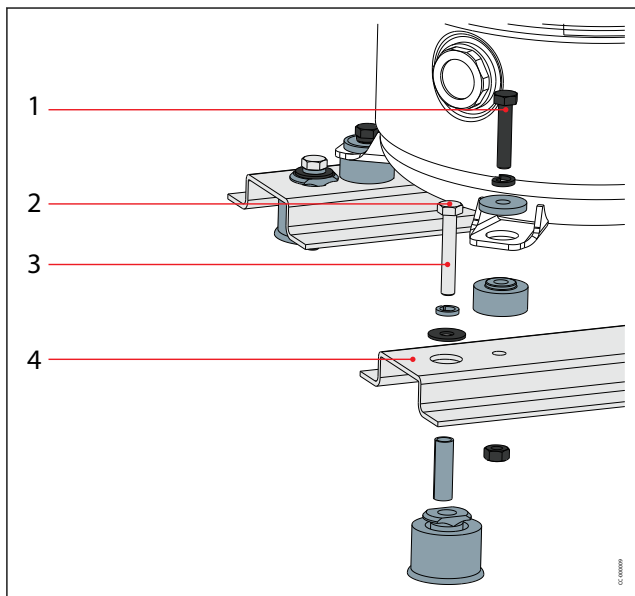
Table 15: Additionnal rigid spacer

Additional rigid spacer	Additional right spacer(to be added on the smallest compressor of the tandem)
DSF215U-230U-255U-275U-315U-331U-355U-375U	7mm
DSF300U	14mm

Tandem requirements DSF465T-525T-600T mounting

The compressors must be mounted with rigid mounting spacers on rails. Rubber grommets and spacers must be installed below the rails.

The rigid mounting spacers and rubber grommets are included in tandem accessory kits.



1	Tightening torque 15Nm
2	Not supplied HM8mm 0.31 inch
3	Tightening torque 15 Nm
4	3mm (0.12inch) Thickness
	Supplied with the compressor
	Included in manifolding kit
	Not supplied

Tandem requirements DSF400X-470X-500X-525X mounting

The large compressor, DSF270,325, is mounted with rigid spacers on the rails.

The DSF130, 175,200 compressor is fixed on beams by rigid spacer, and the beams are mounted with rigid spacers on the rails. Rubber grommets and spacers must be installed below the rails.

Figure 28: DSF270-325

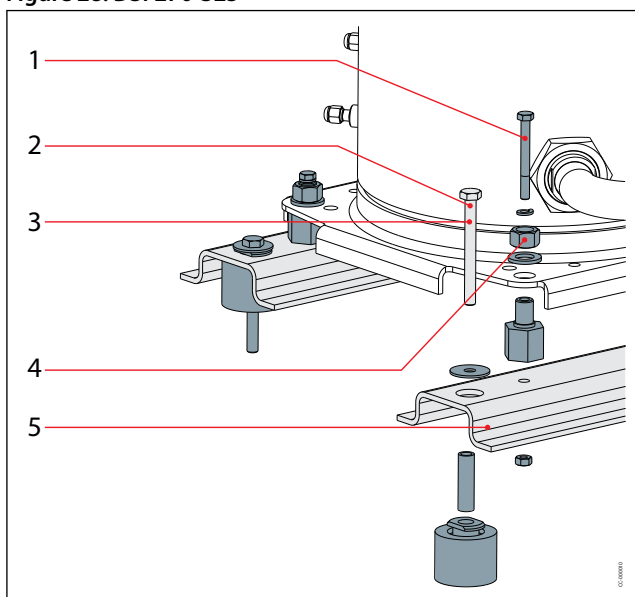
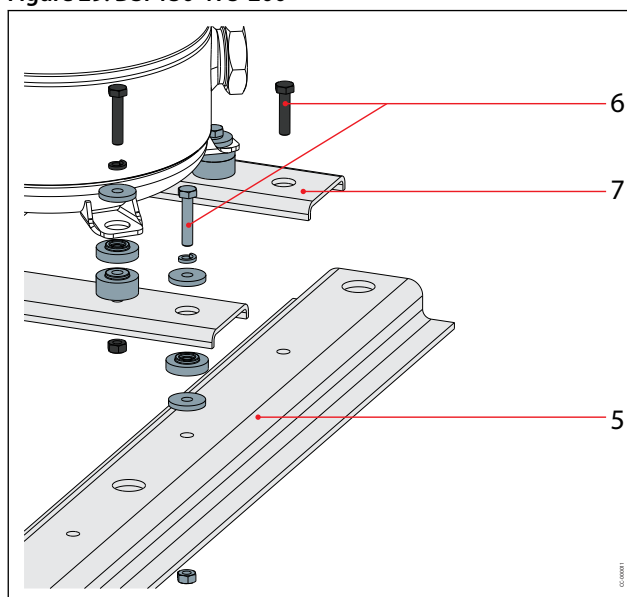





Figure 29: DSF130-175-200



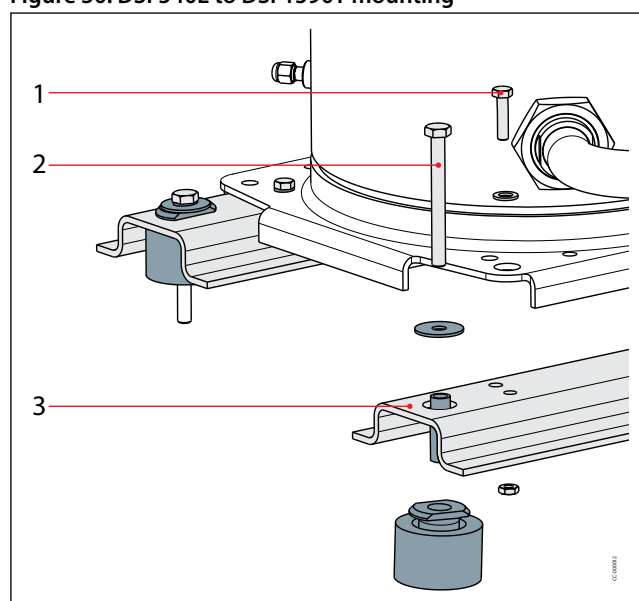
1	Tightening torque 16Nm	6	Tightening torque 15Nm
2	Not supplied $\Phi 10\text{mm}$	7	4mm (0.16inch) thickness
3	Tightening torque 50Nm		Supplied with the compressor
4	Tightening torque 55Nm		Included in manifolding kit
5	5mm (0.2inch) thickness		Not supplied



Tandem requirements, DSF540E to DSF1590T mounting

For parallel mounting, the compressors can be mounted directly on the rails. Rubber grommets and spacers must be installed below the rails.

These parts are included in accessories.

Figure 30: DSF540E to DSF1590T mounting



1	HM 10 x 30 class 10.9, Tightening torque 50 Nm
2	HM 10 x 100 class 10.9, Tightening torque 50 Nm
3	Thickness: 5 mm (0.2 inch)
	Included in tandem/trio kit
	Not supplied

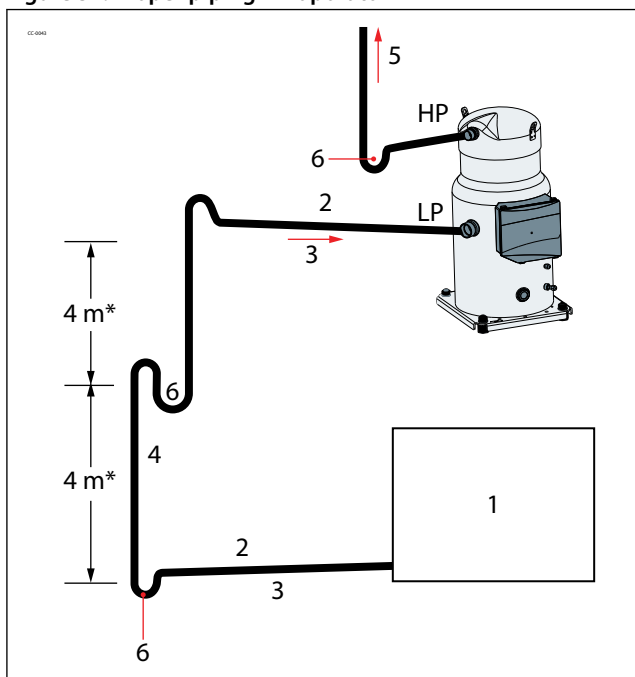
Design piping

General requirements

Proper piping practices should be employed to:

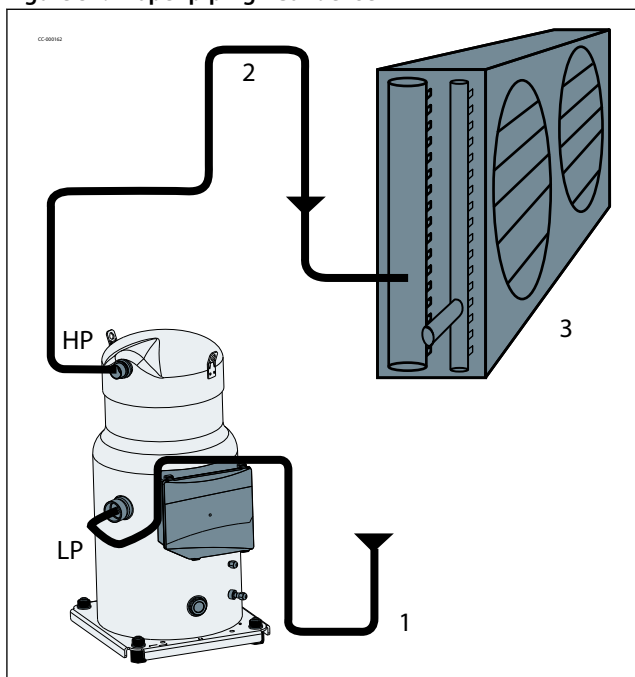
1. Ensure adequate oil return, even under minimum load conditions (refrigerant speed, piping slopes...). For validation tests see section Manage oil in the circuit.
2. Avoid condensed liquid refrigerant from draining back to the compressor when stopped (discharge piping upper loop). For validation tests see section Manage off cycle migration.
3. Piping should be designed with adequate three-dimensional flexibility to avoid excess vibration. It should not be in contact with the surrounding structure, unless a proper tubing mount has been installed. For more information on noise and vibration, see section Sound and vibration data.

Figure 31: Proper piping - Evaporator



- | | |
|---|------------------------------|
| 1 | Evaporator |
| 2 | 0.5% slope |
| 3 | 4m/s or more |
| 4 | 8 to 12 m/s |
| 5 | To condenser |
| 6 | U-trap, as short as possible |
| * | Max. |

Figure 32: Proper piping - Condenser



- | | |
|---|----------------|
| 1 | 3D flexibility |
| 2 | Upper loop |
| 3 | Condenser |

Tandem and Trio requirements (Static)

DSF tandem and trio use static oil balancing principle to equalize oil level between the compressors by gravity. This is ensured by a precise suction and oil equalization piping design.

The discharge line has no impact on oil balancing. It is shown with tee, to indicate that both left and right side discharge headers are possible.

By default, DSF tandems and trios are not factory-built.

To complete an assembly in the field, you will need:

- Tubings, according to specific outline drawings indicated in the following table
- Manifolding accessory kit
- Compressors

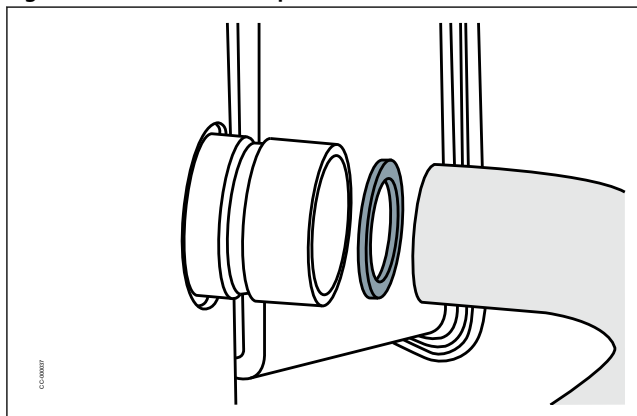
R Suction and oil equalization piping drawings must be respected (diameters, minimum straight lengths, ...).

R Danfoss's recommended piping has undergone laboratory testing to ensure precise pressure balancing between sumps and to maintain vibration levels within acceptable limits. However, since the unit design can have an influence on the efficiency/reliability of this piping, it is mandatory to conduct a system qualification by performing the tests described in this application guidelines (namely tests of oil balancing, oil return and vibration). If an oil imbalance or significant vibrations are detected during these system qualification tests, then a dedicated system design improvement must be carried out. We remind you that in all cases it is necessary to contact Danfoss technical support and run a thorough application review for any launch of a new system where compressors are manifolded in trios.

Suction washer position

R Depending on manifold configuration, it is essential to equalize the pressure of compressor sumps. Hence, a suction washer must be added on certain compressors according to the table. Suction washers are included in tandem or trio accessory kits as described in the illustrations.

Figure 33: Suction washer position



	Included in tandem or trio accessory kit
	Not supplied

By convention, the compressor order (No.1, No.2 ...) is defined counting from left to right, placed on the side facing the electrical boxes of the compressors (see example below on a trio)

Figure 34: Example of right suction

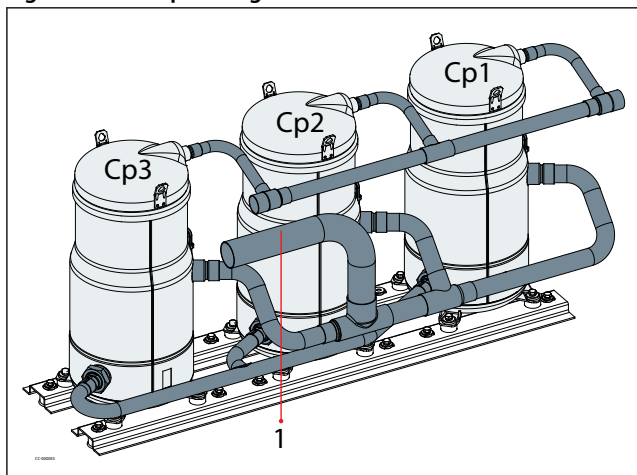
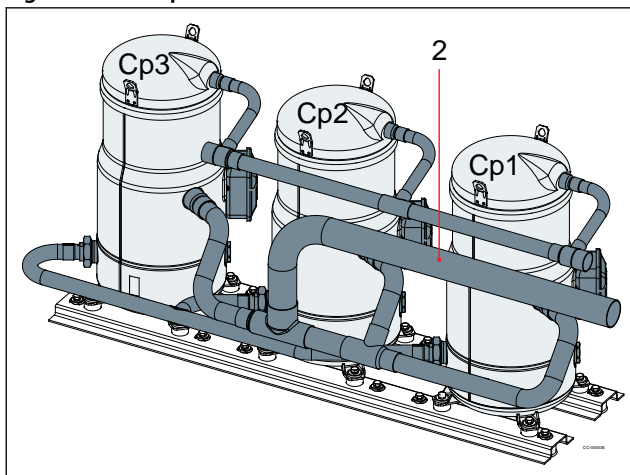


