

Application guidelines

Danfoss scrolls, **H-Series** Residential and light commercial

50 - 60 Hz - R22 - R407C - R410A



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General Information

GENERAL INFORMATION


PRODUCT INFORMATION


SYSTEM DESIGN

INTEGRATION INTO SYSTEM

ORDERING INFORMATION

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.

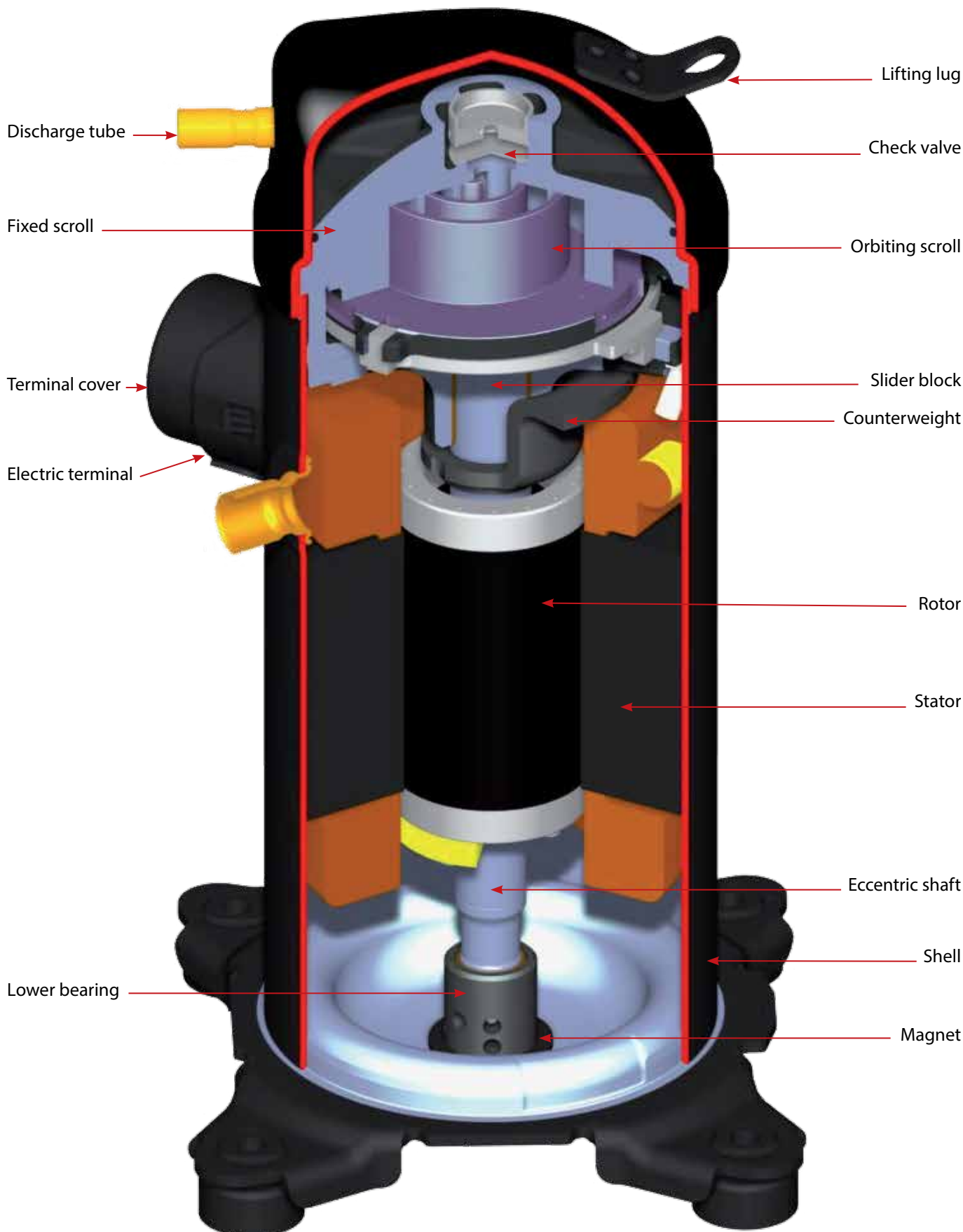
 This icon indicates instructions to avoid reliability risk.

You are strongly advise to follow these instructions. For any deviation from the guidelines, please contact Danfoss Technical Support.

Features

Danfoss H-series scroll compressors are manufactured using the most advanced machining, assembly, and process control techniques. In design of both the compressor and the factory, very high standards of reliability

and process control were first priority. The result is a highly efficient product with the highest reliability obtainable, and a low sound level. The H-series compressors can be black or blue depending on the production site.



Compressor model designation

Danfoss H-series scroll compressor for R22/R407C/R410A is available as single compressor and can be assembled in tandem 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 section "Ordering information and packaging".

Nomenclature

Type	Size	Motor	Features
HRH	036	U1L	P6

Application: _____
H: high temperature / air conditioning

Family: _____
C: commercial scroll
R: residential scroll
L: light commercial scroll

Refrigerant & lubricant: _____
M: R22, alkylbenzene lubricant
P: R407C, PVE lubricant
H: R410A, PVE lubricant
J: R410A, PVE lubricant

Nominal capacity: _____
 In thousand Btu/h at 60 Hz, ARI conditions

Model variation _____
T: design optimized for 7.2/54.4°C
U: design optimized for 7.2/37.8°C

Other features

	Oil sight glass	Oil equalisation	Oil drain	LP gauge port	Gas equalisation port
6	None	None	None	None	None
7	Threaded	None	None	None	None
8	None	Brazed	None	None	Brazed
T	None	Screw	Schrader	None	None

Tubing and electrical connections
P: brazed connections, spade terminals
C: brazed connections, screw terminals

Motor protection
L: internal motor protection

Motor voltage code
1: 208-230V/1~/60 Hz
2: 200-220V/3~/50Hz & 208-230V/3~/60 Hz
4: 380-415V/3~/50 Hz & 460V/3~/60 Hz
5: 220-240V/1~/50 Hz
7: 500V/3~/50 Hz & 575V/ 3~/60 Hz
9: 380V/3~/60 Hz

Feature Version T compressors are built with a threaded oil equalization port to be used with Danfoss variable speed compressors range VZH series.

