

Application guidelines

Danfoss scroll compressors

DSH 090 to 485



Single and manifold

50Hz - 60Hz - R410A - R452B



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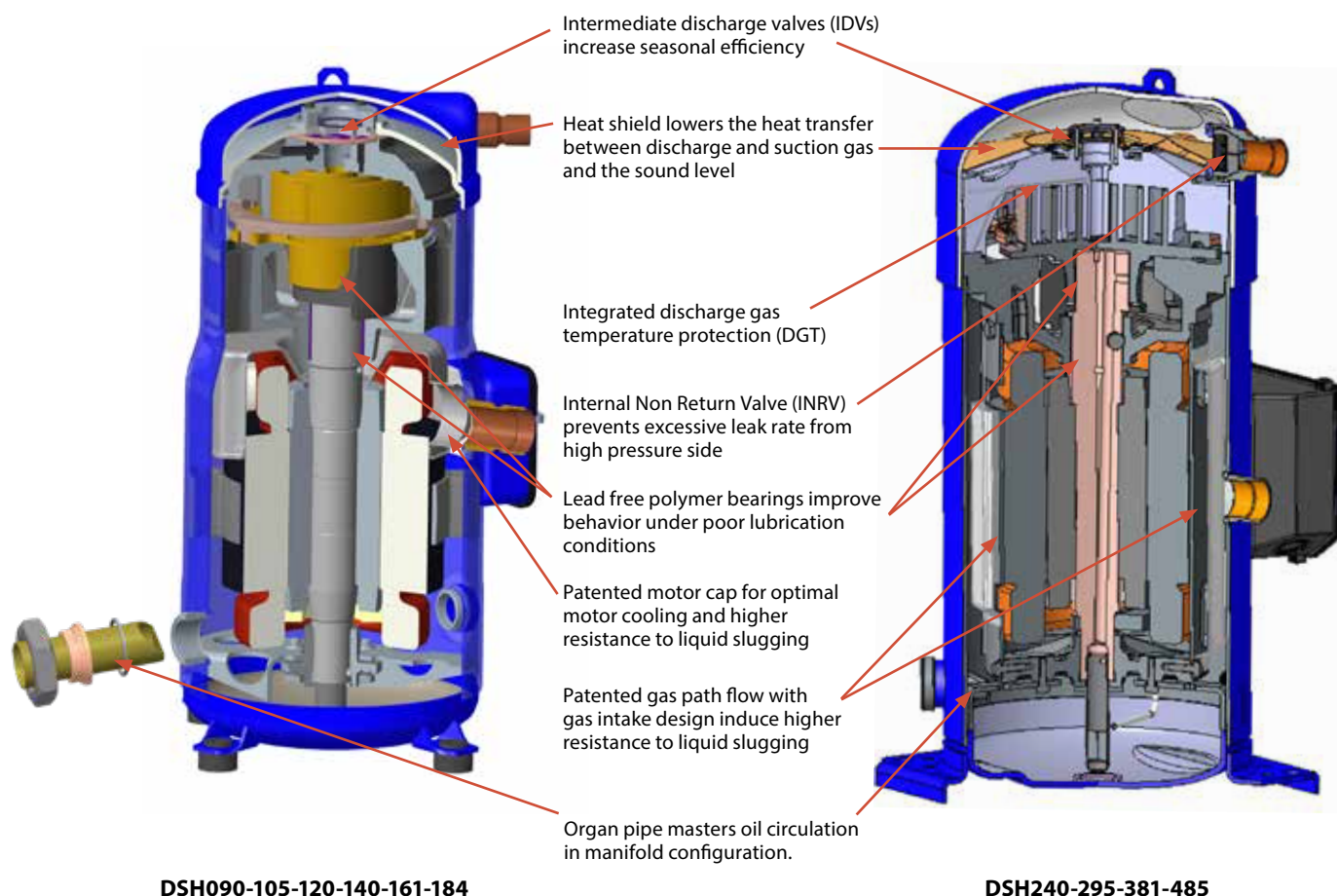
General Information

GENERAL INFORMATION	<p>Danfoss scroll 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:</p> <p> This icon indicates instructions to avoid safety risk.</p> <p> This icon indicates instructions to avoid reliability risk.</p>	<p>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.</p>
PRODUCT INFORMATION	<p>Refrigerant</p> <p>When choosing a refrigerant, different aspects must be taken into consideration:</p> <ul style="list-style-type: none"> • Legislation (now and in the future) • Safety • Application envelope in relation to expected running conditions • Compressor capacity and efficiency • Compressor manufacturer recommendations & Guidelines 	<p>Additional points could influence the final choice:</p> <ul style="list-style-type: none"> • Environmental considerations • Standardisation of refrigerants and lubricants • Refrigerant cost • Refrigerant availability <p>The DSH compressors can be used either with refrigerant R410A or R452B (see page 56/57 models' references which are compatible with both refrigerants)</p>
SYSTEM DESIGN	<p>R410A</p> <p>R410A is a HFC blend (R32: 50%; R125: 50%) with a zero Ozone Depletion Potential (ODP=0) and a Global Warming Potential of 1924/AR5 (2088/AR4). It is a near-azeotropic mixture with a temperature glide less than 0.2 K.</p>	<p>With its high net refrigeration effect coupled to a high density, the R410A has appeared in last decade to be the preferred refrigerant for use in commercial air conditioners and heat pumps.</p>
INTEGRATION INTO SYSTEM	<p>R452B</p> <p>R452B is a HFO/HFC blend (R32: 67%; R125: 7%; R1234yf: 26%) with a zero Ozone Depletion Potential(ODP=0) and a low Global Warming Potential (GWP: 676/AR5 ; 698/AR4). It is a near-azeotropic mixture with a temperature glide around 1 K.</p> <p>R452B has very close capacities versus R410A and due to its very limited discharge temperature</p>	<p>difference it appears today as the best candidate for a direct drop in of R410A.</p> <p>R452B 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.</p>
ORDERING INFORMATION		

Features

Overview

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



How do IDVs work?

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.



GENERAL INFORMATION

PRODUCT INFORMATION

SYSTEM DESIGN

INTEGRATION INTO SYSTEM

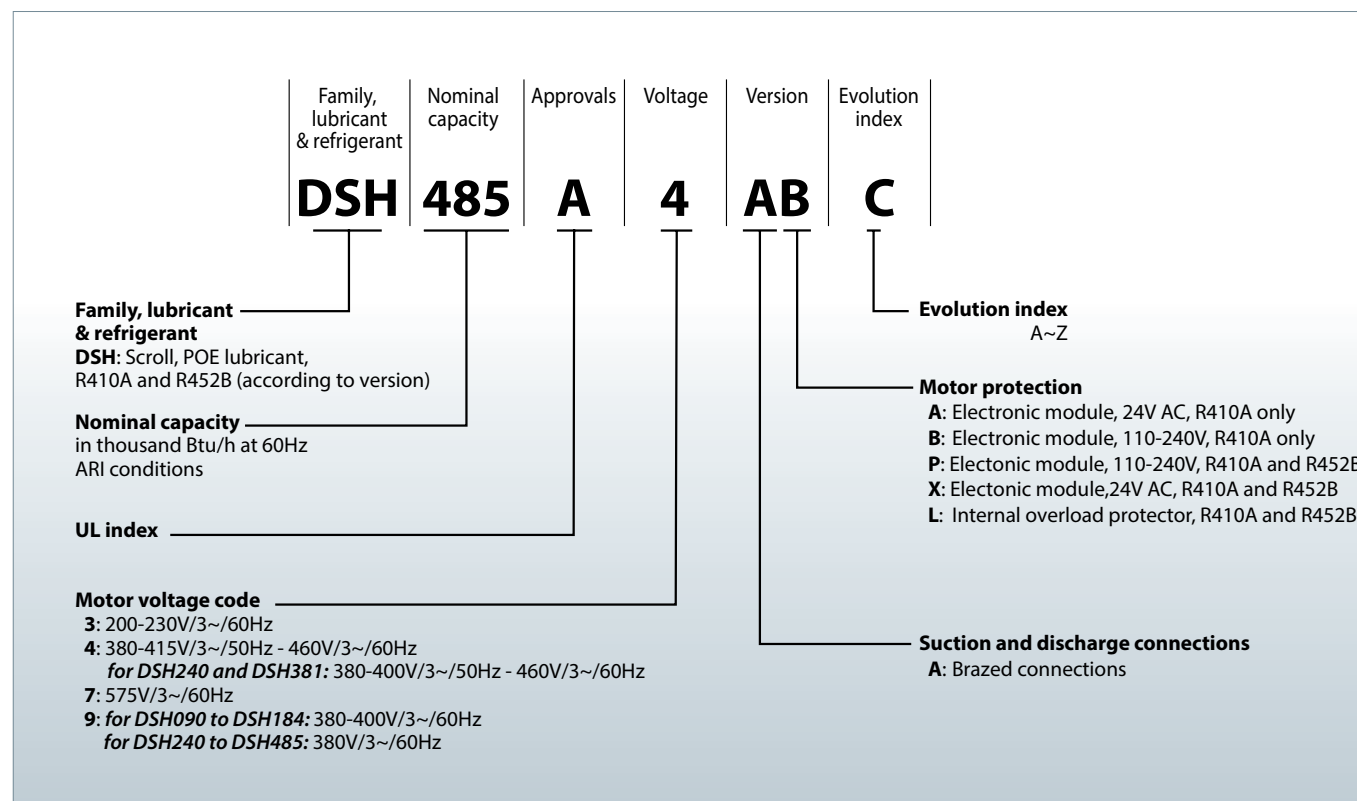
ORDERING INFORMATION

Compressor model designation

Danfoss scroll compressor DSH for R410A and R452B 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 information".

Nomenclature



Technical specifications

50-60 Hz data Single compressor

Model	Nominal tons 60 Hz	Swept volume		Displacement (50 Hz)		Displacement (60 Hz)		Oil charge		Net weight	
	TR	cm ³ /rev	cu.in/rev	m ³ /h	cu.ft/h	m ³ /h	cu.ft/h	dm ³	oz	kg	lbs
DSH090	7.5	88.4	5.39	15.4	544	18.6	657	3.0	102	58	128
DSH105	9.0	103.5	6.32	18.0	636	21.8	770	3.3	112	64	141
DSH120	10.0	116.9	7.13	20.3	717	24.6	869	3.3	112	64	141
DSH140	12.0	133	8.12	23.1	816	27.9	985	3.3	112	67	148
DSH161	13.0	151.7	9.26	26.4	932	31.9	1127	3.3	112	69	152
DSH184	15.0	170.3	10.39	29.6	1045	35.8	1264	3.6	122	71.5	158
DSH240	20.0	227.60	13.89	39.6	1398	47.8	1688	6.1	206	114	251
DSH295	25.0	276.20	16.85	48.1	1699	58.0	2048	6.1	206	117	258
DSH381	30.0	345.00	21.05	60	2119	72.3	2553	6.1	206	162	357
DSH485	40.0	442.60	27.01	77	2719	92.9	3281	6.1	206	176	388

① Displacement at nominal speed: 2900rpm at 50 Hz, 3500rpm at 60 Hz

② Net weight with oil charge

Performances 50-60 Hz R410A Single compressor

Model		Nominal tons 60 Hz	Nominal cooling capacity		Power input	COP	E.E.R.
		TR	W	Btu/h	kW	W/W	Btu/h/W
50 Hz	DSH090	7.5	20050	68413	6.54	3.06	10.46
	DSH105	9.0	23580	80457	7.65	3.08	10.52
	DSH120	10.0	26790	91410	8.61	3.11	10.62
	DSH140	12.0	30370	103625	9.69	3.13	10.69
	DSH161	13.0	34890	119048	11.03	3.16	10.79
	DSH184	15.0	39040	133208	12.36	3.16	10.78
	DSH240	20.0	52730	179920	17.04	3.09	10.56
	DSH295	25.0	64520	220149	20.35	3.17	10.82
	DSH381	30.0	81490	278052	26.21	3.11	10.61
	DSH485	40.0	103500	353152	32.72	3.16	10.79
60 Hz	DSH090	7.5	27470	93730	8.55	3.21	10.96
	DSH105	9.0	32280	110100	10.01	3.22	11.00
	DSH120	10.0	36630	125000	11.25	3.26	11.11
	DSH140	12.0	41510	141600	12.75	3.26	11.11
	DSH161	13.0	47220	161100	14.7	3.21	10.96
	DSH184	15.0	53160	181400	16.36	3.25	11.09
	DSH240	20.0	71760	244852	22.46	3.20	10.90
	DSH295	25.0	87610	298934	26.96	3.25	11.09
	DSH381	30.0	110300	376355	34.52	3.20	10.90
	DSH485	40.0	141900	484177	43.66	3.25	11.09

TR: Ton of Refrigeration, Standard rating conditions

EER: Energy Efficiency Ratio

COP: Coefficient Of Performance

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

For 60 Hz: 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** www.coolselector.danfoss.com

Technical specifications

Performances 50-60 Hz R452B Single compressor

Model		Nominal tons 60 Hz	Nominal cooling capacity		Power input	COP	E.E.R.
		TR	W	Btu/h	kW	W/W	Btu/h/W
50 Hz	DSH090	7.5	19590	66902	6.4	3.05	10.40
	DSH105	9.0	23451	80090	7.4	3.18	10.87
	DSH120	10.0	26366	90045	8.2	3.22	10.98
	DSH140	12.0	30180	103070	9.3	3.24	11.07
	DSH161	13.0	34855	119035	10.5	3.31	11.31
	DSH184	15.0	38779	132437	11.8	3.29	11.24
	DSH240	20.0	52130	177873	16.1	3.23	11.02
	DSH295	25.0	63995	218359	19.4	3.30	11.27
	DSH381	30.0	78426	266615	24.8	3.16	10.77
DSH485	40.0	101971	347935	31.4	3.25	11.08	
60 Hz	DSH090	7.5	26652	91020	8.3	3.20	10.91
	DSH105	9.0	31925	109031	9.6	3.33	11.36
	DSH120	10.0	35779	122192	10.8	3.30	11.27
	DSH140	12.0	40984	139968	12.4	3.29	11.24
	DSH161	13.0	46938	160301	13.8	3.41	11.63
	DSH184	15.0	52181	178206	15.7	3.32	11.32
	DSH240	20.0	70756	241427	21.4	3.31	11.30
	DSH295	25.0	86418	294866	25.5	3.39	11.57
	DSH381	30.0	105578	360243	32.9	3.20	10.93
	DSH485	40.0	137378	468747	41.7	3.30	11.25

TR: Ton of Refrigeration, Standard rating conditions For 50 Hz: Evaporating temperature: 5°C (41°F), Condensing temperature: 50°C (122°F), Superheat: 10K (18°F), Subcooling: 0K (0°F)
 EER: Energy Efficiency Ratio For 60 Hz: Evaporating temperature: 7.2°C (45°F), Condensing temperature: 54.4°C (130°F), Superheat: 11.1K (20°F), Subcooling: 8.3K (15°F)
 COP: Coefficient Of Performance

Subject to modification without prior notification.
 Data given for motor code 4 compressor with above conditions

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

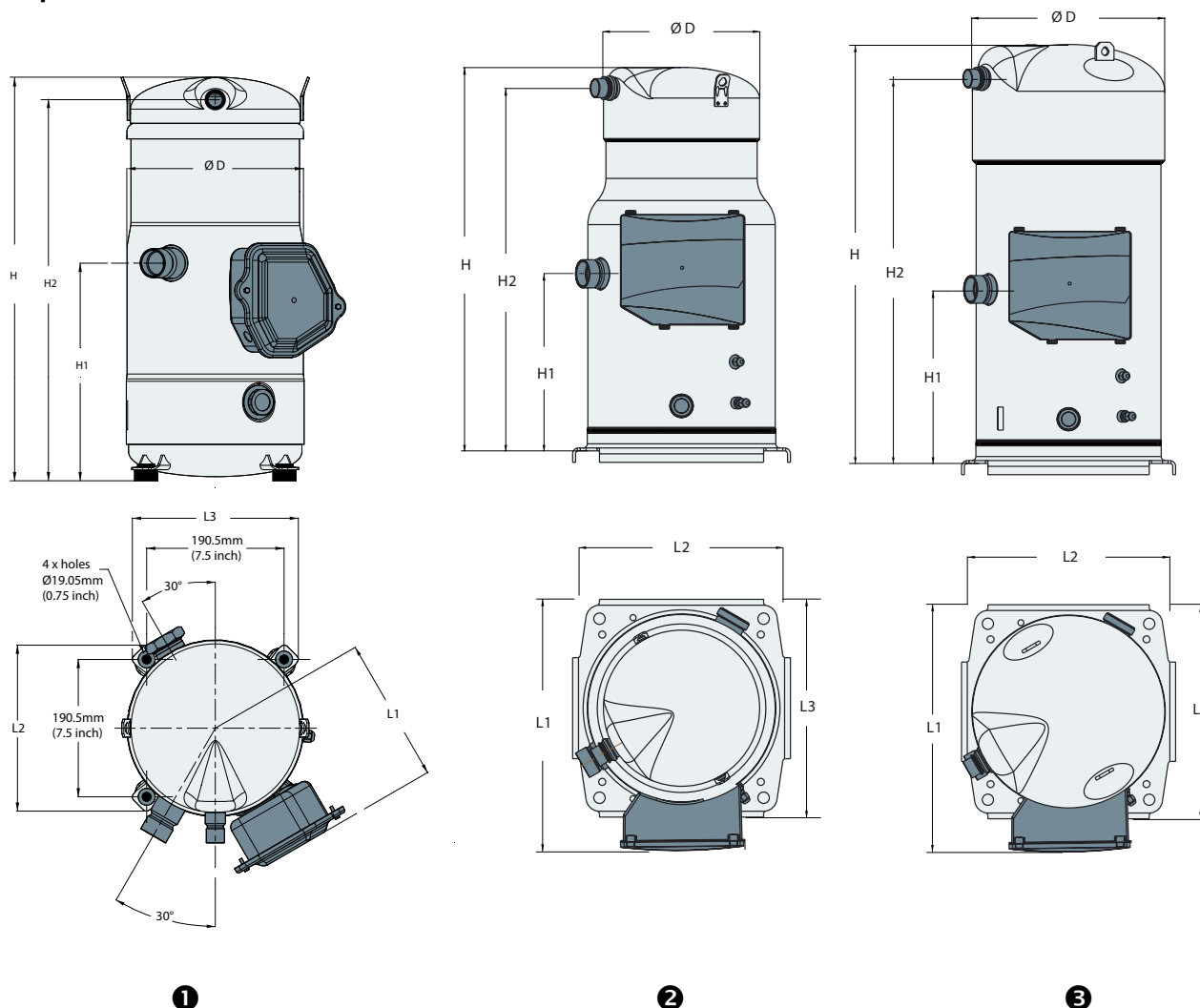
performances can be considered as the sum of capacities of the compressors composing the manifold. For better accuracy, the customer should integrate the appropriate weighing coefficients according to his system very pressure drops and part load levels.