Figure 35: Example of left suction



1	Trio models with Right suction	Cp2	Compressor 2
2	Trio models with Left suction	Cp3	Compressor 3
Cp1	Compressor 1		

Tandem models

Table 16: Tandem models

Tandem model	Composition	Suction	Discharge	Oil equalization	Outline drawing number	Suction from	Washer inner diameter	Washer in suction of	Tandem kit code no
DSF180E	DSF090+DSF090	1"5/8	1"3/8	1"1/8	8560144	Left Right	Not needed		120Z0634
DSF200E	DSF100+DSF100	1"5/8	1"3/8	1"1/8	8560144	Left Right	Not needed		120Z0634
DSF215U	DSF100+DSF115	1"5/8	1"3/8	1"1/8	8560189	Left Right	25 mm (0.98 inch) 26 mm (1.02 inch)	Cp2 Cp2	120Z0694
DSF230E	DSF115+DSF115	1"5/8	1"3/8	1"1/8	8560145	Left Right	Not needed		120Z0634
DSF230U	DSF100+DSF130	1"5/8	1"3/8	1"1/8	8560189	Left Right	27mm (1.06 inch) 27mm (1.06 inch)	Cp2 Cp2	120Z0694
DSF255U	DSF100+DSF155	1"5/8	1"3/8	1"1/8	8560189	Left Right	23 mm (0.91 inch) 23 mm (0.91 inch)	Cp1 Cp1	120Z0694
DSF260E	DSF130+DSF130	1"5/8	1"3/8	1"1/8	8560145	Left Right	Not needed		120Z0634
DSF275U	DSF100+DSF175	1"5/8	1"3/8	1"1/8	8560189	Left Right	21 mm (0.83 inch) 21 mm (0.83 inch)	Cp1 Cp1	120Z0694
DSF285U	DSF130+DSF155	1"5/8	1"3/8	1"1/8	8560168	Left Right	27 mm (1.06 inch) 27 mm (1.06 inch)	Cp1 Cp1	120Z0692
DSF300U	DSF100+DSF200	1"5/8	1"3/8	1"1/8	8560190	Left Right	20 mm (0.79 inch) 20 mm (0.79 inch)	Cp1 Cp1	120Z0693
DSF305U	DSF130+DSF175	1"5/8	1"3/8	1"1/8	8560168	Left Right	25 mm (0.98 inch) 25 mm (0.98 inch)	Cp1 Cp1	120Z0692
DSF310E	DSF155+DSF155	1"5/8	1"3/8	1"1/8	8560145	Left Right	Not needed		120Z0634
DSF315U	DSF115+DSF200	1"5/8	1"3/8	1"1/8	8560167	Left Right	23 mm (0.91 inch) 23 mm (0.91 inch)	Cp1 Cp1	120Z0693
DSF330U	DSF155+DSF175	1"5/8	1"3/8	1"1/8	8560168	Left Right	27.5 mm (1.08 inch) 26 mm (1.02 inch)	Cp1 Cp1	120Z0692
DSF331U	DSF130+DSF200	1"5/8	1"3/8	1"1/8	8560167	Left Right	24 mm (0.94 inch) 24 mm (0.94 inch)	Cp1 Cp1	120Z0694
DSF350E	DSF175+DSF175	1"5/8	1"3/8	1"1/8	8560145	Left Right	Not needed		120Z0634
DSF355U	DSF155+DSF200	1"5/8	1"3/8	1"1/8	8560167	Left Right	25 mm (0.98 inch) 25 mm (0.98 inch)	Cp1 Cp1	120Z0694
DSF375U	DSF175+DSF200	1"5/8	1"3/8	1"1/8	8560167	Left Right	27.5 mm (1.08 inch) 27.5 mm (1.08 inch)	Cp1 Cp1	120Z0694
DSF400E	DSF200+DSF200	1"5/8	1"3/8	1"1/8	8560146	Left Right	Not needed		120Z0634
DSF400X	DSF130+DSF270	2"1/8	1"3/8	1"3/8	8560169	Left Right	24 mm (0.94 inch) 25 mm (0.98 inch)	Cp1 Cp1	120Z0709
DSF470X	DSF200+DSF270	2"1/8	1"3/8	1"3/8	8560170	Left Right	35.5 mm (1.4 inch) 35.5 mm (1.4 inch)	CP2 CP2	120Z0709
DSF500X	DSF175+DSF325	2"1/8	1"3/8	1"3/8	8560169	Left Right	25 mm (0.98 inch) 26 mm (1.02 inch)	Cp1 Cp1	120Z0709
DSF525X	DSF200+DSF325	2"1/8	1"3/8	1"3/8	8560170	Left Right	26 mm (1.02 inch) 26 mm (1.02 inch)	Cp1 Cp1	120Z0709
DSF540E	DSF270+DSF270	2"1/8	1" 5/8	1" 3/8	8556228	Left Right	Not needed		120Z0792
DSF595U	DSF270+DSF325	2"1/8	1" 5/8	1" 3/8	8556228	Left Right	31 mm (1.22 inch)	Cp1	120Z0796
DSF650E	DSF325+DSF325	2"1/8	1" 5/8	1" 3/8	8556228	Left Right	Not needed		120Z0792
DSF800U	DSF270+DSF530	2"1/8	1" 5/8	1" 5/8	8556207	Left Right	24 mm (0.94 inch)	Cp1	120Z0786

Scroll compressors, DSF090 to DSF530 | Mechanical connections

Tandem model	Composition	Suction	Discharge	Oil equalization	Outline drawing number	Suction from	Washer inner diameter	Washer in suction of	Tandem kit code no
DSF970E	DSF485+DSF485	2"5/8	1" 5/8	1" 5/8	8556205	Left Right	Not needed		120Z0785
DSF855U	DSF325+DSF530	2"5/8	1" 5/8	1" 5/8	8556220	Left Right	27 mm (1.06 inch)	Cp1	120Z0787
DSF1060E	DSF530+DSF530	2"5/8	1" 5/8	1" 5/8	8556205	Left Right	Not needed		120Z0785

Trio models

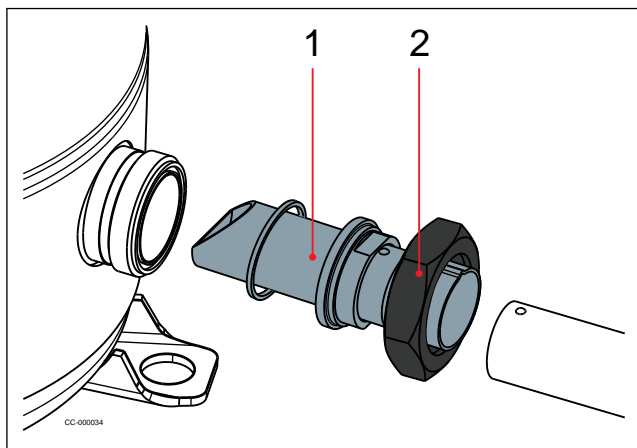
Table 17: Trio models

Trio model	Composition	Suction	Discharge	Oil equalization	Outline drawing number	Suction from	Washer inner diameter	Washer in suction of	Trio kit code no
DSF465T	3xDSF155	2"1/8	1"3/8	1"1/8	8560172	Left	26 mm (1.02 inch)	CP1	120Z0714
						Right	25 mm (0.98 inch)	CP3	
							26 mm (1.02 inch)	CP1	
							24 mm (0.94 inch)	CP3	
DSF525T	3xDSF175	2"1/8	1"3/8	1"1/8	8560172	Left	26 mm (1.02 inch)	CP1	120Z0714
						Right	25 mm (0.98 inch)	CP3	
							26 mm (1.02 inch)	CP1	
							25 mm (0.98 inch)	CP3	
DSF600T	3xDSF200	2"1/8	1"3/8	1"1/8	8560171	Left	26 mm (1.02 inch)	CP1	120Z0714
						Right	25 mm (0.98 inch)	CP3	
							25.5 mm (1.00 inch)	CP1	
							25 mm (0.98 inch)	CP3	
DSF810T	DSF270+DSF270+DSF270	2"5/8	1" 5/8	1" 5/8	8556217	Left	30 mm (1.18 inch)	Cp3	120Z0784
						Right	34.5 mm (1.36 inch)	Cp1 & Cp3	120Z0794
DSF975T	DSF325+DSF325+DSF325	2"5/8	1" 5/8	1" 5/8	8556217	Left	30 mm (1.18 inch)	Cp3	120Z0784
						Right	34.5 mm (1.36 inch)	Cp1 & Cp3	120Z0794
DSF1180T	DSF325+DSF325+DSF530	2"5/8	2" 1/8	1" 5/8	8556310	Left	-	-	120Z0790
						Right	29 mm (1.14)	Cp1 & Cp2	120Z0815
DSF1385T	DSF325+DSF530+DSF530	3"1/8	2" 1/8	1" 5/8	8556314	Left	26 mm (1.02)	Cp1 (DSF325)	120Z0814
	DSF530+DSF530+DSF325					Right	26 mm (1.02)	Cp3 (DSF325)	
DSF1590T	DSF530+DSF530+DSF530	3"1/8	2" 1/8	1" 5/8	8556216	Left	33 mm (1.3 inch)	Cp2 & Cp3	120Z0793
						Right			

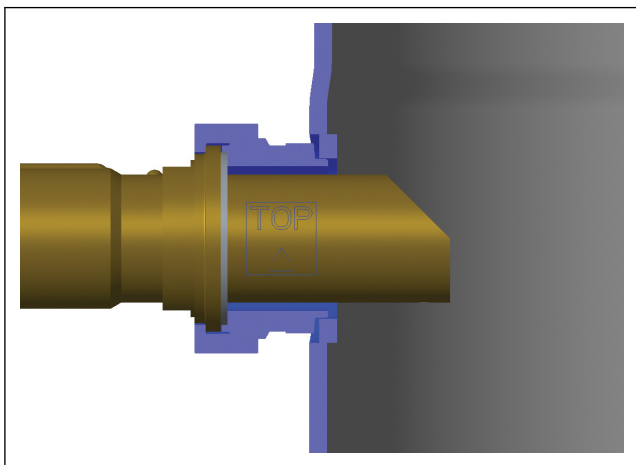
Oil equalization DSF180E-400E

The oil level is balanced by a pipe of 1"1/8 oil equalization line.

In order ensure best oil balance, the organ pipe need to be mounted inside the oil equalization port as indicated on below picture. To connect the equalization line on rotolock connections, the organ pipe adaptor and teflon gasket are included in the tandem kit must be used.



R The organ pipe needs to be installed in the direction indicated by the label attached on pipe surface, which will ensure best oil balance.



Oil equalization design DSF 400X-470X-500X-525X

The oil level is balanced by a pipe of 1"3/8 oil equalization line.

In order to ensure best oil balance, the organ pipe need to be mounted inside the DSF130, DSF175, DSF200 oil equalization port as indicated on below picture. DSF270, DSF325 has integrated organ pipe inside the oil equalization port.

To connect the equalization line on rotolock connections, the organ pipe, adaptor sleeves, Teflon gaskets included in the tandem accessory kit must be used.

Figure 36: For DSF130, DSF175, DSF200

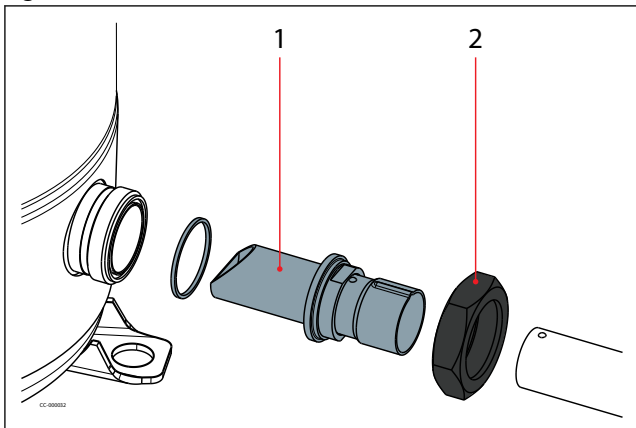
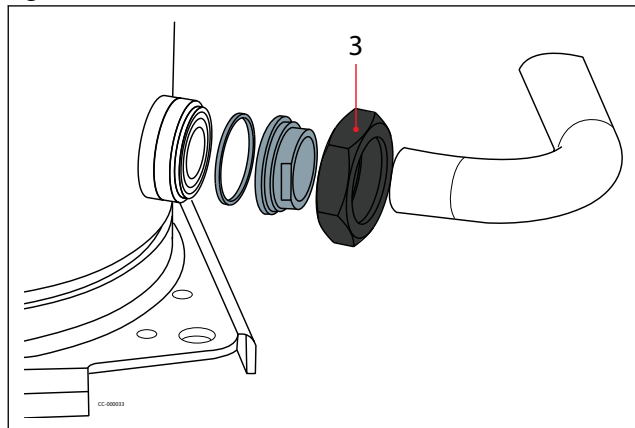




Figure 37: For DSF270, DSF325

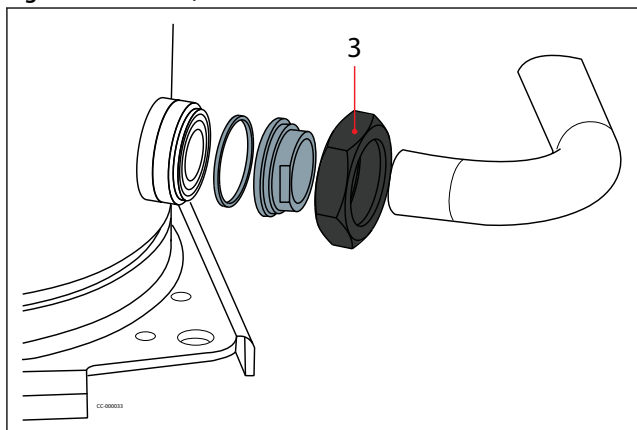




1	Organ pipe		Supplied with the compressor
2	Tightening torque 100Nm		Included in tandem kit
3	Tightening torque 145Nm		

Oil equalization design DSF270-530

The oil level is balanced by a pipe of 1"3/8 or 1"5/8. To connect the equalization line on rotolock connections, the adaptor sleeves included in the tandem or trio accessory kit must be used.

Figure 38: DSF270, DSF530



3	Tightening torque 145 Nm
	Supplied with the compressor
	Included in tandem kit

Electrical connections

Wiring connections

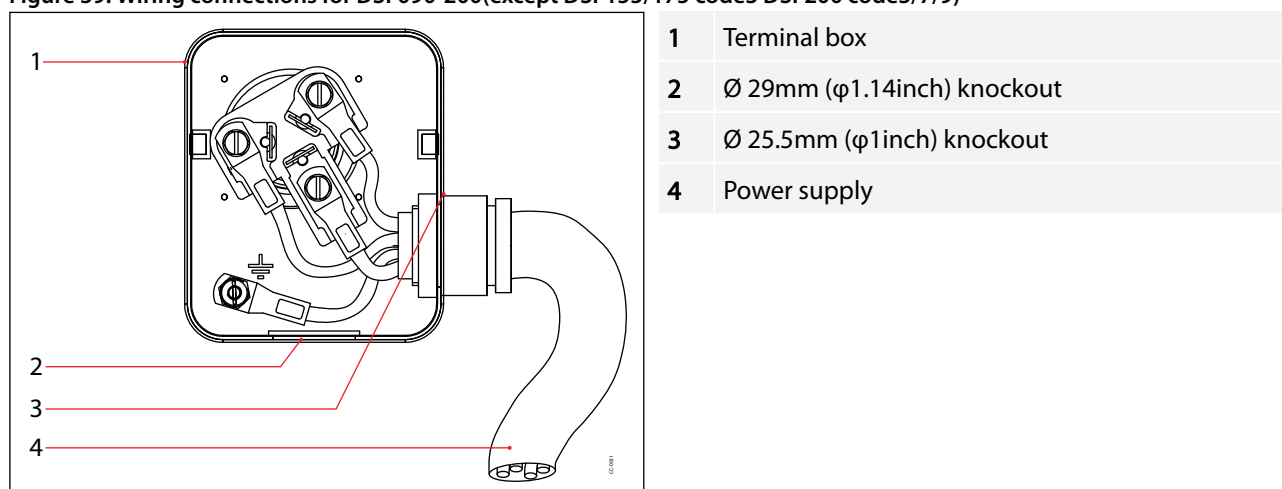
According to compressor model, electrical power is connected to the compressor terminals either by 4.8mm (10-32) screws or by M5 studs and nuts. In both cases the maximum tightening torque is 3 Nm.