GENERAL INFORMATION

PRODUCT INFORMATION

SYSTEM DESIGN

INTEGRATION INTO SYSTEM

ORDERING INFORMATION

Technical specifications

50-60 Hz data

Model	Nominal tons	Nominal cooling capacity		Power input	MCC	COP	E.E.R	Swept volume	Displacement	Oil charge	Net weight	
	60 Hz	W	Btu/h	kW	(A)	W/W	Btu/h/W	cm ³ /rev	m ³ /h	dm ³	kg	
50Hz	HRM025T4	2	5950	20 300	1.86	6.8	3.2	10.9	34.1	5.9	1.06	32
	HRM034U4	2.8	8 350	28 490	2.66	9.5	3.14	10.7	46.2	8.03	1.06	32
	HRM034T4	2.8	8 200	28 000	2.66	9.5	3.29	11.2	46.2	8.03	1.06	32
	HRM038U4	3.2	9 240	31 520	2.94	10.0	3.14	10.7	51.6	8.98	1.06	32
	HRM040U4	3.3	9 710	33 120	2.98	10.0	3.26	11.1	54.4	9.47	1.06	32
	HRM042U4	3.5	10 190	34 770	3.13	11.0	3.26	11.1	57.2	9.95	1.06	32
	HRM042T4	3.5	10 110	34 500	3.08	11.0	3.28	11.2	57.2	9.95	1.06	32
	HRM045U4	3.8	10 940	37 310	3.45	12.0	3.17	10.8	61.5	10.69	1.33	32
	HRM047U4	3.9	11 500	39 250	3.57	12.0	3.23	11	64.1	11.15	1.33	32
	HRM048U4	4	11 510	39 270	3.57	12.5	3.23	11	64.4	11.21	1.57	39
	HRM051T4	4.3	12 390	42 280	3.67	13.0	3.37	11.5	68.8	11.98	1.57	39
	HRM051U4	4.3	12 800	43 690	3.83	13.0	3.34	11.4	68.8	11.98	1.57	39
	HRM054U4	4.5	13 390	45 680	3.97	13.1	3.37	11.5	72.9	12.69	1.57	41
	HRM054T4	4.5	13 300	45 400	3.84	13.1	3.46	11.8	72.9	12.69	1.57	41
	HRM058U4	4.8	14 340	48 930	4.25	15.0	3.37	11.5	78.2	13.6	1.57	41
	HRM060T4	5	14 570	49 720	4.28	15.0	3.4	11.6	81	14.09	1.57	41
	HRM060U4	5	14 820	50 580	4.4	15.0	3.37	11.5	81	14.09	1.57	41
	HLM068T4	5.7	16 880	57 580	5	15.0	3.37	11.5	93.1	16.2	1.57	41
	HLM072T4	6	17 840	60 870	5.29	15.0	3.37	11.5	98.7	17.2	1.57	41
	HLM075T4	6.3	18 430	62 880	5.37	16.0	3.43	11.7	102.8	17.88	1.57	41
HLM081T4	6.8	19 890	67 880	5.8	17.0	3.43	11.7	110.9	19.3	1.57	41	
HCM094T4	7.8	23 060	78 670	6.8	21.0	3.39	11.6	126	21.93	2.66	47	
HCM109T4	9.1	26 690	91 070	7.77	24.0	3.43	11.7	148.8	25.89	2.66	47	
HCM120T4	10	29 130	99 390	8.51	25.0	3.42	11.7	162.4	28.26	2.66	47	
60Hz	HRM025T4	2	7090	24 200	2.22	6.8	3.2	10.9	34.1	7.12	1.06	32
	HRM034U4	2.8	9 810	33 480	3.07	9.5	3.2	10.9	46.2	9.69	1.06	32
	HRM034T4	2.8	9960	34 010	2.98	9.5	3.34	11.4	46.2	9.69	1.06	32
	HRM038U4	3.2	11 130	37 980	3.39	10.0	3.28	11.2	51.6	10.84	1.06	32
	HRM040U4	3.3	11 720	39 980	3.57	10.0	3.28	11.2	54.4	11.43	1.06	32
	HRM042U4	3.5	12 300	41 980	3.75	11.0	3.28	11.2	57.2	12.0	1.06	32
	HRM042T4	3.5	12 160	41 510	3.64	11.0	3.34	11.4	57.2	12.0	1.06	32
	HRM045U4	3.8	13 180	44 980	4.01	12.0	3.28	11.2	61.5	12.9	1.33	32
	HRM047U4	3.9	13 920	47 490	4.22	12.0	3.3	11.3	64.1	13.46	1.33	32
	HRM048U4	4	13 830	47 180	4.25	12.5	3.25	11.1	64.4	13.53	1.57	39
	HRM051T4	4.3	15 030	51 270	4.46	13.0	3.37	11.5	68.8	14.46	1.57	39
	HRM051U4	4.3	15 030	51 280	4.46	13.0	3.37	11.5	68.8	14.46	1.57	39
	HRM054U4	4.5	15 730	53 680	4.62	13.1	3.4	11.6	72.9	15.32	1.57	41
	HRM054T4	4.5	15 820	54 000	4.53	13.1	3.49	11.9	72.9	15.32	1.57	41
	HRM058U4	4.8	16 930	57 780	5.02	15.0	3.37	11.5	78.2	16.41	1.57	41
	HRM060T4	5	17 490	59 670	5.14	15.0	3.4	11.6	81	17.0	1.57	41
	HRM060U4	5	17 490	59 680	5.19	15.0	3.37	11.5	81	17.0	1.57	41
	HLM068T4	5.7	20 190	68 880	5.94	15.0	3.4	11.6	93.1	19.55	1.57	41
	HLM072T4	6	21 330	72 770	6.27	15.0	3.4	11.6	98.7	20.76	1.57	41
	HLM075T4	6.3	22 120	75 480	6.45	16.0	3.43	11.7	102.8	21.58	1.57	41
HLM081T4	6.8	23 880	81 470	6.96	17.0	3.43	11.7	110.9	23.29	1.57	41	
HCM094T4	7.8	27 690	94 470	8.07	21.0	3.43	11.7	126	26.47	2.66	47	
HCM109T4	9.1	32 020	109 270	9.33	24.0	3.43	11.7	148.8	31.25	2.66	47	
HCM120T4	10	34 950	119 260	10.22	25.0	3.42	11.7	162.4	34.11	2.66	47	

