ENGINEERING
TOMORROW

Application guidelines

Danfoss scroll compressors
DSH 090 to 485
Single and manifold

50 Hz - 60 Hz - R410A

http://cc.danfoss.com

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:

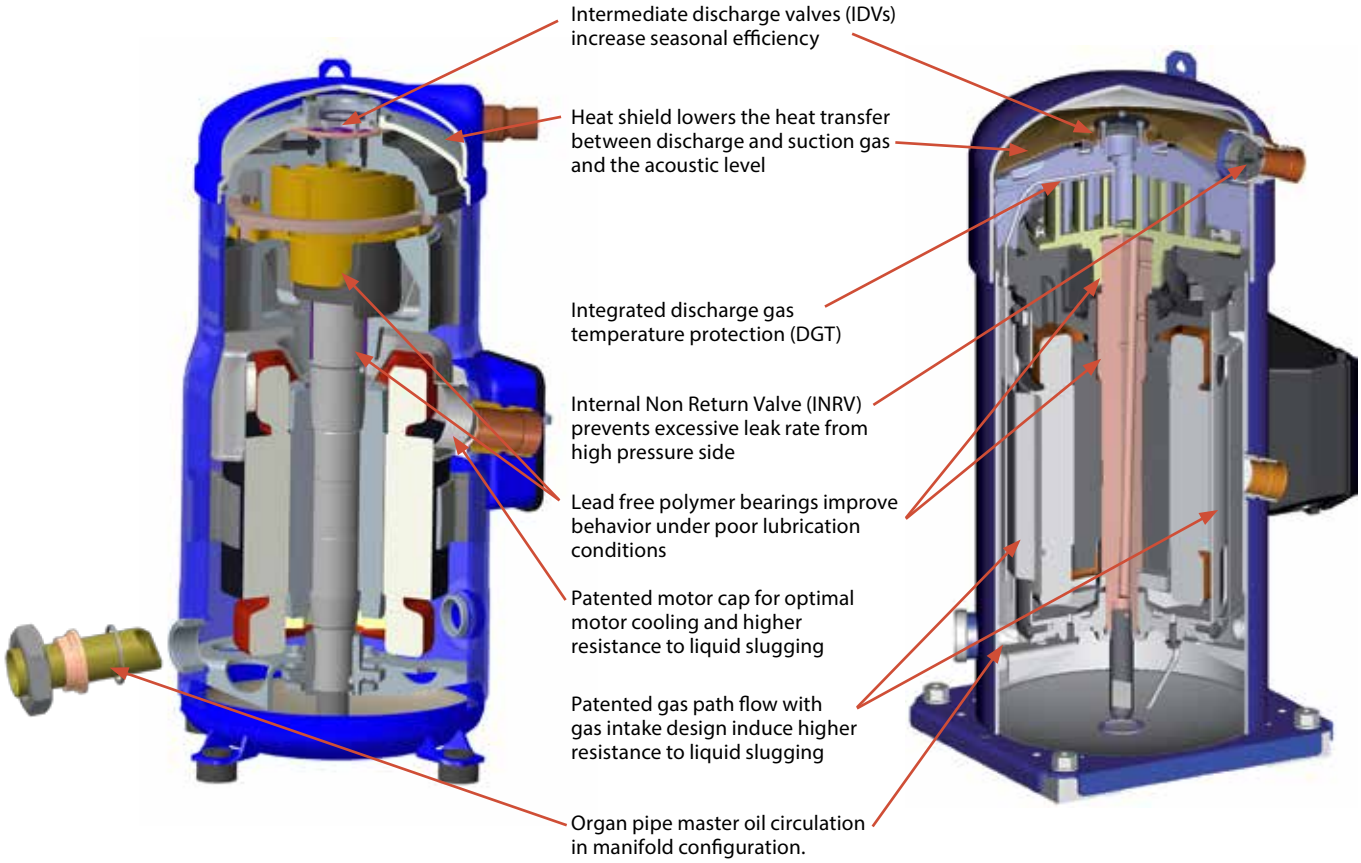
 This icon indicates instructions to avoid safety risk.

 This icon indicates instructions to avoid reliability risk.

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

Overview

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



DSH090-105-120-140-161-184

DSH240-295-381-485

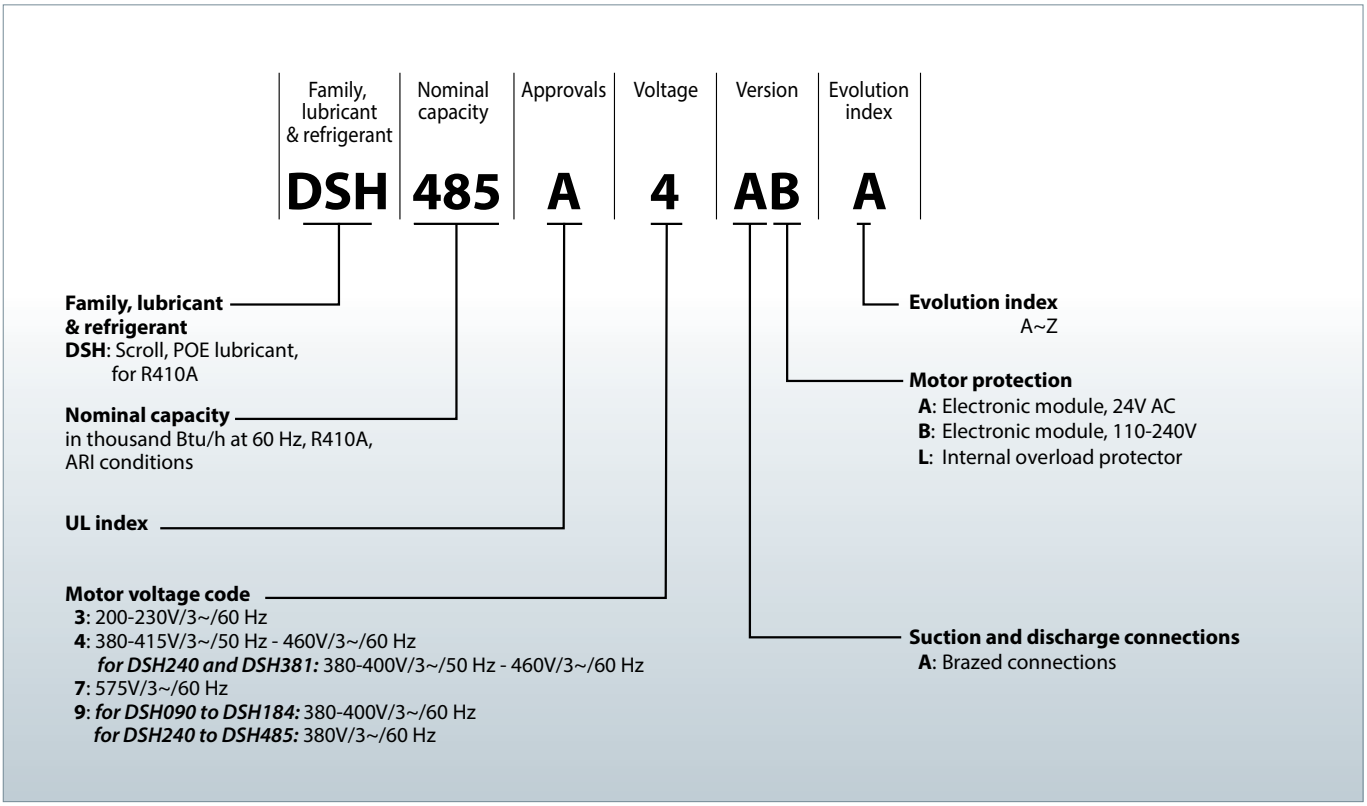
How do IDVs work?

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.

Compressor model designation

Danfoss scroll compressor DSH for R410A 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



50-60 Hz data
Single compressor

Model		Nominal tons 60 Hz	Nominal cooling capacity		Power input	COP	E.E.R.	Swept volume		Displacement ①		Oil charge		Net weight ②	
		TR	W	Btu/h	kW	W/W	Btu/h/W	cm^3/rev	cu.in/rev	m^3/h	cu.ft/h	dm^3	oz	kg	lbs
50 Hz	DSH090	7.5	20050	68413	6.54	3.06	10.46	88.4	5.39	15.4	544	3.0	102	58	128
	DSH105	9.0	23580	80457	7.65	3.08	10.52	103.5	6.32	18.0	636	3.3	113	64	141
	DSH120	10.0	26790	91410	8.61	3.11	10.62	116.9	7.13	20.3	717	3.3	113	64	141
	DSH140	12.0	30370	103625	9.69	3.13	10.69	133	8.12	23.1	816	3.3	113	67	148
	DSH161	13.0	34890	119048	11.03	3.16	10.79	151.7	9.26	26.4	932	3.3	113	69	152
	DSH184	15.0	39040	133208	12.36	3.16	10.78	170.3	10.39	29.6	1045	3.6	123	71.5	158
	DSH240	20.0	52730	179920	17.04	3.09	10.56	227.60	13.89	39.6	1398	6.7	229	108	238
	DSH295	25.0	64520	220149	20.35	3.17	10.82	276.20	16.85	48.1	1699	6.7	229	111	245
	DSH381	30.0	81490	278052	26.21	3.11	10.61	345.00	21.05	60	2119	6.7	229	159	351
	DSH485	40.0	103500	353152	32.72	3.16	10.79	442.60	27.01	77	2719	6.7	229	175	386
60 Hz	DSH090	7.5	27470	93730	8.55	3.21	10.96	88.4	5.39	18.6	657	3.0	102	58	128
	DSH105	9.0	32280	110100	10.01	3.22	11.00	103.5	6.32	21.8	770	3.3	113	64	141
	DSH120	10.0	36630	125000	11.25	3.26	11.11	116.9	7.13	24.6	869	3.3	113	64	141
	DSH140	12.0	41510	141600	12.75	3.26	11.11	133	8.12	27.9	985	3.3	113	67	148
	DSH161	13.0	47220	161100	14.7	3.21	10.96	151.7	9.26	31.9	1127	3.3	113	69	152
	DSH184	15.0	53160	181400	16.36	3.25	11.09	170.3	10.39	35.8	1264	3.6	123	71.5	158
	DSH240	20.0	71760	244852	22.46	3.20	10.90	227.60	13.89	47.8	1688	6.7	229	108	238
	DSH295	25.0	87610	298934	26.96	3.25	11.09	276.20	16.85	58	2048	6.7	229	111	245
	DSH381	30.0	110300	376355	34.52	3.20	10.90	345.00	21.05	72.3	2553	6.7	229	159	351
	DSH485	40.0	141900	484177	43.66	3.25	11.09	442.60	27.01	92.9	3281	6.7	229	175	386

① Displacement at nominal speed: 2900 rpm at 50 Hz, 3500 rpm at 60 Hz
② Net weight with oil charge

TR: Ton of Refrigeration,
EER: Energy Efficiency Ratio
COP: Coefficient Of Performance

Standard rating conditions
Refrigerant: R410A

For 50 Hz: Evaporating temperature: 5°C (41°F), Condensing temperature: 50°C (122°F), Superheat: 10 K (18°F), Subcooling: 0 K (0°F)
For 60 Hz: Evaporating temperature: 7.2°C (45°F), Condensing temperature: 54.4°C (130°F), Superheat: 11.1 K (20°F), Subcooling: 8.3 K (15°F)

Subject to modification without prior notification.
Data given for motor code 4 compressor with above condition, for full data details and capacity tables refer to Coolselector®2
www.coolselector.danfoss.com

50-60 Hz data
Tandem compressors

Model			Composition	Nominal tons 60 Hz	Nominal cooling capacity		Power input	COP	E.E.R.	Displacement ①	
				TR	W	Btu/h	kW	W/W	Btu/h/W	m^3/h	cu.ft/h
50 Hz	Tandem	DSH182	2xDSH090	15.0	39739	135590	13.1	3.04	10.36	30.8	1088
		DSH195	DSH090 + DSH105	16.5	43237	147526	14.2	3.05	10.40	33.4	1180
		DSH210	DSH090 + DSH120	17.5	46418	158380	15.1	3.06	10.46	35.7	1261
		DSH212	2xDSH105	18.0	46736	159462	15.3	3.06	10.43	36.0	1271
		DSH230	DSH090 + DSH140	19.0	49966	170485	16.2	3.08	10.50	38.5	1360
		DSH242	2xDSH120	20.0	53098	181170	17.2	3.08	10.53	40.6	1434
		DSH251	DSH090 + DSH161	20.5	54446	185768	17.6	3.10	10.57	41.8	1476
		DSH260	DSH140 + DSH120	22.0	56646	193275	18.3	3.10	10.56	43.4	1533
		DSH274	DSH090 + DSH184	22.5	58558	199801	18.9	3.10	10.57	45.0	1589
		DSH281	DSH161 + DSH120	23.5	61125	208558	19.6	3.11	10.62	46.7	1649
		DSH282	2xDSH140	23.5	60193	205380	19.4	3.11	10.60	46.2	1632
		DSH289	DSH105 + DSH184	24.0	62056	211737	20.0	3.10	10.58	47.6	1681
		DSH301	DSH161 + DSH140	25.0	64673	220663	20.7	3.12	10.65	49.5	1748
		DSH304	DSH120 + DSH184	25.0	65238	222590	21.0	3.11	10.62	49.9	1762
		DSH322	2xDSH161	26.5	69152	235947	22.1	3.13	10.70	52.8	1865
		DSH324	DSH140 + DSH184	27.0	68785	234695	22.1	3.12	10.64	52.7	1861
		DSH345	DSH161 + DSH184	28.0	73265	249979	23.4	3.13	10.69	56.0	1978
		DSH368	2xDSH184	30.0	77377	264011	24.7	3.13	10.68	59.2	2091
		DSH424	DSH184+DSH240	35.0	90944	310301	29.4	3.09	10.55	69.2	2444
		DSH479	DSH184+DSH295	40.0	102628	350167	32.7	3.14	10.71	77.7	2744
		DSH565	DSH184+DSH381	45.0	119445	407547	38.6	3.10	10.57	89.6	3164
60 Hz		DSH182	2xDSH090	15.0	54446	185768	17.1	3.18	10.86	37.2	1314
		DSH195	DSH090 + DSH105	16.5	59212	202032	18.6	3.19	10.88	40.4	1427
		DSH210	DSH090 + DSH120	17.5	63523	216741	19.8	3.21	10.94	43.2	1526
		DSH212	2xDSH105	18.0	63979	218296	20.0	3.20	10.90	43.6	1540
		DSH230	DSH090 + DSH140	19.0	68359	233242	21.3	3.21	10.95	46.5	1642
		DSH242	2xDSH120	20.0	72601	247713	22.5	3.23	11.01	49.2	1737
		DSH251	DSH090 + DSH161	20.5	74018	252549	23.3	3.18	10.86	50.5	1783
		DSH260	DSH140 + DSH120	22.0	77437	264214	24.0	3.23	11.01	52.5	1854
		DSH274	DSH090 + DSH184	22.5	79904	272634	24.9	3.21	10.94	54.4	1921
		DSH281	DSH161 + DSH120	23.5	83095	283521	26.0	3.20	10.93	56.5	1995
		DSH282	2xDSH140	23.5	82273	280715	25.5	3.23	11.01	55.8	1971
		DSH289	DSH105 + DSH184	24.0	84671	288898	26.4	3.21	10.96	57.6	2034
		DSH301	DSH161 + DSH140	25.0	87931	300022	27.5	3.20	10.93	59.8	2112
		DSH304	DSH120 + DSH184	25.0	88982	303606	27.6	3.22	11.00	60.4	2133
		DSH322	2xDSH161	26.5	93590	319329	29.4	3.18	10.86	63.8	2253
		DSH324	DSH140 + DSH184	27.0	93818	320107	29.1	3.22	11.00	63.7	2250
		DSH345	DSH161 + DSH184	28.0	99477	339414	31.1	3.20	10.93	67.7	2391
		DSH368	2xDSH184	30.0	105363	359499	32.7	3.22	10.99	71.6	2529
		DSH424	DSH184+DSH240	35.0	123796	422391	38.8	3.19	10.88	83.6	2952
		DSH479	DSH184+DSH295	40.0	139503	475984	43.3	3.22	10.99	93.8	3313
		DSH565	DSH184+DSH381	45.0	161989	552706	50.9	3.18	10.86	108.1	3818

① Displacement at nominal speed: 2900 rpm at 50 Hz, 3500 rpm at 60 Hz
② Net weight with oil charge

TR: Ton of Refrigeration,
EER: Energy Efficiency Ratio
COP: Coefficient Of Performance

Standard rating conditions
Refrigerant: R410A

For 50 Hz: Evaporating temperature: 5°C (41°F), Condensing temperature: 50°C (122°F), Superheat: 10 K (18°F), Subcooling: 0 K (0°F)
For 60 Hz: Evaporating temperature: 7.2°C (45°F), Condensing temperature: 54.4°C (130°F), Superheat: 11.1 K (20°F), Subcooling: 8.3 K (15°F)