▲ Cable gland or similar protection component must be used on electrical box's knockouts to against accidental contact with electrical parts inside.

DSF090-200(except DSF155/175 code3 DSF200 code3/7/9)

The terminal box is provided with a Ø 25.5mm (φ1 inch) (ISO25) and a Ø 29mm (φ1.14) (PG21) knockouts.

Figure 39: Wiring connections for DSF090-200(except DSF155/175 code3 DSF200 code3/7/9)

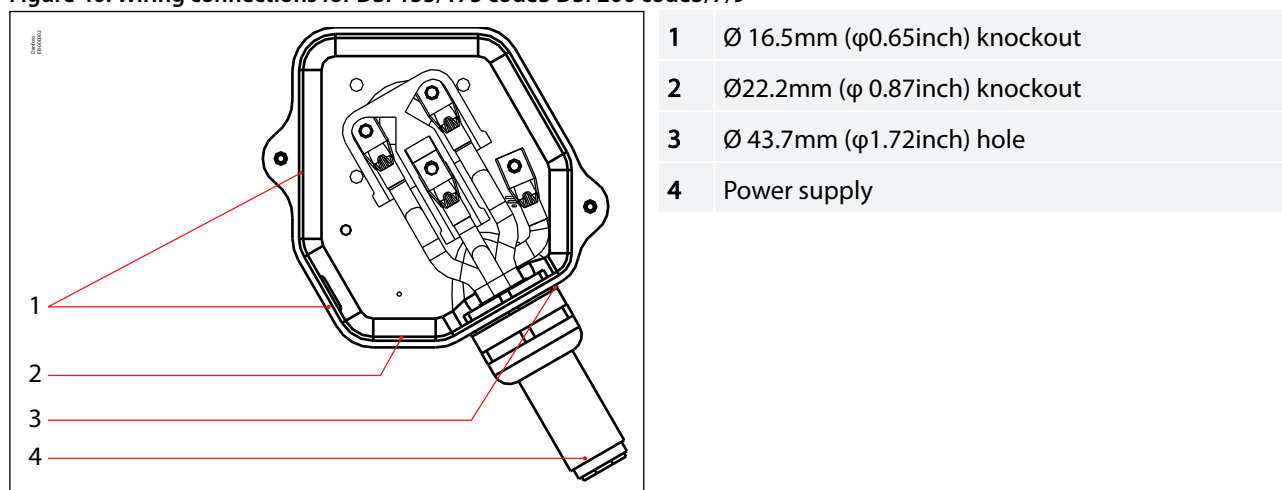


DSF155/175 code3 DSF200 code3/7/9

The terminal box is provided with a Ø 43.7mm (φ1.72inch) hole (UL 1"1/4 conduit) for power supply and 3 other knockout holes:

- Ø22.2mm (φ 0.87inch) (PG16) (UL 1/2")
- Ø16.5mm (φ 0.65inch) (ISO16) (x2)

Figure 40: Wiring connections for DSF155/175 code3 DSF200 code3/7/9



DSF270-325-485-530

The terminal box is provided with 2 triple knockouts and 1 single knockout for power supply and 4 double knockouts for the safety control circuit.

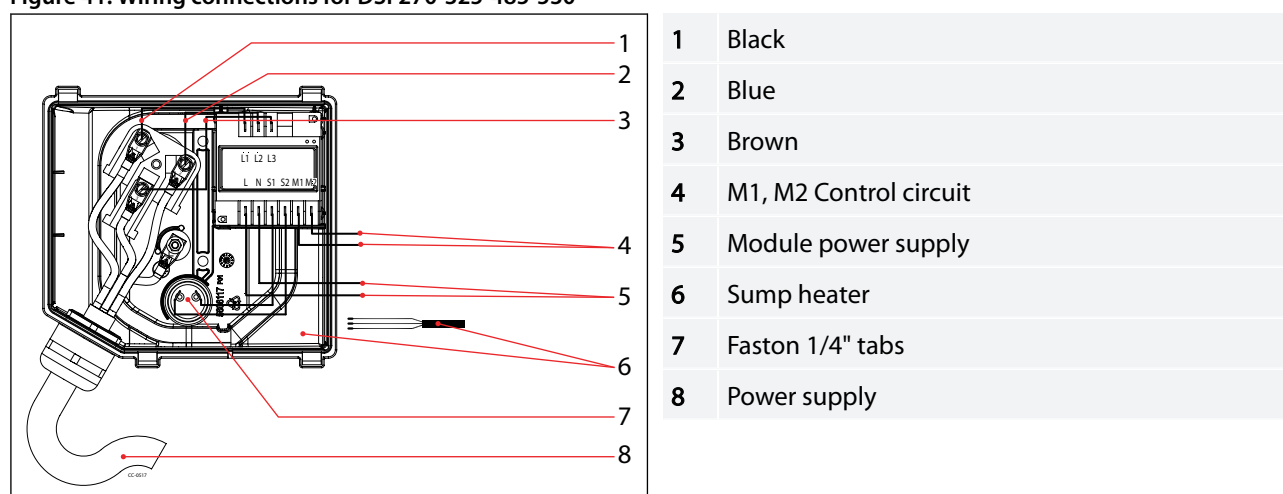
The 3 power supply knockouts accommodate the following diameters:

- Ø 50.8 mm (φ 2 inch) (UL 1"1/2 conduit) & Ø 43.7 mm (φ 1.72 inch) (UL 1"1/4 conduit) & Ø 34.5 mm (φ 1.36 inch) (UL 1" conduit)
- Ø 40.5 mm (φ 1.59 inch) (ISO40) & Ø 32.2 mm (φ 1.27 inch) (ISO32) & Ø 25.5 mm (φ 1 inch) (ISO25)
- Ø 25.5 mm (φ 1 inch) (ISO25)

The 4 others knockouts are as follows:

- Ø 22.5 mm (φ 0.89 inch) (PG16) (UL 1/2") & Ø 16.5 mm (φ 0.65 inch) (ISO16) (x2)
- Ø 20.7 mm (φ 0.81 inch) (ISO20 or PG13.5) (x2)

Figure 41: Wiring connections for DSF270-325-485-530



DSF485 and DSF530 code 3

The terminal box is provided with 2 triple knockouts for power supply, 2 double knockouts and 3 simple knockouts for the safety control circuit.

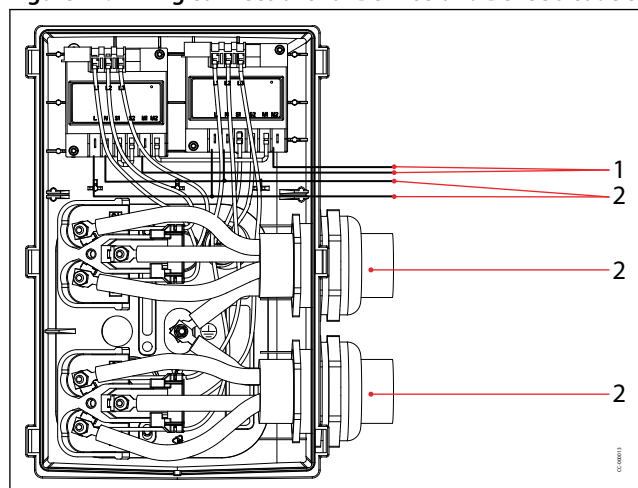
The 2 power supply knockouts accommodate the following diameters:

- Ø 63.5mm (φ 2.5inch) (ISO63 and UL 2"conduit) & Ø 54.2mm (φ 2.13inch) (PG42)& 43.7mm (UL 1"1/4 conduit)

The 5 other knockouts are as follows:

- Ø 22.5mm (φ 0.89inch) (PG16) (UL 1/2") & Ø 16.5mm (φ 0.65 inch) (ISO16)
- Ø 25.5mm (φ 1inch) (ISO25) & 20mm (φ 0.79inch) (ISO20 or PG13.5)
- Ø 22.5mm (φ 0.89inch) (PG16) (UL 1/2")
- Ø 25.5mm (φ 1inch) (ISO25) (x2)

Figure 42: Wiring connections for DSF485 and DSF530 code 3



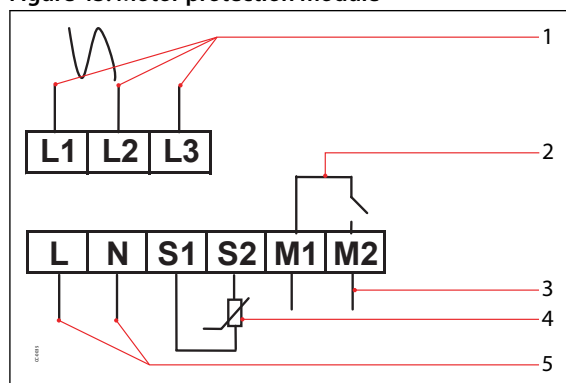
- | | |
|---|------------------------|
| 1 | M1, M2 Control circuit |
| 2 | Power supply |

Motor protection module

The motor protection modules come preinstalled within the terminal box. Phase sequence protection connections and thermistor connections are pre-wired and should not be removed.

The module must be connected to a power supply of the appropriate voltage. The module terminals are 6.3 mm (0.25 inch) size Faston type.

Figure 43: Motor protection module



- | | |
|----|--------------------------|
| L1 | Black |
| L2 | Blue |
| L3 | Brown |
| 1 | Phase sequence input |
| 2 | Internal control contact |
| 3 | Safety circuit |
| 4 | Thermistor connection |
| 5 | Module power |

Electrical specifications

Motor voltage

Danfoss scroll compressors DSF are available in motor voltage listed below.

Table 18: Motor voltage

Frequency	Motor voltage code	Code 3	Code 4	Code 7	Code 9
50 Hz	Nominal voltage	-	380-415V-3ph 400V-3ph ⁽¹⁾	-	-
60 Hz	Nominal voltage	208-230V-3ph	460V-3ph	575V-3ph	380-400V-3ph

⁽¹⁾ DSH090-200

NOTE:

Voltage range: Nominal voltage $\pm 10\%$. The voltage range indicates where the compressor can run in the majority of the application envelope. A boundary voltage supply which accumulates under specific conditions such as high ambience, high superheat, or map boundary conditions, may lead to a compressor trip.

Voltage imbalance

The maximum allowable voltage imbalance is 2%. Voltage imbalance causes high amperage over one or several phases, which in turn leads to overheating and possible motor damage. Voltage imbalance is given by the formula:

$$\% \text{ voltage imbalance} = \frac{|V_{avg} - V_{1-2}| + |V_{avg} - V_{1-3}| + |V_{avg} - V_{2-3}|}{2 \times V_{avg}} \times 100$$

Vavg	Mean voltage of phases 1, 2, 3.
V1-2	Voltage between phases 1 and 2.
V1-3	Voltage between phases 1 and 3.
V2-3	Voltage between phases 2 and 3.

IP rating

The compressor terminal box according to IEC60529 is IP54 for all models when correctly sized IP54 rated cable glands are used.


First numeral, level of protection against contact and foreign objects

5 - Dust protected

Second numeral, level of protection against water

4 - Protection against water splashing

Terminal box temperature

 The temperature inside the terminal box must not exceed 70 °C (158 °F). Consequently, if the compressor is installed in an enclosure, precautions must be taken to avoid that the temperature around the compressor and in the terminal box would rise too much. A ventilation installation on the enclosure panels may be necessary. If not, the electronic protection module may not operate properly. Any compressor damage related to this will not be covered by Danfoss warranty. In the same manner, cables must be selected in a way that ensures the terminal box temperature does not exceed 70 °C (158 °F).

Three phase electrical characteristics

Table 19: Motor voltage code3

Compressor model	LRA	RLA	Max operating current	Winding resistance
	A	A	A	Ω
DSF090	203	31	34	0.39
DSF100	203	32	37	0.39
DSF115	267	38	44	0.27
DSF130	267	44	48	0.27
DSF155	304	41	55	0.24
DSF175	315	47	62	0.22
DSF200	351	56	70	0.22
DSF270	471	70	96	0.16
DSF325	574	84	118	0.13
DSF485	824	142	174	0.17
DSF530	824	137	190	0.17

Table 20: Motor voltage code4

Compressor model	LRA	RLA	Max operating current	Winding resistance
	A	A	A	Ω
DSF090	98	17.1	17	1.47
DSF100	98	17.9	19	1.47
DSF115	142	20	22	1.05
DSF130	142	22.9	24	1.05

Compressor model	LRA	RLA	Max operating current	Winding resistance
	A	A	A	Ω
DSF155	147	25.7	27	0.92
DSF175	158	26.4	30	0.83
DSF200	197	28.5	34	0.83
DSF270	222	38	42	0.7
DSF325	263	45	52	0.56
DSF485	389	76	80	0.28
DSF530	389	74	87	0.28

Table 21: Motor voltage code7

Compressor model	LRA	RLA	Max operating current	Winding resistance
	A	A	A	Ω
DSF090	84	12	13	2.34
DSF100	84	13	14	2.34
DSF115	103	17	16	1.57
DSF130	103	17	18	1.57
DSF155	122	18	21	1.38
DSF175	136	22	23	1.32
DSF200	135	24	26	1.32
DSF270	181	28	35	0.94
DSF325	212	34	43	0.82
DSF485	303	54	63	0.67
DSF530	303	56	68	0.67

Table 22: Motor voltage code9

Compressor model	LRA	RLA	Max operating current	Winding resistance
	A	A	A	Ω
DSF090	124	19	19	1.05
DSF100	124	21	20	1.05
DSF115	160	25	24	0.72
DSF130	160	26	27	0.72
DSF155	168	25	30	0.62
DSF175	177	29	34	0.57
DSF200	239	37	39	0.57
DSF270	276	43	53	0.42
DSF325	317	52	65	0.36
DSF485	479	76	96	0.29
DSF530	479	83	104	0.29

LRA (Locked Rotor Amp)

Locked Rotor Amp value is the higher average current as measured on mechanically blocked compressors tested under nominal voltage. The LRA value can be used as a rough estimation for the starting current. However, in most cases, the real starting current will be lower. A soft starter can be applied to reduce starting current (see section [Soft starts](#)).

RLA (Rated Load Amperage)

The RLA values presented are simply calculated by dividing the maximum current before tripping at overload test conditions by 1.4.

MOC (Maximum Operating Current)

The max operating current is the amperage the compressor will draw when it operates at maximum load of operating envelope within the voltages printed on the nameplate.

MOC can be used as a basis for contactors selection.