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
 COP = Coefficient Of Performance
 EER = Energy Efficiency Ratio

Standard rating conditions: ARI standard
 Refrigerant: R22
 Superheat: 11.1 K

Evaporating temperature: 7.2 °C
 Condensing temperature: 54.4 °C
 Sub-cooling: 8.3 K

Subject to modification without prior notification

Data given for motor code 4 compressor, for full data details and capacity tables refer to Online Datasheet Generator: www.danfoss.com/odsg

Technical specifications

50-60 Hz data

Model	Nominal tons	Nominal cooling capacity		Power input	MCC	COP	E.E.R	Swept volume	Displacement	Oil charge	Net weight
	60 Hz	W	Btu/h	kW	(A)	W/W	Btu/h/W	cm ³ /rev	m ³ /h	dm ³	kg
HRP025T4	2.0	5730	19 570	1.86	6.8	3.08	10.5	34.1	5.90	1.06	32
HRP034T4	2.8	7 940	27 080	2.68	9.5	2.96	10.1	46.2	8.03	1.06	32
HRP038T4	3.2	8 840	30 150	2.82	10.0	3.14	10.7	51.6	8.98	1.06	32
HRP040T4	3.3	9 110	31 080	3.14	10.0	2.90	9.9	54.4	9.47	1.06	32
HRP042T4	3.5	9 580	32 680	3.30	11.0	2.90	9.9	57.2	9.95	1.06	32
HRP045T4	3.8	10 810	36 890	3.58	12.0	3.02	10.3	61.5	10.69	1.33	32
HRP047T4	3.9	11 130	37 980	3.69	12.0	3.02	10.3	64.1	11.15	1.33	32
HRP048T4	4.0	11 100	37 880	3.35	12.5	3.31	11.3	64.4	11.21	1.57	39
HRP051T4	4.3	12 120	41 370	3.83	13.0	3.17	10.8	68.8	11.98	1.57	39
50Hz HRP054T4	4.5	12 570	42 880	3.97	13.1	3.17	10.8	72.8	12.66	1.57	41
HRP058T4	4.8	13 470	45 970	4.25	15.0	3.17	10.8	78.2	13.60	1.57	41
HRP060T4	5.0	13 860	47 280	4.26	15.0	3.25	11.1	81.0	14.09	1.57	41
HLP068T4	5.7	15 700	53 560	5.10	15.0	3.08	10.5	93.1	16.20	1.57	41
HLP072T4	6.0	16 620	56 740	5.30	15.0	3.14	10.7	98.7	17.17	1.57	41
HLP075T4	6.3	18 040	61 550	5.54	16.0	3.26	11.1	102.8	17.88	1.57	41
HLP081T4	6.8	19 480	66 510	5.99	17.0	3.25	11.1	110.9	19.30	1.57	41
HCP094T4	7.8	21 590	73 660	6.63	21.0	3.26	11.1	126.0	21.93	2.66	47
HCP109T4	9.1	26 060	88 950	7.93	24.0	3.28	11.2	148.8	25.89	2.66	47
HCP120T4	10.0	28 150	96 080	8.88	25.0	3.17	10.8	162.4	28.26	2.66	47
60Hz HRP025T4	2.0	6880	23 490	2.22	6.8	3.11	10.6	34.1	7.12	1.06	32
HRP034T4	2.8	9580	32 700	3.20	9.5	3.00	10.2	46.2	9.69	1.06	32
HRP038T4	3.2	10 670	36 410	3.36	10.0	3.18	10.8	46.2	10.84	1.06	32
HRP040T4	3.3	10 990	37 510	3.70	10.0	2.97	10.1	54.4	11.43	1.06	32
HRP042T4	3.5	11 560	39 460	3.93	11.0	2.94	10.0	57.2	12.01	1.06	32
HRP045T4	3.8	13 050	44 540	4.27	12.0	3.06	10.4	61.5	12.9	1.33	32
HRP047T4	3.9	12 690	43 300	4.24	12.0	3.00	10.2	64.1	13.46	1.33	32
HRP048T4	4.0	13 400	45 740	3.99	12.5	3.36	11.5	64.4	13.53	1.57	39
HRP051T4	4.3	14 380	49 080	4.46	13.0	3.23	11.0	68.8	14.46	1.57	39
60Hz HRP054T4	4.5	15 120	51 770	4.73	13.1	3.21	11.0	72.8	15.28	1.57	41
HRP058T4	4.8	16 260	55 510	5.07	15.0	3.17	10.8	78.2	16.41	1.57	41
HRP060T4	5.0	16 720	57 010	5.07	15.0	3.30	11.3	81.0	17.01	1.57	41
HLP068T4	5.7	18 950	64 660	6.08	15.0	3.12	10.6	93.1	19.55	1.57	41
HLP072T4	6.0	20 060	68 480	6.32	15.0	3.17	10.8	98.7	20.72	1.57	41
HLP075T4	6.3	21 770	74 330	6.60	16.0	3.30	11.3	102.8	21.58	1.57	41
HLP081T4	6.8	23 380	79 810	7.14	17.0	3.27	11.2	110.9	23.29	1.57	41
HCP094T4	7.8	26 060	88 950	7.90	21.0	3.30	11.3	126.0	26.47	2.66	47
HCP109T4	9.1	31 450	107 350	9.46	24.0	3.32	11.3	148.8	31.25	2.66	47
HCP120T4	10.0	33 970	115 960	10.59	25.0	3.21	11.0	162.4	34.11	2.66	47