For regular updates and detailed capacities, please refer to **Coolselector®2** www.coolselector.danfoss.com

Dimensions

Single compressors









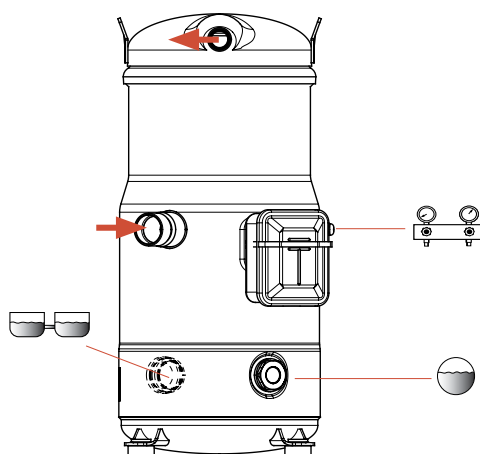
Compressor model	D		H		H1		H2		L1		L2		L3		Outline drawing number	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		
DSH090	243	9.57	485	19.09	235	9.25	451	17.76	180	7.09	230	9.06	230	9.06	❶	8560004
DSH105-120-140-161	243	9.57	542	21.34	278	10.94	509	20.04	180* 201**	7.09* 7.91**	230	9.06	230	9.06		8560003 * 8560041 **
DSH184	243	9.57	558	21.97	299	11.77	524	20.63	201	7.91	230	9.06	230	9.06		8560023
DSH240	320	12.6	653	25.71	302	11.87	618	24.33	427	16.81	371	14.61	371	14.61	❷	8556208
DSH295	320	12.6	653	25.71	302	11.87	618	24.33	427	16.81	371	14.61	371	14.61		
DSH381	333	13.11	726	28.58	302	11.87	667	26.26	429* 478**	16.89* 18.82**	371	14.61	371	14.61	❸	8556199* 8556239**
DSH485	333	13.11	726	28.58	302	11.87	667	26.26	429* 446**	16.89* 17.56**	371	14.61	371	14.61		8556198* 8556237**

* compressor motor codes 4, 7, 9
 ** compressor motor code 3

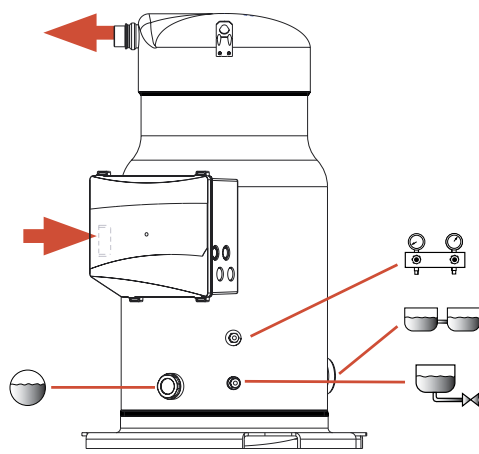
Dimensions

Connection Details

		DSH090	DSH105-120-140-161-184	DSH240-295-381	DSH485
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		Female ¼" Flare incorporating a Schrader valve	
Low pressure gauge port (Shrader)		Male ¼" Flare incorporating a Schrader valve			
Outline		1		2	



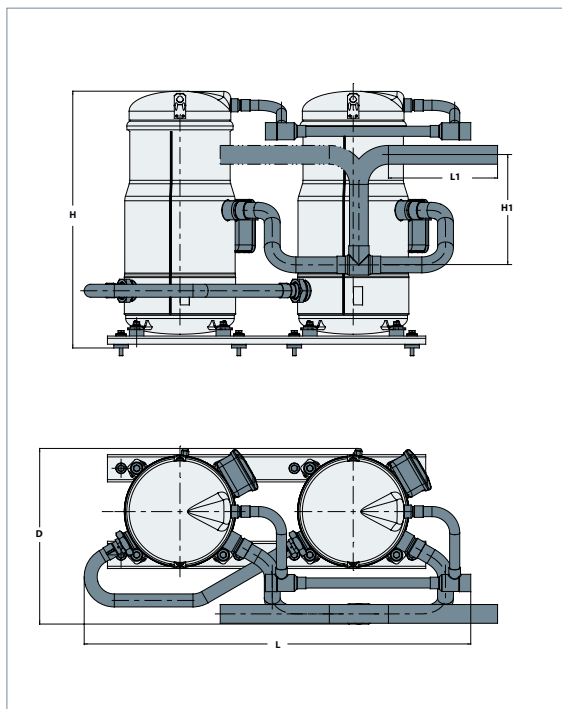
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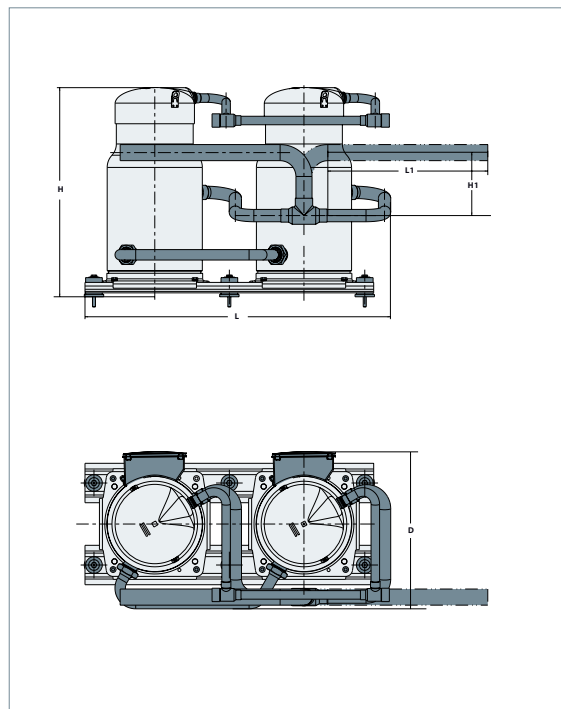
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Dimensions

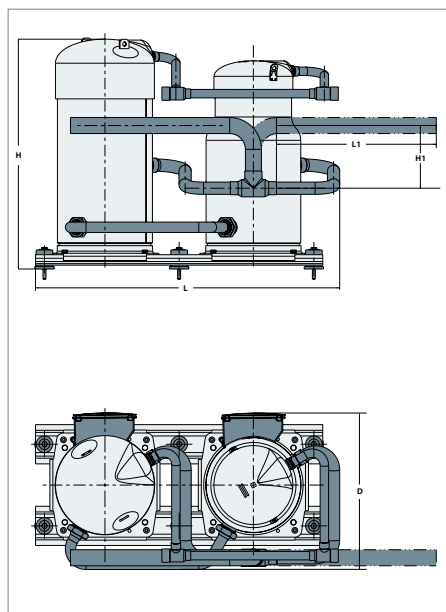
Tandem assemblies



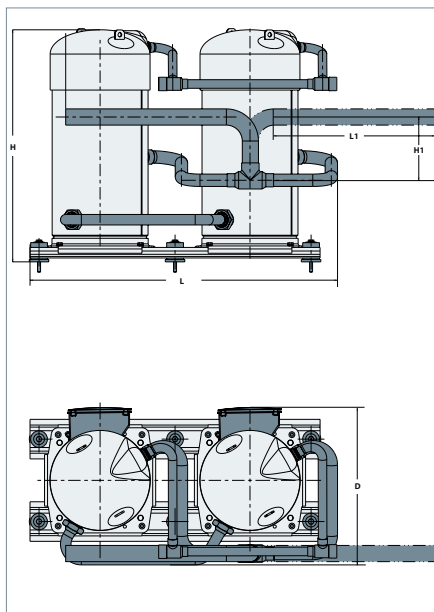
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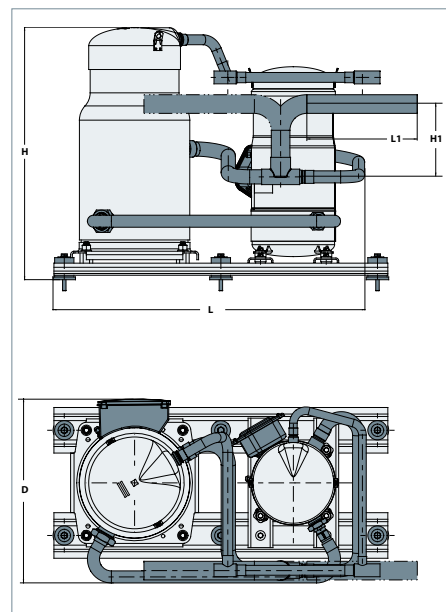
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3



4



5

GENERAL INFORMATION

PRODUCT INFORMATION

SYSTEM DESIGN

INTEGRATION INTO SYSTEM

ORDERING INFORMATION

Dimensions

Tandem assemblies

Tandem model	Composition	L		D		H		L1		H1		Outline drawing number
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	
DSH180E	DSH090 + DSH090	850	33.46	384	15.12	507	19.96					① 8560115
DSH195U	DSH090 + DSH105	850	33.46	386	15.20	565	22.24					① 8556233
DSH210U	DSH090 + DSH120	850	33.46	386	15.20	565	22.24					① 8556233
DSH210E	DSH105 + DSH105	850	33.46	384	15.12	565	22.24					① 8560114
DSH230U	DSH090 + DSH140	850	33.46	386	15.20	565	22.24					① 8556233
DSH240E	DSH120 + DSH120	850	33.46	384	15.12	565	22.24					① 8560114
DSH251U	DSH090 + DSH161	850	33.46	386	15.20	565	22.24					① 8556233
DSH260U	DSH140 + DSH120	850	33.46	386	15.20	565	22.24					① 8556230
DSH274U	DSH090 + DSH184	850	33.46	428	16.85	580	22.83	240 min	9.45 min	242	9.53	① 8556232
DSH281U	DSH161 + DSH120	850	33.46	386	15.20	565	22.24					① 8556230
DSH280E	DSH140 + DSH140	850	33.46	384	15.12	565	22.24					① 8560114
DSH289U	DSH105 + DSH184	850	33.46	428	16.85	580	22.83					① 8556231
DSH301U	DSH161 + DSH140	850	33.46	386	15.20	565	22.24					① 8556230
DSH304U	DSH120 + DSH184	850	33.46	428	16.85	580	22.83					① 8556231
DSH322E	DSH161 + DSH161	850	33.46	384	15.12	565	22.24					① 8560114
DSH324U	DSH140 + DSH184	850	33.46	428	16.85	580	22.83					① 8556231
DSH345U	DSH161 + DSH184	850	33.46	428	16.85	580	22.83					① 8556231
DSH368E	DSH184 + DSH184	850	33.46	428	16.85	580	22.83					① 8560113
DSH360X	DSH120 + DSH240	903	35.55	533	20.98	731	28.78					⑤ 8560128
DSH424X	DSH184 + DSH240	903	35.55	533	20.98	731	28.78					⑤ 8556259
DSH456X	DSH161 + DSH295	903	35.55	533	20.98	731	28.78	359 min	14.13 min	211	8.31	⑤ 8560128
DSH479X	DSH184 + DSH295	903	35.55	533	20.98	731	28.78					⑤ 8556259
DSH565X	DSH184 + DSH381	903	35.55	533	20.98	803	31.61					⑤ 8556260
DSH482E	DSH240 + DSH240	1025	40.35	527	20.75	701	27.6					8556228
DSH535U	DSH240 + DSH295	1025	40.35	527	20.75	701	27.6					② 8556228
DSH590E	DSH295 + DSH295	1025	40.35	527	20.75	701	27.6					8556228
DSH620U	DSH240 + DSH381	1025	40.35	527*/576**	20.75*/22.68**	774	30.5	535 min	21.06 min			8556222
DSH675U	DSH295 + DSH381	1025	40.35	527*/576**	20.75*/22.68**	774	30.5			211	8.31	③ 8556222
DSH725U	DSH240 + DSH485	1025	40.35	546/563**	21.50*/22.17**	774	30.5					8556207
DSH760E	DSH381 + DSH381	1025	40.35	527*/576**	20.75*/22.68**	774	30.5					④ 8556223
DSH780U	DSH295 + DSH485	1025	40.35	546*/563**	21.50*/22.17**	774	30.5					③ 8556220
DSH865U	DSH381 + DSH485	1025	40.35	553*/570**	21.77*/22.44**	774	30.5	640 min	25.20 min			④ 8556224
DSH970E	DSH485 + DSH485	1025	40.35	553*/570**	21.77*/22.44**	774	30.5					8556205

* compressor motor codes 4, 7, 9

** compressor motor code 3

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.

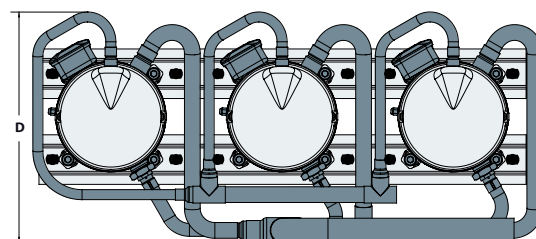
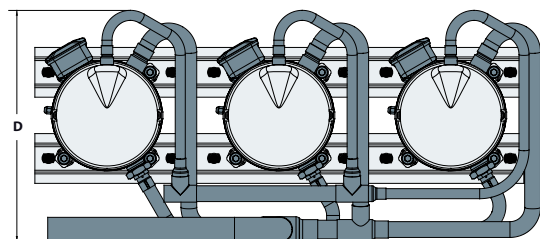
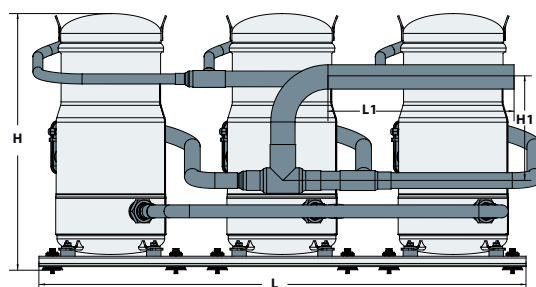
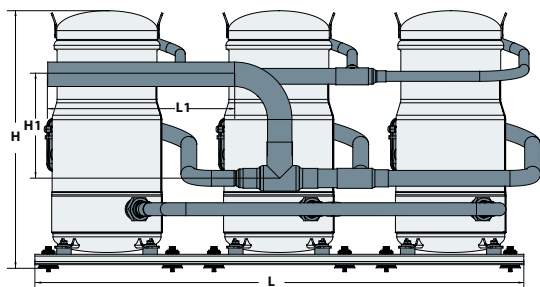
U : Uneven tandem

E : Even tandem

X: Crossplatform (medium-large) tandem

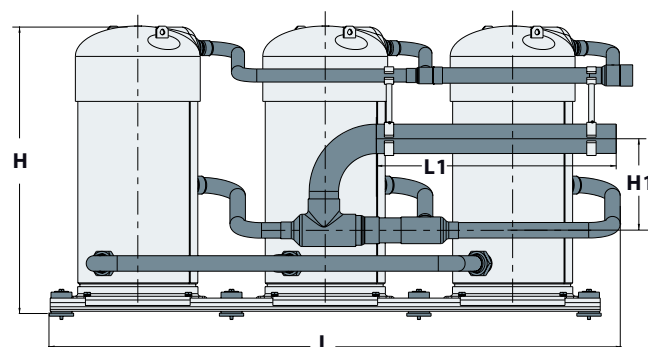
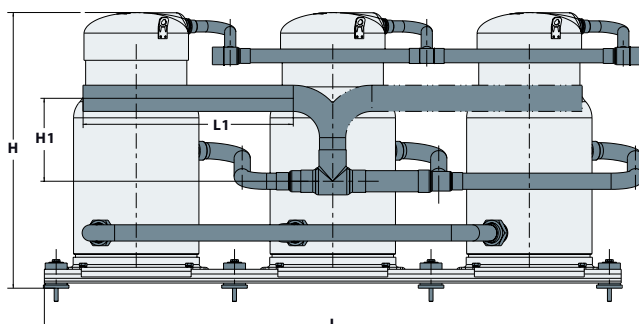
Dimensions

Trio assemblies



6

7



8

9

Trio model	Composition	L		D		H		L1		H1		Outline drawing number	
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		
DSH420	3 x DSH140	1131	44.53	513	20.2	569	22.4	515 min	20.28 min	230	9.06	⑥	8556195
		1118	44.02	513	20.2	569	22.4	511 min	20.12 min			⑦	8556187
DSH483	3 x DSH161	1131	44.53	513	20.2	569	22.4	515 min	20.28 min	230	9.06	⑥	8556195
		1118	44.02	513	20.2	569	22.4	511 min	20.12 min			⑦	8556187
DSH552	3 x DSH184	1139	44.84	518	20.39	584	22.99	515 min	20.28 min	230	9.06	⑥	8556194
		1139	44.84	518	20.39	584	22.99	511 min	20.12 min			⑦	8556193
DSH720	3 x DSH240	1467	57.76	543	21.38	701	27.6	535 min	21.06 min	211	8.31	⑧	8556217
DSH885	3 x DSH295	1467	57.76	543	21.38	701	27.6						8556217
DSH1140	3 x DSH381	1467	57.76	545* 594**	21.46* 23.39**	774	30.5					8556229	
DSH1245	2 x DSH381 + DSH485	1520	59.84	573* 594**	22.56* 23.39**	774	30.5	680 min	26.77 min	244	9.61	⑨	8556234
DSH1350	DSH381 + 2 x DSH485	1520	59.84	573* 590**	22.56* 23.23**	774	30.5						8556235
DSH1455	3 x DSH485	1520	59.84	573* 590**	22.56* 23.23**	774	30.5						8556216

* compressor motor codes 4, 7, 9

** compressor motor code 3

Trio to be achieved by assembly of individual compressors

GENERAL INFORMATION

PRODUCT INFORMATION

SYSTEM DESIGN

INTEGRATION INTO SYSTEM

ORDERING INFORMATION

Electrical data, connections and wiring

Motor voltage

Danfoss scroll compressors DSH are available in four different motor voltages as listed below.

Motor voltage code		Code 3	Code 4	Code 7	Code 9
50 Hz	Nominal voltage	-	380-415V-3ph 380-400V-3ph*	-	-
60 Hz	Nominal voltage	200-230V-3ph	460V-3ph	575V-3ph	380-400V-3ph 380V-3ph **

* DSH240-4 and DSH381-4

** DSH240-9 to DSH485-9

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.

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.

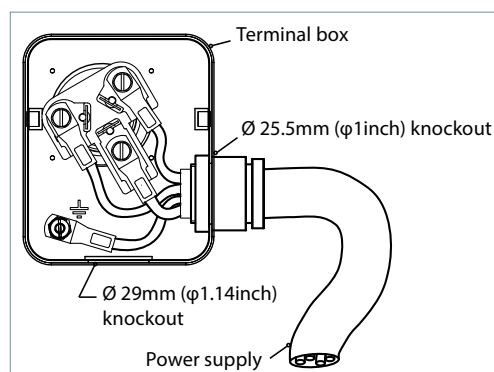
Wiring connections

Electrical power is connected to the compressor terminals by Ø 4.8mm (3/16") screws. The maximum tightening torque is 3Nm. Use a 1/4" ring terminal on the power leads.

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

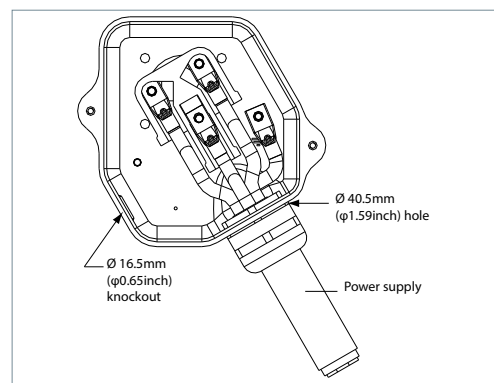
DSH090-105-120-140-161 *except DSH140-161 code3

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



DSH140-161 code3 & DSH184

The terminal box is provided with a Ø 40.5mm (φ1.59inch) hole (ISO40) for power supply and a Ø 16.5mm (φ0.65inch) knockout (ISO16).



Electrical data, connections and wiring

DSH240-295-381*-485*

*except code 3

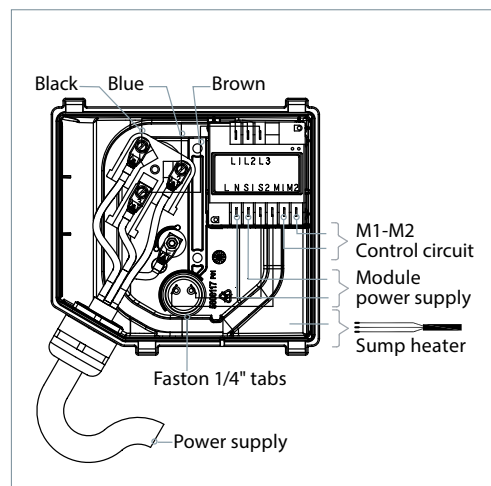
The terminal box is provided with 2 triple knockouts and 1 single knockout for power supply and 4 double knockouts for the safety control circuit.

The 3 power supply knockouts accommodate the following diameters:

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

The 4 others knockouts are as follows:

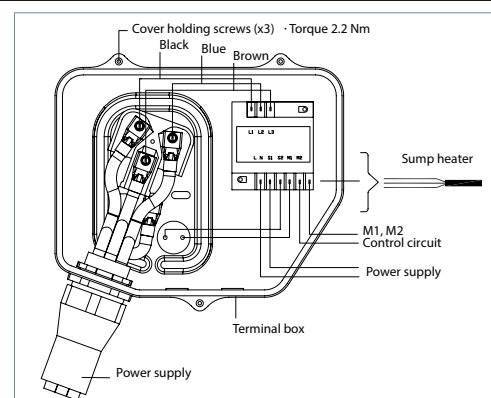
- Ø 22.5mm (φ 0.89inch) (PG16) (UL 1/2") & Ø 16.5mm (φ 0.65inch) (ISO16) (x2)
- Ø 20.7mm (φ 0.81inch) (ISO20 or PG13.5) (x2)



DSH381 code 3

The terminal box is provided with:

- Ø 50.5mm (φ 1.98inch) (ISO 50 & UL1"1/2 conduit) hole with possible Ø 63.5mm (φ 2.5inch) (ISO63 and UL 2"conduit) knockout for power supply
- 2 x Ø 22.5mm (φ 0.89inch) (PG16 and UL 1/2" conduit) knockouts for safety control circuit.