Subject to modification without prior notification.
Data given for motor code 4 compressor with above condition, for full data details and capacity tables refer to Coolselector®2
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50-60 Hz data
Tandem and trios

Model			Composition	Nominal tons 60 Hz	Nominal cooling capacity		Power input	COP	E.E.R.	Displacement ①	
				TR	W	Btu/h	kW	W/W	Btu/h/W	m³/h	cu.ft/h
50 Hz	Tandem	DSH482	2xDSH240	40.0	104511	356602	34.1	3.07	10.46	79.2	2797
		DSH535	DSH240+DSH295	45.0	116195	396468	37.4	3.11	10.60	87.7	3097
		DSH590	2xDSH295	50.0	127879	436335	40.7	3.14	10.72	96.2	3397
		DSH620	DSH240+DSH381	50.0	133012	453850	43.3	3.08	10.49	99.6	3517
		DSH675	DSH295+DSH381	55.0	144696	493717	46.6	3.11	10.60	108.1	3818
		DSH725	DSH240+DSH485	60.0	154824	528275	49.8	3.11	10.62	116.6	4118
		DSH760	2xDSH381	60.0	161513	551099	52.4	3.08	10.51	120	4238
		DSH780	DSH295+DSH485	65.0	166508	568141	53.1	3.14	10.71	125.1	4418
		DSH865	DSH381+DSH485	70.0	183325	625524	58.9	3.11	10.61	137	4838
		DSH970	2xDSH485	80.0	205137	699948	65.4	3.13	10.70	154	5438
	Trio	DSH420	3xDSH140	35.0	89106	304028	29.1	3.07	10.46	69.3	2447
		DSH483	3xDSH161	39.0	102367	349277	33.1	3.09	10.56	79.2	2797
		DSH552	3xDSH184	44.0	114543	390822	37.1	3.09	10.54	88.8	3136
		DSH720	3xDSH240	60.0	154710	527885	51.1	3.03	10.33	118.8	4195
		DSH885	3xDSH295	75.0	189302	645916	61.1	3.10	10.58	144.3	5096
		DSH1140	3xDSH381	90.0	239092	815805	78.6	3.04	10.38	180	6357
		DSH1245	2xDSH381+DSH485	100.0	260617	889253	85.1	3.06	10.44	197	6957
		DSH1350	DSH381+2xDSH485	110.0	282143	962701	91.7	3.08	10.50	214	7557
		DSH1455	3xDSH485	120.0	303669	1036149	98.2	3.09	10.56	231	8158
60 Hz	Tandem	DSH482	2xDSH240	40.0	142228	485297	44.9	3.17	10.80	95.6	3376
		DSH535	DSH240+DSH295	45.0	157936	538892	49.4	3.20	10.90	105.8	3736
		DSH590	2xDSH295	50.0	173643	592487	53.9	3.22	10.99	116	4097
		DSH620	DSH240+DSH381	50.0	180421	615616	57.0	3.17	10.80	120.1	4241
		DSH675	DSH295+DSH381	55.0	196129	669211	61.5	3.19	10.89	130.3	4602
		DSH725	DSH240+DSH485	60.0	211737	722468	66.1	3.20	10.93	140.7	4969
		DSH760	2xDSH381	60.0	218615	745935	69.0	3.17	10.80	144.6	5107
		DSH780	DSH295+DSH485	65.0	227444	776063	70.6	3.22	10.99	150.9	5329
		DSH865	DSH381+DSH485	70.0	249930	852787	78.2	3.20	10.91	165.2	5834
		DSH970	2xDSH485	80.0	281246	959639	87.3	3.22	10.99	185.8	6561
	Trio	DSH420	3xDSH140	35.0	121790	415549	38.3	3.18	10.86	83.7	2956
		DSH483	3xDSH161	39.0	138543	472710	44.1	3.14	10.72	95.7	3380
		DSH552	3xDSH184	44.0	155971	532175	49.1	3.18	10.84	107.4	3793
		DSH720	3xDSH240	60.0	210544	718397	67.4	3.12	10.66	143.4	5064
		DSH885	3xDSH295	75.0	257048	877073	80.9	3.18	10.84	174	6145
		DSH1140	3xDSH381	90.0	323620	1104224	103.6	3.12	10.66	216.9	7660
		DSH1245	2xDSH381+DSH485	100.0	354525	1209675	112.7	3.15	10.73	237.5	8387
		DSH1350	DSH381+2xDSH485	110.0	385430	1315125	121.8	3.16	10.79	258.1	9115
		DSH1455	3xDSH485	120.0	416335	1420575	131.0	3.18	10.85	278.7	9842

① Displacement at nominal speed: 2900 rpm at 50 Hz, 3500 rpm at 60 Hz
② Net weight with oil charge

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EER: Energy Efficiency Ratio
COP: Coefficient Of Performance

Standard rating conditions
Refrigerant: R410A

For 50 Hz: Evaporating temperature: 5°C (41°F), Condensing temperature: 50°C (122°F), Superheat: 10 K (18°F), Subcooling: 0 K (0°F)
For 60 Hz: Evaporating temperature: 7.2°C (45°F), Condensing temperature: 54.4°C (130°F), Superheat: 11.1 K (20°F), Subcooling: 8.3 K (15°F)

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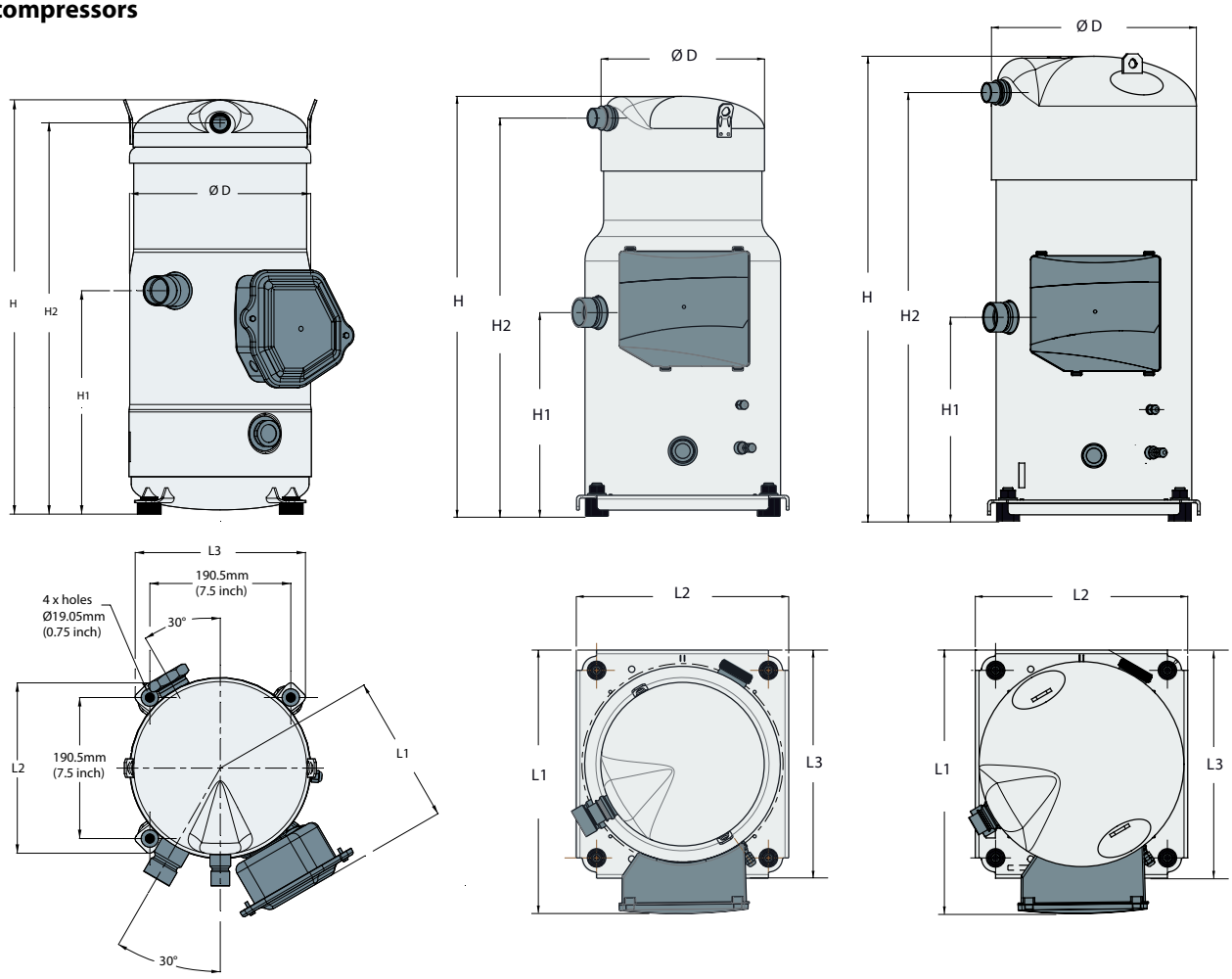
Dimensions

Single compressors



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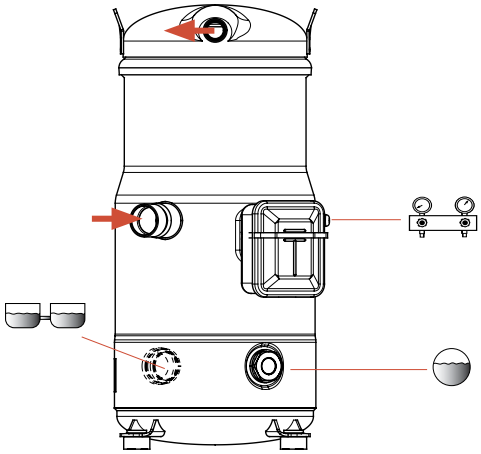
Compressor model	D		H		H1		H2		L1		L2		L3		Outline drawing number	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		
DSH090	243	9.57	485	19.09	235	9.25	451	17.76	180	7.09	230	9.06	230	9.06	❶	8560004
DSH105-120-140-161	243	9.57	542	21.34	278	10.94	509	20.04	180* 201**	7.09* 7.91**	230	9.06	230	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	318	12.52	683	26.89	331	13.03	648	25.51	428	16.85	345	13.58	371	14.61	❷	8556089
DSH295	318	12.52	683	26.89	331	13.03	648	25.51	428	16.85	345	13.58	371	14.61		
DSH381	333	13.11	755	29.72	331	13.03	697	27.44	428* 477**	16.85* 18.78**	345	13.58	371	14.61	❸	8556091* 8556059**
DSH485	333	13.11	755	29.72	331	13.03	697	27.44	428* 446**	16.85* 17.56**	345	13.58	371	14.61		8556133 8556160**

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

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 UNF)			
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	❶		❷	



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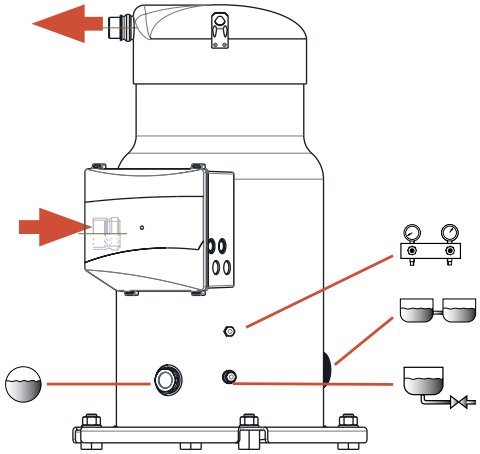

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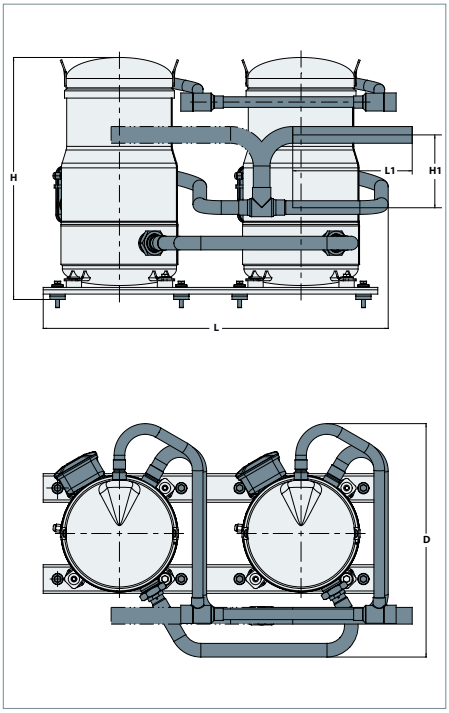
Tandem assemblies



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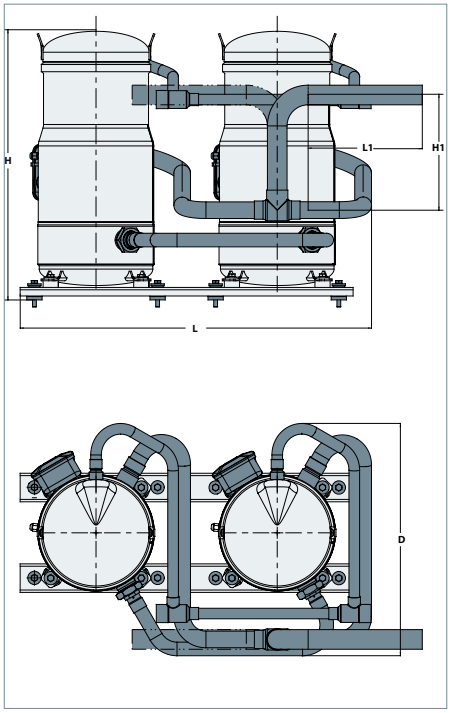

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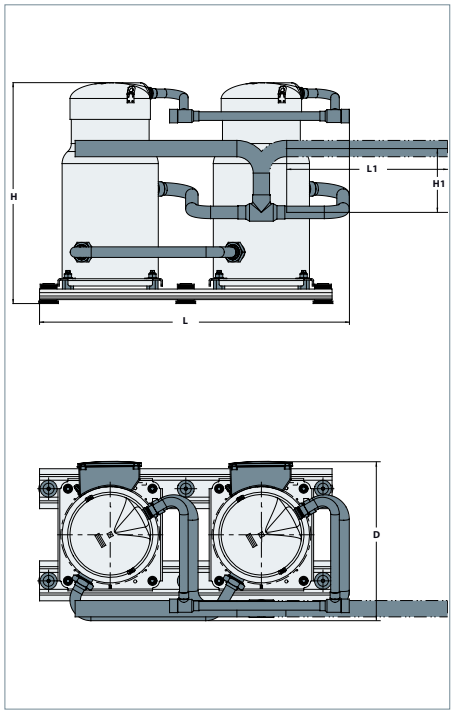

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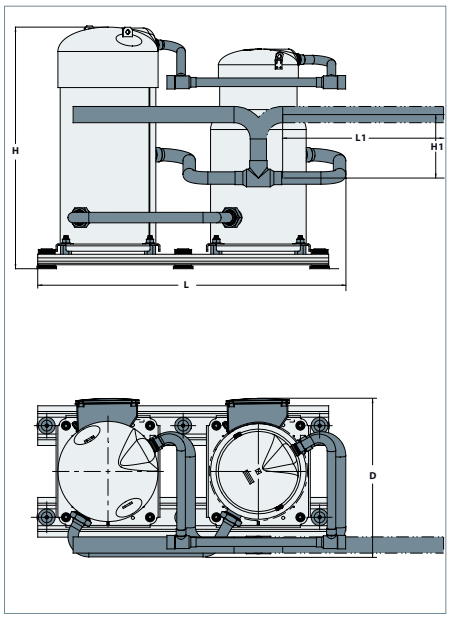

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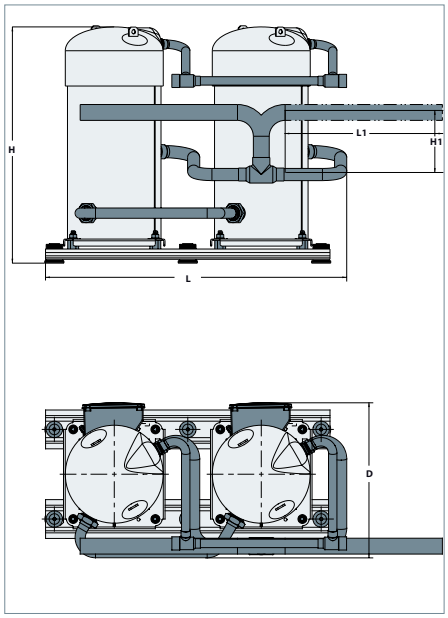