Winding resistance

Winding resistance is the resistance between phases at 25°C (77°F) (resistance value +/- 7%). Winding resistance is generally low and it requires adapted tools for precise measurement. Use a digital ohm-meter, a "4 wires" method and measure under stabilised ambient temperature. Winding resistance varies strongly with winding temperature. If the compressor is stabilised at a different value than 25°C (77°F), the measured resistance must be corrected using the following formula:

$$R_{t_{amb}} = R_{25^{\circ}\text{C} (77^{\circ}\text{F})} \frac{a + t_{amb}}{a + t_{25^{\circ}\text{C} (77^{\circ}\text{F})}}$$

$t_{25^{\circ}\text{C}}$	reference temperature = 25°C (77°F)
t_{amb}	temperature during measurement °C (°F)
$R_{25^{\circ}\text{C} (77^{\circ}\text{F})}$	winding resistance at 25°C (77°F)
R_{amb}	winding resistance at t_{amb}
a	Coefficient $a = 234.5$

Motor protection

DSF090 to DSF200

Compressor models DSF090 to 200 are provided with internal overload motor protection to prevent against excessive current and temperature caused by overloading, low refrigerant flow or phase loss.

The protector is located in star point of motor and, should it be activated, will cut out all three phases. It will be reset automatically.

While not compulsory, an additional thermal magnetic motor circuit breaker is still advisable for either alarm or manual reset.

Then it must be set at max operating current:

- When the motor temperature is too high, then the internal protector will trip.
- When the current is too high the thermal magnetic motor circuit breaker will trip before the internal protection therefore offering possibility of manual reset.

DSF270 to DSF530

DSF compressors are delivered with a pre-installed motor protection module inside the terminal box. This device provides efficient and reliable protection against overheating and overloading as well as phase loss/reversal.

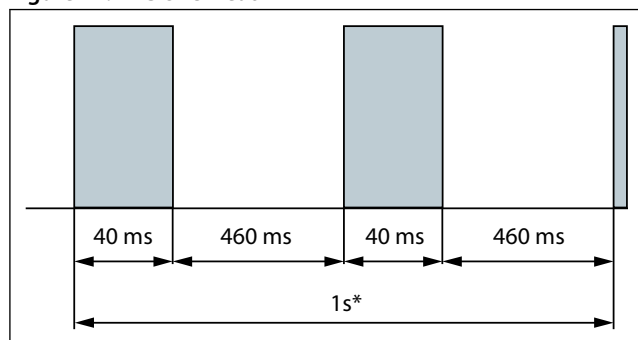
The motor protector comprises a control module and PTC sensors embedded in the motor winding.

The motor temperature is being constantly measured by a PTC thermistor loop connected on S1-S2. If any thermistor exceeds its response temperature, its resistance increases above the trip level (4.500 Ω) and the output relay then trips – i.e. contacts M1-M2 are open. After cooling to below the response temperature (resistance < 2.750 Ω), a 5-minute time delay is activated.

After this delay has elapsed, the relay is once again pulled in – i.e. contacts M1-M2 are closed. The time delay may be cancelled by means of resetting the mains (L-N -disconnect) for approximately 5 sec.

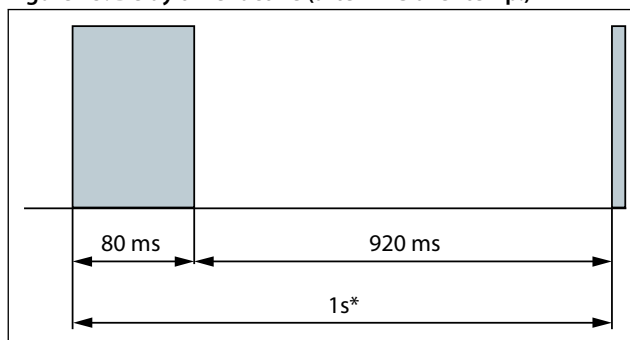
A red/green twin LED is visible on the module. A solid green LED denotes a fault free condition. A blinking red LED indicates an identifiable fault condition:

Figure 44: PTC Overheat



* approx. 1 second

Figure 45: Delay timer active (after PTC over temp.)



* approx. 1 second

While not compulsory, an additional thermal magnetic motor circuit breaker is still advisable for either alarm or manual reset.

Then it must be set below max operating current:

- When the motor temperature is too high, then the internal PTC over temp. and module is activated.
- When the current is too high the thermal magnetic motor circuit breaker will trip before the module activate therefore offering possibility of manual reset.

Phase sequence and reverse rotation protection

Use a phase meter to establish the phase orders and connect line phases L1, L2 and L3 to terminals T1, T2 and T3, respectively.

DSF090 to DSF200

Compressor models DSF090 to 200 incorporates an internal reverse vent valve which will react when the compressor is run in reverse and will allow refrigerant to circulate through a by-pass from the suction to the discharge. Although reverse rotation is not destructive for these models, it should be corrected as soon as possible. Repeated reverse rotation over 24 hours may have negative impact on the bearings.

Reverse rotation will be obvious to the user as soon as power is turned on: the compressor will not build up pressure, the sound level will be abnormally high and power consumption will be minimal. If reverse rotation symptoms occur, shut the compressor down and connect the phases to their proper terminals. If reverse rotation is not halted, the compressor will cycle off-on the motor protection.

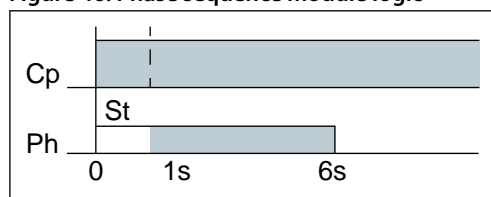
DSF270 to DSF530

Use a phase meter to establish the phase orders and connect line phases L1, L2 and L3 to terminals T1, T2 and T3, respectively.

Compressor models DSF270 to 530 are delivered with an electronic module which provides protection against phase reversal and phase loss at start-up.

The phase sequencing and phase loss monitoring functions are active during a 5-sec window 1 second after compressor start-up (power on L1-L2-L3).

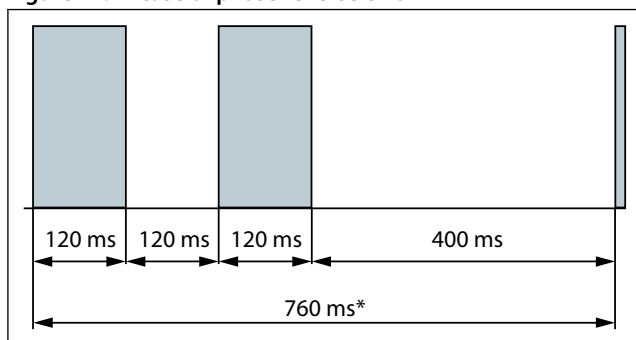
Figure 46: Phase sequence module logic



Cp	Compressor
Ph	Phase monitoring
St	start

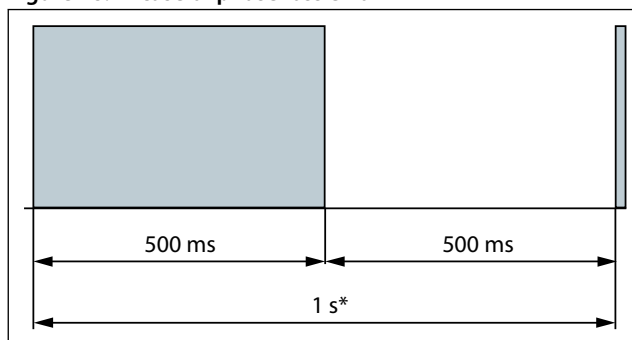
Should one of these parameters be incorrect, the relay would lock out (contact M1-M2 open). The red LED on the module will show the following blink code:

Figure 47: In case of phase reverse error



* Approximate

Figure 48: In case of phase loss error



* Approximate

The lockout may be cancelled by resetting the power mains (disconnect L-N) for approximately 5 seconds.

For more detailed information see "Instructions for electronic module" [AN160986418236](#).

Application

Manage oil in the circuit

Requirement

R Oil level must be visible or full in the sight glass when the compressor is running and when all compressors of the circuit are stopped. For DSF155-200 trio models, top-up oil quantity 1L at least as mandatory.



System evaluation

Table 23: System evaluation

Split type	Single compressor	Manifold compressors
Non split	Test No.1	Test No.1+2
Split	Test No.1+3	Test No.1+2+3

Test, criteria and solutions

Table 24: Test, criteria and solutions

Test No.	Purpose	Test conditions	Pass criteria	Solutions
1	Check proper oil return	 <p>Lowest foreseeable evaporation, and highest foreseeable condensation.</p> <p>Minimum number of compressor running for 6 hours. For reversible system, perform test in both heating and cooling mode.</p>	Oil level must be visible or full in the sight glass when the compressor is running and when all compressors of the circuit are stopped.	<ol style="list-style-type: none"> Top-up with oil, generally 3% of the total system refrigerant charge (in weight). Above 3% look for potential oil trap in the system. Integrate a function in control logic to run all compressors simultaneously in order to boost oil return (for more details see section Control logic). Oil separator can be added
2	Check oil balancing	 <p>Lowest foreseeable evaporation and highest foreseeable condensation and nominal capacity condition For tandem 2 compressors running for 6 hours, for trio, compressor running follow the running sequence: (1+2+3)2hrs → (1+2)2hrs → (2+3)2hrs → (1+3)2hrs For reversible system, perform test in both heating and cooling mode.</p>	Oil level must be visible or full in the sight glass when the compressors are running and when all compressors of the circuit are stopped	<ol style="list-style-type: none"> Top-up with oil, generally 3% of the total system refrigerant charge (in weight). Check that manifold piping is conform to Danfoss requirements. Integrate a function in control logic to stop manifold periodically in order to balance oil (for more details see section Control logic).
3	Oil return in split systems	Since each installation is unique, test 1 and 2 can not fully validate the oil return. Oil level must be checked and adjusted at commissioning.	Oil level must be visible or full in the sight glass when the compressor is running and when all compressors of the circuit are stopped.	<ol style="list-style-type: none"> Pay special attention to "Piping design" Oil separator is strongly recommended, especially in case of part load.

Manage sound and vibration

Sound radiations

We can consider two means to reduce compressors sound radiations:

- Acoustic hoods are quick and easy to install and do not increase the overall size of the compressors. Acoustic hoods are available from Danfoss as accessories. Refer to the tables above for sound levels, attenuation and code numbers.
- Use of sound-insulation materials on the inside of unit panels is also an effective mean to reduce sound radiation.

i NOTE:

During compressor shut down, a short reverse rotation sound is generated. The duration of this sound depends on the pressure difference at shut down and should be less than 3 seconds. This phenomenon has no impact on compressor reliability.

Gas pulsation

DSF has been designed and tested to ensure that gas pulsation is optimized for the most commonly encountered air conditioning pressure ratio. Manifolder compressors are equivalents to lagged sources of gas pulsation. Therefore, pulse level can vary during time.

Mitigations methods:


If an unacceptable level is identified, a discharge muffler with the appropriate resonant volume and mass can be installed.

Mitigation methods

Mitigations methods:

1. To ensure minimum vibrations transmission to the structure, strictly follow Danfoss mounting requirements (mounting feet, rails etc.). For further information on mounting requirements, please refer to section [Design compressor mounting](#).
2. Ensure that there is no direct contact (without insulation) between vibrating components and structure.
3. To avoid resonance phenomenon, pipings and frame must have natural frequencies as far as possible from running frequency. Solutions to change natural frequencies are to work on structure stiffness and mass (brackets, metal sheet thickness or shape...).

Manage operating envelope

 The **Operating envelope data** for DSF scroll compressors guarantees reliable operations of the compressor for steady-state operation.

Steady-state operation envelope is valid for a suction superheat within 5K to 10K range at nominal Voltage.

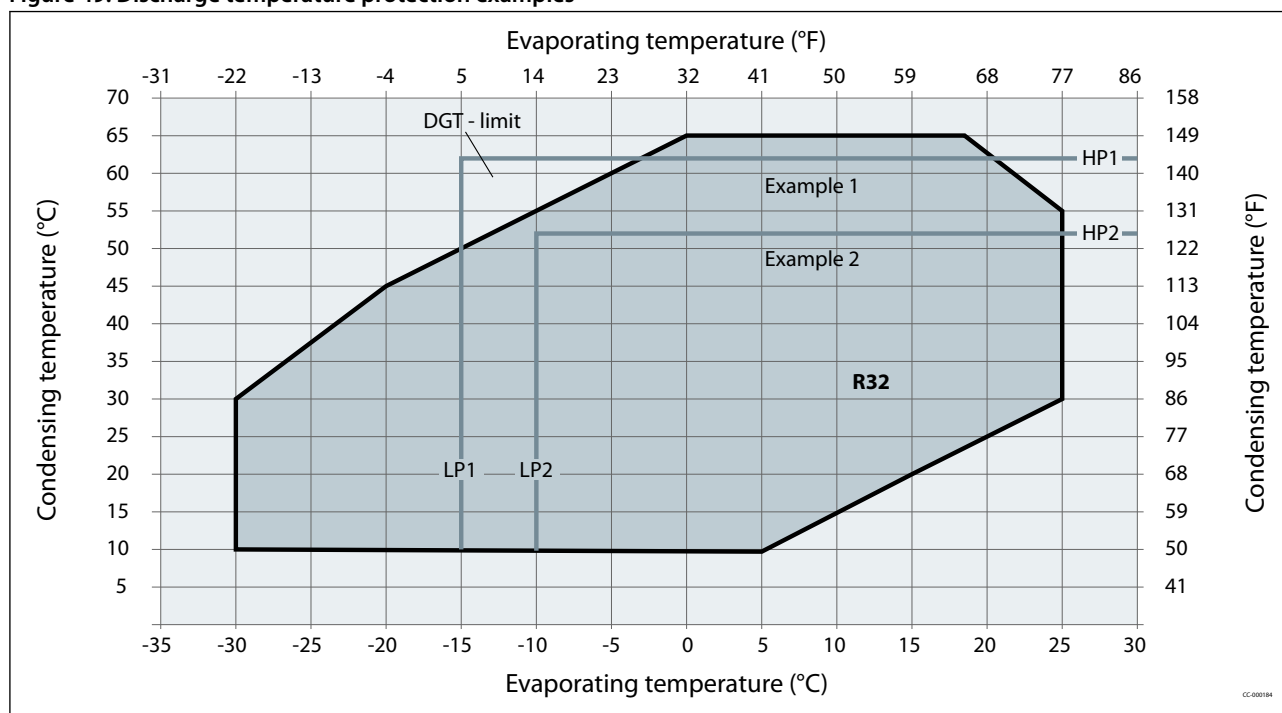
Discharge temperature protection

DSF270 to DSF530 include an integrated discharge temperature protection. Excessive discharge temperature will result in tripping of electronic module output relay.

This protection, effective for suction superheat above 5 – 10 K (9 – 18 °F), should be considered as a compressor safety device and its purpose is not to ensure operation map control.

In case of basic map control by pressure switches that can not ensure totally that the compressor will remain in its operating envelope, an additional external discharge protection is required. (see [Figure 49: Discharge temperature protection examples](#))

Figure 49: Discharge temperature protection examples



Example 1 (R32, SH = 5K)

LP switch setting: LP1 = 3.9 bar (g) (-15°C), HP switch setting: HP1 = 40.2 bar (g) (62°C)

Risk of operation beyond the application envelope.

DGT protection required.

Example 2 (R32, SH = 5K)

LP switch setting: LP2 = 4.8 bar (g) (-10°C), HP switch setting: HP2 = 32 bar (g) (52°C)

No risk of operation beyond the application envelope.