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

COP = Coefficient Of Performance

EER = Energy Efficiency Ratio

Standard rating conditions: ARI standard

Refrigerant: R407C

Superheat: 11.1 K

Evaporating temperature: 7.2 °C

Condensing temperature: 54.4 °C

Sub-cooling: 8.3 K

Subject to modification without prior notification

Data given for motor code 4 compressor, for full data details and capacity tables refer to Online Datasheet Generator: www.danfoss.com/odsg

Technical specifications

50-60 Hz data

Model	Nominal tons 60 Hz	Nominal cooling capacity		Power input	MCC	COP	E.E.R	Swept volume	Displacement	Oil charge	Net weight	
	TR	W	Btu/h	kW	(A)	W/W	Btu/h/W	cm ³ /rev	m ³ /h	dm ³	kg	
50Hz	HRH029U4	2.4	7 120	24 310	2.43	10.0	2.93	10	27.8	4.84	1.06	32
	HRH034U4	2.8	8 500	29 000	2.9	10.0	2.93	10	33.3	5.75	1.06	32
	HRH036U4	3	8 820	30 110	3.13	10.0	2.82	9.62	34.7	6.04	1.06	32
	HRH038U4	3.2	9 250	31 560	3.35	12.0	2.76	9.41	36.5	6.36	1.06	39
	HRH040U4	3.3	10 200	34 810	3.58	12.0	2.85	9.72	39.6	6.9	1.33	39
	HRH041U4	3.3	10 050	34 300	3.43	12.5	2.93	10	39.3	6.8	1.57	39
	HRH044U4	3.7	10 830	36 940	3.92	13.5	2.76	9.41	42.6	7.41	1.57	39
	HRH047U4	3.9	11 340	38 700	3.87	13.5	2.93	10.01	44.4	7.73	1.57	39
	HRH049U4	4.1	12 110	41 320	4.04	13.5	2.99	10.22	47.4	8.24	1.57	39
	HRH051U4	4.3	12 860	43 890	4.21	14.0	3.05	10.42	49.3	8.58	1.57	41
	HRH054U4	4.5	13 340	45 510	4.41	15.0	3.02	10.32	52.1	9.07	1.57	41
	HRH056U4	4.7	13 830	47 200	4.58	15.0	3.02	10.31	54.1	9.42	1.57	41
	HLH061T4	5.1	15 210	51 880	4.89	15.0	3.11	10.61	57.8	10.1	1.57	41
	HLH068T4	5.7	16 880	57 610	5.26	19.0	3.21	10.96	64.4	11.21	1.57	41
	HLJ072T4	6	17 840	60 900	5.56	19.0	3.21	11	68	11.82	1.57	41
	HLJ075T4	6.3	18 600	63 490	5.77	19.0	3.22	11	70.8	12.32	1.57	41
	HLJ083T4	6.9	20 420	69 690	6.28	19.0	3.25	11.1	78.1	13.59	1.57	41
	H CJ090T4	7.5	22 320	76 190	7.19	25.0	3.11	10.6	86.9	15.11	2.66	44
	H CJ091T4	7.5	22 380	76 360	7.03	25.0	3.18	10.87	86.9	15.11	2.46	49
	H CJ105T4	8.8	26 100	89 090	8.25	25.0	3.16	10.8	101.6	17.68	2.66	44
H CJ106T4	8.8	26 050	88 880	8.07	26.0	3.23	11.01	101.6	17.68	2.46	49	
H CJ120T4	10	29 610	101 080	9.53	27.0	3.11	10.6	116.4	20.24	2.66	44	
H CJ121T4	10	29 720	101 400	9.22	26.0	3.22	11	116.4	20.24	2.46	49	
60Hz	HRH029U4	2.4	8 500	29 000	2.84	10.0	2.99	10.2	27.8	5.84	1.06	32
	HRH031U4	2.6	9 080	30 990	3.04	10.0	2.99	10.2	29.8	6.26	1.06	32
	HRH032U4	2.7	9 380	31 990	3.1	10.0	3.02	10.3	30.6	6.43	1.06	32
	HRH034U4	2.8	10 110	34 510	3.38	10.0	2.99	10.2	33.3	6.94	1.06	32
	HRH036U4	3	10 370	35 390	3.47	10.0	2.99	10.2	34.7	7.3	1.06	32
	HRH038U4	3.2	11 100	37 890	3.79	12.0	2.93	10	36.5	7.67	1.06	39
	HRH040U4	3.3	12 160	41 490	4.03	12.0	3.02	10.3	39.6	8.3	1.33	39
	HRH041U4	3.3	12 100	41 300	4.05	12.5	2.99	10.2	39.3	8.3	1.57	39
	HRH044U4	3.7	13 010	44 390	4.31	13.5	3.02	10.3	42.6	8.95	1.57	39
	HRH047U4	3.9	13 630	46 510	4.56	13.5	2.99	10.2	44.4	9.33	1.57	39
	HRH049U4	4.1	14 360	48 990	4.66	13.5	3.08	10.5	47.4	9.95	1.57	39
	HRH051U4	4.3	15 180	51 780	4.84	14.0	3.14	10.7	49.3	10.36	1.57	41
	HRH054U4	4.5	15 970	54 480	5.14	15.0	3.11	10.6	52.1	10.94	1.57	41
	HRH056U4	4.7	16 670	56 880	5.36	15.0	3.11	10.6	54.1	11.36	1.57	41
	HLH061T4	5.1	18 050	61 580	5.7	15.0	3.17	10.8	57.8	12.13	1.57	41
	HLH068T4	5.7	20 130	68 670	6.3	19.0	3.2	10.9	64.4	13.52	1.57	41
	HLJ072T4	6	21 240	72 500	6.65	19.0	3.19	10.9	68	14.27	1.57	41
	HLJ075T4	6.3	22 320	76 190	6.86	19.0	3.25	11.1	70.8	14.87	1.57	41
	HLJ083T4	6.9	24 340	83 090	7.55	19.0	3.22	11	78.1	16.4	1.57	41
	H CJ090T4	7.5	26 810	91 500	8.47	25.0	3.16	10.8	86.9	18.24	2.66	44
H CJ091T4	7.5	27 140	92 600	8.37	25.0	3.24	11.07	86.9	18.24	2.46	49	
H CJ105T4	8.8	31 170	106 390	9.75	25.0	3.2	10.9	101.6	21.34	2.66	44	
H CJ106T4	8.8	31 670	108 050	9.67	26.0	3.28	11.18	101.6	21.34	2.46	49	
H CJ120T4	10	35 620	121 600	11.15	27.0	3.2	10.9	116.4	24.43	2.66	44	
H CJ121T4	10	35 940	122 620	11.07	26.0	3.25	11.08	116.4	24.43	2.46	49	