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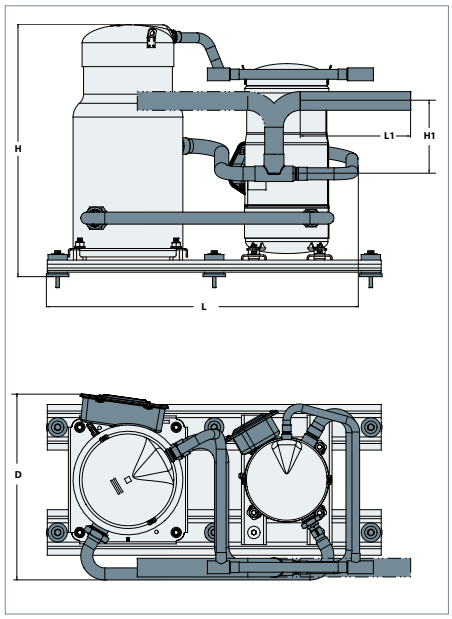

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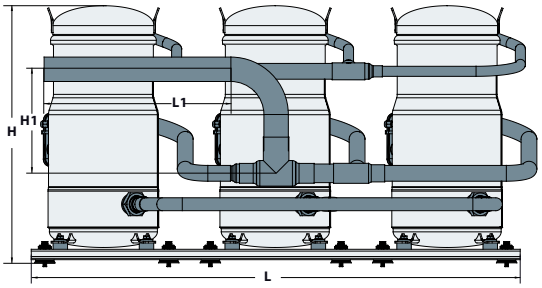
Dimensions

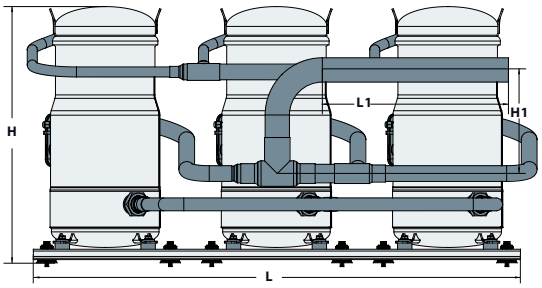
Tandem assemblies

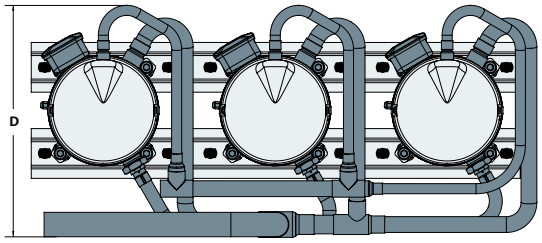
Tandem model	Composition	L		D		H		L1		H1		Outline drawing number	
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		
DSH182	DSH090 + DSH090	723	28.46	488	19.21	507	19.96			152	5.98	❶	8560092
DSH195	DSH090 + DSH105	723	28.46	488	19.21	565	22.24			152	5.98	❶	8560101
DSH210	DSH090 + DSH120	723	28.46	488	19.21	565	22.24			152	5.98	❶	8560101
DSH212	DSH105 + DSH105	738	29.06	488	19.21	565	22.24			242	9.53	❷	8560093
DSH230	DSH090 + DSH140	723	28.46	488	19.21	565	22.24			152	5.98	❶	8560101
DSH242	DSH120 + DSH120	738	29.06	488	19.21	565	22.24			242	9.53	❷	8560093
DSH251	DSH090 + DSH161	723	28.46	488	19.21	565	22.24			152	5.98	❶	8560101
DSH260	DSH140 + DSH120	738	29.06	488	19.21	565	22.24			152	5.98	❶	8560103
DSH274	DSH090 + DSH184	745	29.33	488	19.21	580	22.83	240 min	9.45 min	152	5.98	❶	8556185
DSH281	DSH161 + DSH120	738	29.06	488	19.21	565	22.24			152	5.98	❶	8560103
DSH282	DSH140 + DSH140	738	29.06	488	19.21	565	22.24			242	9.53	❷	8560093
DSH289	DSH105 + DSH184	738	29.06	488	19.21	580	22.83			152	5.98	❶	8560102
DSH301	DSH161 + DSH140	738	29.06	488	19.21	565	22.24			152	5.98	❶	8560103
DSH304	DSH120 + DSH184	738	29.06	488	19.21	580	22.83			152	5.98	❶	8560102
DSH322	DSH161 + DSH161	738	29.06	488	19.21	565	22.24			242	9.53	❷	8560093
DSH324	DSH140 + DSH184	738	29.06	488	19.21	580	22.83			152	5.98	❶	8560102
DSH345	DSH161 + DSH184	738	29.06	488	19.21	580	22.83			242	9.53	❷	8556186
DSH368	DSH184 + DSH184	745	29.33	494	19.45	580	22.83			242	9.53	❷	8560094
DSH424	DSH184+DSH240	903	35.55	539	21.22	730	28.74					❻	8556179
DSH479	DSH184+DSH295	903	35.55	539	21.22	730	28.74	320 min	12.60 min	211	8.31	❻	8556179
DSH565	DSH184+DSH381	903	35.55	533	20.98	803	31.61					❻	8556180
DSH482	DSH240 + DSH240	1025	40.35	527	20.75	731	28.78						8556112
DSH535	DSH240 + DSH295	1025	40.35	527	20.75	731	28.78					❸	8556112
DSH590	DSH295 + DSH295	1025	40.35	527	20.75	731	28.78						8556112
DSH620	DSH240 + DSH381	1025	40.35	527*/576**	20.75*/22.68**	803	31.61	535 min	21.06 min				8556115
DSH675	DSH295 + DSH381	1025	40.35	527*/576**	20.75*/22.68**	803	31.61					❹	8556115
DSH725	DSH240 + DSH485	1025	40.35	546/563**	21.50*/22.17**	803	31.61			211	8.31		8556134
DSH760	DSH381 + DSH381	1025	40.35	527*/576**	20.75*/22.68**	803	31.61					❺	8556117
DSH780	DSH295 + DSH485	1025	40.35	546*/563**	21.50*/22.17**	803	31.61					❹	8556141
DSH865	DSH381 + DSH485	1025	40.35	553*/570**	21.77*/22.44**	803	31.61	640 min	25.20 min			❺	8556136
DSH970	DSH485 + DSH485	1025	40.35	553*/570**	21.77*/22.44**	803	31.61						8556137

* compressor motor codes 4, 7, 9
** compressor motor code 3
Tandems to be achieved by assembly of individual compressors

Trio assemblies







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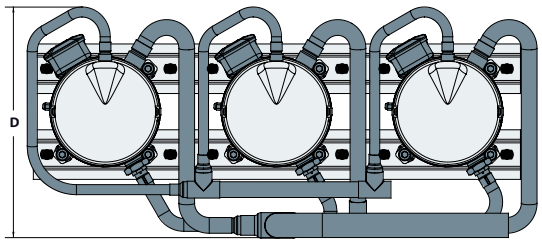

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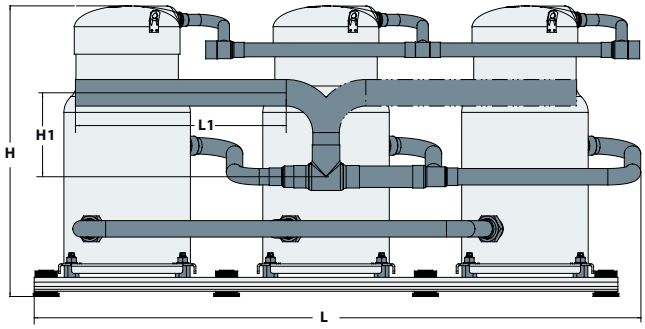

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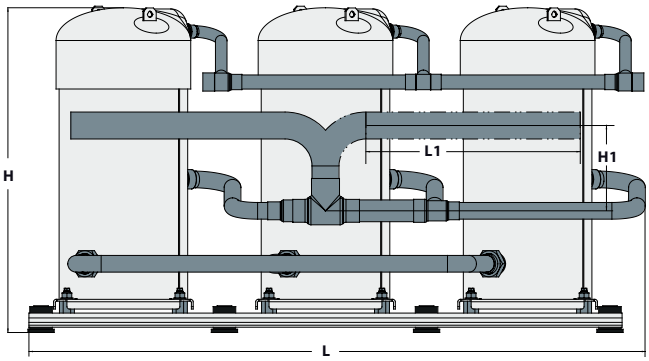

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Trio model	Composition	L		D		H		L1		H1		Outline drawing number	
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch		
DSH420	3 x DSH140	1131	44.53	513	20.2	569	22.4	515 min	20.28 min			❼	8556195
		1118	44.02	513	20.2	569	22.4	511 min	20.12 min			❽	8556187
DSH483	3 x DSH161	1131	44.53	513	20.2	569	22.4	515 min	20.28 min	230	9.06	❼	8556195
		1118	44.02	513	20.2	569	22.4	511 min	20.12 min			❽	8556187
DSH552	3 x DSH184	1139	44.84	518	20.39	584	22.99	515 min	20.28 min			❼	8556194
		1139	44.84	518	20.39	584	22.99	511 min	20.12 min			❽	8556193
DSH720	3 x DSH240	1467	57.76	543	21.38	731	28.78	535 min	21.06 min	211	8.31	❾	8556118
DSH885	3 x DSH295	1467	57.76	543	21.38	731	28.78						8556118
DSH1140	3 x DSH381	1467	57.76	545* 594**	21.46* 23.39**	803	31.61					❿	8556120
DSH1245	2xDSH381 + DSH485	1520	59.84	573* 594**	22.56* 23.39**	803	31.61						8556172
DSH1350	DSH381 + 2Xdsh485	1520	59.84	573* 590**	22.56* 23.23**	803	31.61	680 min	26.77 min	244	9.61		8556173
DSH1455	3 x DSH485	1520	59.84	573* 590**	22.56* 23.23**	803	31.61						8556138

* compressor motor codes 4, 7, 9
** compressor motor code 3
Trio to be acheived by assembly of individual compressors

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	-	380-415 V - 3 ph 380-400 V - 3 ph*	-	-
	Voltage range	-	342-457 V 342-440 V*	-	-
60 Hz	Nominal voltage	200-230 V - 3 ph	460V - 3 ph	575 V - 3 ph	380 - 400 V - 3 ph 380 V - 3 ph **
	Voltage range	180-253 V	414-506 V	517-632 V	342 - 440 V 342 - 418 V **

* DSH240-4 and DSH381-4
** DSH240-9 to DSH485-9

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:

$$\text{\% voltage imbalance} = \frac{|Vavg - V1\text{-}2| + |Vavg - V1\text{-}3| + |Vavg - V2\text{-}3|}{2 \times Vavg} \times 100$$

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.

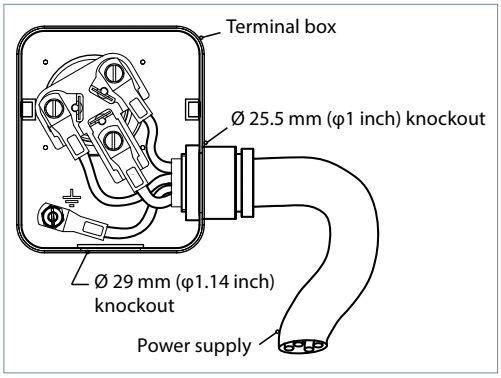
Wiring connections

Electrical power is connected to the compressor terminals by Ø 4.8 mm (3/16") screws.

The maximum tightening torque is 3 Nm. Use a 1/4" ring terminal on the power leads.

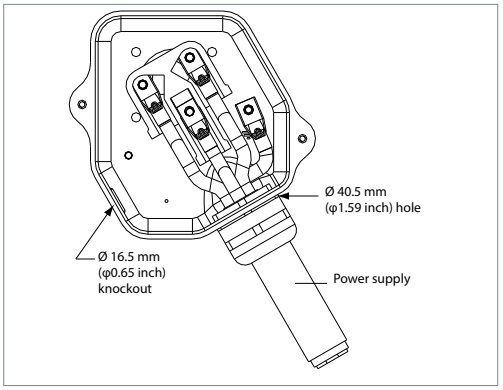
DSH090-105-120-140-161 *except DSH140-161 code3

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



DSH140-161 code3 & DSH184

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



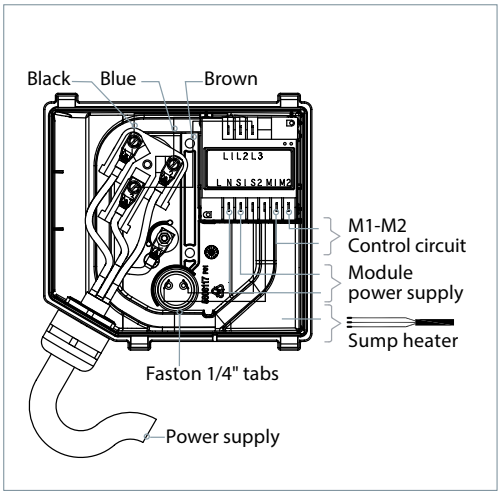
Electrical data, connections and wiring

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.

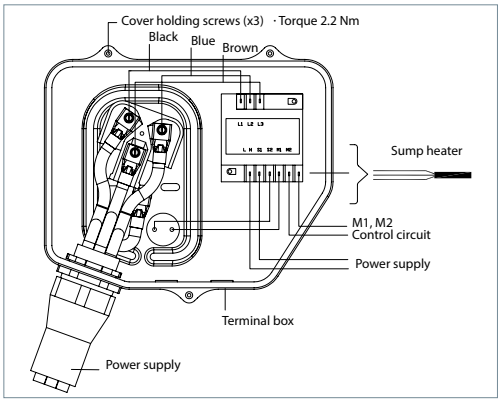
The 3 power supply knockouts accommodate the following diameters:
- Ø 50.8 mm (φ2 inch) (UL 1"1/2 conduit) & Ø 43.7 mm (φ1.72 inch) (UL 1"1/4 conduit) & Ø 34.5 mm (φ1.36 inch) (UL 1" conduit)
- Ø 40.5 mm (φ1.59 inch) (ISO40) & Ø 32.2 mm (φ1.27 inch) (ISO32) & Ø 25.5 mm (φ1 inch) (ISO25)
- Ø 25.5 mm (φ1 inch) (ISO25)

The 4 others knockouts are as follows:
- Ø 22.5 mm (φ0.89 inch) (PG16) (UL 1/2") & Ø 16.5 mm (φ0.65 inch) (ISO16) (x2)
- Ø 20.7 mm (φ0.81 inch) (ISO20 or PG13.5) (x2)



DSH381 code 3

The terminal box is provided with:
- Ø 50.5 mm (φ1.98 inch) (ISO 50 & UL1"1/2 conduit) hole with possible Ø 63.5 mm (φ2.5 inch) (ISO63 and UL 2"conduit) knockout for power supply
- 2 x Ø 22.5 mm (φ0.89 inch) (PG16 and UL ½" conduit) knockouts for safety control circuit.

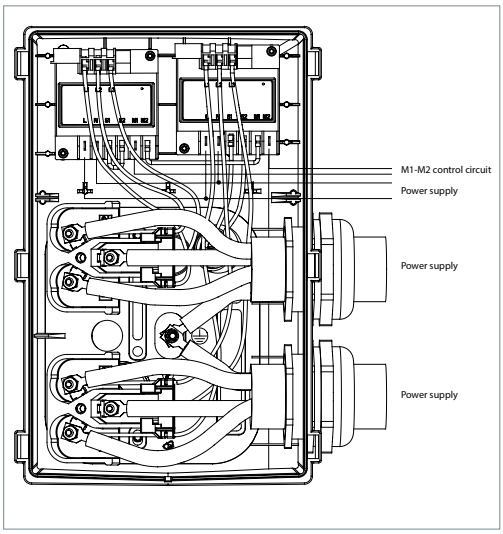


DSH485 code 3

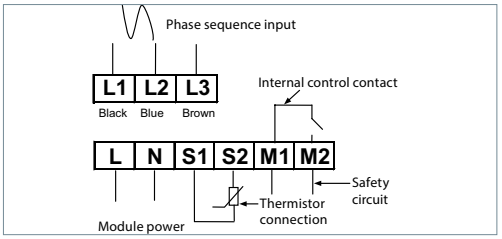
The terminal box is provided with 2 triple knockouts for power supply, 2 double knockouts and 3 simple knockouts for the safety control circuit.

The 2 power supply knockouts accommodate the following diameters:
- Ø 63.5 mm (φ2.5 inch) (ISO63 and UL 2"conduit) & Ø 54.2mm (φ2.13 inch) (PG42)& 43.7 mm (UL 1"1/4 conduit)

The 5 other knockouts are as follows:
- Ø 22.5 mm (φ0.89 inch) (PG16) (UL 1/2") & Ø 16.5 mm (φ0.65 inch) (ISO16)
- Ø 25.5 mm (φ1 inch) (ISO25) & 20 mm (φ0.79 inch) (ISO20 or PG13.5)
- Ø 22.5 mm (φ0.89 inch) (PG16) (UL 1/2")
- Ø 25.5 mm (φ1 inch) (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 (0.25 inch) size Faston type.



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 3 200-230 V / 3ph / 60 Hz	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	155	0.09
	DSH485	1010	190	187	0.07
Motor voltage code 4 380-415 V / 3ph / 50 Hz 460 V / 3ph / 60Hz	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 7 575 V / 3 ph / 60 Hz	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 9 380-400 V / 3ph / 60 Hz	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

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.