No DGT protection required.

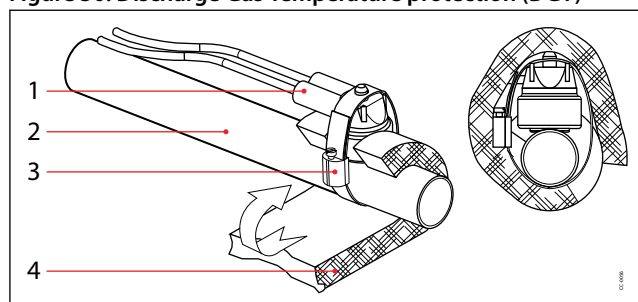
DSF090 to DSF200 have no integrated discharge temperature protection, an external protection is required.

This external protection device can be a thermostat or a temperature sensor. The discharge gas temperature protection must trip the power supply when it reaches the setting point to protect the compressor from overheating.

The discharge gas protection should be set to open at a maximum discharge gas temperature of 150°C(302°F). A PT1000 is recommended.

The discharge gas thermostat or sensor must be attached to the discharge line within 150mm (5.91 inch) from the compressor discharge port and must be thermally insulated and tightly fixed on the pipe (see **Figure 50: Discharge Gas Temperature protection (DGT)**)

Figure 50: Discharge Gas Temperature protection (DGT)



- | | |
|---|----------------|
| 1 | Thermostat |
| 2 | Discharge line |
| 3 | Bracket |
| 4 | Insulation |

System evaluation

HP and LP must be monitored to respect operating envelope limitations. We consider two types of operating envelope management: Basic and Advanced.

Table 25: System evaluation

Basic	Advanced
<ul style="list-style-type: none"> • HP and LP switch • MOP (Max Operating Pressure) ensured by expansion device • Condensing pressure control • DGT external setting points: max 150°C (302°F) 	<ul style="list-style-type: none"> • HP and LP sensor • Operating envelope limits integrated into control logic • Temperature measurement (monitoring by sensor)

Manage superheat

During normal operation, refrigerant enters the compressor as a superheated vapor. Liquid flood back occurs when a part of the refrigerant entering the compressor is still in liquid state.

Liquid flood back can cause oil dilution and, in extreme situations lead to liquid slugging that can damage the compressor.

Requirement

In steady state conditions the expansion device must ensure a suction superheat within 5 – 10 K (9 – 18 °F).

System evaluation


Use the table in relation with the application to quickly evaluate the potential tests to perform.

Table 26: System evaluation

Application	Tests to perform
Non reversible	Liquid flood back test
Reversible	Liquid flood back test Defrost test

Test, criteria and solutions

Table 27: Test, criteria and solutions

Test	Purpose	Test condition	Pass criteria	Solutions
Liquid flood back test	Steady-state	<p>A</p>  <p>Liquid flood back testing must be carried out under expansion valve threshold operating conditions:</p> <ul style="list-style-type: none"> Lowest foreseeable evaporation, and highest foreseeable condensation. Minimum number of compressor running. <p>For reversible system, perform test in both heating and cooling mode.</p>	Suction superheat > 5 K (9 °F) and the oil superheat shall not be more than 60 sec below the safe limit defined in the Dilution Chart (see graph below).	<ol style="list-style-type: none"> Check expansion valve selection and setting. <ul style="list-style-type: none"> For Thermostatic expansion valve (TXV) check bulb position... For Electronic expansion valve (EXV) check measurement chain and PID.... Add a suction accumulator⁽¹⁾
	Transient	<p>Tests must be carried out with most unfavorable conditions :</p> <ul style="list-style-type: none"> fan staging compressor staging ... 	Oil superheat shall not be more than 60 sec per hour below the safe limit defined in the Dilution Chart. (see graph below)	
Defrost test	Check liquid floodback during defrost cycle	Defrost test must be carried out in the most unfavorable conditions (at 0 °C (32 °F) evaporating temperature).	Oil superheat shall not be more than 60 sec per hour below the safe limit defined in the Dilution Chart. (see graph below)	<ol style="list-style-type: none"> Check defrost logic. In reversible systems, the defrost logic can be worked out to limit liquid floodback effect. (for more details see Control logic). Add a suction accumulator⁽¹⁾

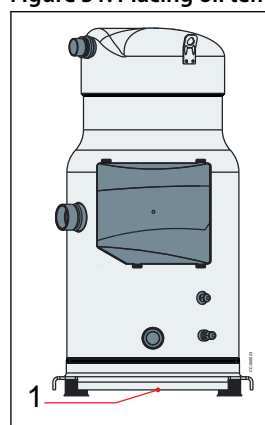
⁽¹⁾ Suction accumulator offers protection by trapping the liquid refrigerant upstream from the compressor. The accumulator should be sized at least 50 % of the total system charge. Suction accumulator dimensions can impact oil return (gas velocity, oil return hole size...), therefore oil return has to be checked according to section [Manage oil in the circuit](#).

Placing oil temperature sensor

Oil temperature sensor must be placed on the bottom of the baseplate. Some thermal paste shall be used to improve the conductivity. The sensor must also be correctly thermally insulated from the ambience.

The Oil superheat is defined as: (Oil temperature - Evaporating temperature)

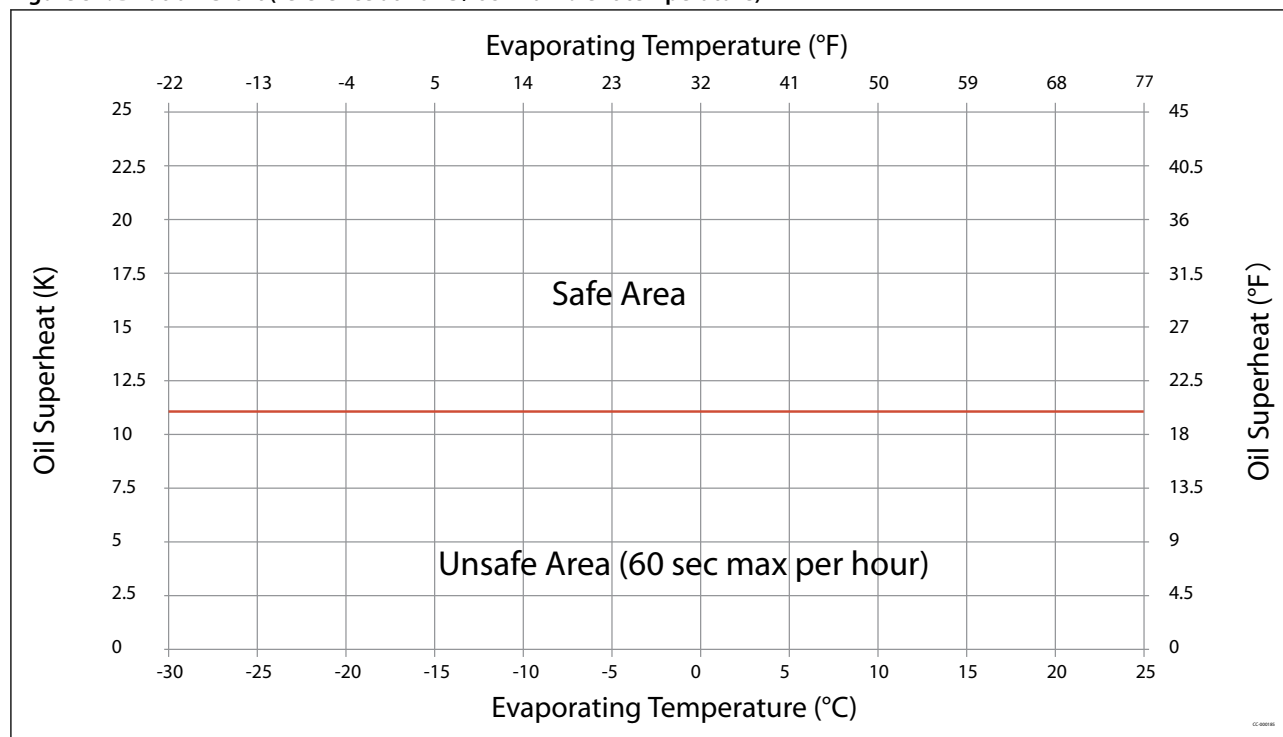
Figure 51: Placing oil temperature sensor on the bottom of the baseplate



- Oil temperature sensor must be placed on the bottom of the baseplate.

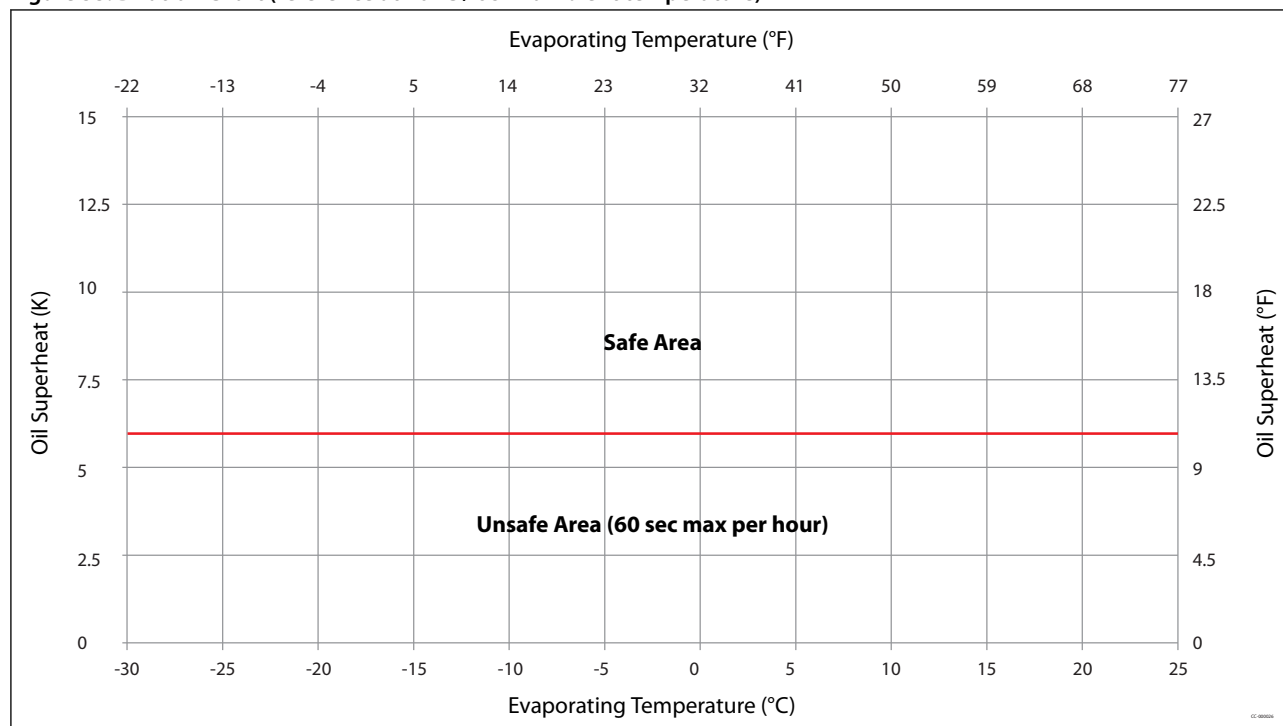
Dilution Chart - DSF090 to DSF200, R32

Figure 52: Dilution Chart (reference at 20 °C / 68 °F ambient temperature)




Dilution Chart - DSF270 to DSF570, R32

Figure 53: Dilution Chart (reference at 20 °C / 68 °F ambient temperature)



Manage off cycle migration

 Off-cycle refrigerant migration happens:

- when the compressor is located at the coldest part of the installation, refrigerant vapor condenses in the compressor.
- or directly in liquid-phase by gravity or pressure difference. When the compressor restarts, the refrigerant diluted in the oil, or stored in evaporator, generates poor lubrication conditions, and may reduce bearings life time. In extreme situations, this leads to liquid slugging that can damage the compressor scroll set.

Requirement

- Compressor can tolerate occasional flooded start, but it should remain exceptional situation and unit design must prevent that this situation happen at each start.
- Right after start, liquid refrigerant must not flow massively to compressor
- The charge limit is a threshold beyond some protective measures must be taken to limit risk of liquid slugging and extreme dilution at start.

System evaluation

Use the [Table 30: Charge limits for Single models](#) and [Table 31: Charge limits for Tandem models](#) in section Charge limits, in relation with the system charge and the application to quickly define necessary safeties to implement.

Table 28: System evaluation

Application	BELOW charge limit	ABOVE charge limit
All	Ensure tightness between condenser & evaporator when system is OFF <ul style="list-style-type: none"> • Thermostatic expansion Valve (TXV), Liquid Line Solenoid Valve LLSV strongly recommended • Electronic expansion valve (EXV) must close when system stop including in power shut down situation 	
Non split	No test or additional safeties required	• Crankcase heater
Split	Since each installation is unique, refrigerant charge may vary <ul style="list-style-type: none"> • Crankcase heater • Liquid Line Solenoid Valve + pump-down cycle 	

Crankcase heater

The surface sump heater are designed to protect the compressor against off-cycle migration of refrigerant.

For DSF090-200, the surface sump heater is located on the compressor shell. For better standby energy consumption, Danfoss provides 48W and 80W two optional surface sump heater. The selection of surface sump heater could be refered to below principle:

Figure 54: DSF090 to 200

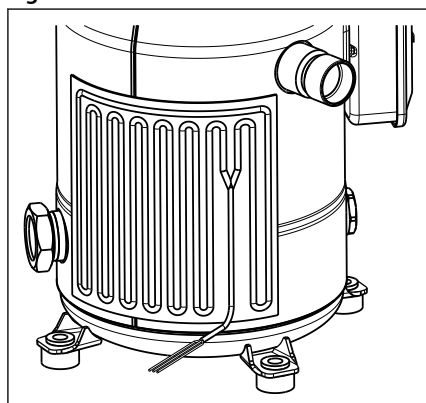
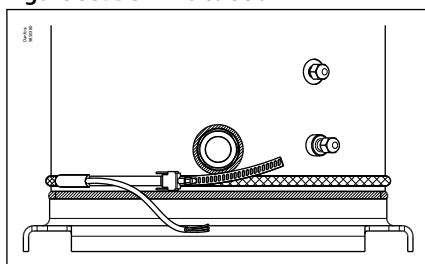


Table 29: surface sump selection principle

Compressor Surrounding Ambient	Surface Sump Heater
Unit has enclosure, no wind	48W SSH
Unit has no enclosure, with wind	80W SSH
Unit has no enclosure, wind >5m/s (ft/s)& ambient temperature <-5°C	80W SSH + additional SSH/thermal insulation

For DSF270-530, the use of a 75W belt heater is recommended.

Figure 55: DSF 270 to 530



The heater must be turned on whenever all the compressors are off. Crankcase heater accessories are available from Danfoss (see section [Accessories and spare parts](#)).

Liquid line solenoid valve (LLSV)

A LLSV is used to isolate the liquid charge on the condenser side, thereby preventing against charge transfer to the compressor during off -cycles. The quantity of refrigerant on the low-pressure side of the system can be further reduced by using a pump-down cycle in association with the LLSV.

Pump-down cycle

By decreasing pressure in the sump, pump down system:

- evacuates refrigerant from oil
- set the sump saturating pressure much lower than ambience temperature and due to that, avoid refrigerant condensation in the compressor.