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

COP = Coefficient Of Performance

EER = Energy Efficiency Ratio

Standard rating conditions: ARI standard

Refrigerant: R410A

Superheat: 11.1 K

Evaporating temperature: 7.2 °C

Condensing temperature: 54.4 °C

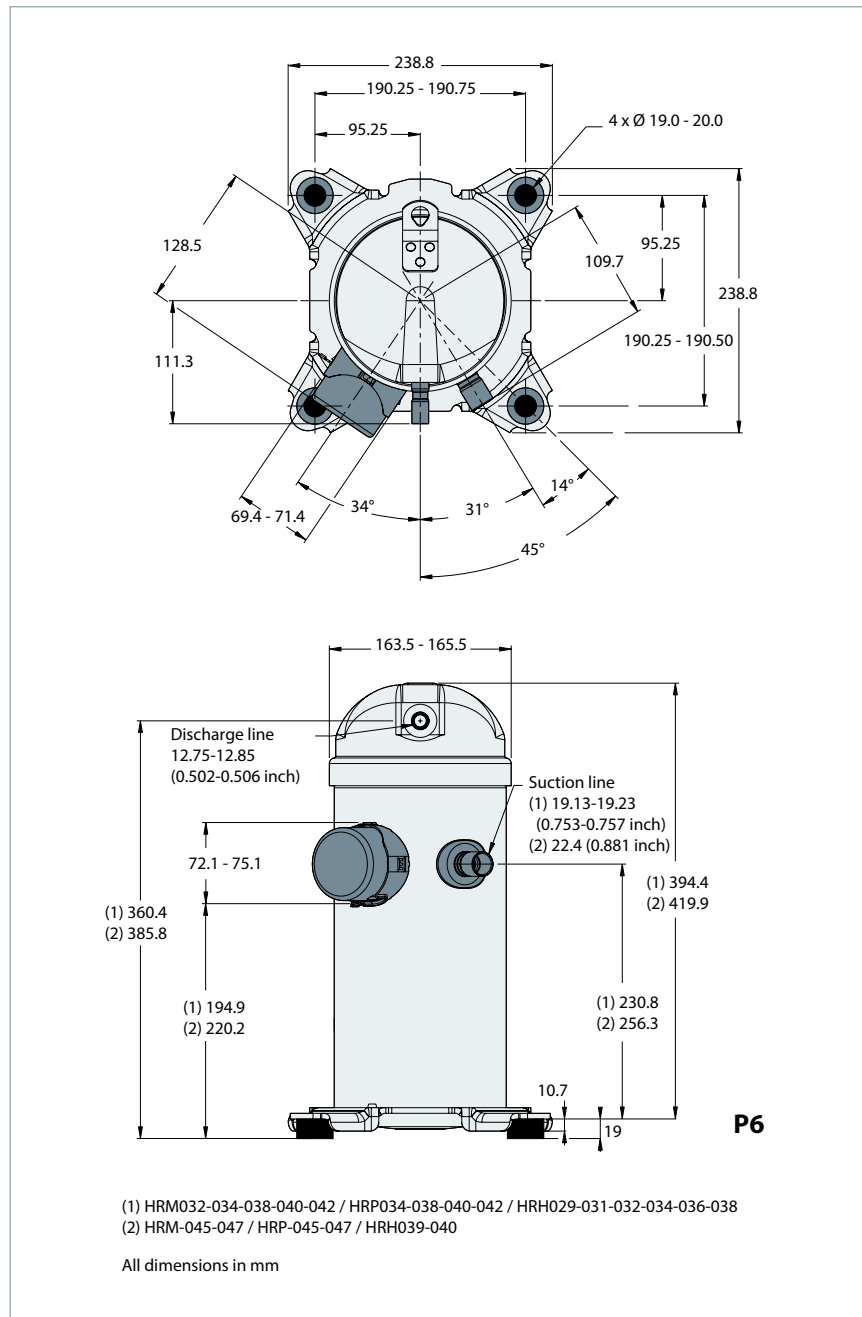
Sub-cooling: 8.3 K

Subject to modification without prior notification

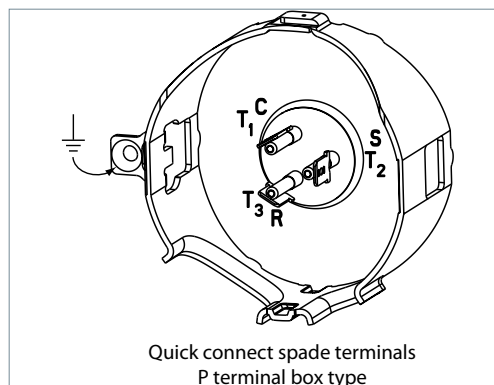