DSH485 code 3

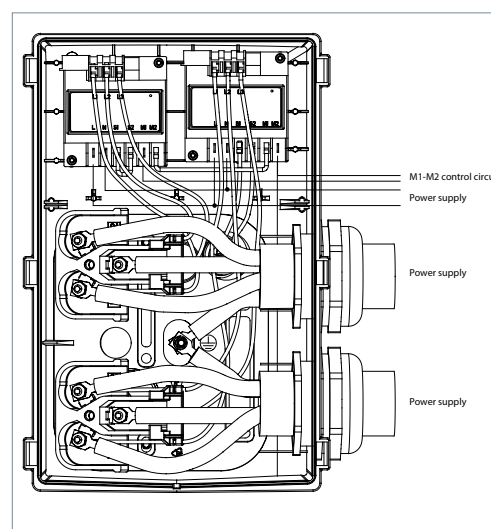
The terminal box is provided with 2 triple knockouts for power supply, 2 double knockouts and 3 simple knockouts for the safety control circuit.

The 2 power supply knockouts accommodate the following diameters:

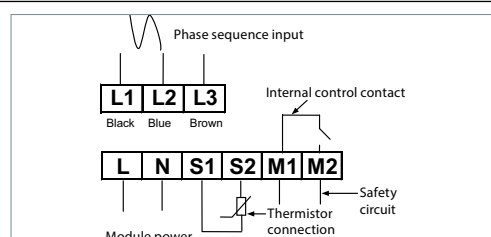
- Ø 63.5mm (φ 2.5inch) (ISO63 and UL 2"conduit) & Ø 54.2mm (φ 2.13inch) (PG42) & 43.7mm (UL 1"1/4 conduit)

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)



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 6.3mm (0.25inch) size Faston type.



Electrical data, connections and wiring

IP rating

The compressor terminal box according to IEC529 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

Compressor model		LRA	MCC	Max. operating current	Winding resistance
		A	A	A	Ω
Motor voltage code 3	DSH090	203	43	38	0.39
	DSH105	267	51	45	0.27
	DSH120	267	61	48	0.27
	DSH140	304	64	56	0.24
	DSH161	315	69	64	0.22
	DSH184	351	75	71	0.22
	DSH240	485	105	103	0.16
	DSH295	560	128	112	0.13
	DSH381	717	170	152	0.09
	DSH485	1010	190	200	0.07
Motor voltage code 4	DSH090	98	22	19	1.47
	DSH105	142	25	22	1.05
	DSH120	142	29	24	1.05
	DSH140	147	30	28	0.92
	DSH161	158	35	31	0.83
	DSH184	197	38.6	36	0.83
	DSH240	215	51	49	0.62
	DSH295	260	62	56	0.52
	DSH381	320	79	72	0.42
	DSH485	413	90	89	0.23
Motor voltage code 7	DSH090	84	18	14	2.34
	DSH105	103	22	17	1.57
	DSH120	103	24	19	1.57
	DSH140	122	26	22	1.38
	DSH161	136	29	24	1.32
	DSH184	135	35	28	1.32
	DSH240	175	41	38	0.94
	DSH295	210	45	44	0.82
	DSH381	235	60	58	0.56
	DSH485	327	71	71	0.36
Motor voltage code 9	DSH090	124	26	23	1.05
	DSH105	160	33	26	0.72
	DSH120	160	35	29	0.72
	DSH140	168	37	33	0.62
	DSH161	177	41	37	0.57
	DSH184	239	51	41	0.57
	DSH240	260	60	58	0.42
	DSH295	310	72	69	0.36
	DSH381	360	90	88	0.24
	DSH485	491	111	106	0.16

Electrical data, connections and wiring

GENERAL INFORMATION	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 start").
	MCC (Maximum Continuous Current)	The MCC is the current at which the motor protection trips under maximum load and low voltage conditions. This MCC value is the maximum at which the compressor can be operated in transient conditions and out of	the application envelope. Above this value, the internal motor protection or external electronic module will cut-out the compressor to protect the motor.
	MOC (Maximum Operating Current)	The MOC is the current when the compressors operate at maximum load conditions and 10% below nominal voltage (max. evaporating temperature and max. condensing temperature).	MOC can be used to select cables and contactors. In normal operation, the compressor current consumption is always less than the MOC value.
	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:	$R_{t_{amb}} = R_{25^{\circ}\text{C} (77^{\circ}\text{F})} \frac{a + t_{amb}}{a + t_{25^{\circ}\text{C} (77^{\circ}\text{F})}}$ <p> $t_{25^{\circ}\text{C}}$: 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} Coefficient $a = 234.5$ </p>
SYSTEM DESIGN	Motor protection		
	DSH090 to DSH184	Compressor models DSH 090 to 184 are provided with internal overload motor protection to prevent against excessive current and temperature caused by overloading, low refrigerant flow or phase loss. The cutout current is the MCC value listed in table "Three phase electrical characteristics". 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 below MCC value (at max operating current): <ul style="list-style-type: none"> • 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.
	DSH240 to DSH485	Compressor models DSH240-295-381-485 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
ORDERING INFORMATION			

of resetting the mains (L-N -disconnect) for approximately 5 sec.

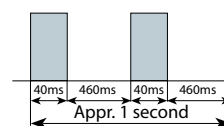
A red/green twin LED is visible on the module (except on DSH485-3). A solid green LED denotes a fault free condition. A blinking red LED indicates an identifiable fault condition:

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

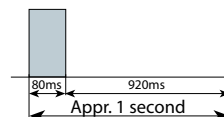
Then it must be set below MCC value (at max operating current):

- When the motor temperature is too high, then the internal PTC over temp. and module is activated.

PTC overheat



Delay timer active (after PTC over temp.)



- 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.

DSH090 to DSH184

Compressor models DSH 090 to 184 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.

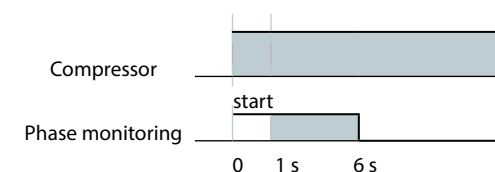
Reverse rotation will be obvious to the user as soon as power is turned on: the compressor will not build up pressure, the sound level will be abnormally high and power consumption will be minimal. If reverse rotation symptoms occur, shut the compressor down and connect the phases to their proper terminals.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

DSH240 to DSH485

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 DSH 240 to 485 are delivered with an electronic module which provides protection against phase reversal and phase loss at start-up.

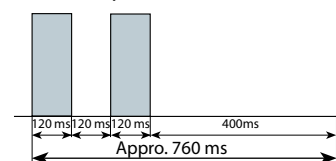
The phase sequencing and phase loss monitoring functions are active during a 5-sec window 1 second after compressor start-up (power on L1-L2-L3).



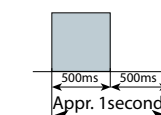
Phase sequence module logic

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 (except on DSH485-3):

In case of phase reverse error:



In case of phase loss error:



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" FRCC.PI.031.

Approval and certificates

Approval and certificates

DSH scroll compressors comply with the following approvals and certificates.

Certificates are listed on:
www.commercialcompressors.danfoss.com/documentation/certificates/

CE 0062 or CE 0038 or CE0871 (European Directive)		All DSH models
UL (Underwriters Laboratories)		All DSH models
Other approvals / certificates		Contact Danfoss

Low voltage directive 2014/35/EU

Products	DSH models
Declaration of conformity	Contact Danfoss

Machines directive 2006/42/EC

Products	DSH models
Manufacturer's declaration of incorporation	Contact Danfoss

Pressure equipment directive 2014/68/EU

Products	DSH090 to 184	DSH240-295-485	DSH381
Category PED R410A	II	II	III
Category PED R452B	III	III	IV
Maximum / Minimum temperature - Ts	-35°C < Ts < 55°C -31°F < Ts < 131°F	-35°C < Ts < 52°C -31°F < Ts < 125.6°F	-35°C < Ts < 52°C -31°F < Ts < 125.6°F
Maximum allowable pressure (Low side) - Ps	R410A : 33.3 bar (g) / R452B : 31.2bar(g) R410A : 483 psig / R452B : 453 psig	31.1bar(g) 451psig	31.1bar(g) 451psig
Declaration of conformity	Contact Danfoss		

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
DSH090	11.7	714	0.7	43	12.4	757
DSH105	13.6	830	0.7	43	14.3	873
DSH120	13.6	830	0.7	43	14.3	873
DSH140	13.6	830	0.7	43	14.3	873
DSH161	13.6	830	0.7	43	14.3	873
DSH184	13.9	848	0.7	43	14.6	891
DSH240	27.5	1678	2.9	177	30.4	1855
DSH295	27.1	1654	2.8	171	29.9	1825
DSH381	31.1	1898	4.0	244	35.1	2142
DSH485	27.5	1678	3.9	238	31.4	1916

Design piping

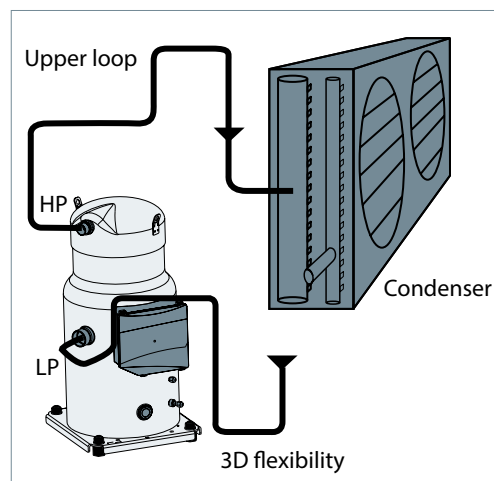
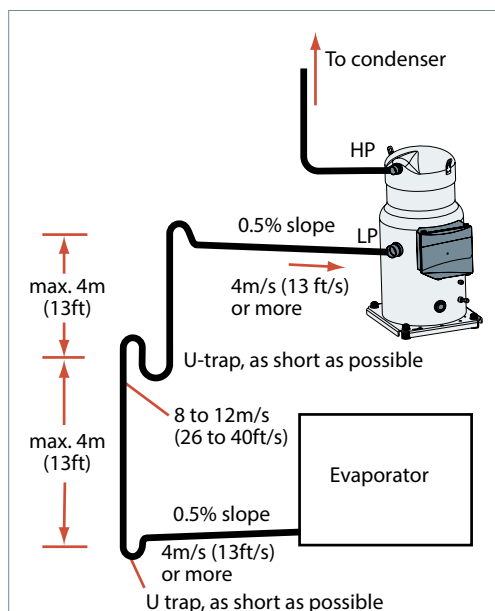
General requirements

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".

General recommendations are described in the figures below:



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 on: "Sound and vibration management".

Design piping

Tandem and trio requirements


DSH 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, DSH 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.

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

Tandem model	Composition	Suction	Discharge	Oil equalization	Kit tandem code no	Outline drawing number
DSH180E	DSH090 + DSH090	1"5/8	1"3/8	1"1/8	120Z0634	8560115
DSH195U	DSH090 + DSH105	1"5/8	1"3/8	1"1/8	120Z0694	8556233
DSH210U	DSH090 + DSH120	1"5/8	1"3/8	1"1/8	120Z0694	8556233
DSH210E	DSH105 + DSH105	1"5/8	1"3/8	1"1/8	120Z0634	8560114
DSH230U	DSH090 + DSH140	1"5/8	1"3/8	1"1/8	120Z0694	8556233
DSH240E	DSH120 + DSH120	1"5/8	1"3/8	1"1/8	120Z0634	8560114
DSH251U	DSH090 + DSH161	1"5/8	1"3/8	1"1/8	120Z0694	8556233
DSH260U	DSH140 + DSH120	1"5/8	1"3/8	1"1/8	120Z0692	8556230
DSH274U	DSH090 + DSH184	1"5/8	1"3/8	1"1/8	120Z0693	8556232
DSH281U	DSH161 + DSH120	1"5/8	1"3/8	1"1/8	120Z0692	8556230
DSH280E	DSH140 + DSH140	1"5/8	1"3/8	1"1/8	120Z0634	8560114
DSH289U	DSH105 + DSH184	1"5/8	1"3/8	1"1/8	120Z0693	8556231
DSH301U	DSH161 + DSH140	1"5/8	1"3/8	1"1/8	120Z0692	8556230
DSH304U	DSH120 + DSH184	1"5/8	1"3/8	1"1/8	120Z0694	8556231
DSH322E	DSH161 + DSH161	1"5/8	1"3/8	1"1/8	120Z0634	8560114
DSH324U	DSH140 + DSH184	1"5/8	1"3/8	1"1/8	120Z0694	8556231
DSH345U	DSH161 + DSH184	1"5/8	1"3/8	1"1/8	120Z0694	8556231
DSH360X	DSH120 + DSH240	2"1/8	1"3/8	1"3/8	120Z0709	8560128
DSH368E	DSH184 + DSH184	1"5/8	1"3/8	1"1/8	120Z0634	8560113
DSH424X	DSH184 + DSH240	2"1/8	1"3/8	1"3/8	120Z0709	8556259
DSH456X	DSH161 + DSH295	2"1/8	1"3/8	1"3/8	120Z0709	8560128
DSH479X	DSH184 + DSH295	2"1/8	1"3/8	1"3/8	120Z0709	8560259
DSH482E	DSH240 + DSH240	2"1/8	1"5/8	1"3/8	7777041	8556228
DSH535U	DSH240 + DSH295	2"1/8	1"5/8	1"3/8	7777037	8556228
DSH565X	DSH184 + DSH381	2"1/8	1"3/8	1"3/8	120Z0709	8556260
DSH590E	DSH295 + DSH295	2"1/8	1"5/8	1"3/8	7777041	8556228
DSH620U	DSH240 + DSH381	2"1/8	1"5/8	1"3/8	7777048	8556222
DSH675U	DSH295 + DSH381	2"1/8	1"5/8	1"3/8	7777037	8556222
DSH725U	DSH240 + DSH485	2"1/8	1"5/8	1"5/8	120Z0569	8556207
DSH760E	DSH381 + DSH381	2"1/8	1"5/8	1"3/8	7777041	8556223
DSH780U	DSH295 + DSH485	2"5/8	1"5/8	1"5/8	120Z0551	8556220
DSH865U	DSH381 + DSH485	2"5/8	1"5/8	1"5/8	120Z0550	8556224
DSH970E	DSH485 + DSH485	2"5/8	1"5/8	1"5/8	120Z0578	8556205

Trio model	Composition	Suction	Discharge	Oil equalization	Suction from	Kit tandem code no	Outline drawing number
DSH420	3xDSH140	2"1/8	1"3/8	1"1/8	Left Right	120Z0672	8556195 8556187
DSH483	3xDSH161	2"1/8	1"3/8	1"1/8	Left Right	120Z0684	8556195 8556187
DSH552	3xDSH184	2"1/8	1"3/8	1"1/8	Left Right	120Z0685	8556194 8556193
DSH720	3xDSH240	2"5/8	1"5/8	1"5/8	Left Right	120Z0673 7777039	8556217
DSH885	3xDSH295	2"5/8	1"5/8	1"5/8	Left Right	120Z0673 7777039	8556217
DSH1140	3xDSH381	2"5/8	1"5/8	1"5/8	Left Right	120Z0686 120Z0688	8556229
DSH1245	2xDSH381 + DSH485	2"5/8	2"1/8	1"5/8	Left Right	7777063	8556234
DSH1350	DSH381 + 2xDSH485	3"1/8	2"1/8	1"5/8	Left Right	7777063	8556235
DSH1455	3xDSH485	3"1/8	2"1/8	1"5/8	Left Right	7777040	8556216

Design piping

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

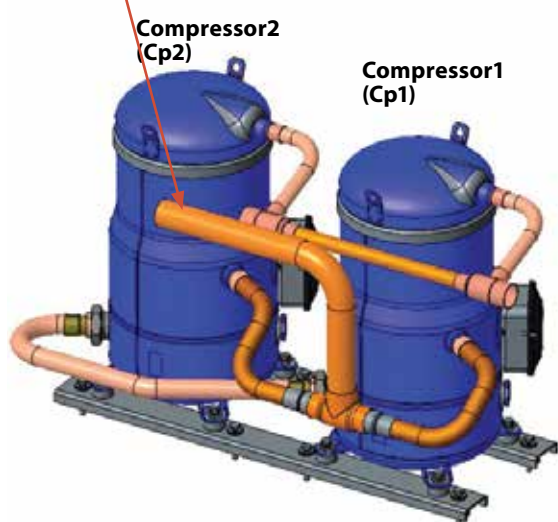
on certain compressors according to the table. Suction washers are included in tandem or trio accessory kits as described in the illustrations.



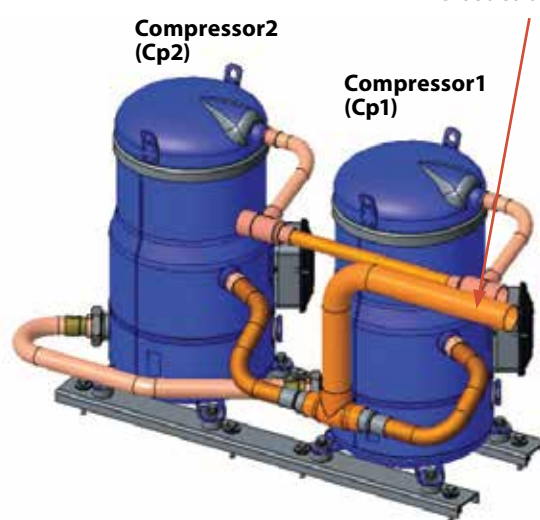
Red ring: Included in tandem or trio accessory kit
Orange ring: Not supplied

On tandem models

Right suction



Left suction



Cp1	Cp2	Tandem model	Suction from	Kit code no to order	Washer reference	Washer inner diameter	Washer in suction of
DSH090 + DSH090		DSH180E	Left Right	120Z0634		Not needed	
DSH090 + DSH105		DSH195U	Left Right	120Z0694	5312497P01 5312497P05	25mm (1.02inch) 26mm (1.02inch)	Cp2 Cp2
DSH090 + DSH120		DSH210U	Left Right	120Z0694	5312497P04 5312497P04	27mm (1.06inch) 27mm (1.06inch)	Cp2 Cp2
DSH105 + DSH105		DSH210E	Left Right	120Z0634		Not needed	
DSH090 + DSH140		DSH230U	Left Right	120Z0694	5312639P05 5312639P05	23mm (0.91inch) 23mm (0.91inch)	Cp1 Cp1
DSH120 + DSH120		DSH240E	Left Right	120Z0634		Not needed	
DSH090 + DSH161		DSH251U	Left Right	120Z0694	5312639P07 5312639P07	21mm (0.83inch) 21mm (0.83inch)	Cp1 Cp1
DSH120 + DSH140		DSH260U	Left Right	120Z0692	5312497P04 5312497P04	27mm (1.06inch) 27mm (1.06inch)	Cp1 Cp1
DSH090 + DSH184		DSH274U	Left Right	120Z0693	5312639P01 5312639P01	20mm (0.79inch) 20mm (0.79inch)	Cp1 Cp1
DSH120 + DSH161		DSH281U	Left Right	120Z0692	5312497P01 5312497P01	25mm (0.98inch) 25mm (0.98inch)	Cp1 Cp1
DSH140 + DSH140		DSH280E	Left Right	120Z0634		Not needed	

Tandem to be achieved by assembly of individual compressors

Design piping

Cp1	Cp2	Tandem model	Suction from	Kit code no to order	Washer reference	Washer inner diameter	Washer in suction of
DSH105 + DSH184	DSH289U		Left	120Z0693	5312497P03	23mm (0.91inch)	Cp1
			Right		5312497P03	23mm (0.91inch)	Cp1
DSH140 + DSH161	DSH301U		Left	120Z0692	5312497P08	27.5mm (1.08inch)	Cp1
			Right		5312497P05	26mm (1.02inch)	Cp1
DSH120 + DSH184	DSH304U		Left	120Z0694	5312497P06	24mm (0.94inch)	Cp1
			Right		5312497P06	24mm (0.94inch)	Cp1
DSH161 + DSH161	DSH322E		Left	120Z0634	Not needed		
			Right				
DSH140 + DSH184	DSH324U		Left	120Z0694	5312497P01	25mm (0.98inch)	Cp1
			Right		5312497P01	25mm (0.98inch)	Cp1
DSH161 + DSH184	DSH345U		Left	120Z0694	5312639P08	27.5mm (1.08inch)	Cp1
			Right		5312639P08	27.5mm (1.08inch)	Cp1
DSH120 + DSH240	DSH360X		Left	120Z0709	5312497P06	24mm (0.94inch)	Cp1
			Right		5312497P01	25mm (0.98inch)	Cp1
DSH184 + DSH184	DSH368E		Left	120Z0634	Not needed		
			Right				
DSH184 + DSH240	DSH424X		Left	120Z0709	5311579P10	35.5mm (1.4inch)	CP2
			Right		5311579P10	35.5mm (1.4inch)	CP2
DSH161 + DSH295	DSH456X		Left	120Z0709	5312497P01	25mm (0.98inch)	Cp1
			Right		5312497P05	26mm (1.02inch)	Cp1
DSH184 + DSH295	DSH479X		Left	120Z0709	5312497P05	26mm (1.02inch)	CP1
			Right		5312497P05	26mm (1.02inch)	CP1
DSH240 + DSH240	DSH482E		Left	7777041	Not needed		
			Right				
DSH240 + DSH295	DSH535U		Left	7777037	5311579P01	31mm (1.22inch)	Cp1
			Right				
DSH184 + DSH381	DSH565X		Left	120Z0709	5312497P06	24mm (0.94inch)	CP1
			Right		5312497P06	24mm (0.94inch)	CP1
DSH295 + DSH295	DSH590E		Left	7777041	Not needed		
			Right				
DSH240 + DSH381	DSH620U		Left	7777048	5311579P05	29mm (1.14inch)	Cp1
			Right				
DSH295 + DSH381	DSH675U		Left	7777037	5311579P01	31mm (1.22inch)	Cp1
			Right				
DSH240 + DSH485	DSH725U		Left	120Z0569	5311579P09	24mm (0.94inch)	Cp1
			Right				
DSH381 + DSH381	DSH760E		Left	7777041	Not needed		
			Right				
DSH295 + DSH485	DSH780U		Left	120Z0551	5311579P07	27mm (1.06inch)	Cp1
			Right				
DSH381 + DSH485	DSH865U		Left	120Z0550	5311579P08	30mm (1.18inch)	Cp1
			Right				
DSH485 + DSH485	DSH970E		Left	120Z0578	Not needed		
			Right				

Note:

For cross platform tandem application, which tandem model name ending with X, a external non-return valve (NRV) is highly recommended to install on DSH120/161/184 discharge line.