Max. operating Current

The max. operating current is the current when the compressors operate at maximum load conditions and 10% below nominal voltage (max. evaporating temperature and max. condensing temperature). Max Oper. A can be used to select cables and contactors. In normal operation, the compressor current consumption is always less than the Max Oper. A. 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:

$$R_{tamb} = R_{25°C\ (77°F)} \frac{a + t_{amb}}{a + t_{25°C\ (77°F)}}$$

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

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):

- 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

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

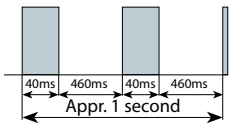
A red/green twin LED is visible on the module (except on DSH485-3). A solid green LED denotes a fault free condition. A blinking red LED indicates an identifiable fault condition:

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

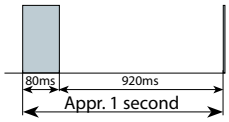
Then it must be set below MCC value (at max operating current):

• 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.

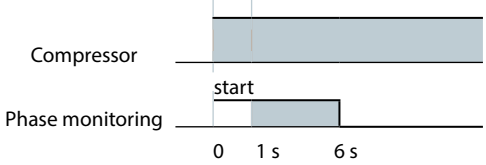
Reverse rotation will be obvious to the user as soon as power is turned on: the compressor will not build up pressure, the sound level will be abnormally high and power consumption will be minimal. If reverse rotation symptoms occur, shut the compressor down and connect the phases to their proper terminals.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

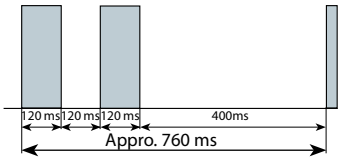
The phase sequencing and phase loss monitoring functions are active during a 5-sec window 1 second after compressor start-up (power on L1-L2-L3).



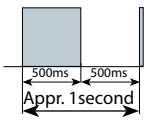
Phase sequence module logic

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

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)	CE	All DSH models
UL (Underwriters Laboratories)	c UL us	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 to 295	DSH381	DSH485
Refrigerant fluids	Group 2	Group 2	Group 2	Group 2
Category PED	II	II	III	II
Evaluation module	D1	D1	H	D1
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 < 51°C -31°F<Ts<123.8°	-35°C < Ts < 51°C -31°F<Ts<123.8°F
Maximum allowable pressure (Low side) - Ps	33.3 bar(g) 483 psig	31.1 bar(g) 451psig	30.2 bar(g) 438psig	30.2 bar(g) 438psig
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	28.5	1739	2.5	153	31.0	1892
DSH295	28.5	1739	2.5	153	31.0	1892
DSH381	30.3	1849	4.0	244	34.3	2093
DSH485	28.2	1721	3.8	232	32.0	1953

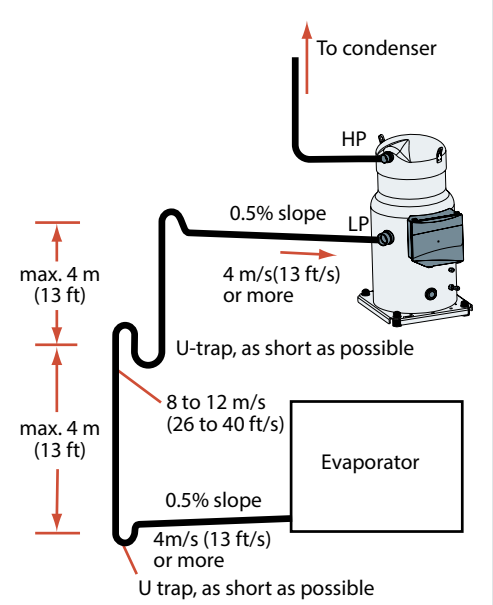
General requirements

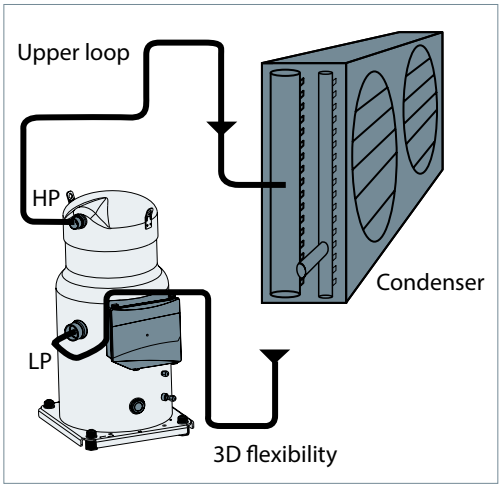
Proper piping practices should be employed to:

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".

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.

For each tandem and trio configuration, specific outline drawings are available as indicated in the following table.

R 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
DSH182	DSH090 + DSH090	1"3/8	1"3/8	1"1/8	120Z0634	8560092
DSH195	DSH090 + DSH105	1"5/8	1"3/8	1"1/8	120Z0644	8560101
DSH210	DSH090 + DSH120	1"5/8	1"3/8	1"1/8	120Z0645	8560101
DSH212	DSH105 + DSH105	1"5/8	1"3/8	1"1/8	120Z0634	8560093
DSH230	DSH090 + DSH140	1"5/8	1"3/8	1"1/8	120Z0644	8560101
DSH242	DSH120 + DSH120	1"5/8	1"3/8	1"1/8	120Z0634	8560093
DSH251	DSH090 + DSH161	1"5/8	1"3/8	1"1/8	120Z0645	8560101
DSH260	DSH140 + DSH120	1"5/8	1"3/8	1"1/8	120Z0646	8560103
DSH274	DSH090 + DSH184	1"5/8	1"3/8	1"1/8	120Z0660	8556185
DSH281	DSH161 + DSH120	1"5/8	1"3/8	1"1/8	120Z0646	8560103
DSH282	DSH140 + DSH140	1"5/8	1"3/8	1"1/8	120Z0634	8560093
DSH289	DSH105 + DSH184	1"5/8	1"3/8	1"1/8	120Z0647	8560102
DSH301	DSH161 + DSH140	1"5/8	1"3/8	1"1/8	120Z0646	8560103
DSH304	DSH120 + DSH184	1"5/8	1"3/8	1"1/8	120Z0647	8560102
DSH322	DSH161 + DSH161	1"5/8	1"3/8	1"1/8	120Z0634	8560093
DSH324	DSH140 + DSH184	1"5/8	1"3/8	1"1/8	120Z0647	8560102
DSH345	DSH161 + DSH184	1"5/8	1"3/8	1"1/8	120Z0645	8556186
DSH368	DSH184 + DSH184	1"5/8	1"3/8	1"1/8	120Z0634	8560094
DSH424	DSH184 + DSH240	2"1/8	1"3/8	1"3/8	120Z0659	8556179
DSH479	DSH184 + DSH295	2"1/8	1"3/8	1"3/8	120Z0659	8556179
DSH482	DSH240 + DSH240	2"1/8	1"5/8	1"3/8	7777041	8556112
DSH535	DSH240 + DSH295	2"1/8	1"5/8	1"3/8	7777037	8556112
DSH565	DSH184 + DSH381	2"1/8	1"3/8	1"3/8	120Z0659	8556180
DSH590	DSH295 + DSH295	2"1/8	1"5/8	1"3/8	7777041	8556112
DSH620	DSH240 + DSH381	2"1/8	1"5/8	1"3/8	7777048	8556115
DSH675	DSH295 + DSH381	2"1/8	1"5/8	1"3/8	7777037	8556115
DSH725	DSH240 + DSH485	2"1/8	1"5/8	1"5/8	120Z0569	8556134
DSH760	DSH381 + DSH381	2"1/8	1"5/8	1"3/8	7777041	8556117
DSH780	DSH295 + DSH485	2"5/8	1"5/8	1"5/8	120Z0551	8556141
DSH865	DSH381 + DSH485	2"5/8	1"5/8	1"5/8	120Z0550	8556136
DSH970	DSH485 + DSH485	2"5/8	1"5/8	1"5/8	120Z0578	8556137

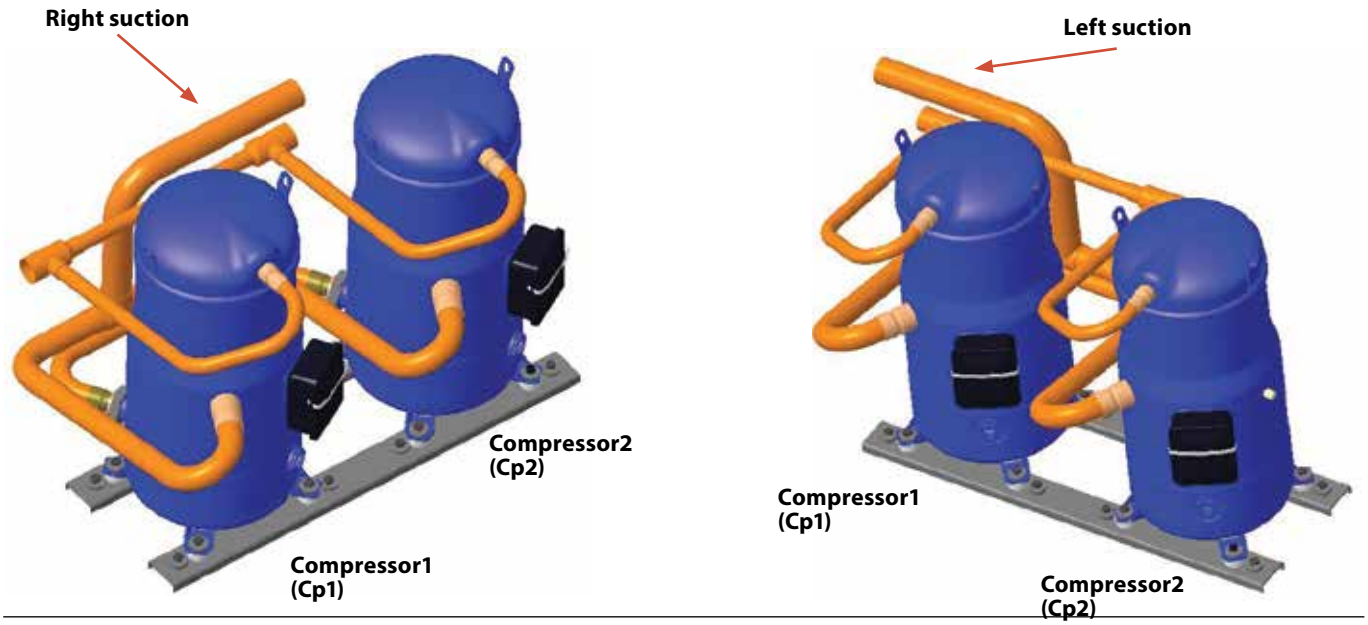
Trio model	Composition	Suction	Discharge	Oil equalization	Suction from	Kit tandem Code No	Outline drawing number
DSH420	3xDSH140	2"1/8	1"3/8	1"1/8	Left	120Z0672	8556195
					Right		8556187
DSH483	3xDSH161	2"1/8	1"3/8	1"1/8	Left	120Z0684	8556195
					Right		8556187
DSH552	3xDSH184	2"1/8	1"3/8	1"1/8	Left	120Z0685	8556194
					Right		8556193
DSH720	3xDSH240	2"5/8	1"5/8	1"5/8	Left	120Z0673	8556118
					Right	7777039	
DSH885	3xDSH295	2"5/8	1"5/8	1"5/8	Left	120Z0673	8556118
					Right	7777039	
DSH1140	3xDSH381	2"5/8	1"5/8	1"5/8	Left	7777040	8556120
					Right	7777049	
DSH1245	2xDSH381 + DSH485	2"5/8	2"1/8	1"5/8	Left	7777063	8556172
					Right		
DSH1350	DSH381 + 2xDSH485	3"1/8	2"1/8	1"5/8	Left	7777063	8556173
					Right		
DSH1455	3xDSH485	3"1/8	2"1/8	1"5/8	Left	7777040	8556138
					Right		

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.

Included in tandem or trio accessory kit
Not supplied

On tandem models



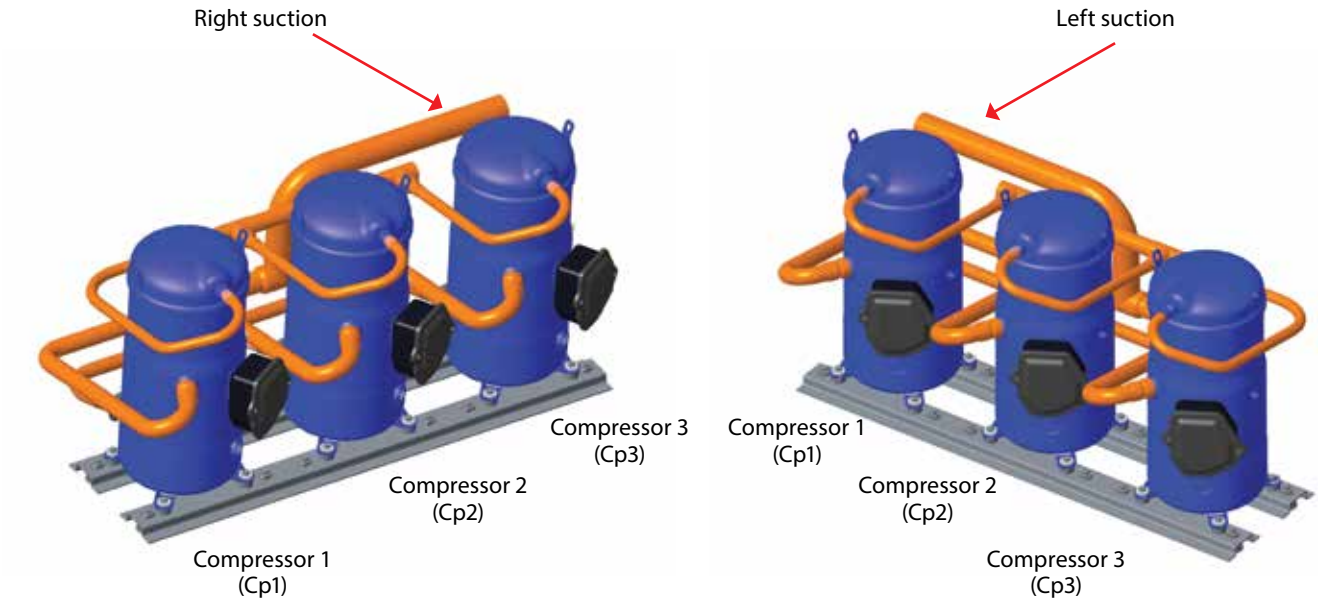
Cp1	Cp2	Tandem Model	Suction From	Kit Code No To Order	Washer Reference	Washer Inner Diameter	Washer In Suction Of
DSH090 + DSH090		DSH182	Left Right	120Z0634		Not needed	
DSH090 + DSH105		DSH195	Left	120Z0644	5312497P02	24mm (0.94 inch)	Cp1
			Right		5312639P04	24.5mm (0.96 inch)	Cp2
DSH090 + DSH120		DSH210	Left	120Z0645	5312497P05	26mm (1.02 inch)	Cp2
			Right		5312497P05	26mm (1.02 inch)	Cp2
DSH105 + DSH105		DSH212	Left	120Z0634		Not needed	
			Right				
DSH090 + DSH140		DSH230	Left	120Z0644	5312639P05	23mm (0.91 inch)	Cp1
			Right		5312497P02	24mm (0.94 inch)	Cp1
DSH120 + DSH120		DSH242	Left	120Z0634		Not needed	
			Right				
DSH090 + DSH161		DSH251	Left	120Z0645	5312639P01	20mm (0.79 inch)	Cp1
			Right		5312639P06	22mm (0.87 inch)	Cp1
DSH140 + DSH120		DSH260	Left	120Z0646	5312497P04	27mm (1.06 inch)	Cp2
			Right		5312497P05	26mm (1.02 inch)	Cp2
DSH090 + DSH184		DSH274	Left	120Z0660	5312497P07	19mm (0.75 inch)	Cp1
			Right		5312497P07	19mm (0.75 inch)	Cp1
DSH161 + DSH120		DSH281	Left	120Z0646	5312497P01	25mm (0.98 inch)	Cp2
			Right		5312497P01	25mm (0.98 inch)	Cp2
DSH140 + DSH140		DSH282	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	DSH289	Left	120Z0647	5312639P02	22mm (0.87 inch)	Cp1
			Right		5312639P03	23.5mm (0.93 inch)	Cp1
DSH161	DSH140	DSH301	Left	120Z0646	5312497P05	26mm (1.02 inch)	Cp2
			Right		5312497P05	26mm (1.02 inch)	Cp2
DSH120	DSH184	DSH304	Left	120Z0647	5312639P04	24.5mm (0.96 inch)	Cp1
			Right		5312639P04	24.5mm (0.96 inch)	Cp1
DSH161	DSH161	DSH322	Left	120Z0634	Not needed		
			Right				
DSH140	DSH184	DSH324	Left	120Z0647	5312639P04	24.5mm (0.96 inch)	Cp1
			Right		5312497P01	25mm (0.98 inch)	Cp1
DSH161	DSH184	DSH345	Left	120Z0645	5312497P05	26mm (1.02 inch)	Cp1
			Right		5312497P05	26mm (1.02 inch)	Cp1
DSH184	DSH184	DSH368	Left	120Z0634	Not needed		
			Right				
DSH184	DSH240	DSH424	Left	120Z0659	5311579P10	35.5mm (1.4 inch)	CP2
			Right		5311579P10	35.5mm (1.4 inch)	CP2
DSH184	DSH295	DSH479	Left	120Z0659	5312497P05	26mm (1.02 inch)	CP1
			Right		5312497P05	26mm (1.02 inch)	CP1
DSH240	DSH240	DSH482	Left	7777041	Not needed		
			Right				
DSH240	DSH295	DSH535	Left	7777037	5311579P01	31mm (1.22 inch)	Cp1
			Right				
DSH184	DSH381	DSH565	Left	120Z0659	5312497P06	24mm (0.94 inch)	CP1
			Right		5312497P06	24mm (0.94 inch)	CP1
DSH295	DSH295	DSH590	Left	7777041	Not needed		
			Right				
DSH240	DSH381	DSH620	Left	7777048	5311579P05	29mm (1.14 inch)	Cp1
			Right				
DSH295	DSH381	DSH675	Left	7777037	5311579P01	31mm (1.22 inch)	Cp1
			Right				
DSH240	DSH485	DSH725	Left	120Z0569	5311579P09	24mm (0.94 inch)	Cp1
			Right				
DSH381	DSH381	DSH760	Left	7777041	Not needed		
			Right				
DSH295	DSH485	DSH780	Left	120Z0551	5311579P07	27mm (1.06 inch)	Cp1
			Right				
DSH381	DSH485	DSH865	Left	120Z0550	5311579P08	30mm (1.18 inch)	Cp1
			Right				
DSH485	DSH485	DSH970	Left	120Z0578	Not needed		
			Right				