Data given for motor code 4 compressor, for full data details and capacity tables refer to Online Datasheet Generator: www.danfoss.com/odsg

Dimensions

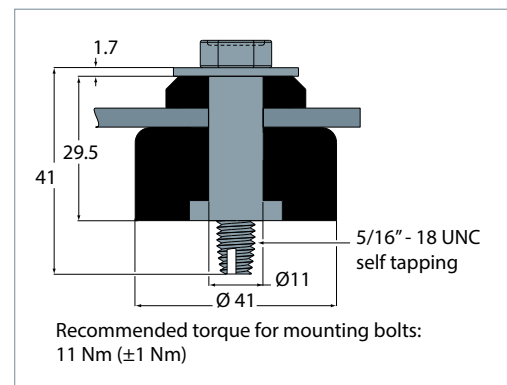
HRM032-034-038-040-042 / HRP034-038-040-042 / HRH029-031-032-034-036-038 /
HRM-045-047 / HRP-045-047 / HRH039-040



Terminal box



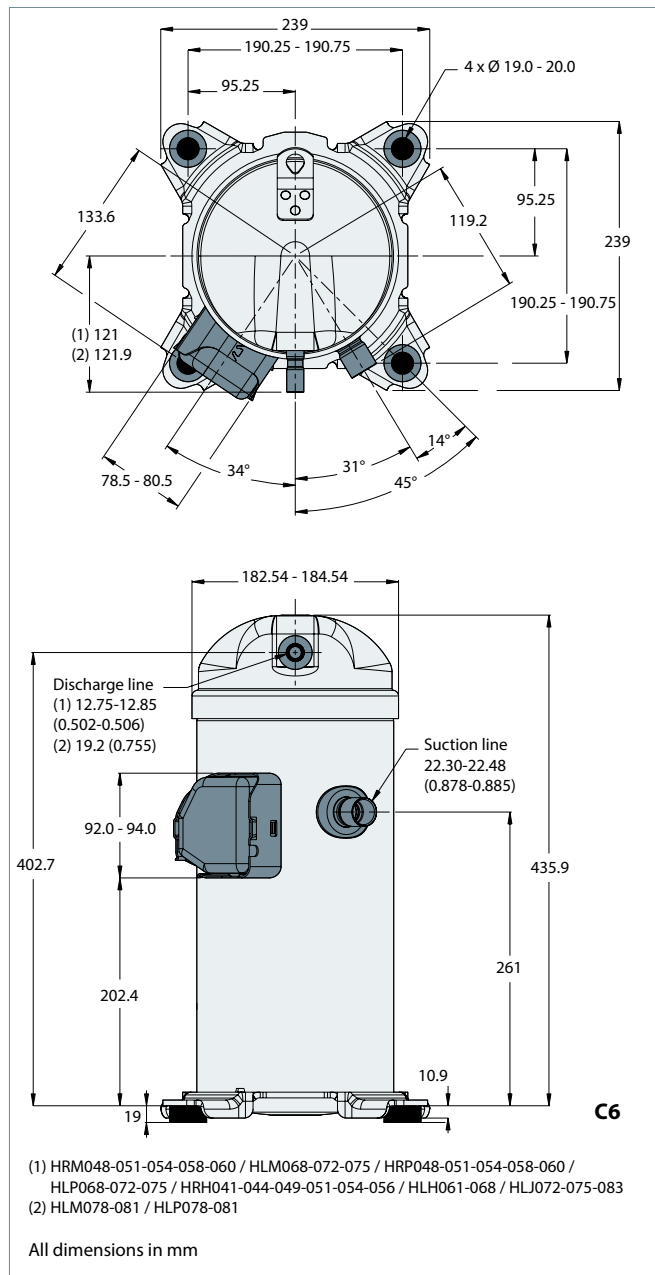
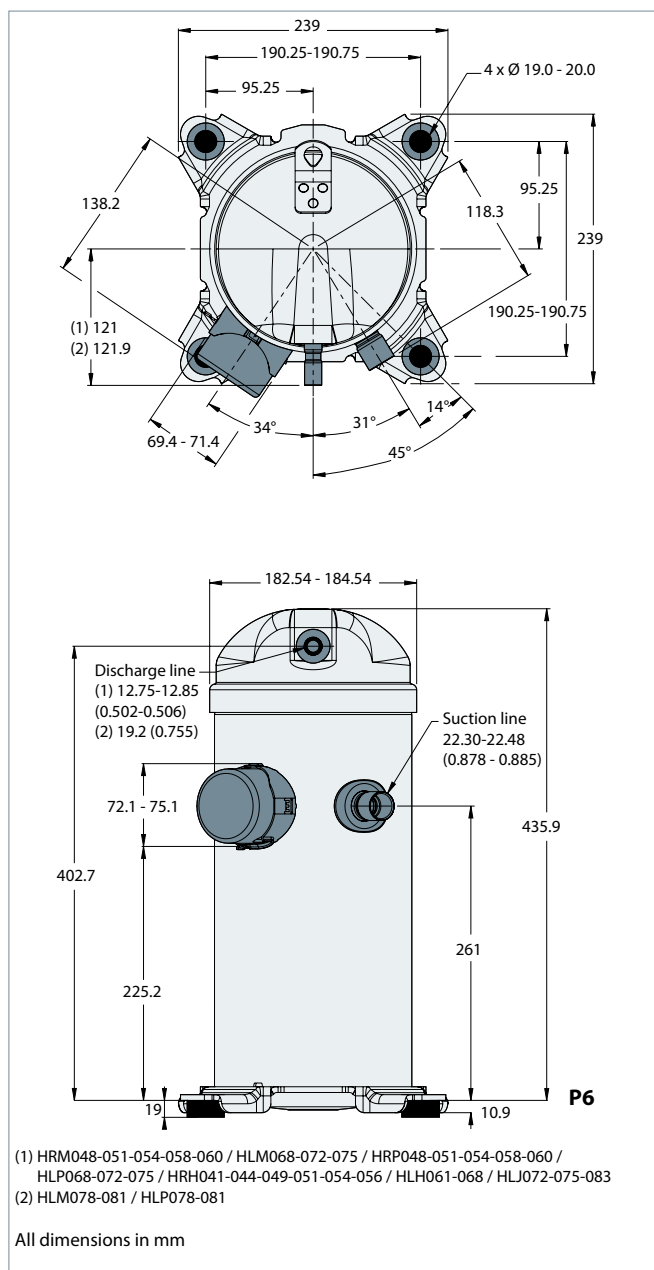
Mounting grommet