GENERAL INFORMATION

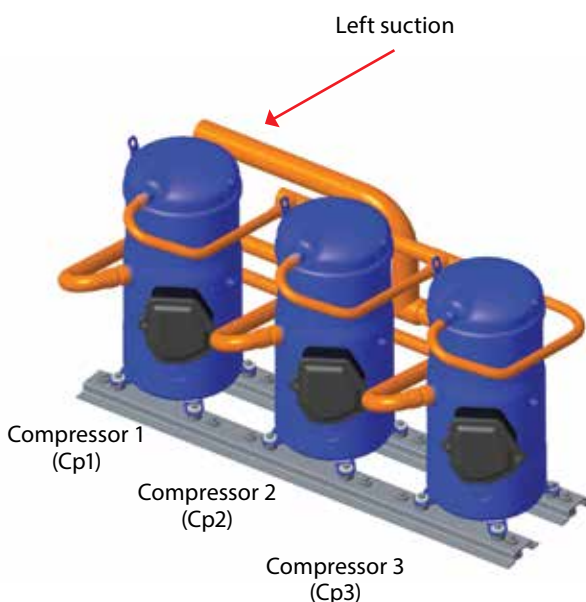
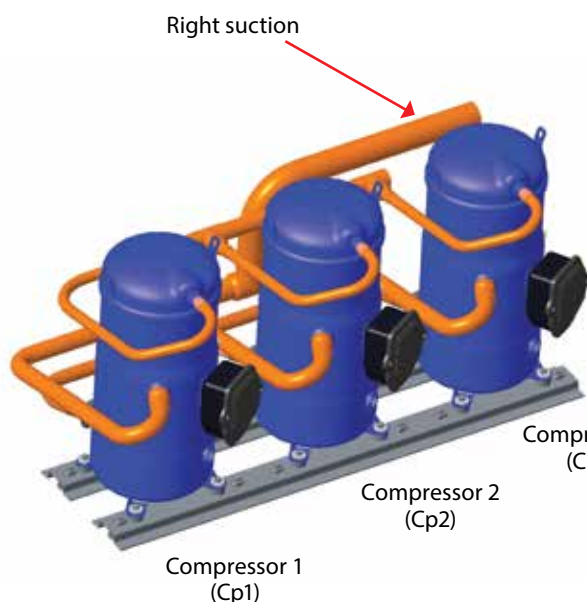
PRODUCT INFORMATION

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On trio models:



Cp1		Cp2		Cp3		Trio model	Suction from	Kit code no to order	Washer reference	Washer inner diameter	Washer in suction of
DSH140	+	DSH140	+	DSH140	=	DSH420	Left	120Z0672	5312497P05	26mm (1.02inch)	CP1
							Right		5312497P06	24mm (0.94inch)	CP3
									5312639P04	24.5mm (0.96inch)	CP1
									5312639P04	24.5mm (0.96inch)	CP3
DSH161	+	DSH161	+	DSH161	=	DSH483	Left	120Z0684	5312497P05	26mm (1.02inch)	CP1
							Right		5312497P01	25mm (0.98inch)	CP3
									5312497P05	26mm (1.02inch)	CP1
									5312497P01	25mm (0.98inch)	CP3
DSH184	+	DSH184	+	DSH184	=	DSH552	Left	120Z0685	5312497P04	27mm (1.06inch)	CP1
							Right		5312497P06	24mm (0.94inch)	CP3
									5312497P08	26.5mm (1.04inch)	CP1
									5312639P04	24.5mm (0.96inch)	CP3
DSH240	+	DSH240	+	DSH240	=	DSH720	Left	120Z0673	5311579P08	30mm (1.18inch)	Cp3
							Right	7777039	5311579P03	34.5mm (1.36inch)	Cp1 and Cp3
DSH295	+	DSH295	+	DSH295	=	DSH885	Left	120Z0673	5311579P08	30mm (1.18inch)	Cp3
							Right	7777039	5311579P03	34.5mm (1.36inch)	Cp1 and Cp3
DSH381	+	DSH381	+	DSH381	=	DSH1140	Left	120Z0686	5311579P01 5311579P05	31mm (1.22inch) and 29mm (1.14inch)	Cp1 and Cp3
							Right	120Z0688	5311579P01	31mm (1.22inch)	Cp1
DSH381	+	DSH381	+	DSH485	=	DSH1245	Left Right	7777063	5311579P05	29mm (1.14 inch)	Cp1
DSH485	+	DSH485	+	DSH381	=	DSH1350	Left Right	7777063	5311579P05	29mm (1.14inch)	Cp3
DSH485	+	DSH485	+	DSH485	=	DSH1455	Left Right	7777040	5311579P02	33mm (1.3inch)	Cp2 and Cp3

Design piping

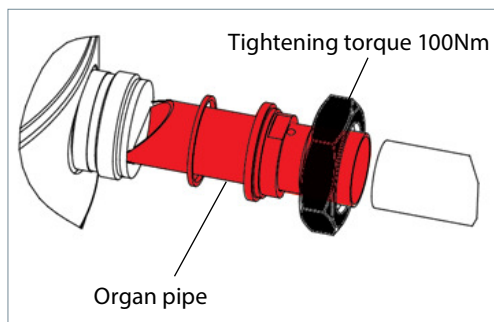
Oil equalization design

DSH180E to DSH368E

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

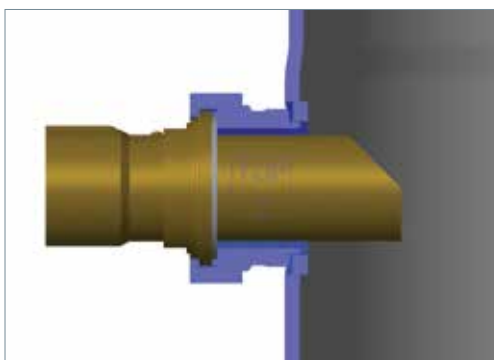
port as indicated on below picture. To connect the equalization line on rotolock connections, the organ pipe adaptor and teflon gasket are included in the tandem kit must be used.



Supplied with the compressor
 Included in tandem kit

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.



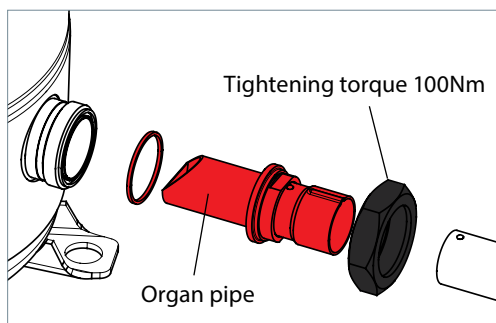
Design piping

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DSH360X-424X-456X-479X-565X

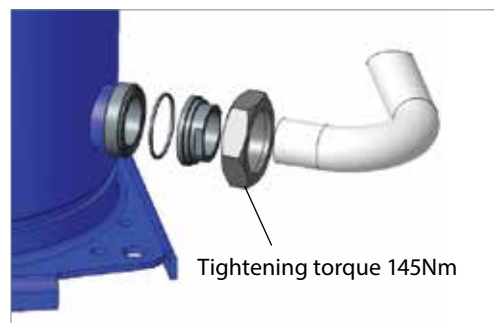
The oil level is balanced by a pipe of 1"3/8 oil equalization line.

In order to ensure best oil balance, the organ pipe need to be mounted inside the DSH120, 161 or 184 oil equalization port as indicated on below picture. DSH240, 295 or 381 has integrated organ pipe inside the oil equalization port.



For DSH120, DSH161 or DSH184

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



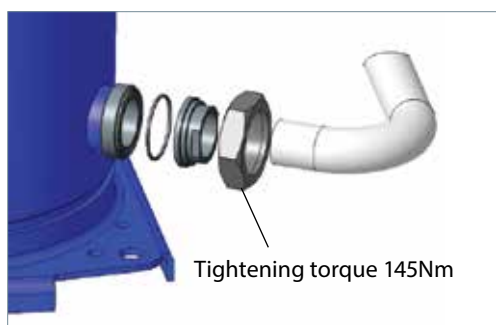
For DSH240, DSH295 or DSH381

- Supplied with the compressor
- Included in tandem kit

DSH482-535, DSH590 to DSH1455

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.



- Included in tandem kit

Design compressor mounting

General requirements

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

the manifold assembly must be mounted with flexible grommets onto the frame.

Compressors used in parallel applications must be mounted with rigid spacers onto rails and

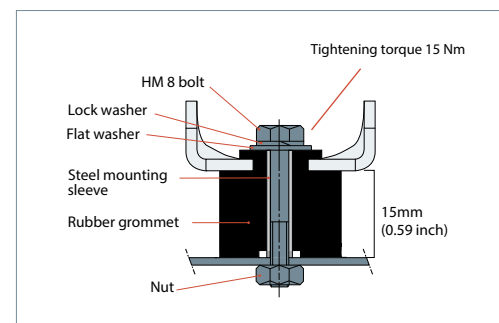
During operation, the maximum inclination from the vertical plane must not exceed 3 degrees.

Single requirements

DSH090-105-120-140-161-184 mounting

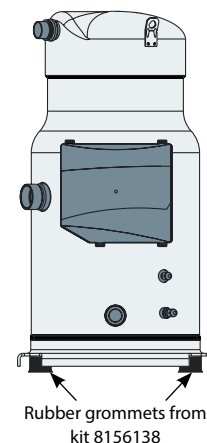
Compressors DSH090-105-120-140-161-184 are delivered with rubber grommets and steel mounting sleeve used to isolated the compressor from the base frame.

The grommets must be compressed until contact between the flat washer and the steel mounting sleeve is established. The required bolt size for the DSH090-105-120-140-161-184 compressors is HM8-40. This bolt must be tightened to a torque of 15Nm.

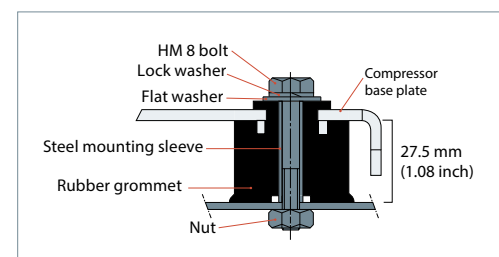


DSH240-295-381-485 mounting

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 DSH240-295-381-485 compressors is HM8-55. This bolt must be tightened to a torque of 21Nm.



Design compressor mounting

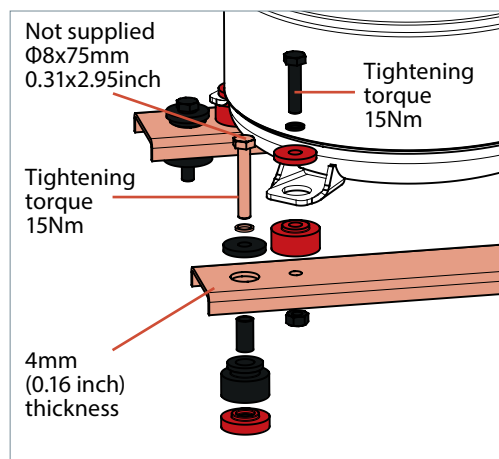
Manifolding requirements

DSH180E to DSH368E 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.

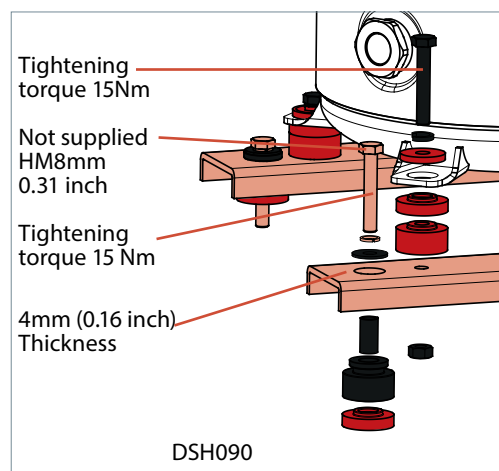


- Supplied with the compressor
- Included in manifolding kit
- Not supplied

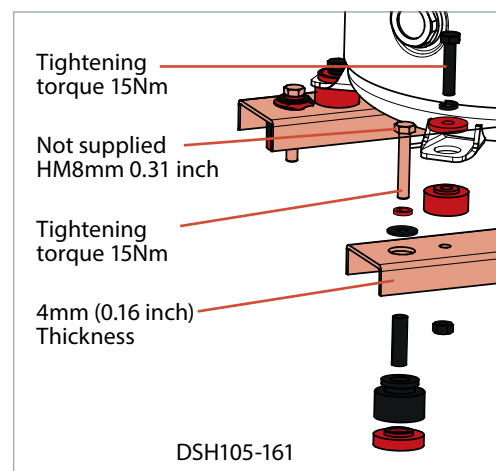
DSH195U-210U-230U-251U mounting

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

Because for oil balance port height, DSH090 is 7mm lower than DSH105-161, in order to ensure that the oil equalization connection is at the same level for both compressors, an additional 7mm rigid spacer must be added under DSH090 (see drawing. The 7 mm rigid spacer is supplied with the tandem accessory kit).



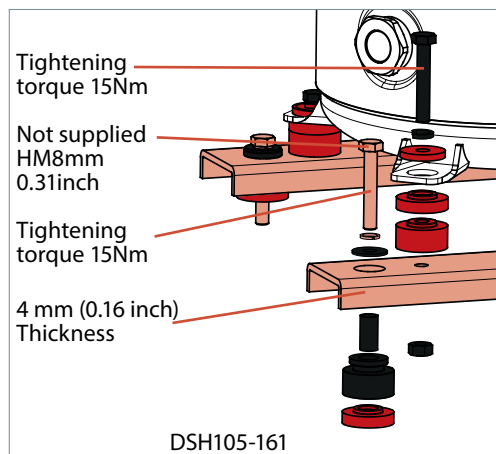
- Supplied with the compressor
- Included in manifolding kit
- Not supplied



DSH289U-304U-324U-345U mounting

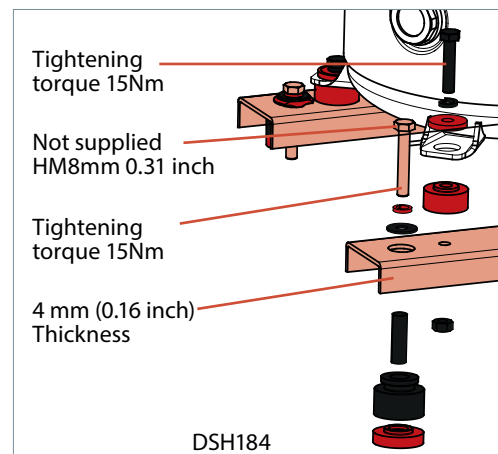
The compressors must be mounted with rigid mounting spacers on rails. Rubber grommets and spacers must be installed below the rails.

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



- Supplied with the compressor
- Included in manifolding kit
- Not supplied

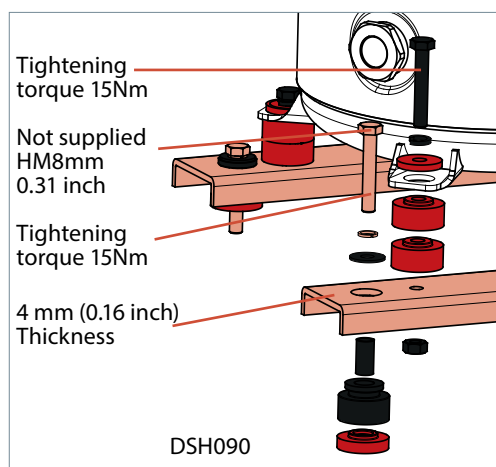
Because for oil balance port height, DSH105-161 is 7mm lower than DSH184, in order to ensure that the oil equalization connection is at the same level for both compressors, an additional 7mm rigid spacer must be added under DSH105-161 (see drawing. The 7 mm rigid spacer is supplied with the tandem accessory kit).



DSH274U mounting

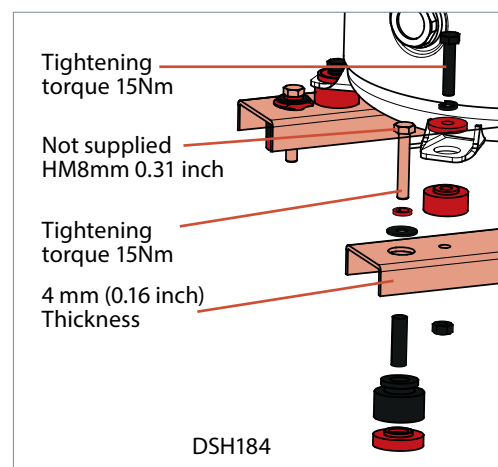
The compressors must be mounted with rigid mounting spacers on rails. Rubber grommets and spacers must be installed below the rails.

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



- Supplied with the compressor
- Included in manifolding kit
- Not supplied

Because for oil balance port height, DSH105-161 is 7mm lower than DSH184, in order to ensure that the oil equalization connection is at the same level for both compressors, an additional 7mm rigid spacer must be added under DSH105-161 (see drawing. The 7 mm rigid spacer is supplied with the tandem accessory kit).

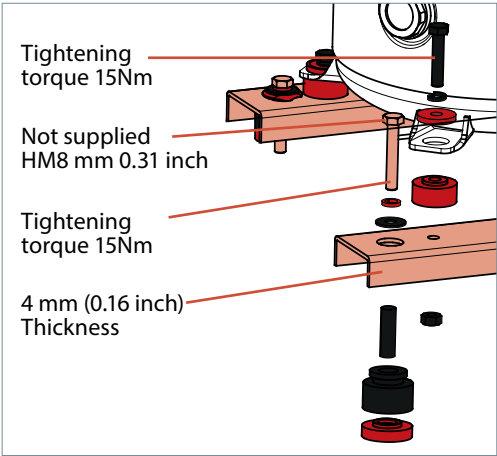


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**DSH260U-281U-301U
mounting**

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.