Pump-down must be set higher than 1.7 bar(g) (25 psig). For more details on pump-down cycle see [Pump-down logic recommendations](#) in section Control logic.

Charge limits

Table 30: Charge limits for Single models

Models	Composition	Refrigerant charge limit	
		kg	lbs
DSF090	-	8	18
DSF100	-	8	18
DSF115	-	10	22
DSF130	-	10	22
DSF155	-	10	22
DSF175	-	10	22
DSF200	-	10	22
DSF270	-	15	33
DSF325	-	15	33
DSF485	-	17	37
DSF530	-	17	37

Table 31: Charge limits for Tandem models

Models	Composition	Refrigerant charge limit	
		kg	lbs
DSF180E	DSF090+DSF090	12	26
DSF200E	DSF100+DSF100	12	26
DSF230E	DSF115+DSF115	12	26
DSF260E	DSF130+DSF130	12	26
DSF215U	DSF100+DSF115	12	26
DSF230U	DSF100+DSF130	12	26
DSF255U	DSF100+DSF155	12	26
DSF275U	DSF100+DSF175	12	26
DSF285U	DSF130+DSF155	12	26
DSF300U	DSF100+DSF200	12	26
DSF305U	DSF130+DSF175	12	26
DSF310E	DSF155+DSF155	14	31

Models	Composition	Refrigerant charge limit	
		kg	lbs
DSF315U	DSF115+DSF200	12	26
DSF350E	DSF175+DSF175	14	31
DSF400E	DSF200+DSF200	14	31
DSF330U	DSF155+DSF175	14	31
DSF331U	DSF130+DSF200	12	26
DSF355U	DSF155+DSF200	14	31
DSF375U	DSF175+DSF200	14	31
DSF400X	DSF130+DSF270	14	31
DSF500X	DSF175+DSF325	14	31
DSF470X	DSF200+DSF270	14	31
DSF525X	DSF200+DSF325	14	31
DSF540E	2xDSF270	21	46
DSF595U	DSF270 + DSF325	21	46
DSF650E	2xDSF325	25	55
DSF800U	DSF270 + DSF530	21	46
DSF855U	DSF325 + DSF530	25	55
DSF970E	DSF485 + DSF485	34	75
DSF1060E	DSF530 + DSF530	34	75

Table 32: Charge limits for Trio models

Models	Composition	Refrigerant charge limit	
		kg	lbs
DSF465T	3 × DSF155	14	31
DSF525T	3 × DSF175	14	31
DSF600T	3 × DSF200	14	31
DSF810T	3 × DSF270	21	46
DSF975T	3 × DSF325	25	55
DSF1180T	DSF325+DSF325+DSF530	25	55
DSF1385T	DSF530+DSF530+DSF325	34	75
DSF1590T	3 × DSF530	34	75

Power supply and electrical protection

Wiring information

Requirements

- Protect the compressor from short circuit and overcurrent by a thermal magnetic motor circuit breaker set to Max. operating current or lower (see table in section Three phase electrical characteristics). For DSF090-200, phase sequence protection is strongly recommended.
- DSF 270-530 compressors are delivered with a pre-installed motor protection module inside the terminal box that must be powered on.
- HP safety switch and electronic module relay output (M1-M2) must be wired in the safety chain. Other safety devices such as LP can be either hardware or software managed.
- Provide separate electrical supply for the heaters so that they remain energized even when the machine is out of service (e.g. seasonal shutdown).

The wiring diagrams below are examples for a safe and reliable compressor wiring:

Figure 56: Compressor model DSF090 - 200

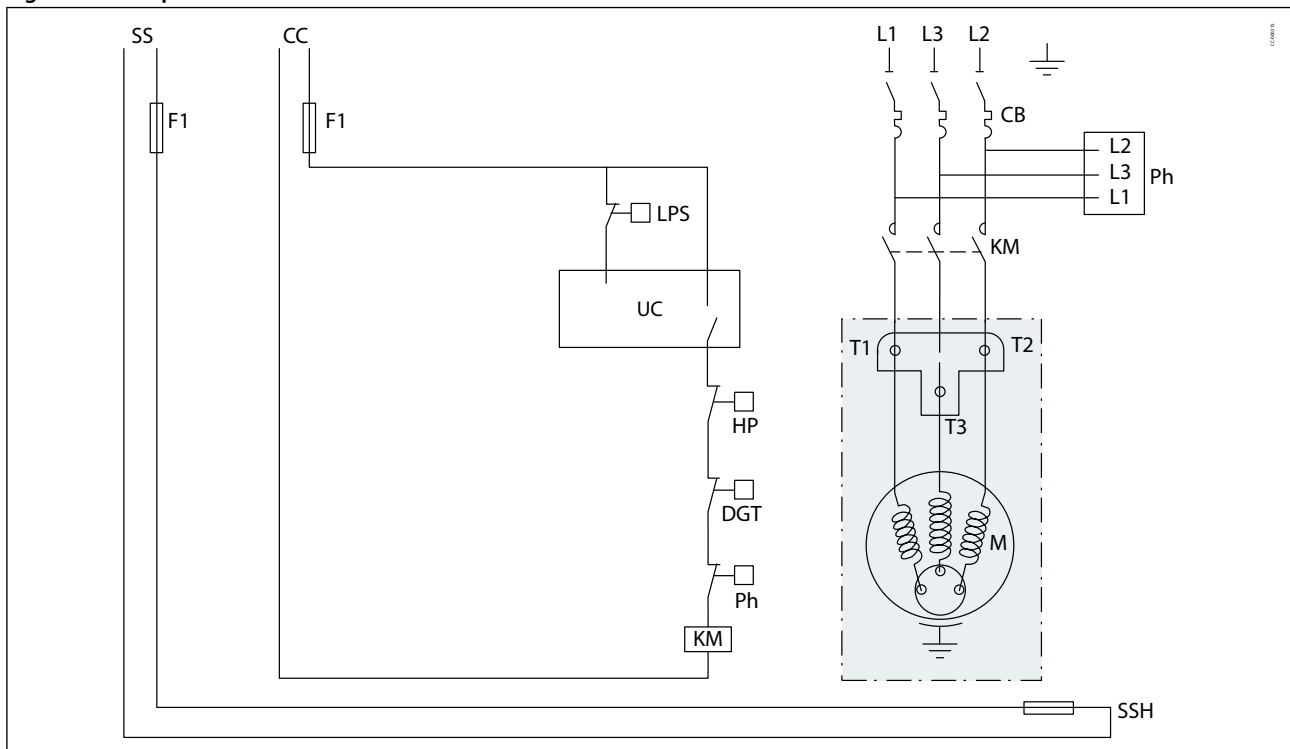


Figure 57: Compressor model DSF270 - 325

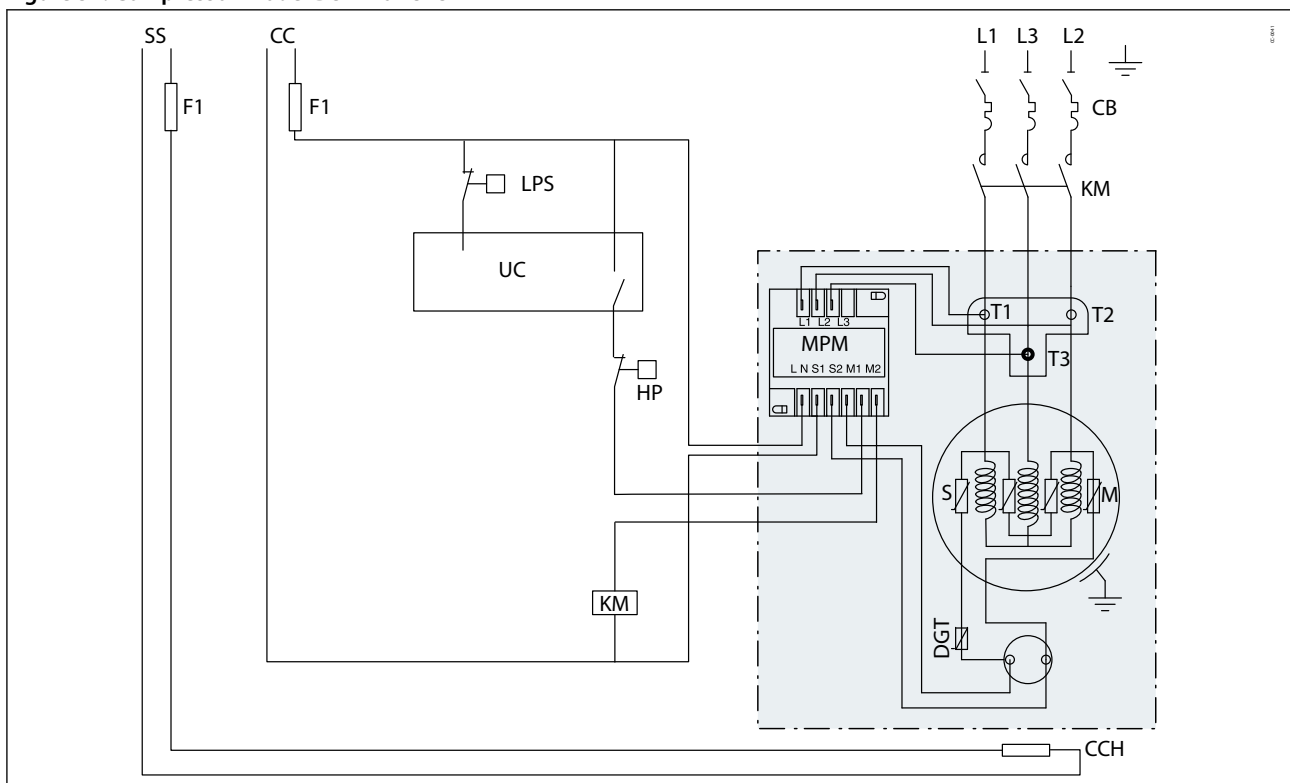
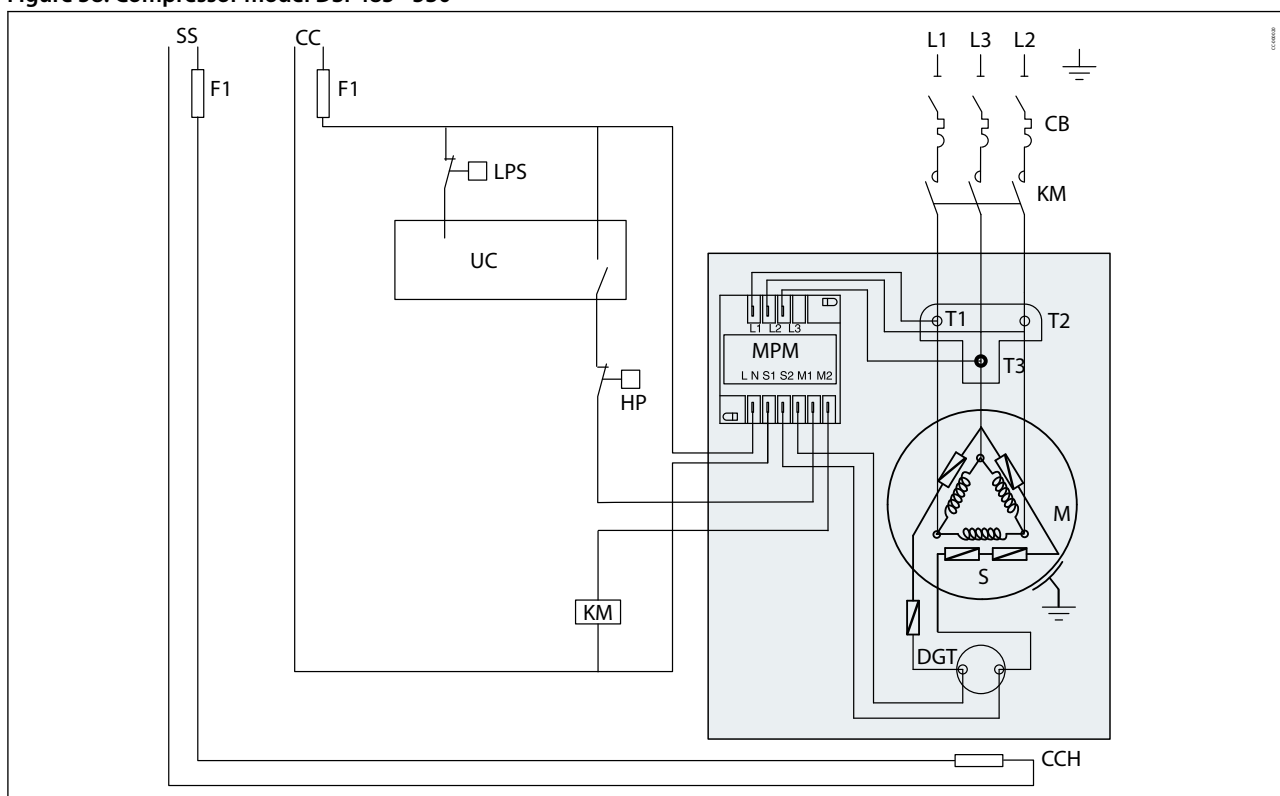


Figure 58: Compressor model DSF485 - 530



CB	Thermal magnetic motor circuit breaker	LPS	Safety pressure switch
CC	Control circuit	M	Compressor motor
CCH	Crankcase heater	MPM	Motor Protection Module
DGT	Discharge gas thermistor (embedded in compressor)	S	Thermistor chain (motor and discharge temperature)
F1	Fuses	SS	Seprate supply
HP	High pressure safety switch	SSH	Surface sump heater
KM	Compressor contactor		

Soft starts

⚠ Soft starters are designed to reduce the starting current of 3-phase AC motors. Soft starter must be set so compressor start-up time is always less than 0.5 seconds to ensure proper lubrication of compressor parts.

Ramp-down must be set to minimum to ensure proper discharge valve closing.

⚠ Make sure that the soft starter selected is compatible with R32 refrigerant.

Control logic

Safety control logic requirements

Table 33: Safety control logic requirements

Safeties	Tripping conditions		Re-start conditions	
	Value	Time	Value	Time
HP safety switch	See Pressure settings table from section Operating envelope data	Immediate, no delay. No by-pass	Conditions back to normal. Switch closed again.	Manual reset
LP safety switch				Maximum 5 auto reset during a period of 12 hours, then manual reset.
Electronic module (Motor protection, DGT)	Contact M1-M2 opened			

Cycle rate limit requirements

Danfoss requires a minimum compressor running time of 2 minutes to ensure proper oil return and sufficient motor cooling.

Additionally, compressor must not exceed 12 starts per hour. 12 starts per hour must not be considered as an average, this is the maximum number of starts acceptable to keep a good regulation accuracy during low load.

Oil management logic recommendations

In some cases, oil management can be enhanced by control logic:

- If oil return test failed, a function can be integrated in control logic to run all compressors simultaneously during 2 minutes every hour in order to boost oil return. Time and delay can be fine-tuned by oil return test No.1 in section **Manage oil in the circuit**. During oil boost, pay special attention to superheat management to avoid liquid flood back.
- In trio system, after running long time in same state with 2 or 3 compressors, (1+2+3) or (1+2), (2+3) or (3+1), oil unbalance may appears. A function can be implemented in control logic to stop all compressors during one minute every two hours in order to balance oil. Time and sequence can be fine-tuned during Oil balancing test in section **Manage oil in the circuit**.