On trio models:



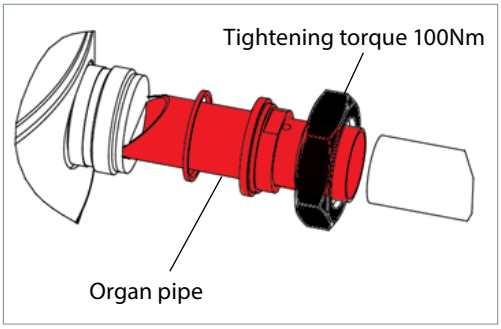
Cp1		Cp2		Cp3		Trio model	Suction from	Kit code n° to order	Washer reference	Washer Inner Diameter	Washer in suction of
DSH140	+	DSH140	+	DSH140	=	DSH420	Left	120Z0672	5312497P05	26mm (1.02 inch)	CP1
									5312497P06	24mm (0.94 inch)	CP3
							Right		5312639P04	24.5mm (0.96 inch)	CP1
									5312639P04	24.5mm (0.96 inch)	CP3
DSH161	+	DSH161	+	DSH161	=	DSH483	Left	120Z0684	5312497P05	26mm (1.02 inch)	CP1
									5312497P01	25mm (0.98 inch)	CP3
							Right		5312497P05	26mm (1.02 inch)	CP1
									5312497P01	25mm (0.98 inch)	CP3
DSH184	+	DSH184	+	DSH184	=	DSH552	Left	120Z0685	5312497P04	27mm (1.06 inch)	CP1
									5312497P06	24mm (0.94 inch)	CP3
							Right		5312497P08	26.5mm (1.04 inch)	CP1
									5312639P04	24.5mm (0.96 inch)	CP3
DSH240	+	DSH240	+	DSH240	=	DSH720	Left	120Z0673	5311579P08	30mm (1.18 inch)	Cp3
							Right	7777039	5311579P03	34.5mm (1.36 inch)	Cp1 and Cp3
DSH295	+	DSH295	+	DSH295	=	DSH885	Left	120Z0673	5311579P08	30mm (1.18 inch)	Cp3
							Right	7777039	5311579P03	34.5mm (1.36 inch)	Cp1 and Cp3
DSH381	+	DSH381	+	DSH381	=	DSH1140	Left	120Z0686	5311579P01 5311579P05	31mm (1.22 inch) and 29mm (1.14 inch)	Cp1 and Cp3
							Right	120Z0688	5311579P01	31mm (1.22 inch)	Cp1
DSH381	+	DSH381	+	DSH485	=	DSH1245	Left Right	7777063	5311579P05	29mm (1.14 inch)	Cp1
DSH381	+	DSH485	+	DSH485	=	DSH1350	Left Right	7777063	5311579P05	29mm (1.14 inch)	Cp3
DSH485	+	DSH485	+	DSH485	=	DSH1455	Left Right	7777040	5311579P02	33mm (1.3 inch)	Cp2 and Cp3

Oil equalization design

DSH182 to DSH368

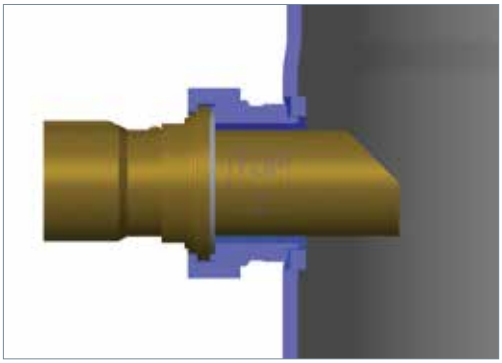
The oil level is balanced by a pipe of 1"1/8 oil equalization line.

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.

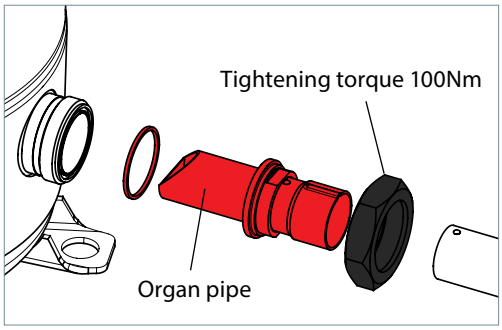


DSH424-479-565

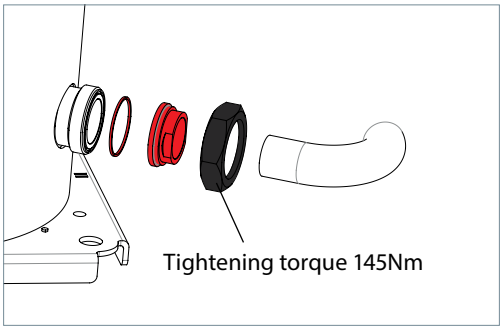
The oil level is balanced by a pipe of 1"3/8 oil equalization line.

In order to ensure best oil balance, the organ pipe need to be mounted inside the DSH184 oil equalization port as indicated on below picture. DSH240, 295 or 381 has integrated organ pipe inside the oil equalization port.

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



For DSH184

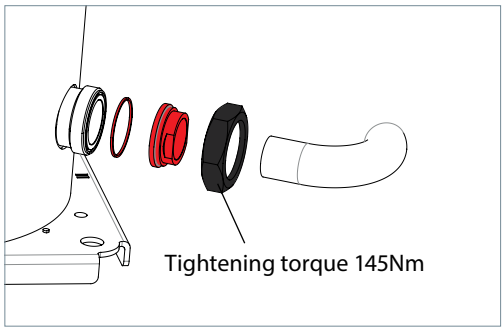


For DSH240, DSH295 or DSH381

Supplied with the compressor
Included in tandem kit

DSH482-535, DSH590 to DSH1350

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.



Supplied with the compressor
Included in tandem or trio accessory kit
Not supplied

General requirements

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

Compressors used in parallel applications must be mounted with rigid spacers onto rails and the manifold assembly must be mounted with flexible grommets onto the frame.

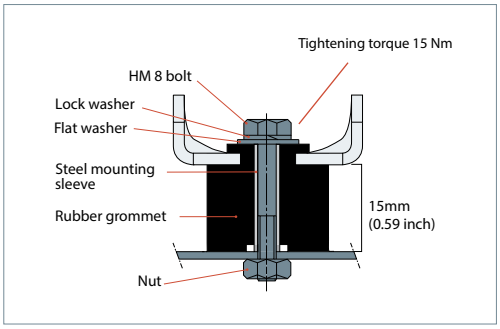
During operation, the maximum inclination from the vertical plane must not exceed 3 degrees.

Single requirements

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

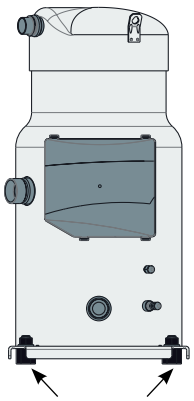
Compressors DSH090-105-120-140-161-184 are delivered with rubber grommets and steel mounting sleeve used to isolated the compressor from the base frame.

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 15 Nm.

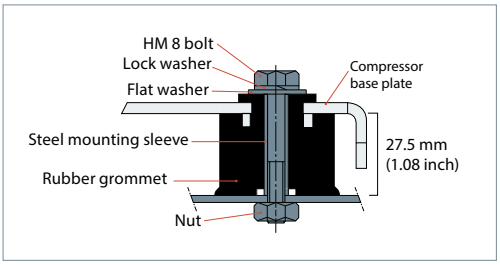


DSH240-295-381-485 mounting

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 21 Nm.



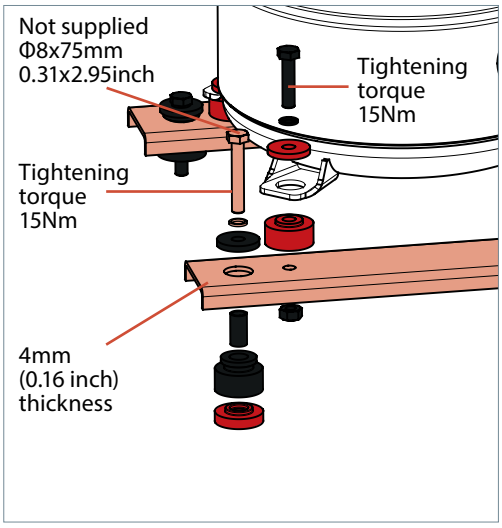
Tandem requirements

DSH182 to DSH368 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.

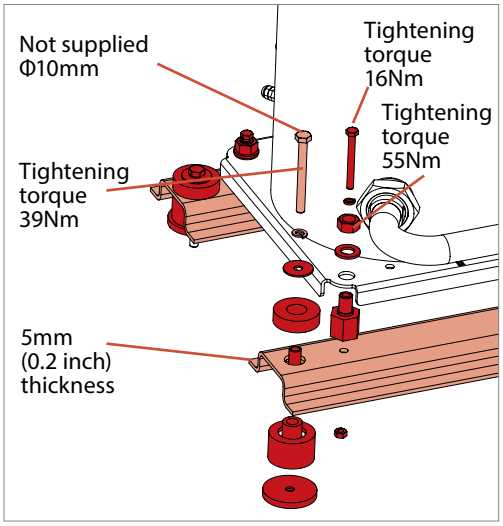
For more details about parallel mounting feet, please see parallel unit outline drawing.



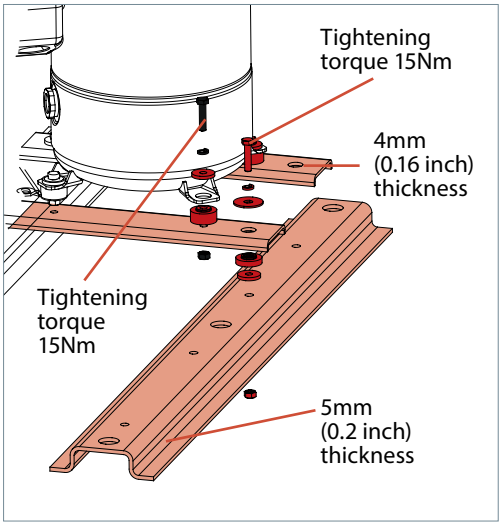
Supplied with the compressor
Included in tandem kit
Not supplied

DSH424-479-565 mounting

The large compressor, DSH240, 295 or 381, is mounted with hexagonal rigid spacers on the rails. The DSH184 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

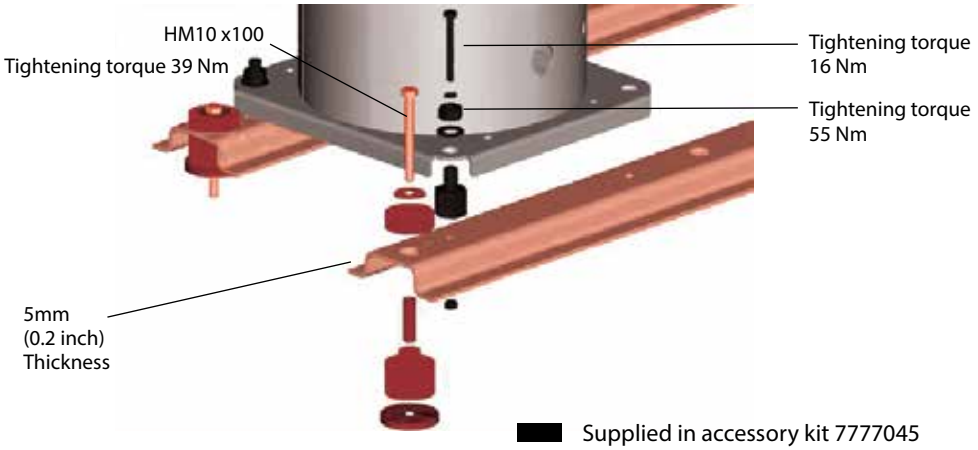


DSH184

Supplied with the compressor
Included in tandem kit
Not supplied

DSH482 to DSH1455 mounting * except DSH565

For parallel mounting, the compressors must be mounted with hexagonal rigid spacers on the rails. Rubber grommets and spacers must be installed below the rails. These parts are included in accessories.



Supplied in accessory kit 7777045
Included in tandem or trio accessory kit
Not supplied

For 60Hz applications, it is recommended to replace hexagonal rigid spacers by triangular rigid spacers available in kit 120Z0495 (see also section "Mechanical vibrations") instead of hexagonal ones from kit 7777045.

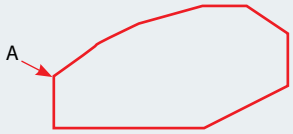
Requirement

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.

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	 Lowest foreseeable evaporation, and highest foreseeable condensation. **Minimum number of compressor** running for 6 hours. For reversible system, perform test in both heating and cooling mode.	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.	1. Top-up with oil, generally 3% of the total system refrigerant charge (in weight). Above 3% look for potential oil trap in the system. 2. Integrate a function in control logic to run all compressors simultaneously in order to boost oil return (for more details see section “Control Logic”) 3. Oil separator can be added
2	Check oil balancing	 Lowest foreseeable evaporation, and highest foreseeable condensation. **All compressor** running for 6 hours. For reversible system, perform test in both heating and cooling mode.	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	1. Top-up with oil, generally 3% of the total system refrigerant charge (in weight). 2. Check that manifold piping is conform to Danfoss requirements. 3. 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.	1. Pay special attention to “Piping design” 2. Oil separator is strongly recommended, espacially in case of part load.