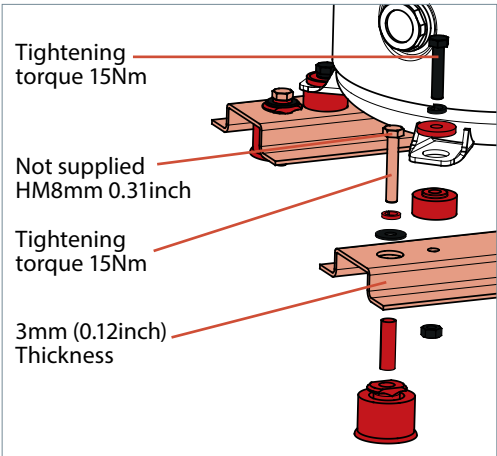


- Supplied with the compressor
- Included in manifold kit
- Not supplied

DSH420T-483T-552T

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.



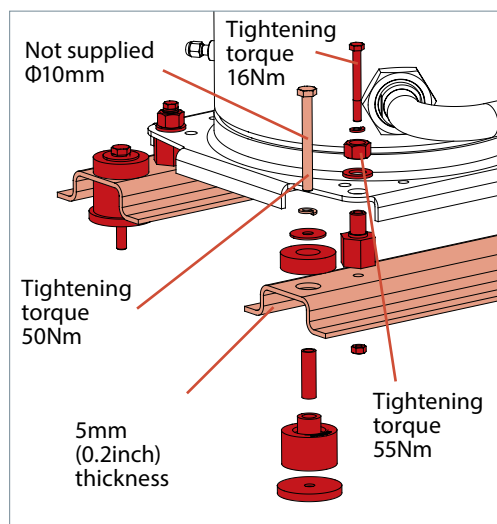
- Supplied with the compressor
- Included in manifold kit
- Not supplied

Design compressor mounting

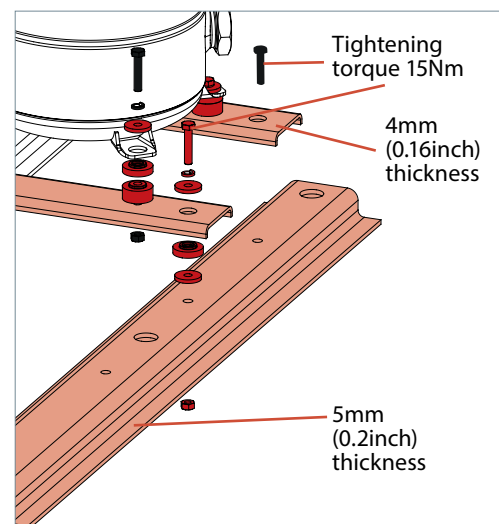
DSH360X-424X-456X-479X-565X mounting

The large compressor, DSH240, 295 or 381, is mounted with rigid spacers on the rails. The DSH120, 161 or 184 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.



DSH240-295-381



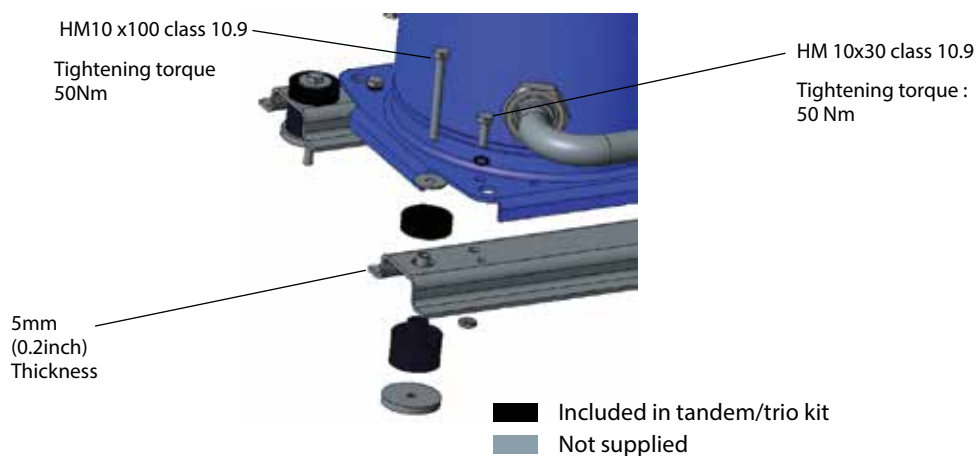
DSH120-161-184

- Supplied with the compressor
- Included in tandem kit
- Not supplied

DSH482 to DSH1455 mounting * except DSH565

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.



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 DSH medium trio models, top-up oil quantity 1L at least as mandatory.

System evaluation

	Single compressor	Manifold compressors
Non split	Test N°1	Test N°1+2
Split	Test N°1+3	Test N°1+2+3

Test, criteria and solutions

Test N°	Purpose	Test conditions	Pass criteria	Solutions
1	Check proper oil return	 <p>Lowest foreseeable evaporation, and highest foreseeable condensation. Minimum number of compressor running for 6 hours.</p> <p>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</p> <p>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.

Compressor sound radiation

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.

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 are similar with R410A and R452B, and are as follows:

- For compressors running alone:

Compressor model	50 Hz		60 Hz		Acoustic hood code number
	Sound power dB(A)	Attenuation dBA ①	Sound power dB(A)	Attenuation dBA ①	
DSH090	73	6	76	6	120Z0034
DSH105	75	6	78	6	102Z0035
DSH120	75	6	78	6	120Z0035
DSH140	76	6	79	6	120Z0035
DSH161	76	6	79	6	120Z0035
DSH184	78	6	81	6	120Z0135
DSH240	82	6	85	4	120Z0022
DSH295	82	6	85	4	120Z0022
DSH381*	89	6	91	4	120Z0022
DSH485**	89	4	91	4	120Z0022

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

* For DSH381 code 3 use acoustic hood reference 120Z0579

**No acoustic hood available for DSH485 code 3

① Attenuation given with acoustic hood

- For compressors running simultaneously,

- the global sound level of "n" identical compressors is:

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

Example for the trio DSH720 = 3 x DSH240 (50 Hz)

$$L_{DSH240} = 82 \text{ dB(A)}$$

$$L_{DSH720} = 82 + 10 \log_{10} 3 = 86.8 \text{ dB(A)}$$

- the global sound level of "n" different compressors with respectively L_i sound level is:

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

Example for the tandem

DSH424 = DSH184+DSH240 (50 Hz)

$$L_{DSH184} = 78 \text{ dB(A)}, L_{DSH240} = 82 \text{ dB(A)}$$

$$L_{DSH424} = 10 \log_{10} (10^{0.1 \times 78} + 10^{0.1 \times 82}) = 83.5 \text{ dB(A)}$$

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	Model	Composition	Sound power dB(A)	
			50 Hz	60 Hz
Tandem	DSH180E	2×DSH090	76.0	79.0
	DSH195U	DSH090 + DSH105	77.0	80.0
	DSH210U	DSH090 + DSH120	77.0	80.0
	DSH210E	2×DSH105	78.0	81.0
	DSH230U	DSH090 + DSH140	78.0	81.0
	DSH240E	2×DSH120	78.0	81.0
	DSH251U	DSH090 + DSH161	78.0	81.0
	DSH260U	DSH140 + DSH120	78.5	81.5
	DSH274U	DSH090 + DSH184	79.0	82.0
	DSH281U	DSH161 + DSH120	78.5	81.5
	DSH280E	2×DSH140	79.0	82.0
	DSH289U	DSH105 + DSH184	80.0	83.0
	DSH301U	DSH161 + DSH140	79.0	82.0
	DSH304U	DSH120 + DSH184	80.0	83.0
	DSH322E	2×DSH161	79.0	82.0
	DSH324U	DSH140 + DSH184	80.0	83.0
	DSH345U	DSH161 + DSH184	80.0	83.0
	DSH368E	2×DSH184	81.0	84.0
	DSH360X	DSH120 + DSH240	83.0	86.5
	DSH424X	DSH184 + DSH240	83.5	87.0
	DSH456X	DSH161 + DSH295	83.0	87.0
	DSH479X	DSH184 + DSH295	83.5	87.0
	DSH565X	DSH184 + DSH381	87.5	89.5
	DSH482E	2×DSH240	85.0	88.0
	DSH535U	DSH240+DSH295	85.0	88.0
	DSH590E	2×DSH295	85.0	88.0
	DSH620U	DSH240+DSH381	88.0	91.0
	DSH675U	DSH295+DSH381	88.0	91.0
	DSH760E	2×DSH381	90.0	92.0
	DSH725U	DSH240+DSH485	90.0	92.0
	DSH780U	DSH295+DSH485	90.0	92.0
	DSH865U	DSH381+DSH485	91.0	93.0
	DSH970E	2×DSH485	92.0	94.0
Trio	DSH420	3×DSH140	81.0	84.0
	DSH483	3×DSH161	81.0	84.0
	DSH552	3×DSH184	83.0	86.0
	DSH720	3×DSH240	87.0	91.0
	DSH885	3×DSH295	87.0	91.0
	DSH1140	3×DSH381	92.0	94.0
	DSH1245	2×DSH381+DSH485	92.5	94.5
	DSH1350	DSH381+2×DSH485	93.0	95.0
	DSH1455	3×DSH485	94.0	96.0

Manage sound and vibration

			GENERAL INFORMATION
<p>Mitigations methods:</p> <p>We can consider two means to reduce compressors sound radiations:</p> <ol style="list-style-type: none"> 1. 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. 2. Use of sound-insulation materials on the inside of unit panels is also an effective mean to reduce sound radiation. <p>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.</p>			
			PRODUCT INFORMATION
Mechanical vibrations	<p>A compressor generates some vibrations that propagate into the surrounding parts and structure. The vibration level of a DSH compressor alone does not exceed 120µm peak to peak for DSH090 to DSH184, and 154µm peak to peak for DSH240 to DSH485. However, when system structure natural frequencies are close to running frequency, vibrations are amplified due to resonance phenomenon.</p> <p>A high vibration level is damageable for piping reliability and generates high sound levels.</p>	<p>requirements (mounting feet, rails etc.). For further information on mounting requirements, please refer to section "Design compressor mounting".</p> <ol style="list-style-type: none"> 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 frequencies(50 or 60 Hz). Solutions to change natural frequencies are to work on structure stiffness and mass (brackets, metal sheet thickness or shape...) 	
	<p>Mitigations methods:</p> <ol style="list-style-type: none"> 1. To ensure minimum vibrations transmission to the structure, strictly follow Danfoss mounting 		
			SYSTEM DESIGN
Gas pulsation	<p>DSH has been designed and tested to ensure that gas pulsation is optimized for the most commonly encountered air conditioning pressure ratio. Manifolded compressors are equivalents to lagged sources of gas pulsation. Therefore, pulse level can vary during time.</p>	<p>Mitigations methods:</p> <p>If an unacceptable level is identified, a discharge muffler with the appropriate resonant volume and mass can be installed.</p>	
			INTEGRATION INTO SYSTEM
			ORDERING INFORMATION

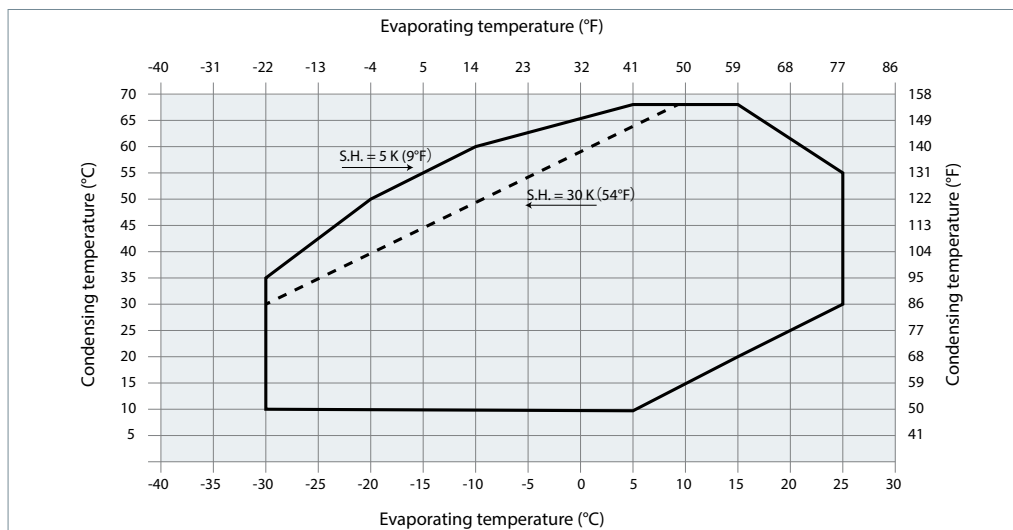
Manage operating envelope

Requirement

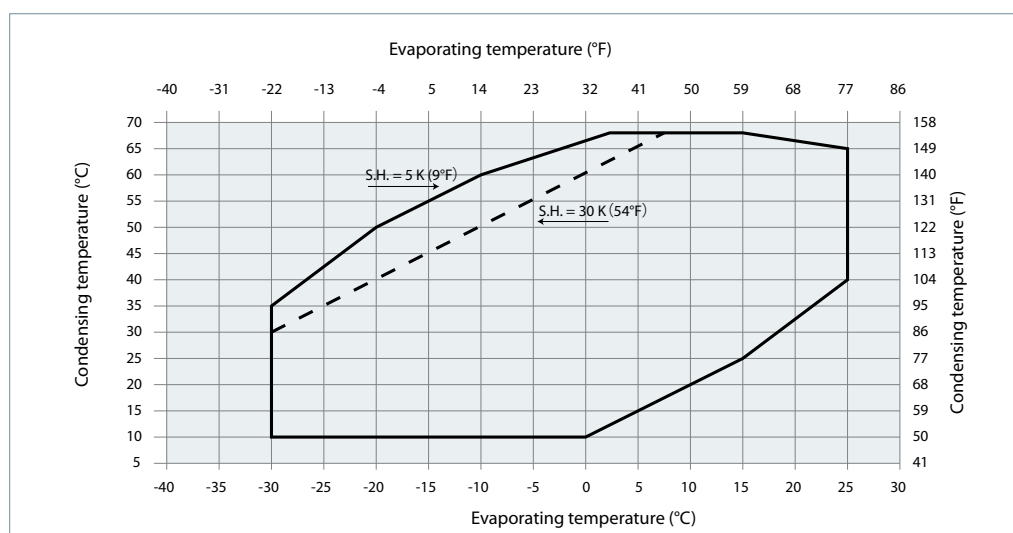
R The operating envelopes for DSH scroll compressors are given in the figures below and guarantees reliable operations of the compressor for steady-state operation.

Steady-state operation envelope is valid for a suction superheat within 5K to 30K range at nominal Voltage.

Operating envelope R410A DSH090 to DSH184



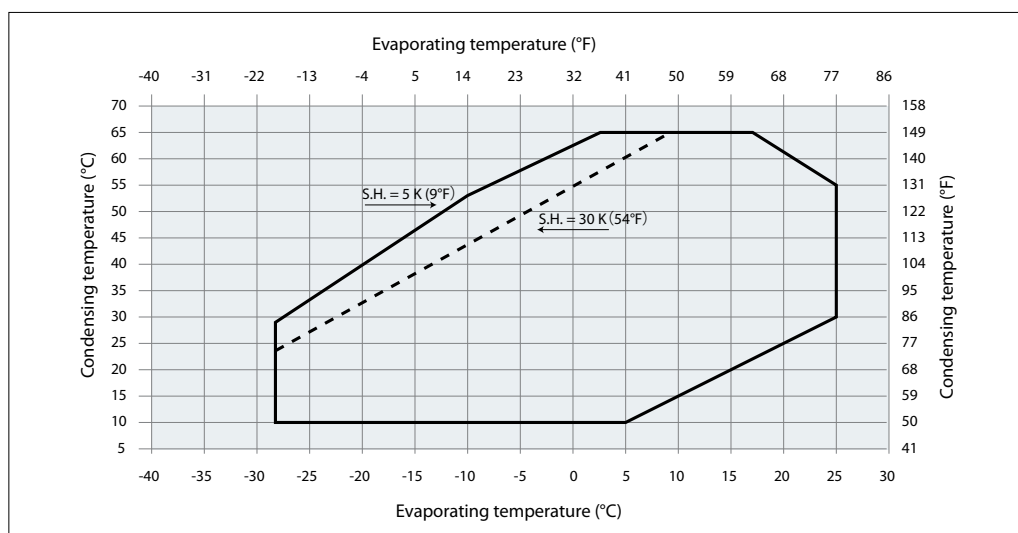
Operating envelope R410A DSH240 to DSH485



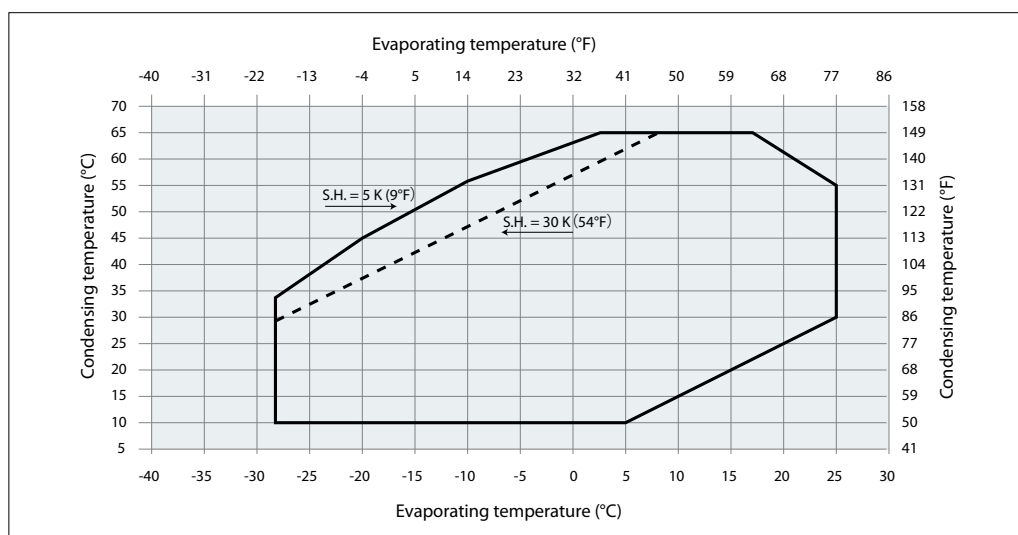
Note: The application envelope of a cross-platform manifold results in the conjunction of map limitations of compressors composing the tandem.

Manage operating envelope

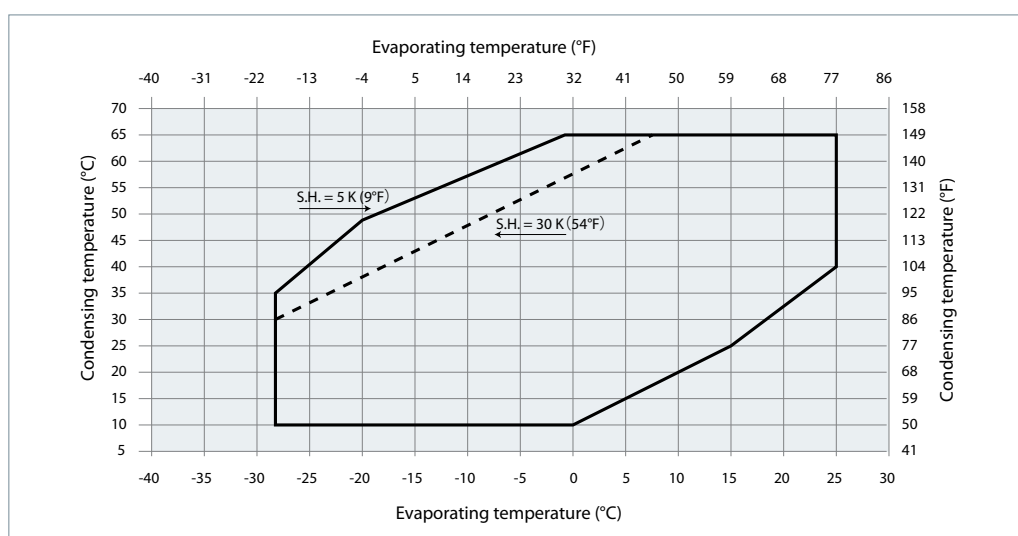
Operating envelope R452B DSH090 to DSH105



Operating envelope R452B DSH120 to DSH184



Operating envelope R452B DSH240 to DSH485



Note: The application envelope of a cross-platform manifold results in the conjunction of map limitations of compressors composing the tandem.