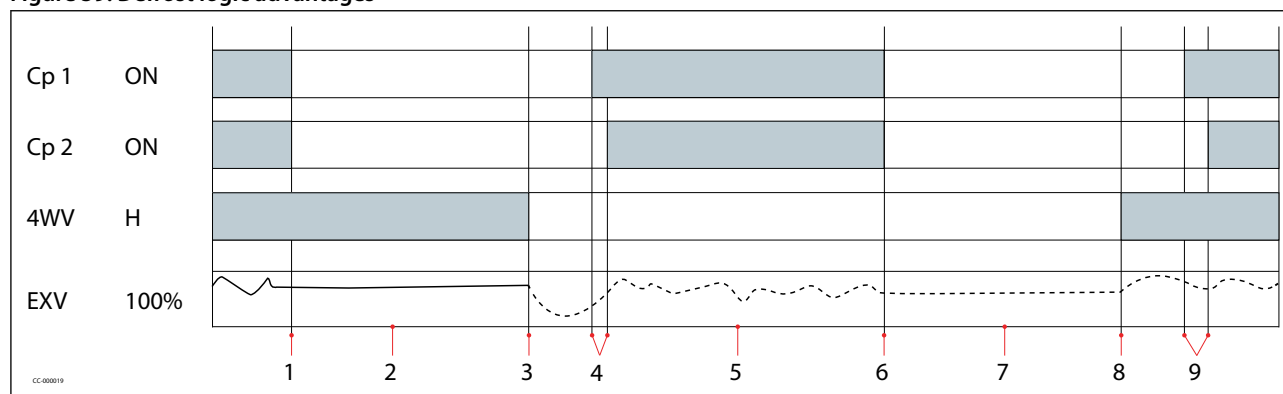
Defrost logic recommendations / Reversible systems

In reversible systems, the defrost logic can be worked out to limit liquid flood back effect by:


1. Running full load during defrost to share liquid refrigerant between all compressors.
2. Reducing refrigerant flooding to compressor by transferring liquid refrigerant from one exchanger to the other before reversing valve thanks pressures.

The following defrost logic combines both advantages:

Figure 59: Defrost logic advantages



Cp 1	Compressor 1
Cp 2	Compressor 2
ON	On
H	Heating
1	Defrost start. Stop all compressors
2	4 Way Valve (4WV) stays in heating mode. EXV opened to transfer liquid from outdoor to indoor exchanger thanks to pressure difference.
3	When pressures are almost balanced ⁽¹⁾ , change 4WV to cooling mode.
4	Start Cp1 and Cp 2 with 0.5 seconds delay between 2 successive starts
5	Defrost
6	Defrost end. Stop all compressors
7	4 WV stays in cooling mode. EXV opened to transfer liquid from indoor to outdoor exchanger thanks to pressure difference
8	When pressures are almost balanced ⁽¹⁾ , change 4WV to heating mode.
9	Start Cp1 and Cp 2 with 0.5 seconds delay between 2 successive starts

 In reversible systems, to ensure compressor reliability, the 4-way valve must not reverse when the compressor is stopped due to heating or cooling demand (stop on thermostat).

⁽¹⁾ EXV Opening degree and time have to be set to keep a minimum pressure for 4 way valve moving. In any case, defrost logics must respect requirements and tests described in sections [Manage superheat](#) and [Operating envelope data](#).

Pump-down logic recommendations

Pump down is initiated prior to shutting down the last compressor on the circuit by de-energizing a liquid line solenoid valve or closing electronic expansion valve. When suction pressure reached the cut-out pressure, compressor is stopped, and liquid solenoid valve or electronic expansion valve remains closed.


Two types of pump-down exist:

- One shot pump down (preferred): when last compressor of the circuit stops, suction pressure is decreased 1.5 bar (22 psi) below nominal evaporating pressure with minimum of 1.7 bar(g) (25 psig). Even if suction pressure increases again, the compressor will not restart.
- Continuous pump-down: traditional pump-down, Compressor restarts automatically when suction pressure increases up to 4 cycles maximum.

Non Return Valve (NRV)

DSF compressors integrate tight internal non return valve (INRV), therefore no external Non Return Valve (NRV) is needed.

Reduce moisture in the system

 Excessive air and moisture

- can increase condensing pressure and cause high discharge temperatures.
- can create acid giving rise to copper plating.
- can destroy the lubricating properties of the oil.

All these phenomena can reduce service life and cause mechanical and electrical compressor failure.

Requirements

DSF compressors are delivered with < 100 ppm moisture level.

At the time of commissioning, system moisture content may be up to 100 ppm.

During operation, the filter drier must reduce this to a level between 20 and 50 ppm.

Solutions

To achieve this requirement, a properly sized and type of drier is required.

Important selection criteria's include:

- driers water content capacity
- system refrigeration capacity
- system refrigerant charge

For new installations with DSF compressors with polyolester oil, Danfoss recommends using the Danfoss DML (100% molecular sieve) solid core filter drier.

Assembly line procedure

Compressor storage


Store the compressor not exposed to rain, corrosive or flammable atmosphere between -35 °C (-31 °F) and 70 °C (158 °F) when charged with nitrogen and between -35 °C (-31 °F) and Ts max value (see section [Pressure equipment directive 2014/68/EU](#)) when charged with refrigerant.

Compressor holding charge


Each compressor is shipped with a nominal dry nitrogen holding charge between 0.3 bar (4 psi) and 0.7 bar (10 psi) and is sealed with elastomer plugs.

Respect the following sequence to avoid discharge check valve gets stuck in open position:

- Remove the suction plug first
- Remove the discharge plug afterwards

 An opened compressor must not be exposed to air for more than 20 minutes to avoid moisture is captured by the POE oil.

Compressor handling and storage

 Each Danfoss scroll compressor is equipped with two lift rings on the top shell.

Always use both these rings when lifting the compressor. Use lifting equipment rated and certified for the weight of the compressor. The use of a spreader bar rated for the lifting lugs spacing and the weight of the compressor is necessary to ensure better load distribution. The use of lifting hooks closed with a clasp and certified to lift the weight of the compressor is also highly recommended. Always respect the appropriate rules concerning lifting objects of the type and weight of these compressors. Maintain the compressor in an upright position during all handling manoeuvres (maximum of 15° from vertical).

Never use only one lifting lug to lift the compressor. The compressor is too heavy for the single lug to handle, and the risk is run that the lug could separate from the compressor with extensive damage and possible personal injury as a result.

Store the compressor not exposed to rain, corrosive or flammable atmosphere between -35°C and Ts value when charged with refrigerant and between -35°C and 70°C when charged with nitrogen.

When the compressor is mounted as part of an installation, never use the lift rings on the compressor to lift the installation. The risk is run that the lugs could separate from the compressor or that the compressor could separate from the base frame with extensive damage and possible personal injury as a result.

Never apply force to the terminal box with the intention of moving the compressor, as the force placed upon the terminal box can cause extensive damage to both the box and the components contained inside.

Figure 60: Heavy



Figure 61: Correct

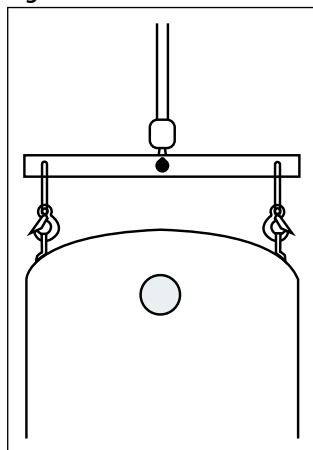
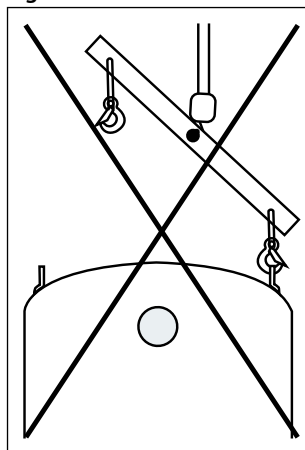


Figure 62: Incorrect



Piping assembly

Good practices for piping assembly is a pre-requisite to ensure compressor life time (system cleanliness, brazing procedure etc.)

Table 34: System cleanliness

Circuit contamination possible cause	Requirement
Brazing and welding oxides	During brazing, flow nitrogen through the system.
Particles and burrs	Remove any particles and burrs generated by tube cutting and hole drilling.
Moisture and air	Use only clean and dehydrated refrigeration grade copper tubing. Opened compressor must not be exposed to air more than 20 minutes to avoid moisture captured by oil.

Brazing procedure:

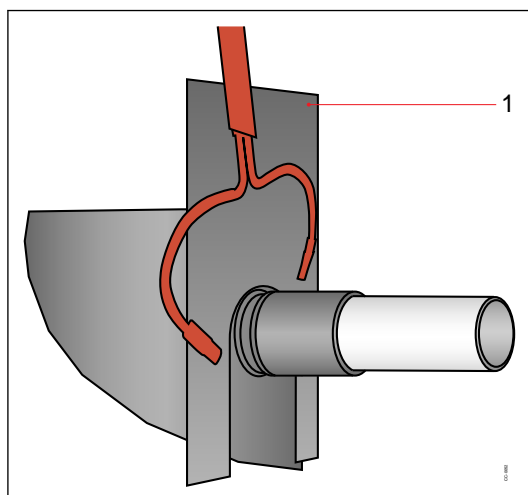
- Brazing operations must be performed by qualified personnel.
- Make sure that no electrical wiring is connected to the compressor.
- To prevent compressor shell and electrical box overheating, use a heat shield and/or a heat-absorbent compound.
- Clean up connections with degreasing agent.
- Flow nitrogen through the compressor.
- Use flux in paste or flux coated brazing rod.
- Use brazing rod with a minimum of 5% silver content.
- It is recommended to use double-tipped torch using acetylene to ensure a uniform heating of connection.
- For discharge connections brazing time should be less than 2 minutes to avoid NRVI damages if any.
- To enhance the resistance to rust, a varnish on the connection is recommended.

DSF compressors connectors are made of steel copper coated, which benefit to protect against corrosion and facilitate adhesion during brazing operation.

As per standards practice in the refrigeration industry, Danfoss Commercial Compressor recommend to use of **silver cadmium free solder** alloy and **flux** (added or flux coated rods). The significant silver content in these brazing alloy will help the brazing operation, providing an excellent fluidity and a limited heating temperature. It will bring also a good resistance to corrosion, a proper elongation compatible with system vibration, and good behavior under thermal variation improving the strength of connection and limiting fractures and refrigerant leaks. (Crucial with A2L refrigerants).

A typical content of 30 – 40% Ag (Silver) is recommended by Danfoss.

The use of self-flux alloys (as phosphorous alloys) is not recommended by Danfoss. This type of brazing require a higher working temperature, that may overheat the connectors, damaging the thin layer of copper, resulting in phosphides creation and joint zone embrittlement.



1 Heat shield

For more detailed information see "Braze technique for compressors connectors" [AP192186420580](#).

R Before eventual un-brazing of the compressor or any system component, the refrigerant charge must be removed and the installation vacuumed.

System pressure test and leak detection

R The compressor has been strength tested at the factory; however, once integrated into a system, it is necessary to evaluate the tightness and pressure resistance of the whole system.

- Always use an inert gas such as Nitrogen or Helium.
- Pressurize the system on HP side first then LP side. (Do not exceed the pressures indicated in the table below.)
- Pay particular attention to all screwed connections

Table 35: System pressure test and leak detection

Maximum compressor test pressures	DSF090-200	DSF270-325-485-530
Maximum compressor test pressure high side (HP)	53.6 bar (g) (777 psig) HP-LP<37 bar (537 psi)	53.6 bar (g) (777 psig) HP-LP<37 bar (537 psi)
Maximum compressor test pressure low side (LP)	36.7 bar (g) (533 psig) LP – HP <5 bar (73 psi) Maximum speed 4.8 bar/s (70 psi/s)	34.3 bar (g) (497 psig) LP – HP <5 bar (73 psi) Maximum speed 4.8 bar/s (70 psi/s) ⁽¹⁾

⁽¹⁾ DSF compressors have an internal non return valve fitting; the maximum pressurizing speed must be respected to ensure pressure equalization between LP and HP side over scroll elements.

Vacuum evacuation and moisture removal

R Requirements:

- Never use the compressor to evacuate the system.
- Connect a vacuum pump to both the LP and HP sides.
- Evacuate the system to a pressure of 500 µm Hg (0.67 mbar/0.02 in.Hg) absolute.

Recommendations:

- Energized heaters improve moisture removal.
- Alternate vacuum phases and break vacuum with Nitrogen to improve moisture removal.

For more detailed information see "Vacuum pump-down and dehydration procedure" [AP000086424630en](#).

Refrigerant charging

R Initial charge:

- For the initial charge, the compressor must not run.
- Charge refrigerant as close as possible to the nominal system charge.
- This initial charging operation must be done in liquid phase between the condenser outlet and the filter drier.

If needed, a complement of charge can be done before evaporator, in liquid phase while compressor is running by slowly throttling liquid in.

Never bypass safety low pressure switch.

For more detailed information see "Recommended refrigerant system charging practice" [AP000086421422](#).


Dielectric strength and insulation resistance tests

Several tests have been performed on each compressor at the factory between each phase and ground.

- Dielectric strength test is done with a high potential voltage (hi-pot) of $2U_n + 1000$ V AC at least, and leakage current must be less than 5 mA.
- Insulation resistance is measured with a 500 V DC megohm tester and must be higher than 1 megohm.

Recommendations:

- Additional dielectric test is not recommended as it may reduce motor lifetime. Nevertheless, if such as test is necessary, it must be performed at a lower voltage.
- Insulation resistance test can be done.
- The presence of refrigerant around the motor windings will result in lower resistance values to ground and higher leakage current readings. Such readings do not indicate a faulty compressor. To prevent this, the system can be first operated briefly to distribute refrigerant.

 Do not use a megohm meter nor apply power to the compressor while it is under vacuum as this may cause internal damage.

Commissioning

Preliminary check

 Check electrical power supply:

- Phase order: Reverse rotation is obvious if the compressor do not build up pressure and sound level is abnormal high

DSF compressors are equipped with an electronic module: reverse rotation will be automatically detected. For more details refer to section [Motor protection](#).

- Voltage and voltage unbalance within tolerance: For more details refer to section [Motor voltage](#).

Initial start-up

- Crankcase heaters must be energized at least 6 hours in advance to remove refrigerant.
- A quicker start-up is possible by "jogging" the compressor to evacuate refrigerant. Start the compressor for 1 second, then wait for 1 to 2 minutes. After 3 or 4 jogs the compressor can be started. This operation must be repeated for each compressor individually.

System monitoring

The system must be monitored after initial startup for a minimum of 60 minutes to ensure proper operating characteristics such as:

- Correct superheat and subcooling.
- Current draw of individual compressors within acceptable values (max operating current).
- No abnormal vibrations and noise.
- Correct oil level.

If Oil Top-up is needed, it must be done while the compressor is idle. Use the schrader connector or any other accessible connector on the compressor suction line. Always use original Danfoss POE oil 185SL from new cans. For more detailed information see "Lubricants filling in instructions for Danfoss Commercial Compressors"

[AP000086435866](#).

Dismantle and disposal



site.