Typical sounds and vibrations in systems can be broken down into the following three categories:
- Sound radiation (through air)
- Mechanical vibrations (through parts and structure)
- Gas pulsation (through refrigerant)

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

Compressor sound radiation

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

Sound levels are as follows:
- For compressors running alone:

Compressor model	50 Hz		60 Hz		Acoustic hood code number	Bottom insulation code number
	Sound power dB(A)	Attenuation dBA ①	Sound power dB(A)	Attenuation dBA ①		
DSH090	73	6	76	6	120Z0034	Not Needed
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	86	4	120Z0022	120Z0353
DSH295	82	6	86	4	120Z0022	120Z0353
DSH381*	87	6	89	4	120Z0022	120Z0353
DSH485**	89	4	91	4	120Z0022	120Z0353

Sound power and attenuation are given at ARI conditions, measured in free space
* For DSH381code 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:

$L_{GLOBAL} = Li + 10\ Log_{10}\ n$

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

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

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

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

$$L_{GLOBAL} = \overset{i=n}{\underset{i=1}{10\ Log_{10}(\Sigma\ 10^{0.1*Li})}}$$

Example for the tandem

DSH424 = DSH184+DSH240 (50Hz)

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

$L_{DSH424} = 10\ Log_{10}(10^{0.1x78}+10^{0.1x82}) = 83.5dB(A)$

Manage sound and vibration

	Model	Composition	Sound power dB(A)	
			50Hz	60Hz
Tandem	DSH182	DSH090 + DSH090	76.0	79.0
	DSH195	DSH090 + DSH105	77.0	80.0
	DSH210	DSH090 + DSH120	77.0	80.0
	DSH212	DSH105 + DSH105	78.0	81.0
	DSH230	DSH090 + DSH140	78.0	81.0
	DSH242	DSH120 + DSH120	78.0	81.0
	DSH251	DSH090 + DSH161	78.0	81.0
	DSH260	DSH140 + DSH120	78.5	81.5
	DSH274	DSH090 + DSH184	79.0	82.0
	DSH281	DSH161 + DSH120	78.5	81.5
	DSH282	DSH140 + DSH140	79.0	82.0
	DSH289	DSH105 + DSH184	80.0	83.0
	DSH301	DSH161 + DSH140	79.0	82.0
	DSH304	DSH120 + DSH184	80.0	83.0
	DSH322	DSH161 + DSH161	79.0	82.0
	DSH324	DSH140 + DSH184	80.0	83.0
	DSH345	DSH161 + DSH184	80.0	83.0
	DSH368	DSH184 + DSH184	81.0	84.0
	DSH424	DSH184 + DSH240	83.5	87.0
	DSH479	DSH184 + DSH295	83.5	87.0
	DSH565	DSH184 + DSH381	87.5	89.5
	DSH482	2xDSH240	85.0	890
	DSH535	DSH240+DSH295	85.0	89.0
	DSH590	2xDSH295	85.0	89 0
	DSH620	DSH240+DSH381	88.0	91.0
	DSH675	DSH295+DSH381	88.0	91.0
	DSH760	2xDSH381	90.0	92.0
	DSH725	DSH240+DSH485	90.0	92.0
	DSH780	DSH295+DSH485	90.0	92.0
	DSH865	DSH381+DSH485	91.0	93.0
	DSH970	2xDSH485	92.0	94.0
Trio	DSH420	3xDSH140	81.0	84.0
	DSH483	3xDSH161	81.0	84.0
	DSH552	3xDSH184	83.0	86.0
	DSH720	3xDSH240	87.0	91.0
	DSH885	3xDSH295	87.0	91.0
	DSH1140	3xDSH381	92.0	94.0
	DSH1455	3xDSH485	94.0	96.0
	DSH1245	2xDSH381+DSH485	92.5	94.5
	DSH1350	DSH381+2xDSH485	93.0	95.0

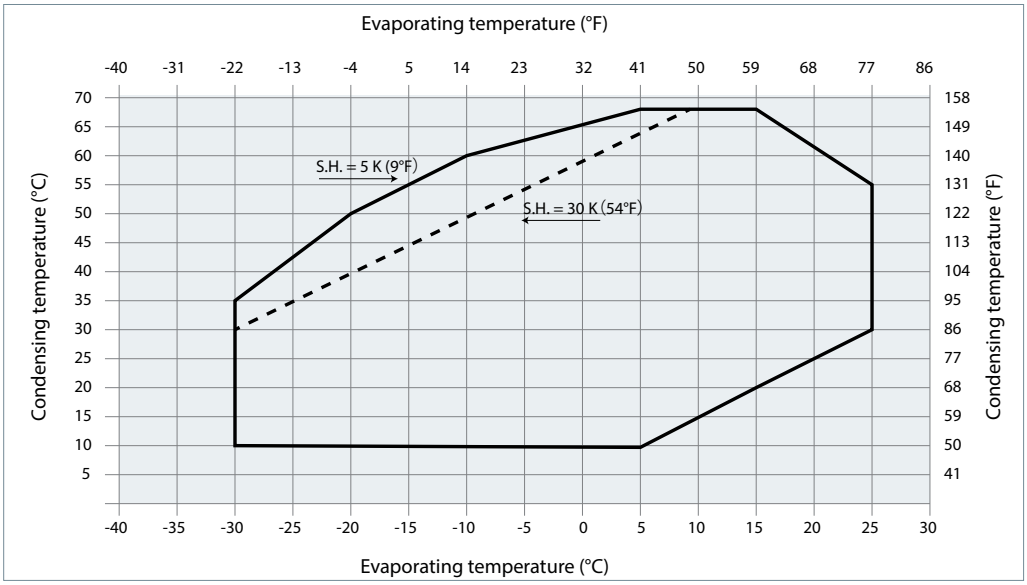
	Mitigations methods: We can consider two means to reduce compressors sound radiations: 1. Acoustic hoods are quick and easy to install and do not increase the overall size of the compressors. Acoustic hoods are available from Danfoss as accessories. Refer to the tables above for sound levels, attenuation and code numbers.	2. Use of sound-insulation materials on the inside of unit panels is also an effective mean to reduce sound radiation. 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.
Mechanical vibrations	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. A high vibration level is damageable for piping reliability and generates high sound levels. **Mitigations methods:** 1. To ensure minimum vibrations transmission to the structure, strictly follow Danfoss mounting	requirements (mounting feet, rails etc..). For further information on mounting requirements, please refer to section "Design compressor mounting". 2. Ensure that there is no direct contact (without insulation) between vibrating components and structure. 3. To avoid resonance phenomenon, pipings and frame must have natural frequencies as far as possible from running frequencies(50 or 60Hz). Solutions to change natural frequencies are to work on structure stiffness and mass (brackets, metal sheet thickness or shape…)
Gas pulsation	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.	**Mitigations methods:** If an unacceptable level is identified, a discharge muffler with the appropriate resonant volume and mass can be installed.

Requirement

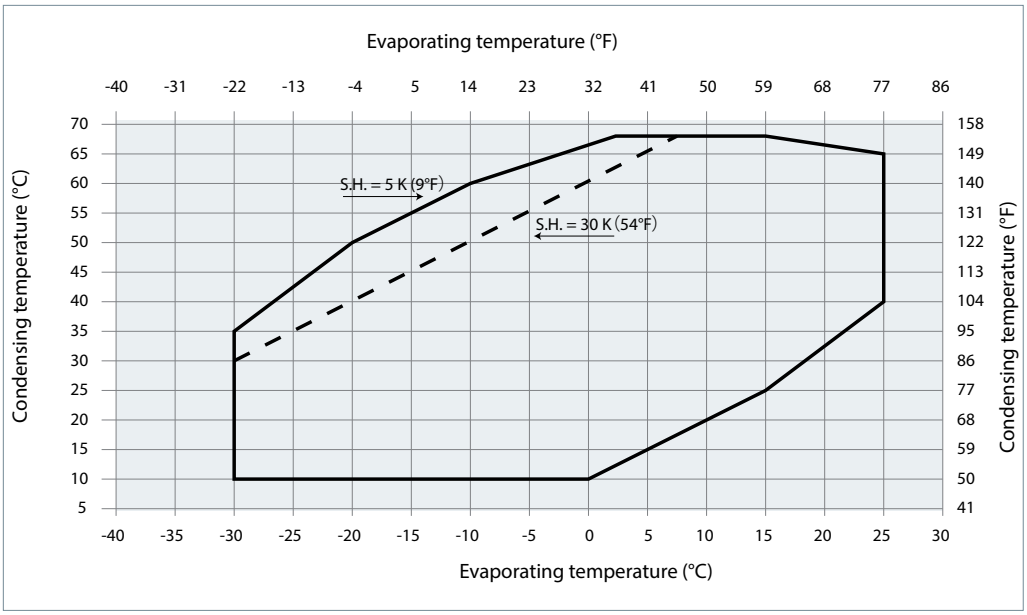
R The operating envelopes for DSH scroll compressors are given in the figures below and guarantees reliable operations of the compressor for steady-state operation.

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

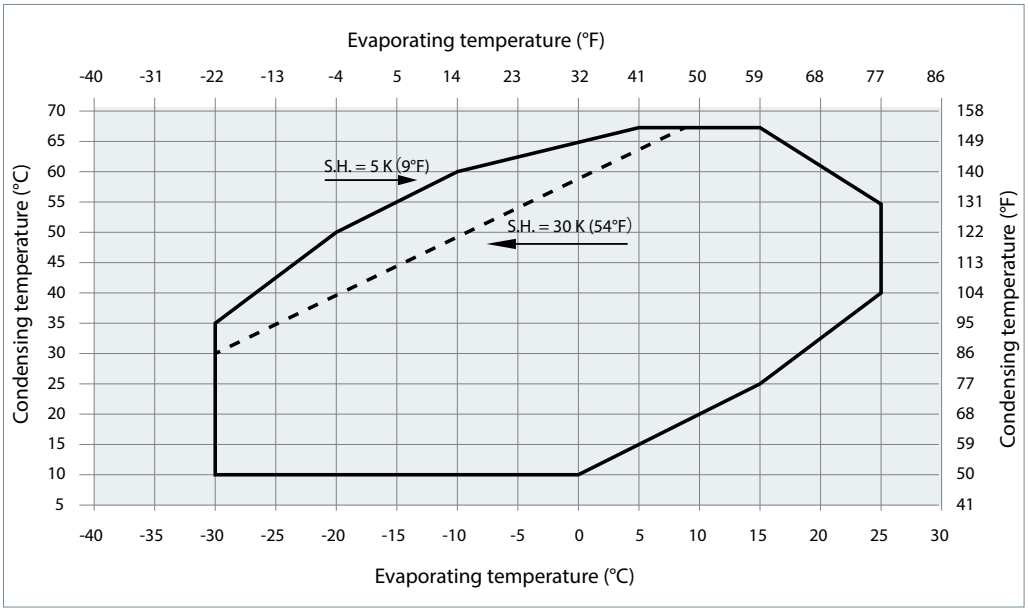
Operating envelope
Single DSH090 to DSH184
Tandem DSH182 to DSH368
Trio DSH420 to DSH552



Operating envelope
Single DSH240 to DSH485
Tandem DSH482-535, DSH590 to DSH970
Trio DSH720 to DSH1350



Operating envelope
Tandem DSH424-479-565



Pressure settings		R410A
Working range high side	bar(g)	9.9-44.7
	psig	144-648
Working range low side	bar(g)	1.7-15.5
	psig	25-225
Maximum high pressure safety switch setting	bar(g)	46.1
	psig	669
Minimum low pressure safety switch setting	bar(g)	1.5
	psig	22
Minimum low pressure pump-down switch setting	bar(g)	1.5 bar below nominal evap. pressure with minimum of 1.7 bar(g)
	psig	22 psi below nominal evap. pressure with minimum of 25psig

High and low pressure protection

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

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

HP safety switch must be reset manually.

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

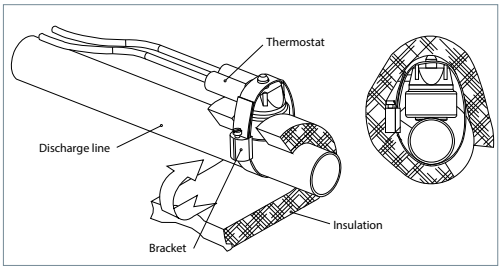
Discharge temperature protection

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.

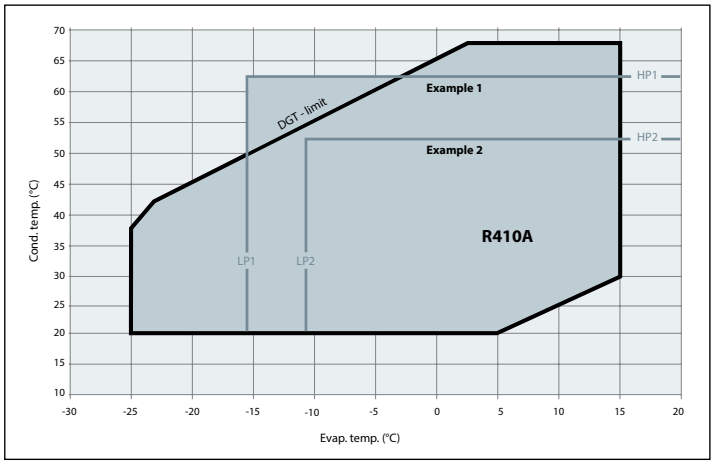
The discharge gas thermostat accessory kit (code 7750009) includes all components required for installation as shown on the right. DGT installation must respect below requirements:

- The thermostat must be attached to the discharge line within 150 mm (5.91 inch) 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 = 11 K)
LP switch setting:
LP1 = 3.3 bar (g) (-15.5°C)
HP switch setting:
HP1 = 38 bar (g) (62°C)
Risk of operation beyond the application envelope.
DGT protection required.

Example 2 (R410A, SH = 11 K)
LP switch setting:
LP2 = 4.6 bar (g) (-10.5°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.

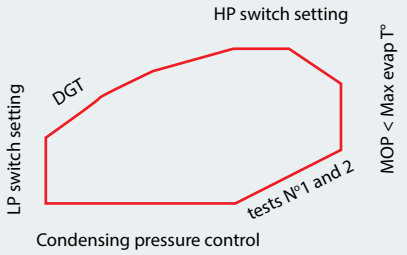
This protection is effective within a suction superheat range from 5 to 30K (9 to 54 °F).

System evaluation

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

Basic:	Advanced:
• HP and LP switch • MOP (Max Operating Pressure) ensured by expansion device • Condensing pressure control • DGT external*	• HP and LP sensor • Operating envelope limits integrated into control logic • DGT external*

See “Test, criteria and solutions”



* 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 temerature...)	Continuous running within envelope	Work on compressor staging, fan staging, water flow etc.
2		Perform a defrost test if reversible unit		

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.

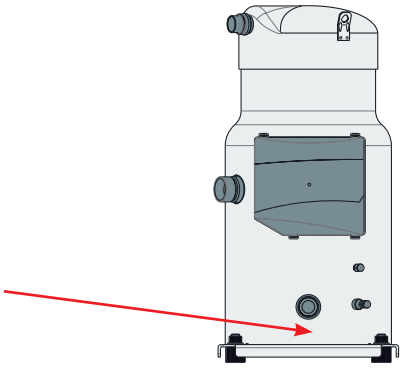
Application	Tests to perform
Non reversible	Liquid flood back test
Reversible	Liquid flood back test Defrost test

Test, criteria and solutions

Test N°	Purpose	Test condition	Pass criteria	Solutions
Liquid flood back test	Steady-state	 Liquid flood back testing must be carried out under expansion valve threshold operating conditions: • Lowest foreseeable evaporation, and highest foreseeable condensation. • Minimum number of compressor running. For reversible system, perform test in both heating and cooling mode.	Suction superheat >5K (9°F)	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	Tests must be carried out with most unfavorable conditions : • fan staging, • compressor staging • …	Oil superheat shall not be more than 30 sec 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 30 sec below the safe limit defined in the Dilution Chart. (see graph below)	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*.

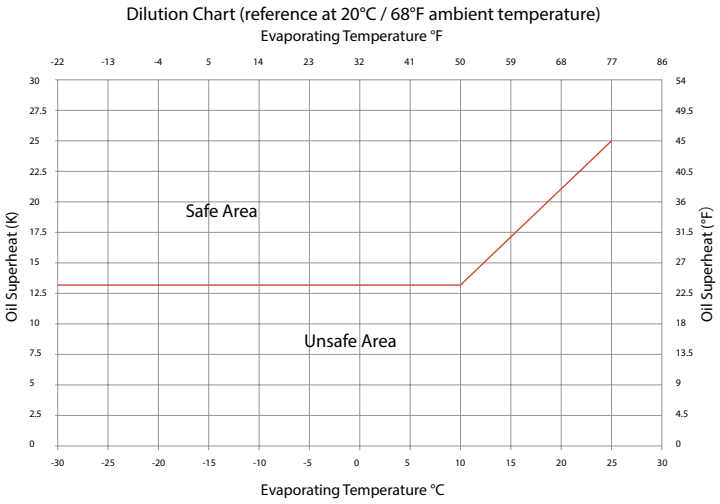
*Suction accumulator offers protection by trapping the liquid refrigerant upstream from the compressor. The accumulator should be sized at least 50 % of the total system charge. Suction accumulator dimensions can impact oil return (gas velocity, oil return hole size…), therefore oil return has to be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

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 ambiance.

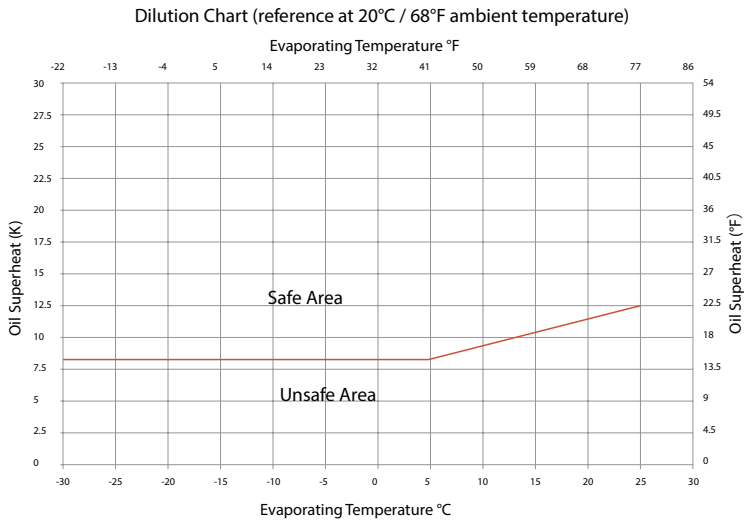


The Oil superheat is defined as:
(Oil temperature - Evaporating temperature)

DSH090 to DSH184



DSH240 to DSH485



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 generates poor lubrication conditions. In extreme situations, this leads to liquid slugging that can damage the compressor.