Manage operating envelope

Pressure settings		R410A	R452B
Working range high side	bar(g)	9.9-44.7	9.2-39.2
	psig	144-648	133-569
Working range low side	bar(g)	1.7-15.5	1.7-14.4
	psig	25-225	25-209
Maximum high pressure safety switch setting	bar(g)	46.1	40.6
	psig	669	589
Minimum low pressure safety switch setting	bar(g)	1.5	1.5
	psig	22	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 25psig	

High and low pressure protection

R 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.

Discharge temperature protection

DSH090 to DSH184

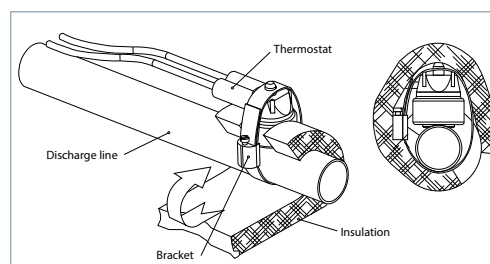
For DSH090-105-120-140-161-184 compressors, the external Discharge Gas Temperature protection (DGT) is required if the high and low pressure switch settings do not protect the compressor against operations beyond its specific application envelope.

The discharge gas thermostat accessory kit (code 7750009) includes all components required for installation as shown on the right. DGT installation must respect below requirements:

- The thermostat must be attached to the discharge line within 150mm (5.91inch) from

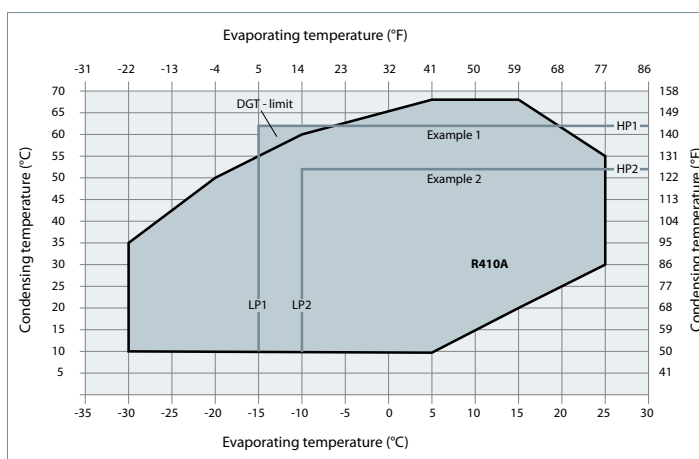
the compressor discharge port and must be thermally insulated and tightly fixed on the pipe.

- The DGT should be set to open at a discharge gas temperature of 135°C (275°F) or lower.



Example 1 (R410A, SH = 11K)
LP switch setting:
LP1 = 3.8 bar (g) (-15°C)
HP switch setting:
HP1 = 38 bar (g) (62°C)
Risk of operation beyond the application envelope.
DGT protection required.

Example 2 (R410A, SH = 11K)
LP switch setting:
LP2 = 4.7 bar (g) (-10°C)
HP switch setting:
HP2 = 31 bar (g) (52°C)
No risk of operation beyond the application envelope.
No DGT protection required.



DSH240 to DSH485

DSH240-295-381-485 compressors include an integrated discharge gas temperature protection, excessive discharge temperature will result in tripping of electronic module output relay.

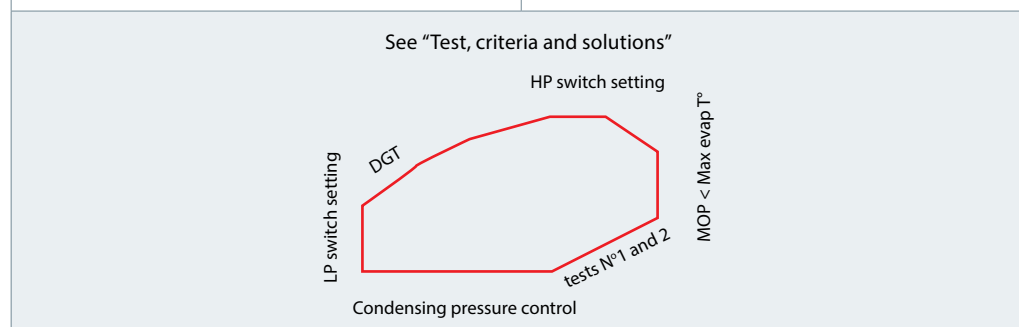
This protection is effective within a suction superheat range from 5 to 30K (9 to 54°F).

Manage operating envelope

System evaluation

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

- | | |
|--|---|
| Basic: <ul style="list-style-type: none"> • HP and LP switch • MOP (Max Operating Pressure) ensured by expansion device • Condensing pressure control • DGT external* | Advanced: <ul style="list-style-type: none"> • HP and LP sensor • Operating envelope limits integrated into control logic • DGT external* |
|--|---|



* For DSH090 to DSH184

Test, criteria and solutions

Test N°	Purpose	Test condition	Pass criteria	Solutions
1	Ensure compressor operate within envelope	Start test at minimum foreseeable evaporating temperature (minimum ambient temperature...)	Continuous running within envelope	Work on compressor staging, fan staging, water flow etc.
2		Perform a defrost test if reversible unit		

Manage superheat

GENERAL INFORMATION

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 5K to 30K (9 to 54°F).

System evaluation

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

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

Test, criteria and solutions

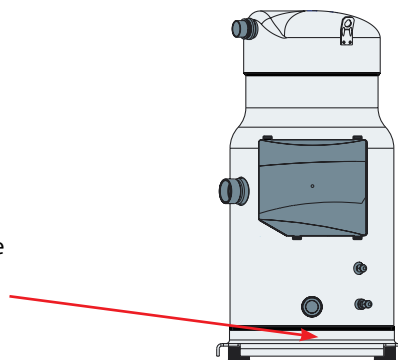
Test N°	Purpose	Test condition	Pass criteria	Solutions
Liquid flood back test	Steady-state	 <p>Liquid flood back testing must be carried out under expansion valve threshold operating conditions:</p> <ul style="list-style-type: none"> • Lowest foreseeable evaporation, and highest foreseeable condensation. • Minimum number of compressor running. <p>For reversible system, perform test in both heating and cooling mode.</p>	Suction superheat >5K (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"> 1. Check expansion valve selection and setting. • For Thermostatic expansion valve (TXV) check bulb position... • For Electronic expansion valve (EXV) check measurement chain and PID.... 2. Add a suction accumulator*.
	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"> 1. Check defrost logic. In reversible systems, the defrost logic can be worked out to limit liquid floodback effect. (for more details see "Control Logic"). 2. Add a suction accumulator*.

*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".

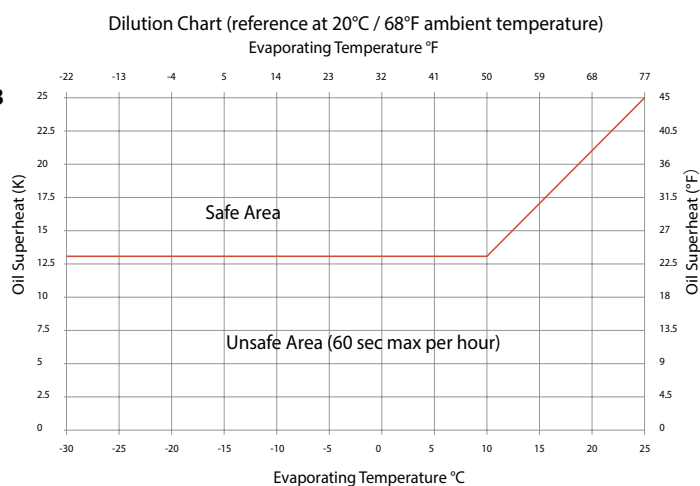
ORDERING INFORMATION

Oil temperature sensor must be placed between the oil sight glass and the compressor baseplate. Some thermal paste shall be used to improve the conductivity. The sensor must also be correctly thermally insulated from the ambience.

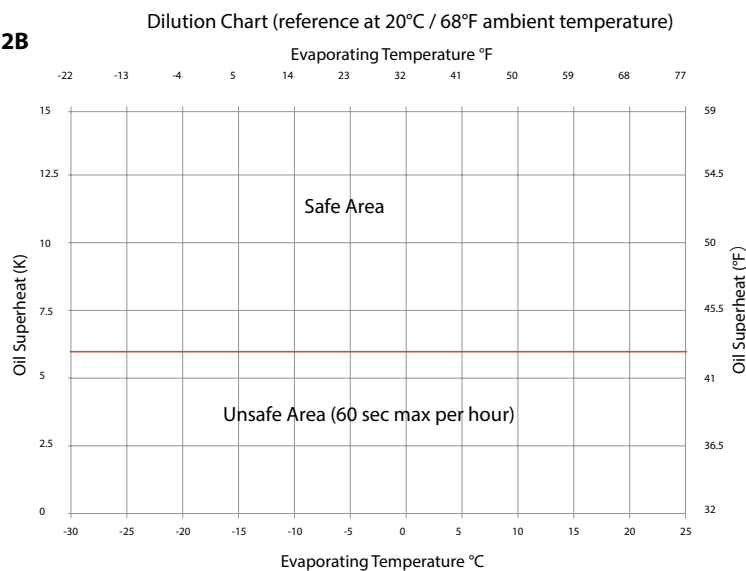
The Oil superheat is defined as:
(Oil temperature - Evaporating temperature)



**DSH090 to
DSH184
R410A / R452B**



**DSH240 to
DSH485
R410A / R452B**



Manage off cycle migration

- R** 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 below in relation with the system charge and the application to quickly define necessary safeties to implement.

Application	BELOW charge limit	ABOVE charge limit
All	Ensure tightness between condenser & evaporator when system is OFF • 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 • With R452B, an External Non-Return Valve is recommended ****	
Non split	No test or additional safeties required	• Surface Sump Heater * • External Non-Return Valve ****
Split	Since each installation is unique, refrigerant charge may vary • Surface Sump Heater * • Liquid Line Solenoid Valve**+ pump-down cycle*** • External Non-Return Valve	

*Surface Sump heater

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

For DSH090-105-120-140-161-184, 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 refer to below 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

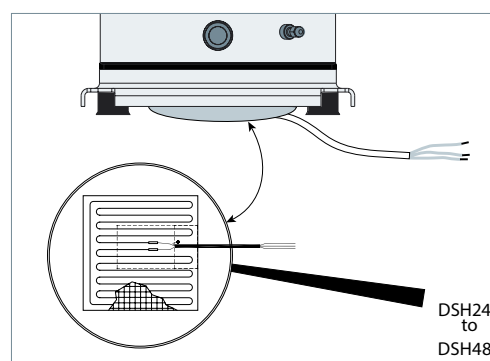
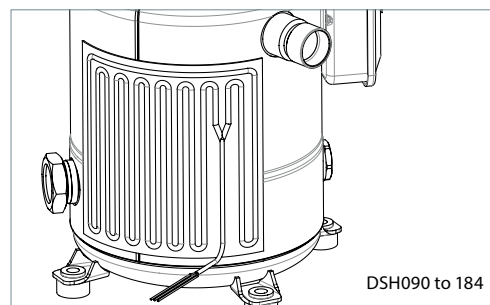
For DSH240-295-381-485, the 56W surface sump heater is located below the sump, associated with a thermal insulation.

The heater must be turned on whenever all the compressors are off.

Surface sump heater accessories are available from Danfoss (see section "Accessories").

**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.

Manage off cycle migration

***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 1.7bar(g) (25 psig).

For more details on pump-down cycle see section "Control Logic".

**** External non-return valve is only for DSH090-105-120-140-161-184. DSH240-295-381-485 have integrated internal non-return valve

Charge limits are defined in the table below :

	Models	Composition	Refrigerant charge limit	
			kg	lbs
Single		DSH090	8	18
		DSH105	10	22
		DSH120	10	22
		DSH140	10	22
		DSH161	10	22
		DSH184	10	22
		DSH240	15	33
		DSH295	15	33
		DSH381	17	37
		DSH485	17	37
Tandem	DSH180E	2xDSH090	12	26
	DSH195U	DSH090 + DSH105	12	26
	DSH210U	DSH090 + DSH120	12	26
	DSH210E	2xDSH105	12	26
	DSH230U	DSH090 + DSH140	12	26
	DSH240E	2xDSH120	12	26
	DSH251U	DSH090 + DSH161	12	26
	DSH260U	DSH140 + DSH120	12	26
	DSH274U	DSH090 + DSH184	12	26
	DSH281U	DSH161 + DSH120	12	26
	DSH280E	2xDSH140	14	31
	DSH289U	DSH105 + DSH184	12	26
	DSH301U	DSH161 + DSH140	14	31
	DSH304U	DSH120 + DSH184	12	26
	DSH322E	2xDSH161	14	31
	DSH324U	DSH140 + DSH184	14	31
	DSH345U	DSH161 + DSH184	14	31
	DSH368E	2xDSH184	14	31
	DSH360X	DSH120 + DSH240	14	31
	DSH424X	DSH184 + DSH240	14	31
	DSH456X	DSH161 + DSH295	14	31
	DSH479X	DSH184 + DSH295	14	31
	DSH565X	DSH184 + DSH381	14	31
	DSH482E	2xDSH240	21	46
	DSH535U	DSH240 + DSH295	21	46
	DSH590E	2xDSH295	25	55
	DSH620U	DSH240 + DSH381	21	46
	DSH675U	DSH295 + DSH381	25	55
	DSH760E	2xDSH381	29	64
	DSH725U	DSH240 + DSH485	21	46
	DSH780U	DSH295 + DSH485	25	55
	DSH865U	DSH381 + DSH485	29	64
	DSH970E	2xDSH485	34	75
Trio	DSH420	3xDSH140	14	31
	DSH483	3xDSH161	14	31
	DSH552	3xDSH184	14	31
	DSH720	3xDSH240	21	46
	DSH885	3xDSH295	25	55
	DSH1140	3xDSH381	29	64
	DSH1245	2xDSH381 + DSH485	29	64
	DSH1350	DSH381 + 2xDSH485	29	64
	DSH1455	3xDSH485	34	75

Provide power supply and electrical protection

Wiring information

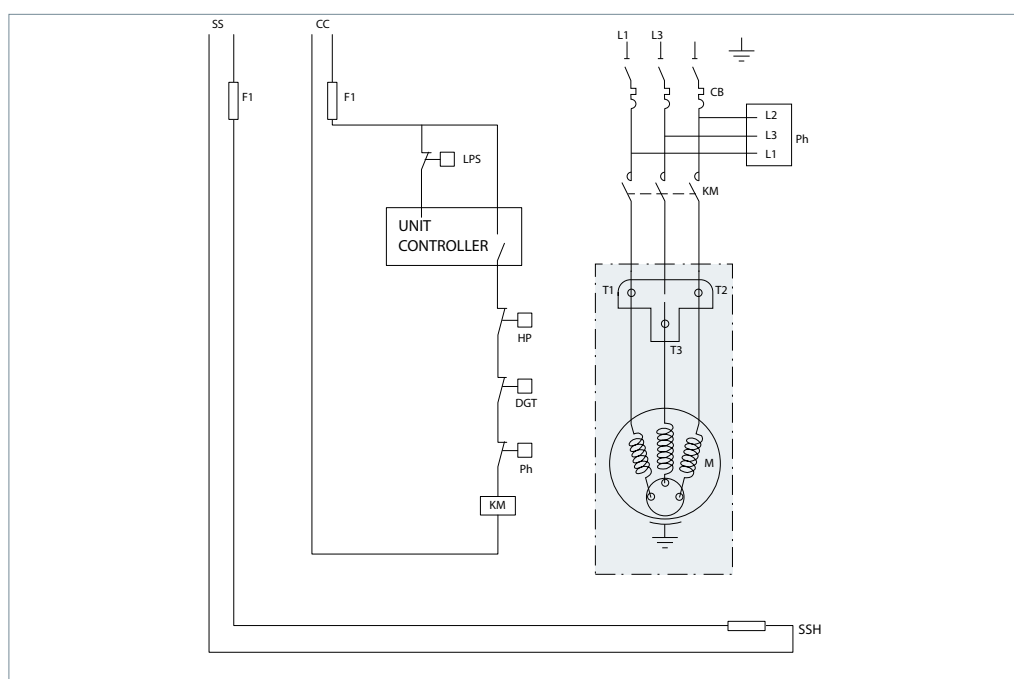
Requirements:

- 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 DSH090-105-120-140-161-184, phase sequence protection is strongly recommended.
- Compressor models DSH240-295-381-485 are delivered with a pre-installed motor protection module inside the terminal box that must be powered on.

- HP safety switch, DGT (only for DSH090 to DSH184) and electronic module relay output (M1-M2, only for DSH240 to DSH485) 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:

Compressor model DSH 090 - 105 - 120 - 140 - 161 - 184

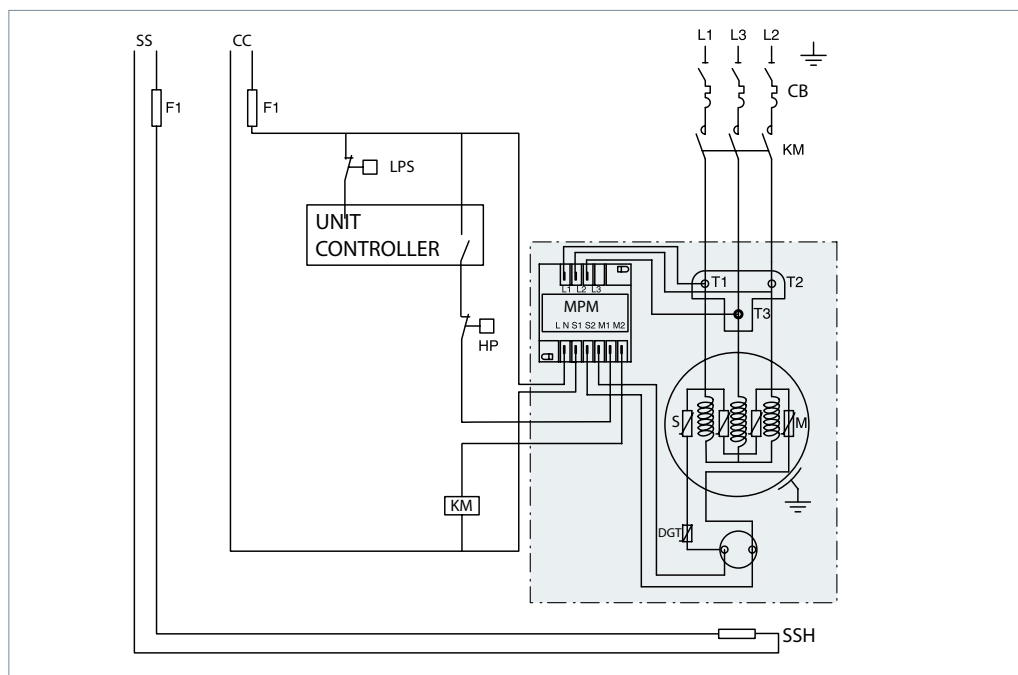


Legends

Fuses	F1
Compressor contactor	KM
High pressure safety switch	HP
Safety pressure switch	LPS
Discharge gas thermistor	DGT
Compressor motor	M
Surface sump heater	SSH
Thermal magnetic motor circuit breaker	CB
Phase sequence relay	Ph