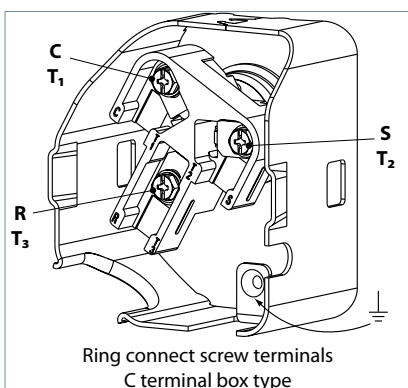
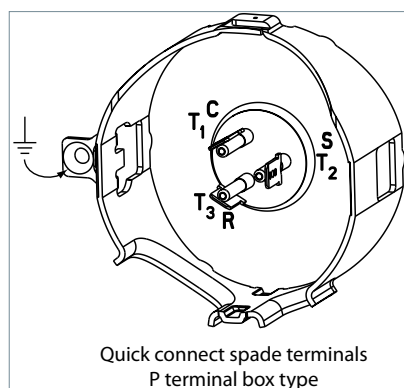
Refer to section 44 for overview of shipped mounting accessories

Dimensions

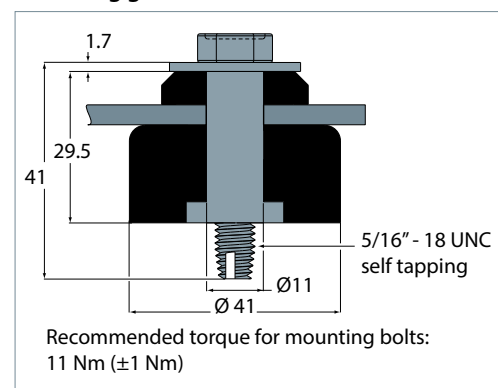
HRM048-051-054-058-060 / HLM068-072-075-078-081 / HRP048-051-054-058-060 /
HLP068-072-075-078-081 / HRH041-044-049-051-054-056 / HLH061-068 / HLJ072-075-083