Requirement

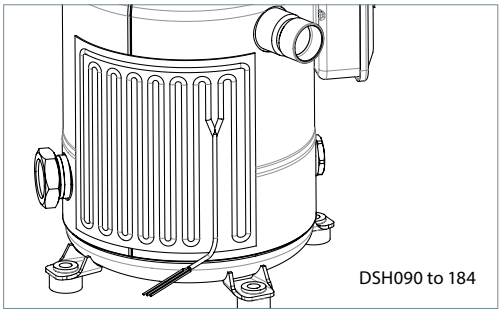
At start-up, the amount of liquid refrigerant in the compressors must not exceed an acceptable level.

System evaluation

Use the table below in relation with the system charge and the application to quickly define necessary safeties to implement.

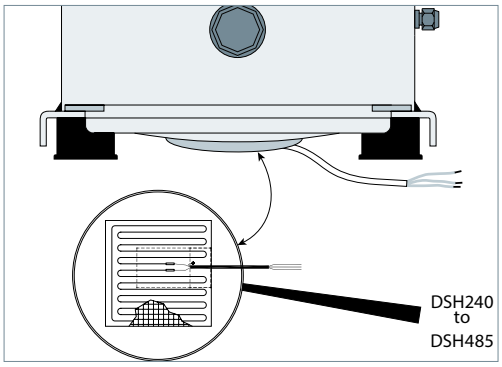
Application	BELOW charge limit	ABOVE charge limit
All	Ensure tightness between condenser & evaporator when system is OFF • Thermostatic expansion Valve (TXV) , Liquid Line Solenoid Valve LLSV** strongly recommended • Electronic expansion valve (EXV) must close when system stop including in power shut down situation	
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:


DSH090 to 184

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 seater is located below the sump, associated with a thermal insulation.


DSH240 to DSH485

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.

***Pump-down cycle
By decreasing pressure in the sump, pump down system:
• evacuates refrigerant from oil
• set the sump saturating pressure much lower than ambiance temperature and due to that, avoid refrigerant condensation in the compressor.
Pump-down must be set higher than 1.7 bar(g) (25 psig).

For more details on pump-down cycle see 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	DSH182	DSH090+DSH090	12	26
	DSH195	DSH090+DSH105	12	26
	DSH210	DSH090+DSH120	12	26
	DSH212	DSH105+DSH105	12	26
	DSH230	DSH090+DSH140	12	26
	DSH242	DSH120+DSH120	12	26
	DSH251	DSH090+DSH161	12	26
	DSH260	DSH140+DSH120	12	26
	DSH274	DSH090+DSH184	12	26
	DSH281	DSH161+DSH120	12	26
	DSH282	DSH140+DSH140	14	31
	DSH289	DSH105+DSH184	12	26
	DSH301	DSH161+DSH140	14	31
	DSH304	DSH120+DSH184	12	26
	DSH322	DSH161+DSH161	14	31
	DSH324	DSH140+DSH184	14	31
	DSH345	DSH161+DSH184	14	31
	DSH368	DSH184+DSH184	14	31
	DSH424	DSH184+DSH240	14	31
	DSH479	DSH184+DSH295	14	31
	DSH565	DSH184+DSH381	14	31
	DSH482	2xDSH240	21	46
	DSH535	DSH240+DSH295	21	46
	DSH590	2xDSH295	25	55
	DSH620	DSH240+DSH381	21	46
	DSH675	DSH295+DSH381	25	55
	DSH760	2xDSH381	29	64
	DSH725	DSH240+DSH485	21	46
	DSH780	DSH295+DSH485	25	55
	DSH865	DSH381+DSH485	29	64
	DSH970	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

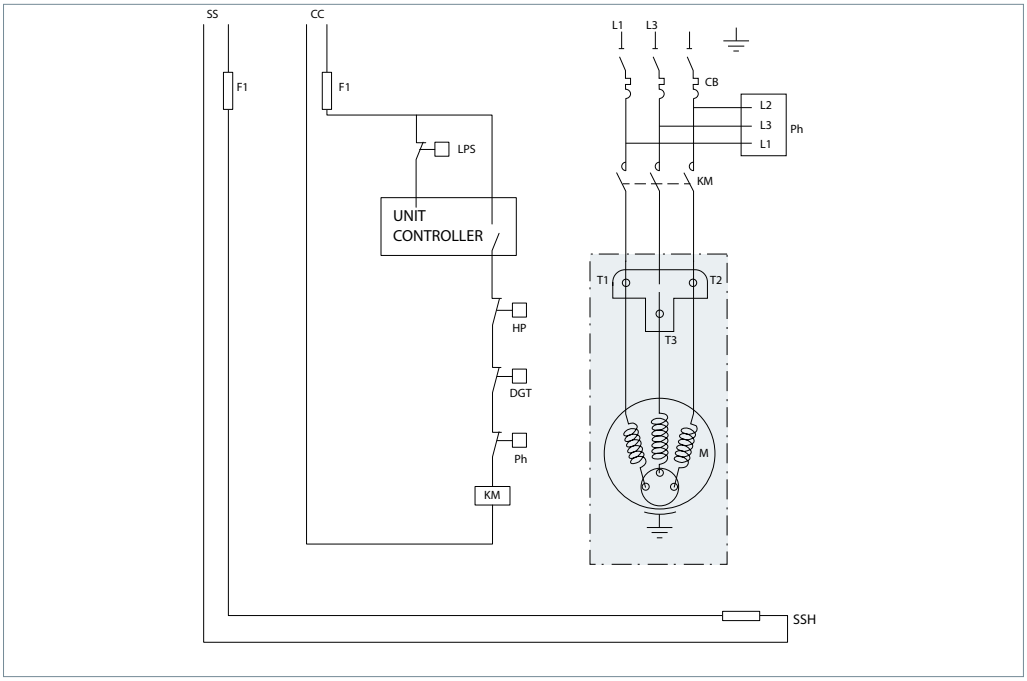
Wiring information

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:

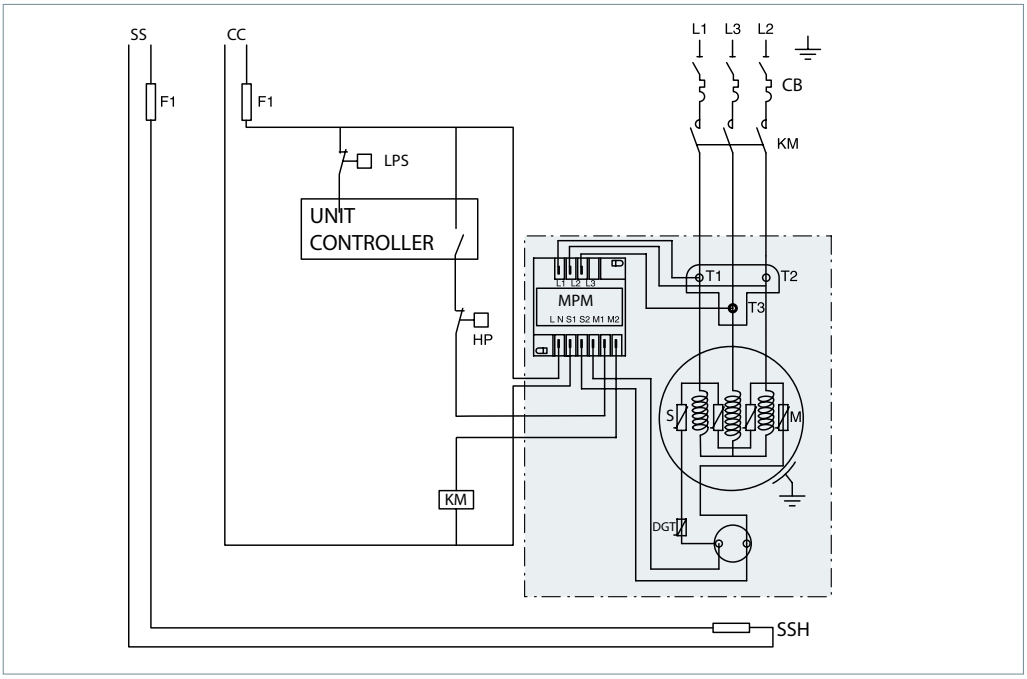
Compressor model DSH 090 - 105 - 120 - 140 - 161 - 184



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

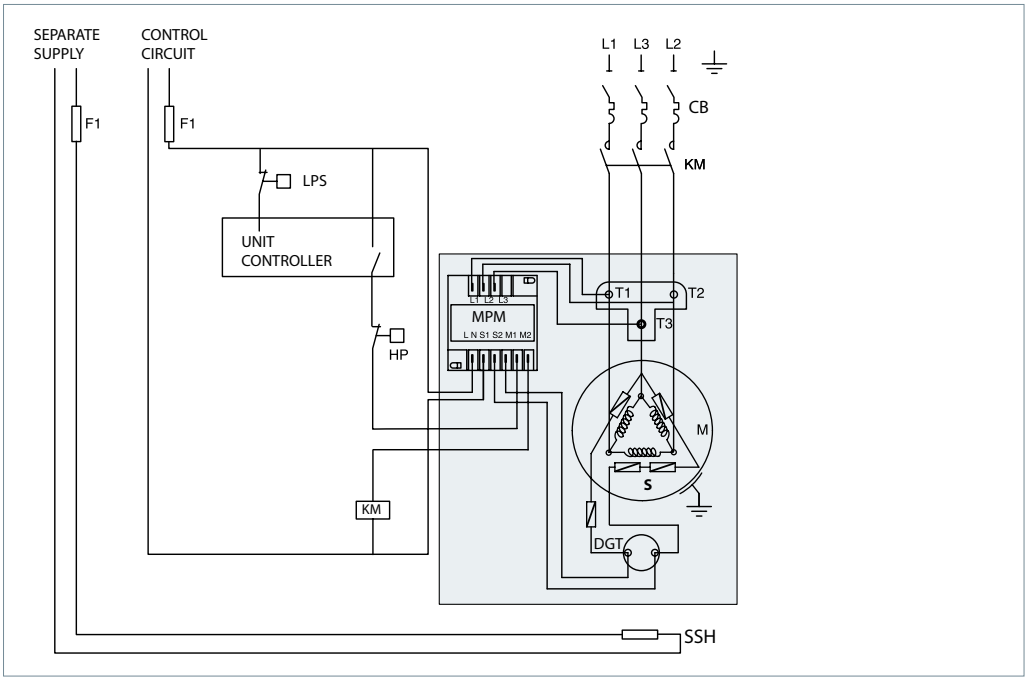
Compressor model DSH240-295-381



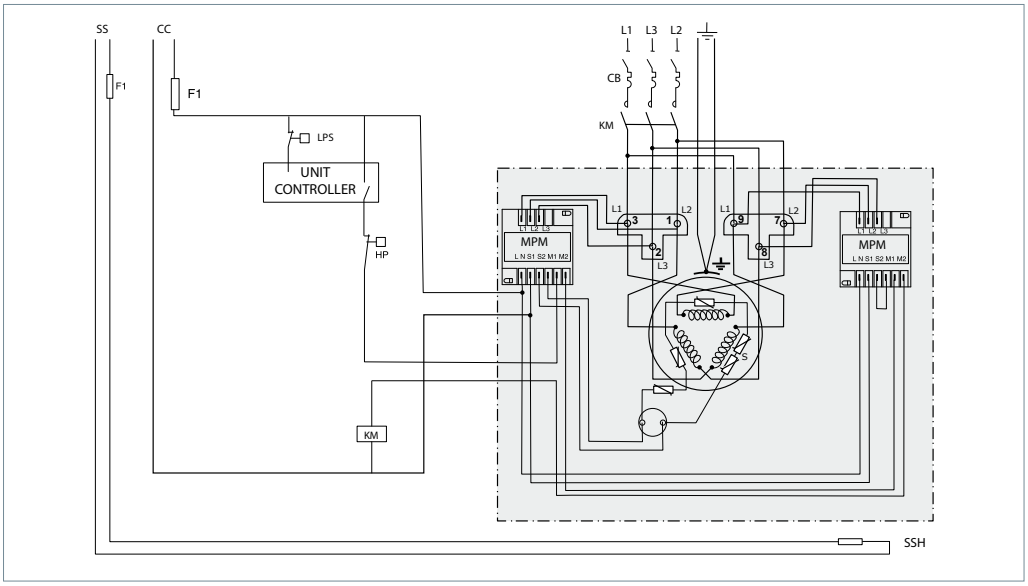
Legends

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

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

Soft starts

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

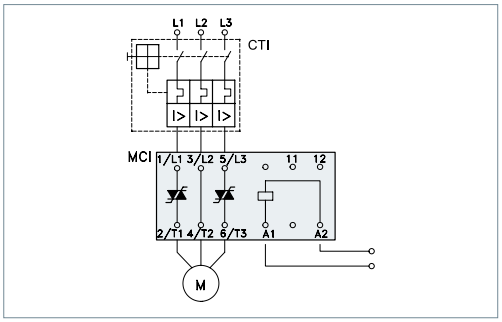
Ramp-down must be set to minimum to ensure proper discharge valve closing.
Danfoss MCI and MCD soft-start controller are available as accessories: MCI and MCD can reduce the inrush current up to 40%.

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
DSH140-161-184 code 4	MCI25C	MCI25C*
DSH240 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

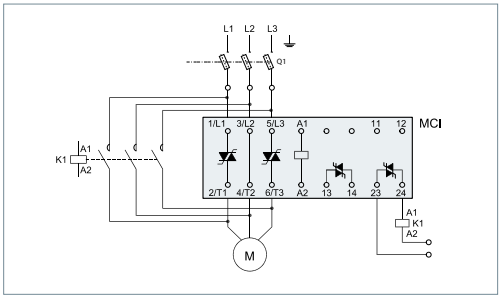
- MCI15C, MCI25C, MCI50CM replaces the contactor KM . All settings such as initial torque, ramp-up time (less than 0.5 sec) and ramp-down time are preset and do not require any modification.

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.

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 manifold system, after running long time in full load, oil unbalance may appears. A function can be implemented in control logic to stop all manifold compressors during one minute every two hours in order to balance oil. Time and delay can be fine-tuned by Oil balancing test N°2 in section "Manage oil in the circuit".

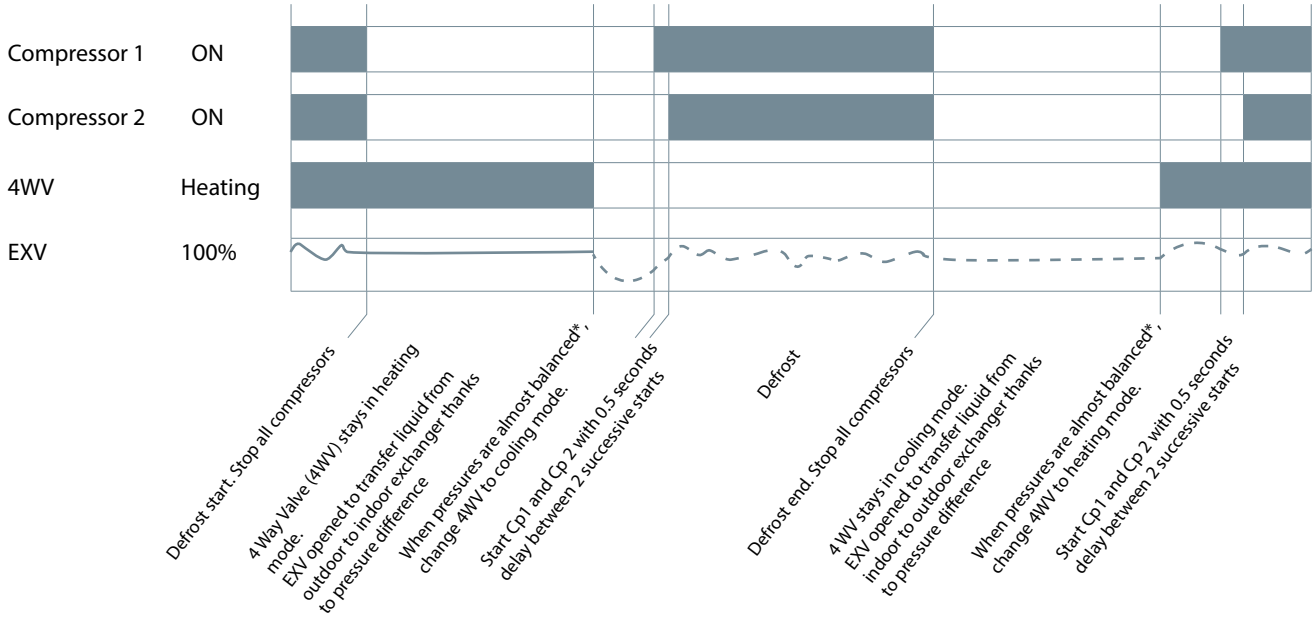
Defrost logic recommendations / Reversible systems

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).