Provide power supply and electrical protection

Compressor model DSH240-295-381



Legends

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

GENERAL INFORMATION

PRODUCT INFORMATION

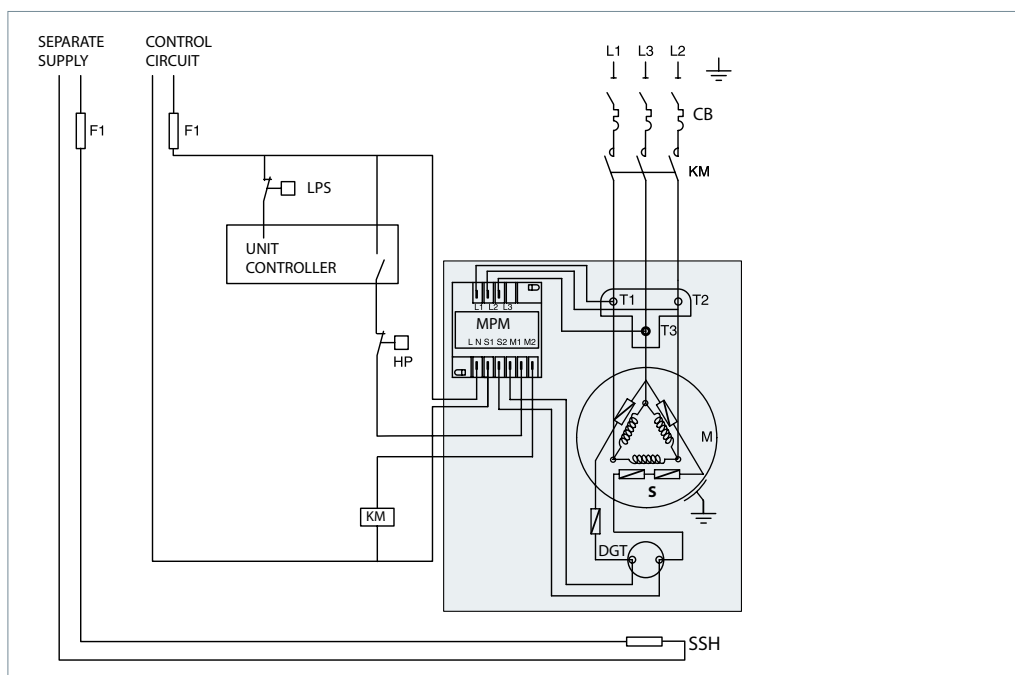
SYSTEM DESIGN

INTEGRATION INTO SYSTEM

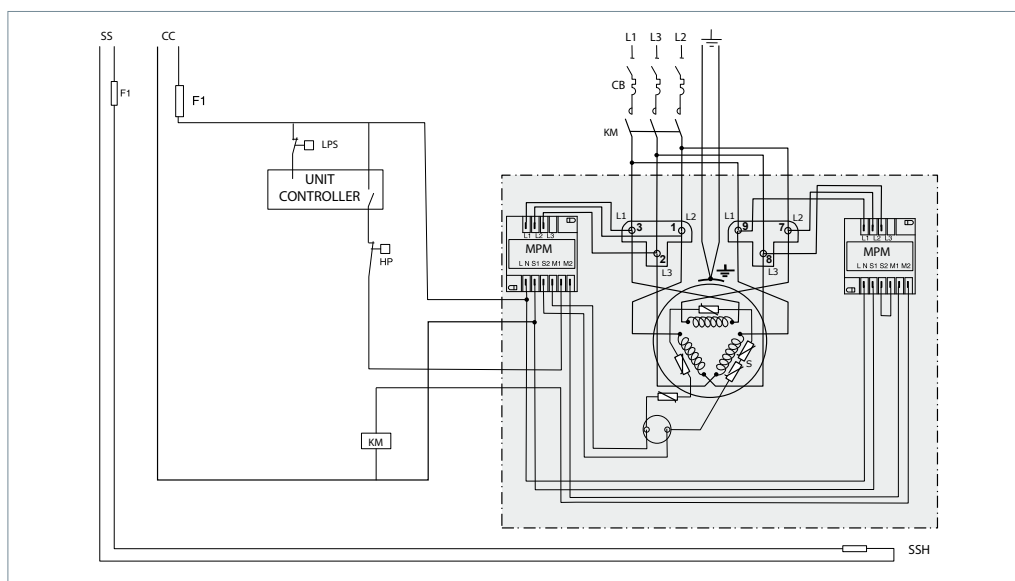
ORDERING INFORMATION

Provide power supply and electrical protection

Compressor model DSH485 except code 3



Compressor model DSH485 code 3



Legends

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

Provide power supply and electrical protection

Soft starts

R 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.

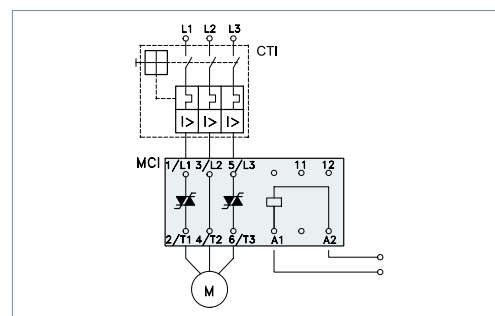
Ramp-down must be set to minimum to ensure proper discharge valve closing. Danfoss MCI and MCD soft-start controller are available as accessories: MCI and MCD can reduce the inrush current up to 40%.

Selection table:

Compressor model	Soft start reference Ambient max. 40°C	Soft start reference Ambient max. 55°C
DSH090 code 4	MCI15C	MCI15C
DSH105-120 code 4	MCI25C	MCI25C
DSH140-161 code 4	MCI25C	MCI25C*
DSH184-240 code 4	MCI50CM	MCI50CM
DSH295 code 4	MCI50CM	MCI50CM*
DSH381 code 4	MCI50CM*	MCI50CM*
DSH485 code 4	MCD201-055	MCD201-055
DSH485 code 3	MCD5-0195B-T5	MCD5-0195B-T5

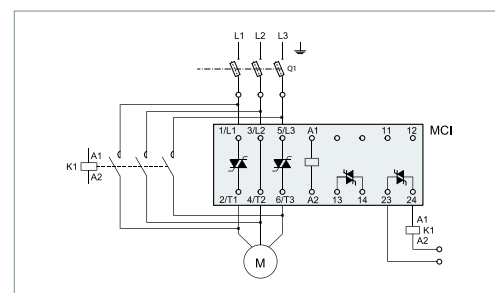
- MCI15C, MCI25C, MCI50CM replaces the contactor KM. All settings such as initial torque, ramp-up time (less than 0.5 sec) and ramp-down time are preset and do not require any modification.

See wiring diagram:



- MCI25M*, MCI50CM* requires a by-pass contactor K1. This configuration is needed to withstand current or temperature levels. All settings such as initial torque, ramp-up time (less than 0.5 sec) and ramp-down time are preset and do not require any modification.

See wiring diagram:



- For MCD201-055, the following settings have to be adjusted:

Frequency	Initial torque (%U)	Voltage Ramp-up (seconds)	Ramp-down (seconds)
50 Hz	60%	2	0
60 Hz	70%	0,5	0

- For MCD5-0195B-T5, constant current mode has to be used with Current Limit / Initial Current set at 400A.

Control logic

Safety control logic requirements

Safeties	Tripping conditions		Re-start conditions	
	Value	Time	Value	Time
HP safety switch	See Pressure settings table from section "Manage operating envelope"	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			Maximum 5 auto reset during a period of 12 hours, then manual reset.

* only for DSH240 to DSH485.

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.

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 N°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".

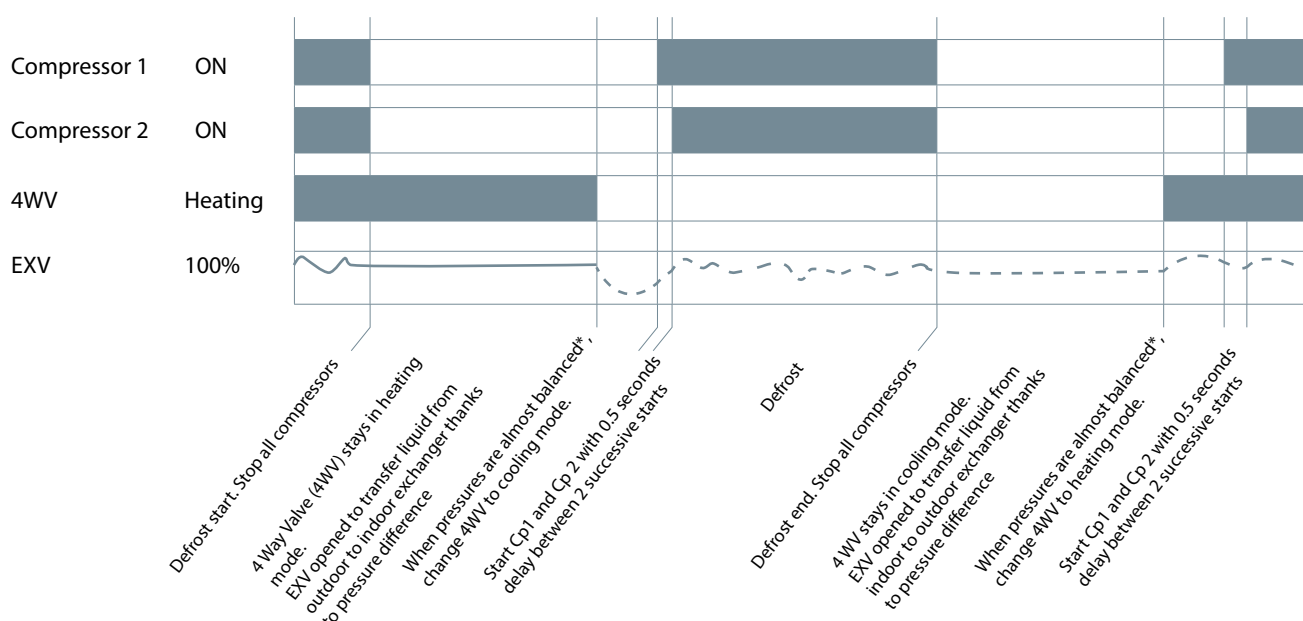
Defrost logic recommendations / Reversible systems

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:



* 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 "Manage operating envelope".

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).



Control logic

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 1.5bar (22psi) below nominal evaporating pressure with minimum of 1.7bar(g) (25psig). 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.

For DSH090 to DSH184, an external Non Return Valve (NRV) in the discharge line is recommended. DSH240 to DSH485 compressors

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

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Reduce moisture in the system

GENERAL INFORMATION	<div><div><div><div><div></div><div>R</div></div></div><div>Excessive air and moisture</div></div><div><div><ul style="list-style-type: none">• 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.</div></div></div>	All these phenomena can reduce service life and cause mechanical and electrical compressor failure.
Requirements	<div>DSH compressors are delivered with < 100ppm moisture level.</div> <div>At the time of commissioning, system moisture content may be up to 100ppm.</div>	During operation, the filter drier must reduce this to a level between 20 and 50ppm.
Solutions	<div>To achieve this requirement, a properly sized and type of drier is required. Important selection criteria's include:</div> <div><div><ul style="list-style-type: none">• driers water content capacity,• system refrigeration capacity,• system refrigerant charge.</div></div>	For new installations with DSH compressors with polyolester oil, Danfoss recommends using the Danfoss DML (100% molecular sieve) solid core filter drier.
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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") when charged with refrigerant.

Compressor holding charge

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

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

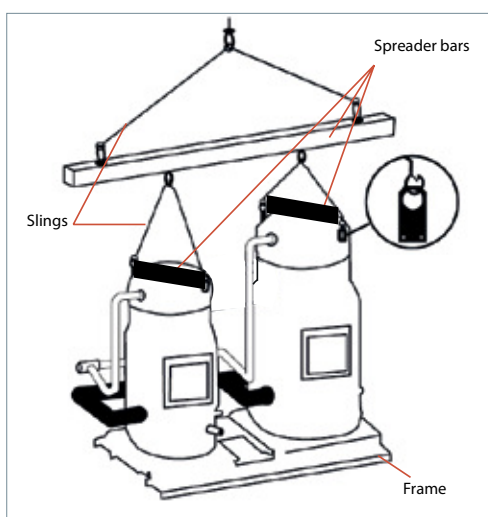
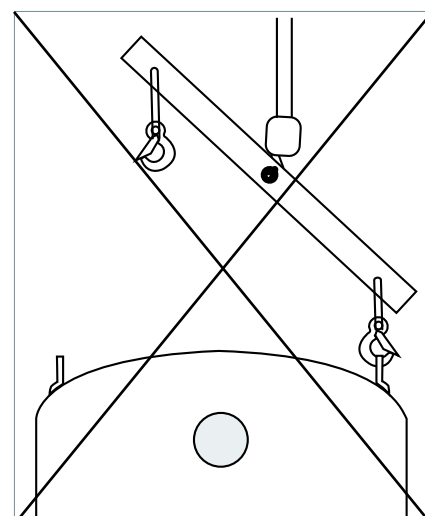
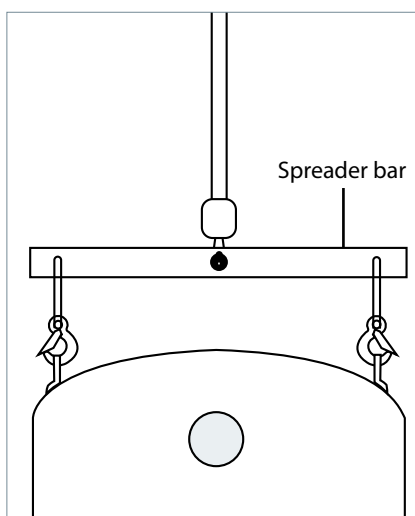
- Remove the suction plug first
- Remove the discharge plug afterwards
- ⚠ An opened compressor must not be exposed to air for more than 20 minutes to avoid moisture is captured by the POE oil.

Handling

- ⚠ Each Danfoss DSH 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 or compressor assembly.
- A spreader bar rated for the weight of the compressor is highly recommended to ensure a better load distribution.
- The use of lifting hooks closed with a clasp is recommended.

- For tandem and trio assemblies, use a spreader bar and all compressor rings as shown in picture below.
- Never use the lift rings on the compressor to lift the full unit.

Maintain the compressor in an upright position during all handling manoeuvres (maximum of 15° from vertical).



Assembly line procedure

Piping assembly

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

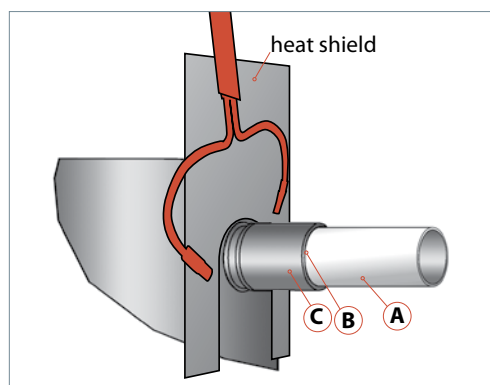
System cleanliness

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.



! Before eventual un-brazing of the compressor or any system component, the refrigerant charge must be removed.

System pressure test and leak detection

! The compressor has been strength tested and leak proof tested (<3g/year) at the factory. For system tests:

- Always use an inert gas such as Nitrogen or Helium.

- Pressurize the system on HP side first then LP side.
- Do not exceed the following pressures indicated in table below

Maximum compressor test pressures	DSH090-105-120-140-161-184	DSH240-295 -381-485
Maximum compressor test pressure high side (HP)	48.7bar (g) (706psig) HP-LP<37bar (537psi)	
Maximum compressor test pressure low side (LP)	33.3 bar (g) (483psig) LP-HP<5bar (73psi) Maximum speed 4.8bar/s (70psi/s)	34.3bar (g) (497psig) LP - HP <5bar (73psi) Maximum speed 4.8bar/s (70psi/s)*

*On DSH240-295-381-485 (models with internal non return valve in discharge fitting), or if an external non return valve is present on the discharge line, the maximum pressurizing

speed must be respected to ensure pressure equalization between LP and HP side over scroll elements.

Assembly line procedure

Vacuum evacuation and moisture removal



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 μ m 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" TI-026-0302.

Refrigerant charging



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" FRCC.EN.050.

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 2Un +1000V 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.

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Commissioning

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	 Check electrical power supply: <ul style="list-style-type: none"> • Phase order: Reverse rotation is obvious if the compressor do not build up pressure and sound level is abnormal high. For DSH090-184 compressors equipped with internal reverse vent valve which can protect compressor without damage within duration below 24h. For more details refer to section "Phase sequence and reverse rotation protection". 	<p>For DSH240 to DSH485 compressors equipped with an electronic module, reverse rotation will be automatically detected. For more details refer to section "Motor protection".</p> <ul style="list-style-type: none"> • Voltage and voltage unbalance within tolerance: For more details refer to section "Motor voltage".
	Initial start-up	
	<ul style="list-style-type: none"> • Surface sump 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	
PRODUCT INFORMATION	<p>The system must be monitored after initial startup for a minimum of 60 minutes to ensure proper operating characteristics such as:</p> <ul style="list-style-type: none"> • Correct superheat and subcooling. • Current draw of individual compressors within acceptable values (max operating current). • No abnormal vibrations and noise. • Correct oil level. 	<p>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 160SZ from new cans. For more detailed information see "Lubricants filling in instructions for Danfoss Commercial Compressors" TI 2-025-0402.</p>
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Dismantal and disposal



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

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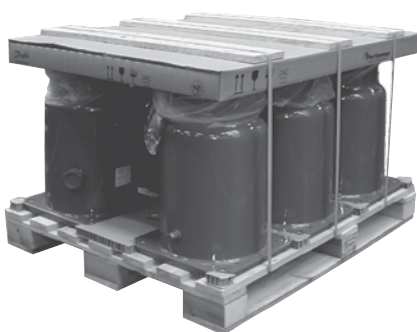
Packaging

Single pack



Compressor model	Length		Width		Height		Gross weight	
	mm	inch	mm	inch	mm	inch	kg	lbs
DSH090	565	22.2	470	18.5	718	28.3	69	152
DSH105	565	22.2	470	18.5	718	28.3	76	168
DSH120	565	22.2	470	18.5	718	28.3	76	168
DSH140	565	22.2	470	18.5	718	28.3	79	174
DSH161	565	22.2	470	18.5	718	28.3	81	179
DSH184	565	22.2	470	18.5	718	28.3	84	185
DSH240	760	29.9	600	23.6	900	35.4	124	273
DSH295	760	29.9	600	23.6	900	35.4	127	279
DSH381	760	29.9	600	23.6	900	35.4	174	383
DSH485	760	29.9	600	23.6	900	35.4	191	420

Industrial pack



Compressor model	Nbr*	Length		Width		Height		Gross weight		Static stacking pallets
		mm	inch	mm	inch	mm	inch	kg	lbs	
DSH090	8	1150	45.3	950	37.4	680	26.8	494	1089	2
DSH105	8	1150	45.3	950	37.4	750	29.5	544	1199	2
DSH120	8	1150	45.3	950	37.4	750	29.5	544	1199	2
DSH140	8	1150	45.3	950	37.4	750	29.5	566	1248	2
DSH161	8	1150	45.3	950	37.4	750	29.5	582	1283	2
DSH184	8	1150	45.3	950	37.4	750	29.5	606	1336	2
DSH240	6	1150	45.3	965	38	768	30.2	693	1528	2
DSH295	6	1150	45.3	965	38	768	30.2	712	1570	2
DSH381	4	1150	45.3	965	38	800	31.5	678	1494	2
DSH485	4	1150	45.3	965	38	800	31.5	744	1640	2

* nbr: number of compressors per pack

Ordering codes

Compressor code numbers

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

For compressors DSH240 to DSH485 use in single applications, flexible grommets are available as accessory kit 8156138.

Single pack



Compressors DSH090 to DSH184 are delivered with flexible grommets.