Danfoss recommends that compressors and compressor oil should be recycled by a suitable company at its

Packaging

Single pack



Table 36: Single pack

Compressor model	Length		Width		Height		Gross weight	
	mm	inch	mm	inch	mm	inch	kg	lbs
DSF090	565	22.2	470	18.5	718	28.3	69	152
DSF100	565	22.2	470	18.5	718	28.3	69	152
DSF115	565	22.2	470	18.5	718	28.3	76	168
DSF130	565	22.2	470	18.5	718	28.3	76	168
DSF155	565	22.2	470	18.5	718	28.3	79	174
DSF175	565	22.2	470	18.5	718	28.3	81	179
DSF200	565	22.2	470	18.5	718	28.3	84	185
DSF270	750	29.5	750	29.5	1050	41.3	128	282
DSF325	750	29.5	750	29.5	1050	41.3	131	289
DSF485	750	29.5	750	29.5	1050	41.3	195	430
DSF530	750	29.5	750	29.5	1050	41.3	195	430

Industrial pack



Table 37: Industrial pack

Compressor model	Nbr ⁽¹⁾	Length		Width		Height		Gross weight		Static stacking pallets
		mm	inch	mm	inch	mm	inch	kg	lbs	
DSF090	8	1150	45.3	950	37.4	680	26.8	494	1089	2
DSF100	8	1150	45.3	950	37.4	680	26.8	494	1089	2
DSF115	8	1150	45.3	950	37.4	750	29.5	544	1199	2
DSF130	8	1150	45.3	950	37.4	750	29.5	544	1199	2
DSF155	8	1150	45.3	950	37.4	750	29.5	566	1248	2
DSF175	8	1150	45.3	950	37.4	750	29.5	582	1283	2
DSF200	8	1150	45.3	950	37.4	750	29.5	606	1336	2
DSF270	6	1150	45.3	965	38	768	30.2	693	1528	2
DSF325	6	1150	45.3	965	38	768	30.2	712	1570	2
DSF485	4	1150	45.3	965	38	800	31.5	744	1640	2
DSF530	4	1150	45.3	965	38	800	31.5	744	1640	2

⁽¹⁾ Number of compressors per pack.

Ordering

Compressor code numbers

Danfoss scroll compressors DSF can be ordered in either industrial packs or in single packs. Please use the code numbers from below tables for ordering.

For compressors DSF270 to DSF530 use in single applications, flexible grommets are available as accessory kit 8156138.

Single pack



Table 38: Single pack

Compressor model	Connections	Motor protection	Code no.			
			3	4	7	9
			208-230/3/60	380-415/3/50 460/3/60	575/3/60	380-400/3/60
DSF090	Brazed	Internal	120H1908	120H1635	120H1906	120H1904
DSF100	Brazed	Internal	120H1902	120H1637	120H1900	120H1898
DSF115	Brazed	Internal	120H1896	120H1639	120H1894	120H1892
DSF130	Brazed	Internal	120H1890	120H1503	120H1888	120H1886
DSF155	Brazed	Internal	120H1884	120H1475	120H1882	120H1880
DSF175	Brazed	Internal	120H1878	120H1477	120H1876	120H1874
DSF200	Brazed	Internal	120H1872	120H1479	120H1870	120H1868
DSF270	Brazed	Module 24 V AC ⁽¹⁾	120H1611	120H1422	120H1630	-
	Brazed	Module 110 – 240 V ⁽¹⁾	120H1609	120H1424	-	120H1621
DSF325	Brazed	Module 24 V AC ⁽¹⁾	120H1605	120H1426	120H1643	-
	Brazed	Module 110 – 240 V ⁽¹⁾	120H1603	120H1428	-	120H1619
DSF485	Brazed	Module 24 V AC ⁽¹⁾	120H1601	120H1446	120H1642	-
	Brazed	Module 110 – 240 V ⁽¹⁾	120H1599	120H1448	-	120H1617
DSF530	Brazed	Module 24 V AC ⁽¹⁾	120H1595	120H1430	120H1641	-
	Brazed	Module 110 – 240 V ⁽¹⁾	120H1593	120H1432	-	120H1615

⁽¹⁾ Electronic motor protection, module located in terminal box.

NOTE:

Mounting kit for DSF270 to DSF530 single compressor applications: Ref 8156138.

Industrial pack



Table 39: Industrial pack

Compressor model	Connections	Motor protection	Code no.			
			3	4	7	9
			208-230/3/60	380-415/3/50 460/3/60	575/3/60	380-400/3/60
DSF090	Brazed	Internal	120H1907	120H1636	120H1905	120H1903
DSF100	Brazed	Internal	120H1901	120H1638	120H1899	120H1897
DSF115	Brazed	Internal	120H1895	120H1640	120H1893	120H1891
DSF130	Brazed	Internal	120H1889	120H1502	120H1887	120H1885
DSF155	Brazed	Internal	120H1883	120H1474	120H1881	120H1879
DSF175	Brazed	Internal	120H1877	120H1476	120H1875	120H1873
DSF200	Brazed	Internal	120H1871	120H1478	120H1869	120H1867
DSF270	Brazed	Module 24 V AC ⁽¹⁾	120H1610	120H1423	-	-
	Brazed	Module 110 – 240 V ⁽¹⁾	120H1608	120H1425	-	120H1620
DSF325	Brazed	Module 24 V AC ⁽¹⁾	120H1604	120H1427	-	-
	Brazed	Module 110 – 240 V ⁽¹⁾	120H1602	120H1429	-	120H1618
DSF485	Brazed	Module 24 V AC ⁽¹⁾	120H1600	120H1447	-	-
	Brazed	Module 110 – 240 V ⁽¹⁾	120H1598	120H1449	-	120H1616
DSF530	Brazed	Module 24 V AC ⁽¹⁾	120H1594	120H1431	-	-
	Brazed	Module 110 – 240 V ⁽¹⁾	120H1592	120H1433	-	120H1614

⁽¹⁾ Electronic motor protection, module located in terminal box.

Accessories and spare parts

Gaskets



Table 40: Gaskets

Code no.	Description	Application	Packaging	Pack size
8156132	Gasket, 1"3/4	Models with 1"3/4 rotolock connection	Multipack	10
8156133	Gasket, 2"1/4	Models with 2"1/4 rotolock connection	Multipack	10
7956003	Gasket, 1"3/4	Models with 1"3/4 rotolock connection	Industry pack	50
7956004	Gasket, 2"1/4	Models with 2"1/4 rotolock connection	Industry pack	50

Solder sleeve



Table 41: Solder sleeve

Code no.	Description	Application	Packaging	Pack size
8153004	Solder sleeve P02 (1"3/4 Rotolock - 1"1/8 ODF)	Models with 1"3/4 rotolock connection	Multipack	10
8153006	Solder sleeve P03 (2"1/4 Rotolock - 1"5/8 ODF)	Models with 2"1/4 rotolock connection	Multipack	10

Rotolock nut



Table 42: Rotolock nut

Code no.	Description	Application	Packaging	Pack size
8153124	Rotolock nut, 1"3/4	Models with 1-3/4" rotolock connection	Multipack	10
8153126	Rotolock nut, 2"1/4	Models with 2-1/4" rotolock connection	Multipack	10

Motor protection modules



Table 43: Motor protection modules

Code no.	Description	Application	Packaging	Pack size
120Z0584	Electronic motor protection module, 24 V AC	DSF270-530	Single pack	1
120Z0585	Electronic motor protection module, 110/240 V	DSF270-530	Single pack	1
120Z0624	Electronic motor protection module, 24 V AC	DSF485-530 code3	Single pack	1
120Z0802	Electronic motor protection module, 110/240 V	DSF485-530 code3	Single pack	1

Crankcase heaters

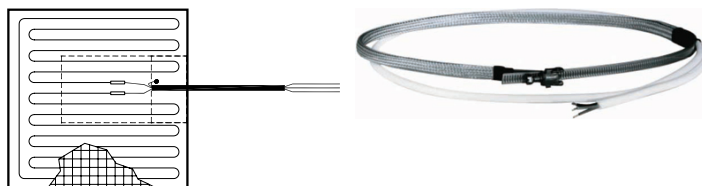


Table 44: Crankcase heaters

Code no.	Description	Application	Packaging	Pack size
120Z0388	80W 24V surface sump heater CE and UL	DSF090 to 200	Multipack	8
120Z0389	80W 230V surface sump heater CE and UL	DSF090 to 200	Multipack	8
120Z0390	80W 400V surface sump heater CE and UL	DSF090 to 200	Multipack	8
120Z0391	80W 460V surface sump heater CE and UL	DSF090 to 200	Multipack	8
120Z0402	80W 575V surface sump heater CE and UL	DSF090 to 200	Multipack	8
120Z0667	48W 24V surface sump heater CE and UL	DSF090 to 200	Single pack	1
120Z0668	48W 230V surface sump heater CE and UL	DSF090 to 200	Single pack	1
120Z0669	48W 400V surface sump heater CE and UL	DSF090 to 200	Single pack	1
120Z0670	48W 460V surface sump heater CE and UL	DSF090 to 200	Single pack	1
120Z0671	48W 575V surface sump heater CE and UL	DSF090 to 200	Single pack	1
7773108	Belt type crankcase heater,75W,230V,CE & UL	DSF270-530	Multipack	6
7973005	Belt type crankcase heater,75W,230V,CE & UL	DSF270-530	Industry pack	50
7773118	Belt type crankcase heater,75W,400V,CE & UL	DSF270-530	Multipack	6
120Z0464	Belt type crankcase heater,75W,460 V,CE & UL	DSF270-530	Multipack	6
120Z0465	Belt type crankcase heater,75W,575 V,CE & UL	DSF270-530	Multipack	6
120Z0870	Belt type crankcase heater,75W, 24 V,CE & UL	DSF270-530	Multipack	6

Mounting hardware



Table 45: Mounting hardware

Code no.	Description	Application	Packaging	Pack size
120Z0066	Mounting kit for scroll compressors. Grommets, sleeves, bolts, washers	DSF090 to 200	Single pack	1
8156138	Mounting kit for scroll compressors. Grommets, sleeves, bolts, washers	DSF270-530 in single installation	Single pack	1
120Z0495	Mounting kit for scroll compressors. including triangle rigid spacers, Grommets, Sleeves, Bolts, Washers	DSF270 to 530 Manifold installations when mounting directly on rail is not wished	Single pack	1

Lubricant



Table 46: Lubricant

Code no.	Description	Packaging	Pack size
120Z0750	POE lubricant 185SL, 1 litre can	Multipack	12

Terminal boxes, covers and T-block connectors



Table 47: Terminal boxes, covers and T-block connectors

Code no.	Description	Application	Packaging	Pack Size
8156135	Service kit for terminal box 96 x 115 mm, including 1 cover, 1 clamp	DSF090 to 200(except DSF155/175 code 3 and DSF200 code 3/7/9)	Multipack	10
8173230	T block connector 52 x 57 mm	DSF090 to 200(except DSF155/175 code 3 and DSF200 code 3/7/9)	Multipack	10
8173021	T block connector 60 x 75 mm	DSF155/175 code 3, DSF200 code 3/7/9	Multipack	10
120Z0413	Terminal box cover	DSF155/175 code 3, DSF200 code 3/7/9	Single pack	1
120Z0458	Terminal box 210 x 190 mm, incl. cover	DSF270-325-485*-530* (*except code3)	Single pack	1
120Z0604	Terminal box 210x340 mm, incl. cover	DSF485-530 code3	Single pack	1
120Z0774	T block connector 80x80 mm	DSF270-530	Multipack	10
120Z0910	Terminal box Cover	DSF270-325-485*-530* (* : except code3)	Single pack	1

Acoustic hoods



Table 48: Acoustic hoods

Code no.	Description	Application	Packaging	Pack Size
120Z0768	Acoustic hood DSF large scroll	DSF270-530	Single pack	1
120Z0490	Acoustic hood body for scroll compressor	DSF090-100	Single pack	1
120Z0491	Acoustic hood body for scroll compressor	DSF115-175	Single pack	1
120Z0492	Acoustic hood body for scroll compressor	DSF200	Single pack	1
120Z0493	Acoustic hood top for scroll compressor	DSF090-200	Single pack	1

Miscellaneous



Table 49: Miscellaneous

Code no.	Description	Packaging	Pack Size
8156019	Sight glass with gaskets (black & white)	Multipack	4
8156129	Gasket for oil sight glass, 1"1/8 (white teflon)	Multipack	10
7956005	Gasket for oil sight glass, 1"1/8 (white teflon)	Multipack	50
8154001	Danfoss Commercial Compressors blue spray paint	Single pack	1

Tandem kits

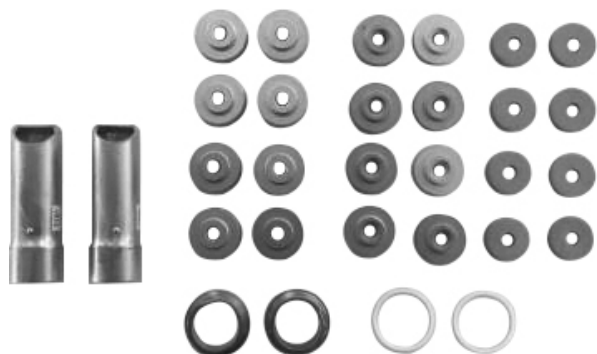


Table 50: Tandem kits

Code no.	Description	Application	Packaging	Pack Size
120Z0634	Suction washer, rigid spacer, organ pipe, gasket	DSF260E-310E-DSF350E-DSF400E	Single pack	1
120Z0692	Suction washer, rigid spacer, organ pipe, gasket	DSF285U-305U-330U	Single pack	1
120Z0693	Suction washer, rigid spacer, organ pipe, gasket	DSF300U-315U	Single pack	1
120Z0694	Suction washer, rigid spacer, organ pipe, gasket	DSF331U-355U-DSF375U	Single pack	1
120Z0781	Kit tandem crossplatform	DSF400X-470X-DSF500X-DSF525X	Single pack	1
120Z0786	Kit tandem, solid, washer 24mm, OEL 1" 5/8	DSF800U	Single pack	1
120Z0787	Kit tandem, solid, washer 27mm, OEL 1" 5/8	DSF855U	Single pack	1
120Z0785	Kit tandem, solid, OEL 1" 5/8	DSF970E-1060E	Single pack	1
120Z0792	Kit tandem, solid, OEL 1" 3/8	DSF540E-650E	Single pack	1
120Z0796	Kit tandem, solid, washer 31mm, OEL 1" 3/8	DSF595U	Single pack	1

Trio kits



Table 51: Trio kits

Code no.	Description	Application	Packaging	Pack Size
120Z0714	Organ pipe, sleeves, rigid spacer, gasket, rubber grommet	DSF465T-DSF525T-DSF600T	Single pack	1
120Z0784	Kit trio, solid, washer 30 mm, OEL 1" 5/8	DSF810T-975T (left suction)	Single pack	1
120Z0790	Kit Trio, solid, OEL 1" 5/8	DSF1180T (left suction)	Single pack	1
120Z0793	Kit trio, solid, washer 33 mm, OEL 1" 5/8	DSF1590T (left and right suction)	Single pack	1
120Z0794	Kit trio, solid, washer 34.5 mm, OEL 1" 5/8	DSF810T-975T (right suction)	Single pack	1
120Z0814	Kit Trio, solid, washer 26mm, OEL 1" 5/8	DSF1385T (left and right suction)	Single pack	1
120Z0815	Kit Trio, solid, washer 29mm (x2), OEL 1" 5/8	DSF1180T (right suction)	Single pack	1

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