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

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.

	R Excessive air and moisture • can increase condensing pressure and cause high discharge temperatures. • can create acid giving rise to copper platting. • can destroy the lubricating properties of the oil.	All these phenomena can reduce service life and cause mechanical and electrical compressor failure.
Requirements	DSH compressors are delivered with < 100 ppm moisture level. At the time of commissioning, system moisture content may be up to 100 ppm.	During operation, the filter drier must reduce this to a level between 20 and 50 ppm.
Solutions	To achieve this requirement, a properly sized and type of drier is required. Important selection criteria's include: • driers water content capacity, • system refrigeration capacity, • system refrigerant charge.	For new installations with DSH compressors with polyolester oil, Danfoss recommends using the Danfoss DML (100% molecular sieve) solid core filter drier.

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 R410A refrigerant.

Compressor holding charge

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

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

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

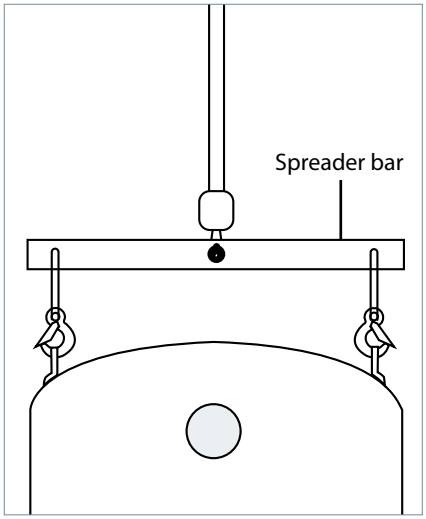
R An opened compressor must not be exposed to air for more than 20 minutes to avoid moisture is captured by the POE oil.

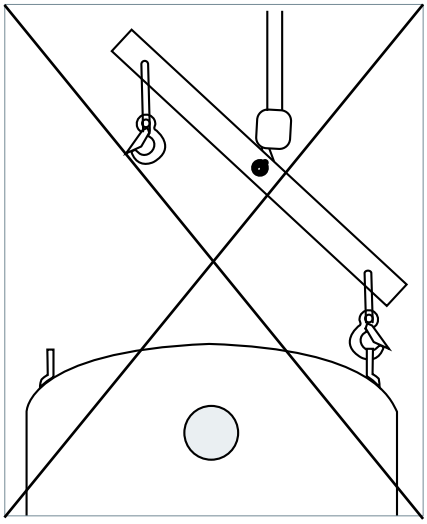
Handling

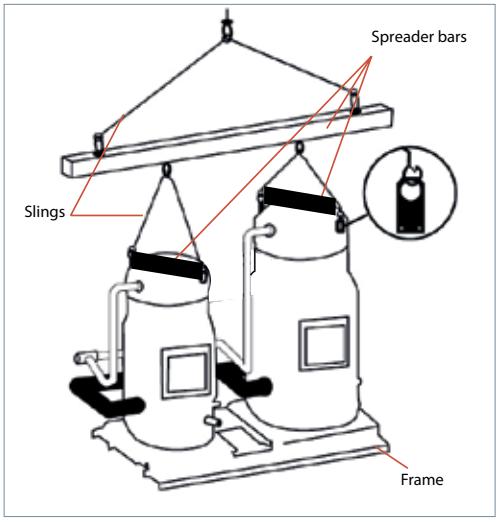
! Each Danfoss DSH scroll compressor is equipped with two lift rings on the top shell.

- 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).







Piping assembly

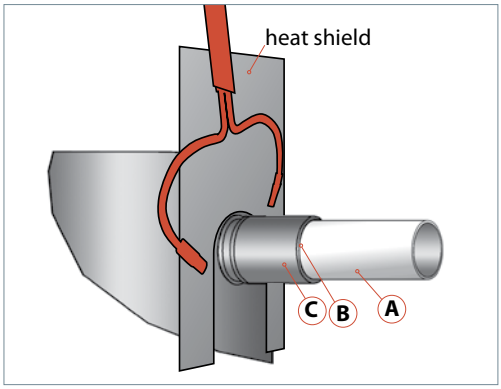
Good practices for piping assembly is a pre-requisite to ensure compressor life time (system cleanliness, brazing procedure etc.)

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	DSH381-485
Maximum compressor test pressure high side (HP)		48.7 bar (g) (706 psig) HP-LP<37bar (537 psi)	
Maximum compressor test pressure low side (LP)	33.3 bar (g) (483 psig) LP-HP<5bar (73 psi) Maximum speed 4.8 bar/s (70 psi/s)	34.3 bar (497 psi) LP – HP <5 bar (73 psi) Maximum speed 4.8 bar/s (70 psi/s)*	33.3 bar (483 psi) LP – HP <5 bar (73 psi) Maximum speed 4.8 bar/s (70 psi/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.

Vacuum evacuation and moisture removal

R

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

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

For more detailed information see "Vacuum pump-down and dehydration procedure" TI-026-0302.

Refrigerant charging

R

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

If needed, a complement of charge can be done before evaporator, in liquid phase while compressor is running by slowly throttling liquid in.
Never bypass safety low pressure switch.

For more detailed information see "Recommended refrigerant system charging practice" 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.

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

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.

Preliminary check

⚠ Check electrical power supply:
- Phase order: Reverse rotation is obvious if the compressor do not build up pressure and sound level is abnormal high. 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".

For DSH240 to DSH485 compressors equipped with an electronic module, reverse rotation will be automatically detected. For more details refer to section "Motor protection".
- Voltage and voltage unbalance within tolerance: For more details refer to section "Motor voltage".

Initial start-up

- 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

The system must be monitored after initial startup for a minimum of 60 minutes to ensure proper operating characteristics such as:
- Correct superheat and subcooling.
- Current draw of individual compressors within acceptable values (max operating current).
- No abnormal vibrations and noise.
- Correct oil level.

If Oil Top-up is needed, it must be done while the compressor is idle. Use the schrader connector or any other accessible connector on the compressor suction line. Always use original Danfoss POE oil 160SZ from new cans.
For more detailed information see "Lubricants filling in instructions for Danfoss Commercial Compressors" TI 2-025-0402.

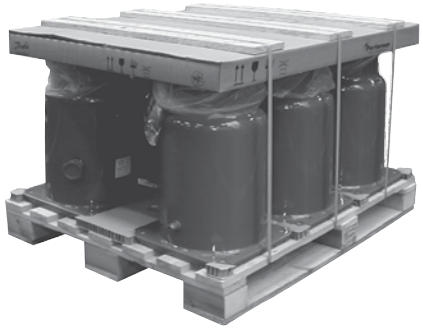
Danfoss recommends that compressors and compressor oil should be recycled by a suitable company at its site.

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	122	269
DSH295	760	29.9	600	23.6	900	35.4	125	276
DSH381	760	29.9	600	23.6	900	35.4	172	379
DSH485	760	29.9	600	23.6	900	35.4	189	417

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	683	1506	2
DSH295	6	1150	45.3	965	38	768	30.2	702	1548	2
DSH381	4	1150	45.3	965	38	800	31.5	671	1479	2
DSH485	4	1150	45.3	965	38	800	31.5	737	1625	2

* nbr: number of compressors per pack

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.

Compressors DSH090 to DSH184 are delivered with flexible grommets.

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

For use in manifold configuration, rigid spacers are available as accessory kit 7777045 (120Z0495 for 60Hz applications).

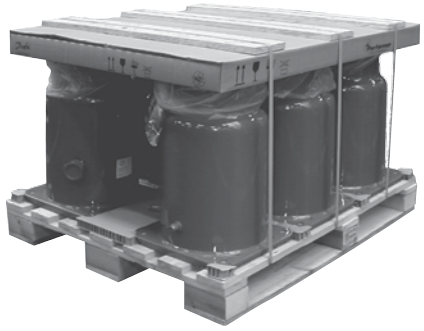
Single pack

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	120H1182	120H1184	120H1186
DSH105	Brazed	Internal	120H1188	120H1190	120H1192	120H1194
DSH120	Brazed	Internal	120H1196	120H1198	120H1200	120H1202
DSH140	Brazed	Internal	120H1204	120H1206	120H1208	120H1210
DSH161	Brazed	Internal	120H1212	120H1214	120H1216	120H1218
DSH184	Brazed	Internal	120H1220	120H1222	120H1224	120H1226
DSH240	Brazed	Module 24V AC*	120H1159	120H1119	120H1151	120H1135
	Brazed	Module 110-240V *	120H1161	120H1121	120H1152	120H1137
DSH295	Brazed	Module 24V AC*	120H1163	120H1123	120H1153	120H1139
	Brazed	Module 110-240V *	120H1165	120H1125	120H1154	120H1141
DSH381	Brazed	Module 24V AC*	120H1167	120H1127	120H1155**	120H1143**
	Brazed	Module 110-240 V *	120H1169	120H1129	120H1156**	120H1145**
DSH485	Brazed	Module 24V AC*	120H1105**	120H1131	120H1157	120H1147
	Brazed	Module 110-240 V *	-	120H1133	120H1158	120H1149

* Electronic motor protection, module located in terminal box
** Soon to be released
Mounting kit for DSH240-295-381-485 single compressor applications : Ref 8156138

Ordering codes

Industrial pack



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	120H1183	120H1185	120H1187
DSH105	Brazed	Internal	120H1189	120H1191	120H1193	120H1195
DSH120	Brazed	Internal	120H1197	120H1199	120H1201	120H1203
DSH140	Brazed	Internal	120H1205	120H1207	120H1209	120H1211
DSH161	Brazed	Internal	120H1213	120H1215	120H1217	120H1219
DSH184	Brazed	Internal	120H1221	120H1223	120H1225	120H1227
DSH240	Brazed	Module 24V AC*	120H1160	120H1120	-	120H1136
	Brazed	Module 110-240 V *	120H1162	120H1122	-	120H1138
DSH295	Brazed	Module 24V AC*	120H1164	120H1124	-	120H1140
	Brazed	Module 110-240 V *	120H1166	120H1126	-	120H1142
DSH381	Brazed	Module 24V AC*	120H1168	120H1128	-	120H1144**
	Brazed	Module 110-240 V *	120H1170	120H1130	-	120H1146**
DSH485	Brazed	Module 24V AC*	120H1104**	120H1132	-	120H1148
	Brazed	Module 110-240 V *	-	120H1134	-	120H1150

* Electronic motor protection, module located in terminal box
** Soon to be released

Mounting kit for DSH240-295-381-485 manifold configurations (one kit per compressor):
Ref 7777045 for 50 Hz applications
Ref 120Z0495 for 60 Hz applications

Tandem code number

To build a complete tandem, you must order the 2 compressors and the Tandem accessory kit code below:

Tandem Model	Cp1	Cp2	Suction From	Tandem Kit Code No.	Mounting kit
DSH182	DSH090	DSH090	Left Right	120Z0634	
DSH195	DSH090	DSH105	Left Right	120Z0644	
DSH210	DSH090	DSH120	Left Right	120Z0645	
DSH212	DSH105	DSH105	Left Right	120Z0634	
DSH230	DSH090	DSH140	Left Right	120Z0644	
DSH242	DSH120	DSH120	Left Right	120Z0634	
DSH251	DSH090	DSH120	Left Right	120Z0645	
DSH260	DSH140	DSH120	Left Right	120Z0646	
DSH274	DSH090	DSH184	Left Right	120Z0660	
DSH281	DSH161	DSH120	Left Right	120Z0646	
DSH282	DSH140	DSH140	Left Right	120Z0634	Not needed
DSH289	DSH105	DSH184	Left Right	120Z0647	
DSH301	DSH161	DSH140	Left Right	120Z0646	
DSH304	DSH120	DSH184	Left Right	120Z0647	
DSH322	DSH161	DSH161	Left Right	120Z0634	
DSH324	DSH140	DSH184	Left Right	120Z0647	
DSH345	DSH161	DSH184	Left Right	120Z0645	
DSH368	DSH184	DSH184	Left Right	120Z0634	
DSH424	DSH184	DSH240	Left Right	120Z0659	
DSH479	DSH184	DSH295	Left Right	120Z0659	
DSH565	DSH184	DSH381	Left Right	120Z0659	
DSH482	DSH240	DSH240	Left Right	7777041	7777045 for 50Hz 120z0495 for 60Hz
DSH535	DSH240	DSH295	Left Right	7777037	
DSH590	DSH295	DSH295	Left Right	7777041	
DSH620	DSH240	DSH381	Left Right	7777048	
DSH675	DSH295	DSH381	Left Right	7777037	
DSH725	DSH240	DSH485	Left Right	120Z0569	
DSH760	DSH381	DSH381	Left Right	7777041	
DSH780	DSH295	DSH485	Left Right	120Z0551	
DSH865	DSH381	DSH485	Left Right	120Z0550	
DSH970	DSH485	DSH485	Left Right	120Z0578	

For example: Tandem DSH535
- Compressor 1: DSH240 Code number 120H1122 (Motor code 4/110-240 V electronic module/Industrial pack)
- Compressor 2: DSH295 Code number 120H1126 (Motor code 4/110-240 V electronic module/Industrial pack)
- Tandem kit DSH535: Code number 7777037
- Two mounting Kits 7777045 (or 120Z0495 if 60 Hz application)

For example: Tandem DSH324
- Compressor 1: DSH140 Code number 120H1207 (Motor code 4 /Industrial pack)
- Compressor 2: DSH184 Code number 120H1223 (Motor code 4 /Industrial pack)
- Tandem kit DSH324 120Z0647

Trio code numbers

To build a trio, you must order 3 compressors and the trio kit code below.

Trio model		Cp1	Cp2	Cp3	Suction from	Trio Kit code n°	Mounting kit
DSH420	=	DSH140	DSH140	DSH140	Left Right	120Z0672	
DSH483	=	DSH161	DSH161	DSH161	Left Right	120Z0684	Not needed
DSH552	=	DSH184	DSH184	DSH184	Left Right	120Z0685	
DSH720	=	DSH240	DSH240	DSH240	Left Right	120Z0673 7777039	
DSH885	=	DSH295	DSH295	DSH295	Left Right	120Z0673 7777039	
DSH1140	=	DSH381	DSH381	DSH381	Left Right	120Z0686 120Z0688	7777045 for 50Hz or 120Z0495 for 60Hz
DSH1245	=	DSH381	DSH381	DSH485	Left Right	7777063	
DSH1350	=	DSH381	DSH485	DSH485	Left Right	7777063	
DSH1455	=	DSH485	DSH485	DSH485	Left Right	7777040	

For example : Trio DSH1245
- Compressors 1 and 2: DSH381 Code number 120H1130 (Motor code 4/110-240 V electronic module/Industrial pack)
- Compressor 3: DSH485 Code number 120H1134 (Motor code 4/110-240 V electronic module/Industrial pack)
- Trio kit DSH1245: Code number 7777063
- Three mounting Kits 7777045 (or 120Z0495 if 60 Hz application)

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

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

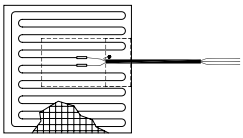
Motor protection modules

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
120Z0360	56W 24V surface sump heater + bottom insulation, CE & UL	DSH240-295-381-485	Multipack	6
120Z0376	56W 230V surface sump heater + bottom insulation, CE & UL	DSH240-295-381-485	Multipack	6
120Z0377	56W 400V surface sump heater + bottom insulation, CE & UL	DSH240-295-381-485	Multipack	6
120Z0378	56W 460V surface sump heater + bottom insulation, CE & UL	DSH240-295-381-485	Multipack	6
120Z0379	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
7777045	Mounting kit for 1 scroll compressors including 4 hexagon rigid spacer, 4 sleeves, 4 bolts, 4 washers	DSH240 to 485 in parallel installation (50 Hz)	Single pack	1
120Z0495	Mounting kit for 1 scroll compressor including 4 triangle rigid spacer, 4 sleeves, 4 bolts, 4 washers	DSH240 to 485 in parallel installation (60 Hz)	Single pack	1

Accessories

Lubricant

Code no.	Description	Packaging	Pack Size
7754023	POE lubricant, 1 litre can	Single pack	1
120Z0571	POE lubricant, 2.5 litre can	Single pack	1

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	DSH182-212-242-282-322-368	Single pack	1
120Z0644	Suction washer, rigid spacer, organ pipe, gasket	DSH195-230	Single pack	1
120Z0645	Suction washer, rigid spacer, organ pipe, gasket	DSH210-251-345	Single pack	1
120z0646	Suction washer, rigid spacer, organ pipe, gasket	DSH260-281-301	Single pack	1
120Z0647	Suction washer, rigid spacer, organ pipe, gasket	DSH289-304-324	Single pack	1
120Z0660	Suction washer, rigid spacer, organ pipe, gasket	DSH274	Single pack	1
120Z0659	Suction washer, rigid spacer, grommets, organ pipe, sleeve, gasket	DSH424-479-564	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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