Compressors compatible R452B and R410A

Compressor model	Connections	Motor protection	Code no.			
			3	4	7	9
			200-230/3/60	380-415/3/50 460/3/60	575/3/60	380-400/3/60
DSH090	Brazed	Internal	-	120H1182	-	-
DSH105	Brazed	Internal	-	120H1190	-	-
DSH120	Brazed	Internal	-	120H1198	-	-
DSH140	Brazed	Internal	-	120H1206	-	-
DSH161	Brazed	Internal	-	120H1214	-	-
DSH184	Brazed	Internal	-	120H1222	-	-
DSH240	Brazed	Module 24V AC*	-	120H1376	-	-
	Brazed	Module 110-240V *	-	120H1374	-	-
DSH295	Brazed	Module 24V AC*	-	120H1372	-	-
	Brazed	Module 110-240V *	-	120H1370	-	-
DSH381	Brazed	Module 24V AC*	-	120H1368	-	-
	Brazed	Module 110-240V *	-	120H1366	-	-
DSH485	Brazed	Module 24V AC*	-	120H1364	-	-
	Brazed	Module 110-240V *	-	120H1362	-	-

* Electronic motor protection, module located in terminal box

Mounting kit for DSH240-295-381-485 single compressor applications : Ref 8156138

Compressors compatible R410A only

Compressor model	Connections	Motor protection	Code no.			
			3	4	7	9
			200-230/3/60	380-415/3/50 460/3/60	575/3/60	380-400/3/60
DSH090	Brazed	Internal	120H1180	-	120H1184	120H1186
DSH105	Brazed	Internal	120H1188	-	120H1192	120H1194
DSH120	Brazed	Internal	120H1196	-	120H1200	120H1202
DSH140	Brazed	Internal	120H1204	-	120H1208	120H1210
DSH161	Brazed	Internal	120H1212	-	120H1216	120H1218
DSH184	Brazed	Internal	120H1220	-	120H1224	120H1226
DSH240	Brazed	Module 24V AC*	120H1291**	120H1331**	120H1299**	120H1315**
	Brazed	Module 110-240V *	120H1289**	120H1329**	120H1298**	120H1313**
DSH295	Brazed	Module 24V AC*	120H1287**	120H1327**	120H1297**	120H1311**
	Brazed	Module 110-240V *	120H1285**	120H1325**	120H1296**	120H1309**
DSH381	Brazed	Module 24V AC*	120H1283	120H1323**	120H1295	120H1307**
	Brazed	Module 110-240V *	120H1281	120H1321**	120H1294	120H1305**
DSH485	Brazed	Module 24V AC*	120H1344	120H1319**	120H1293	120H1303
	Brazed	Module 110-240V *	-	120H1317**	120H1292	120H1301

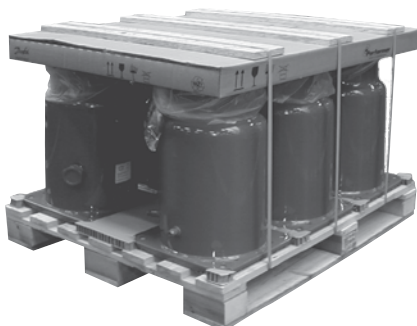
* Electronic motor protection, module located in terminal box

** Will be available Q2 2019

Mounting kit for DSH240-295-381-485 single compressor applications : Ref 8156138

Ordering codes

Industrial pack



Compressors compatible R452B and R410A

Compressor model	Connections	Motor protection	Code no.			
			3	4	7	9
			200-230/3/60	380-415/3/50 460/3/60	575/3/60	380-400/3/60
DSH090	Brazed	Internal	-	120H1183	-	-
DSH105	Brazed	Internal	-	120H1191	-	-
DSH120	Brazed	Internal	-	120H1199	-	-
DSH140	Brazed	Internal	-	120H1207	-	-
DSH161	Brazed	Internal	-	120H1215	-	-
DSH184	Brazed	Internal	-	120H1223	-	-
DSH240	Brazed	Module 24V AC*	-	120H1375	-	-
	Brazed	Module 110-240V *	-	120H1373	-	-
DSH295	Brazed	Module 24V AC*	-	120H1371	-	-
	Brazed	Module 110-240V *	-	120H1369	-	-
DSH381	Brazed	Module 24V AC*	-	120H1367	-	-
	Brazed	Module 110-240V *	-	120H1365	-	-
DSH485	Brazed	Module 24V AC*	-	120H1363	-	-
	Brazed	Module 110-240V *	-	120H1361	-	-

* Electronic motor protection, module located in terminal box

Compressors compatible R410A only

Compressor model	Connections	Motor protection	Code no.			
			3	4	7	9
			200-230/3/60	380-415/3/50 460/3/60	575/3/60	380-400/3/60
DSH090	Brazed	Internal	120H1181	-	120H1185	120H1187
DSH105	Brazed	Internal	120H1189	-	120H1193	120H1195
DSH120	Brazed	Internal	120H1197	-	120H1201	120H1203
DSH140	Brazed	Internal	120H1205	-	120H1209	120H1211
DSH161	Brazed	Internal	120H1213	-	120H1217	120H1219
DSH184	Brazed	Internal	120H1221	-	120H1225	120H1227
DSH240	Brazed	Module 24V AC*	120H1290**	120H1330**	-	120H1314**
	Brazed	Module 110-240V *	120H1288**	120H1328**	-	120H1312**
DSH295	Brazed	Module 24V AC*	120H1286**	120H1326**	-	120H1310**
	Brazed	Module 110-240V *	120H1284**	120H1324**	-	120H1308**
DSH381	Brazed	Module 24V AC*	120H1282	120H1322**	-	120H1306**
	Brazed	Module 110-240V *	120H1280	120H1320**	-	120H1304**
DSH485	Brazed	Module 24V AC*	120H1343	120H1318**	-	120H1302
	Brazed	Module 110-240V *	-	120H1316**	-	120H1300

* Electronic motor protection, module located in terminal box

** Will be available Q2 2019

Ordering codes

Tandem kits

By default, DSH tandems and trios are not factory-built. To complete an assembly in the field, you will need:

- Tubings, according to specific outline drawings.
- Manifolding accessory kit indicated below

- Compressors.

Note that to get a tandem compatible with R452B you have to make sure that each compressor composing the tandem is R452B compatible.

Tandem Model	Cp1	Cp2	Suction From	Tandem Kit Code No.	Mounting kit
DSH180E	DSH090	DSH090	Left	120Z0634	Not needed
DSH195U	DSH090	DSH105	Right	120Z0694	
DSH210U	DSH090	DSH120	Left	120Z0694	
DSH210E	DSH105	DSH105	Right	120Z0634	
DSH230U	DSH090	DSH140	Left	120Z0694	
DSH240E	DSH120	DSH120	Right	120Z0634	
DSH251U	DSH090	DSH161	Left	120Z0694	
DSH260U	DSH120	DSH140	Right	120Z0692	
DSH274U	DSH090	DSH184	Left	120Z0693	
DSH281U	DSH120	DSH161	Right	120Z0692	
DSH280E	DSH140	DSH140	Left	120Z0634	
DSH289U	DSH105	DSH184	Right	120Z0693	
DSH301U	DSH140	DSH161	Left	120Z0692	
DSH304U	DSH120	DSH184	Right	120Z0694	
DSH322E	DSH161	DSH161	Left	120Z0634	
DSH324U	DSH140	DSH184	Right	120Z0694	
DSH345U	DSH161	DSH184	Left	120Z0694	
DSH368E	DSH184	DSH184	Right	120Z0634	
DSH360X	DSH120	DSH240	Left	120Z0709	
DSH424X	DSH184	DSH240	Right	120Z0709	
DSH456X	DSH161	DSH295	Left	120Z0709	
DSH479X	DSH184	DSH295	Right	120Z0709	
DSH565X	DSH184	DSH381	Left	120Z0709	
DSH482E	DSH240	DSH240	Right	7777041	
DSH535U	DSH240	DSH295	Left	7777037	
DSH590E	DSH295	DSH295	Right	7777041	
DSH620U	DSH240	DSH381	Left	7777048	
DSH675U	DSH295	DSH381	Right	7777037	
DSH725U	DSH240	DSH485	Left	120Z0569	
DSH760E	DSH381	DSH381	Right	7777041	
DSH780U	DSH295	DSH485	Left	120Z0551	
DSH865U	DSH381	DSH485	Right	120Z0550	
DSH970E	DSH485	DSH485	Left	120Z0578	

For example: Tandem DSH535U

- Compressor 1: DSH240 Code number 120H1122 (Motor code 4/110-240V electronic module/Industrial pack)
- Compressor 2: DSH295 Code number 120H1126 (Motor code 4/110-240V electronic module/Industrial pack)
- Tandem kit DSH535U: Code number 7777037

For example: Tandem DSH324U

- Compressor 1: DSH140 Code number 120H1207 (Motor code 4 /Industrial pack)
- Compressor 2: DSH184 Code number 120H1223 (Motor code 4 /Industrial pack)
- Tandem kit DSH324U 120Z0647

Ordering codes

Trio kits

By default, DSH tandems and trios are not factory-built.
To complete an assembly in the field, you will need:
- Tubings, according to specific outline drawings.

- Manifolding accessory kit indicated below
- Compressors.
Note that to get a trio compatible with R452B you have to make sure that each compressor composing the trio is R452B compatible

Trio model	Cp1	Cp2	Cp3	Suction from	Trio Kit code n°	Mounting kit
DSH420	=	DSH140	DSH140	Left	120Z0672	
DSH483	=	DSH161	DSH161	Right	120Z0684	
DSH552	=	DSH184	DSH184	Left	120Z0685	
DSH720	=	DSH240	DSH240	Right	120Z0673	
DSH885	=	DSH295	DSH295	Left	7777039	
DSH1140	=	DSH381	DSH381	Right	120Z0673	
DSH1245	=	DSH381	DSH381	Left	120Z0686	
DSH1350	=	DSH381	DSH485	Right	120Z0688	
DSH1455	=	DSH485	DSH485	Left	7777063	
				Right	7777063	
				Left	7777040	

For example : Trio DSH1245
- Compressors 1 and 2: DSH381 Code number 120H1130 (Motor code 4/110-240V electronic module/Industrial pack)
- Compressor 3: DSH485 Code number 120H1134 (Motor code 4/110-240V electronic module/Industrial pack)
- Trio kit DSH1245: Code number 7777063

For example: Trio DSH420
- Compressor 1, 2 and 3: DSH140 Code number 120H1207
- Trio kit DSH420: Code number 120Z0672

Not needed

Accessories

Solder sleeve adapter set



Code no.	Description	Application	Packaging	Pack size
120Z0125	Rotolock adaptor set (1"3/4 ~ 1"1/8) , (1"1/4 ~ 7/8")	DSH090	Multipack	8
120Z0405	Rotolock adaptor set (1"3/4 ~ 1"3/8) , (1"1/4 ~ 7/8")	DSH105 to 184	Multipack	8
7765028	Rotolock adaptor set (2"1/4 ~ 1"5/8) , (1"3/4 ~ 1"1/8)	DSH240-295-381	Multipack	6
120Z0504	Rotolock adaptor set (2"1/4 ~ 1"5/8) , (1"3/4 ~ 1"3/8)	DSH485	Multipack	6

Rotolock adapter



Code no.	Description	Application	Packaging	Pack size
120Z0367	Adaptor (1"1/4 Rotolock - 7/8" ODS)	Models with 7/8" ODF	Multipack	10
120Z0364	Adaptor (1"3/4 Rotolock - 1"1/8 ODS)	Models with 1"1/8 ODF	Multipack	10
120Z0431	Adaptor (1"3/4 Rotolock - 1"3/8 ODS)	Models with 1"3/8 ODF	Multipack	10
120Z0432	Adaptor (2"1/4 Rotolock - 1"5/8 ODS)	Models with 1"5/8 ODF	Multipack	10

Gaskets



Code no.	Description	Application	Packaging	Pack size
8156131	Gasket, 1"1/4	Models with 1"1/4 rotolock connection	Multipack	10
7956002	Gasket, 1"1/4	Models with 1"1/4 rotolock connection	Industry pack	50
8156132	Gasket, 1"3/4	Models with 1"3/4 rotolock connection	Multipack	10
7956003	Gasket, 1"3/4	Models with 1"3/4 rotolock connection	Industry pack	50
8156133	Gasket, 2"1/4	Models with 2"1/4 rotolock connection	Multipack	10
7956004	Gasket, 2"1/4	Models with 2"1/4 rotolock connection	Industry pack	50

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
8153008	Solder sleeve P04 (1"1/4 Rotolock - 3/4" ODF)	Models with 1"1/4 rotolock connection	Multipack	10
8153012	Rotolock connector P05 (1"1/4 Rotolock - 7/8" ODF)	Models with 1"1/4 rotolock connection	Multipack	10
8153013	Solder sleeve P07 (1"3/4 Rotolock - 7/8" ODF)	Models with 1"3/4 rotolock connection	Multipack	10
8153003	Solder sleeve P10 (1"3/4 Rotolock - 1"3/8 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

Accessories

Rotolock nut



Code no.	Description	Application	Packaging	Pack size
8153123	Rotolock nut, 1"1/4	Models with 1-1/4" rotolock connection	Multipack	10
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

Rotolock service valve set



Code no.	Description	Application	Packaging	Pack size
7703008	Valve set, V02 (1"3/4 ~ 1"1/8), V05 (1"1/4 ~ 7/8")	DSH090	Multipack	6
7703392	Valve set, V10 (1"3/4 ~ 1"3/8), V05 (1"1/4 ~ 7/8")	DSH105 to 184	Multipack	6
7703383	Valve set, V03 (2"1/4 ~ 1"5/8), V02 (1"3/4 ~ 1"1/8)	DSH240-295-381	Multipack	4
120Z0547	Valve set, V03 (2"1/4 ~ 1"5/8), V10 (1"3/4 ~ 1"3/8)	DSH485	Multipack	4

* diameter restriction

3-phase soft start equipment



Code no.	Description	Application	Packaging	Pack size
7705006	Electronic soft start kit, MCI 15 C	DSH090	Single pack	1
7705007	Electronic soft start kit, MCI 25 C	DSH105 to 184	Single pack	1
037N0401	Electronic soft start kit, MCI50CM	DSH240-295-381	Single pack	1
175G5205	Electronic soft start kit MCD201-055-T6-CV1	DSH485*	Single pack	1
175G5510	Electronic soft start kit MCD5-0195B-T5	DSH485 code 3	Single pack	1

Motor protection modules

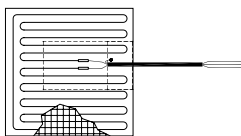


Code no.	Description	Application	Packaging	Pack size
120Z0584	Electronic motor protection module, 24 V AC	DSH240-295-381-485*	Single pack	1
120Z0585	Electronic motor protection module, 115/240 V	DSH240-295-381-485*	Single pack	1
120Z0624	Electronic motor protection module, 24V AC	DSH485 code 3	Single pack	1

*except DSH485 code 3

Accessories

Surface sump heaters



Code no.	Description	Application	Packaging	Pack size
120Z0667	48W 24V surface sump heater CE and UL	DSH090 to 184	Single pack	1
120Z0668	48W 230V surface sump heater CE and UL		Single pack	1
120Z0669	48W 400V surface sump heater CE and UL		Single pack	1
120Z0670	48W 460V surface sump heater CE and UL		Single pack	1
120Z0671	48W 575V surface sump heater CE and UL		Single pack	1
120Z0388	80W 24V surface sump heater CE and UL		Multipack	8
120Z0389	80W 230V surface sump heater CE and UL		Multipack	8
120Z0390	80W 400V surface sump heater CE and UL		Multipack	8
120Z0391	80W 460V surface sump heater CE and UL		Multipack	8
120Z0402	80W 575V surface sump heater CE and UL		Multipack	8
120Z0703	56W 24V surface sump heater + bottom insulation, CE & UL	DSH240-295-381-485	Multipack	6
120Z0704	56W 230V surface sump heater + bottom insulation, CE & UL	DSH240-295-381-485	Multipack	6
120Z0705	56W 400V surface sump heater + bottom insulation, CE & UL	DSH240-295-381-485	Multipack	6
120Z0706	56W 460V surface sump heater + bottom insulation, CE & UL	DSH240-295-381-485	Multipack	6
120Z0707	56W 575V surface sump heater + bottom insulation, CE & UL	DSH240-295-381-485	Multipack	6

Discharge temperature protection



Code no.	Description	Application	Packaging	Pack Size
7750009	Discharge thermostat kit	DSH090 to 184	Multipack	10
7973008	Discharge thermostat kit	DSH090 to 184	Industry pack	50

Mounting hardware



Code no.	Description	Application	Packaging	Pack Size
120Z0066	Mounting kit for scroll compressors. Grommets, sleeves, bolts, washers	DSH090 to 184	Single pack	1
8156138	Mounting kit for scroll compressors. Grommets, sleeves, bolts, washers	DSH240 to 485 in single installation	Single pack	1

Accessories

Lubricant



Code no.	Description	Packaging	Pack Size
7754023	POE lubricant, 1 litre can	Multipack	12
120Z0571	POE lubricant, 2.5 litre can	Multipack	4

Acoustic hoods



Code no.	Description	Application	Packaging	Pack Size
120Z0034	Acoustic hood for scroll compressor	DSH090	Single pack	1
120Z0035	Acoustic hood for scroll compressor	DSH105 to 161 (except DSH161-140 code3)	Single pack	1
120Z0135	Acoustic hood for scroll compressor	DSH184 - DSH140 code3 - DSH161 code3	Single pack	1
120Z0022	Acoustic hood for scroll compressor	DSH240-295-381*-485*	Single pack	1
120Z0579	Acoustic hood for scroll compressor	DSH381 code 3	Single pack	1
120Z0353	Bottom insulation for scroll compressor	DSH240-295-381-485	Single pack	1

* except code 3

Terminal boxes, covers and T-block connectors



Code no.	Description	Application	Packaging	Pack Size
120Z0413	Terminal box cover	DSH184 - DSH140 code3 - DSH161 code3	Single pack	1
8156135	Service kit for terminal box 96 x 115 mm, including 1 cover, 1 clamp	DSH090 to 161 (except DSH140 code3 and DSH161 code3)	Multipack	10
8173230	T block connector 52 x 57 mm	DSH090 to 161 (except DSH140 code3 and DSH161 code3)	Multipack	10
8173021	T block connector 60 x 75 mm	DSH184 - DSH140 code3 - DSH161 code3 DSH240*-295*-381*	Multipack	10
8173331	T block connector 80x80 mm	DSH240-295-381 code 3 DSH485	Multipack	10
120Z0458	Terminal box 210 x 190 mm, incl. cover	DSH240-295-381*-485*	Single pack	1
120Z0150	Terminal box cover	DSH381 code 3	Single pack	1
120Z0604	Terminal box 210x340mm, incl. cover	DSH485 code 3	Single pack	1

* except code 3

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

Accessories

Tandem kits



Code no.	Description	Application	Packaging	Pack Size
120Z0634	Suction washer, rigid spacer, organ pipe, gasket	DSH180E-210E-240E-280E-322E-368E	Single pack	1
120Z0692	Suction washer, rigid spacer, organ pipe, gasket	DSH260U-281U-301U	Single pack	1
120Z0693	Suction washer, rigid spacer, organ pipe, gasket	DSH274U-289U	Single pack	1
120Z0694	Suction washer, rigid spacer, organ pipe, gasket	DSH195U-210U-230U-251U-304U-324U-345U	Single pack	1
120Z0660	Suction washer, rigid spacer, organ pipe, gasket	DSH274	Single pack	1
120Z0709	Suction washer, rigid spacer, grommets, organ pipe, sleeve, gasket	DSH360X-424X-456X-479X-565X	Single pack	1
7777041	Suction washer, grommets, sleeve for oil connect	DSH482.590.760	Single pack	1
7777037	Suction washer, grommets, sleeve for oil connect	DSH535.675	Single pack	1
7777048	Suction washer, grommets, sleeve for oil connect	DSH620	Single pack	1
120Z0569	Suction washer, grommets, sleeve for oil connect	DSH725	Single pack	1
120Z0550	Suction washer, grommets, sleeve for oil connect	DSH865	Single pack	1
120Z0551	Suction washer, grommets, sleeve for oil connect	DSH780	Single pack	1
120Z0578	Suction washer, grommets, sleeve for oil connect	DSH970	Single pack	1

Trio kits



Code no.	Description	Application	Packaging	Pack Size
120Z0672	Organ pipe, sleeves, rigid spacer, gasket, rubber grommet	DSH420	Single pack	1
120Z0684	Organ pipe, sleeves, rigid spacer, gasket, rubber grommet	DSH483	Single pack	1
120Z0685	Organ pipe, sleeves, rigid spacer, gasket, rubber grommet	DSH552	Single pack	1
7777039	Suction washer, grommets, sleeve for oil connect	DSH720.885 (right suction)	Single pack	1
120Z0673	Suction washer, grommets, sleeve for oil connect	DSH720.885 (left suction)	Single pack	1
7777040	Suction washer, grommets, sleeve for oil connect	DSH 1455 (left and right suction)	Single pack	1
120Z0688	Suction washer, grommets, sleeve for oil connect	DSH1140 (right suction)	Single pack	1
120Z0686	Suction washer, grommets, sleeve for oil connect	DSH1140 (left suction)	Single pack	1
7777063	Suction washer, grommets, sleeve for oil connect	DSH1245.1350	Single pack	1

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We have 40 years of experience within the development of hermetic compressors which has brought us amongst the global leaders in our business, and positioned us as distinct variable speed technology specialists. Today we operate from engineering and manufacturing facilities spanning across three continents.



Danfoss Scrolls



Danfoss Inverter Scrolls



Danfoss Light Commercial Refrigeration Compressors



Danfoss Maneurop Reciprocating Compressors



Danfoss Turbocor Compressors



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Our products can be found in a variety of applications such as rooftops, chillers, residential air conditioners, heatpumps, coldrooms, supermarkets, milk tank cooling and industrial cooling processes.

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