Terminal boxes



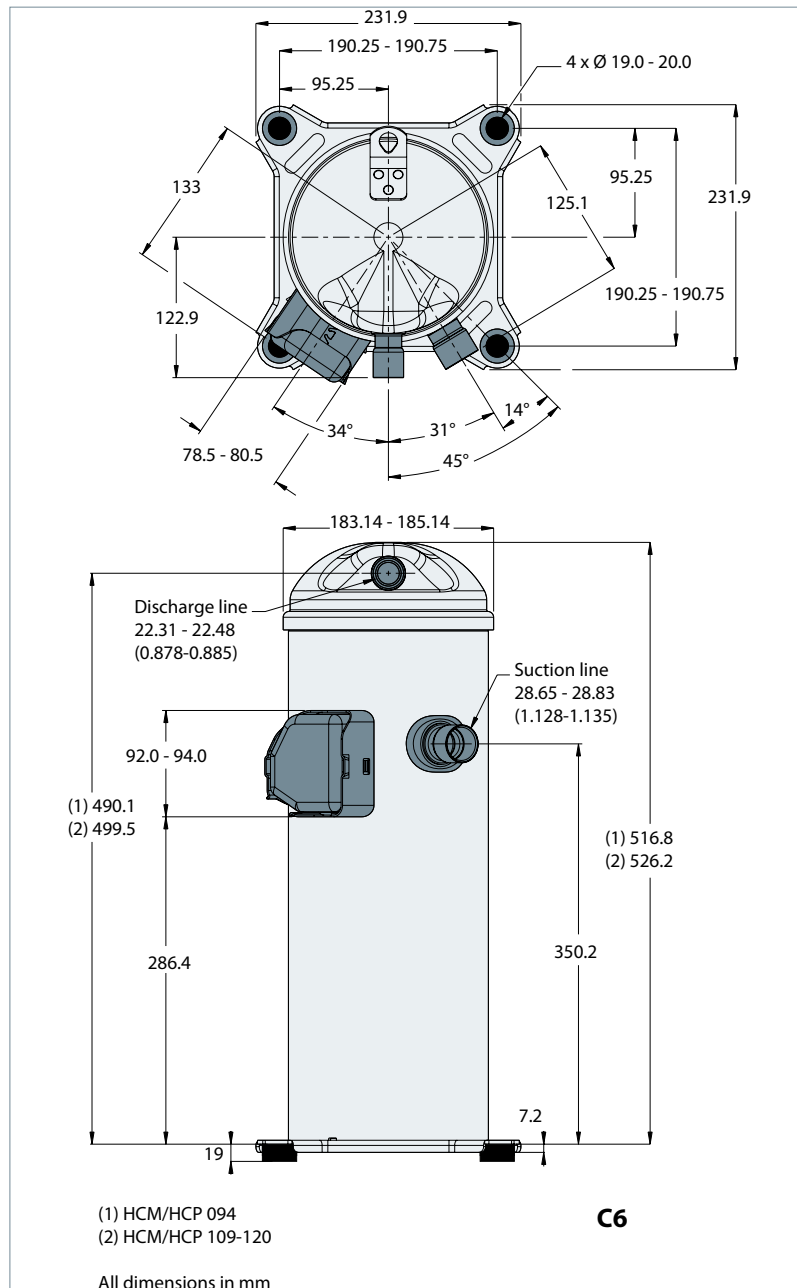
Mounting grommet



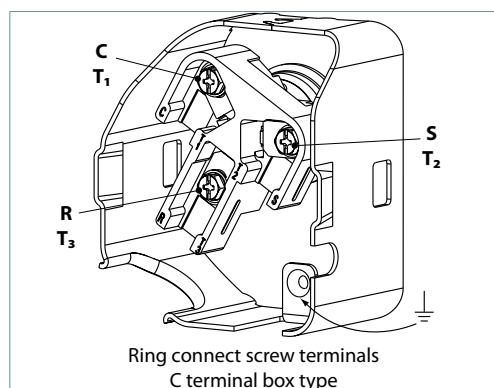
Refer to section 44 for overview of shipped mounting accessories

Dimensions

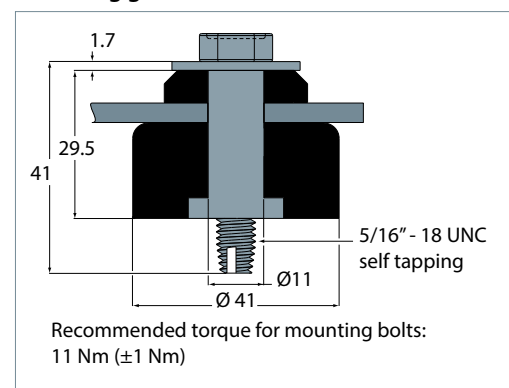
HCM/HCP 094-109-120



Terminal box



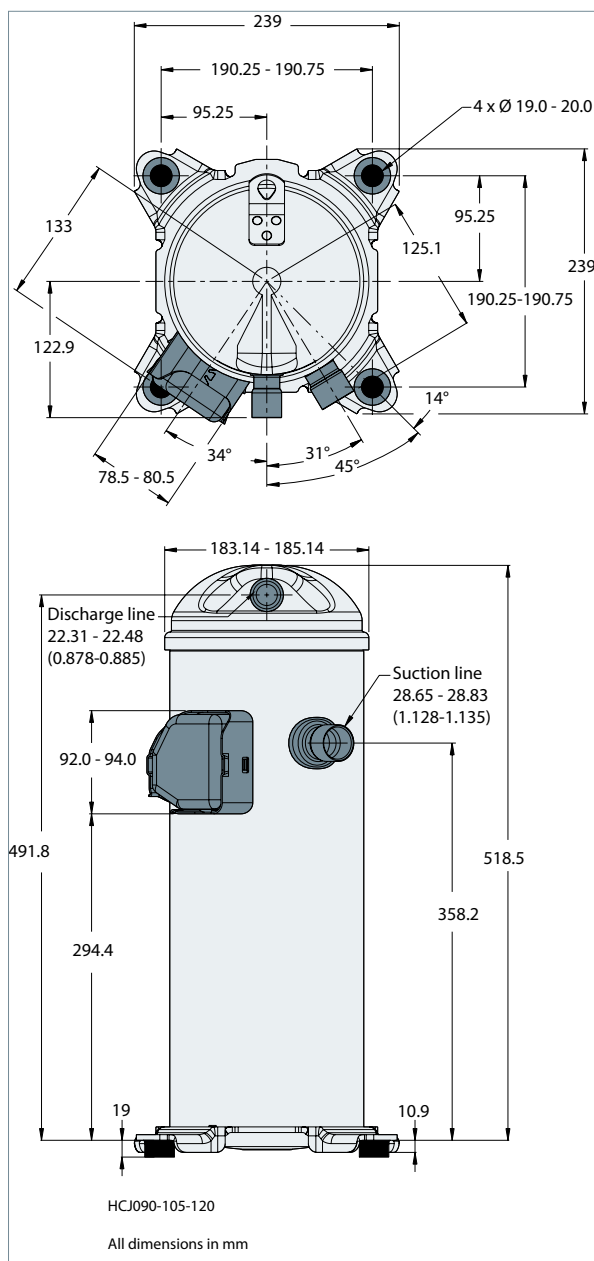
Mounting grommet



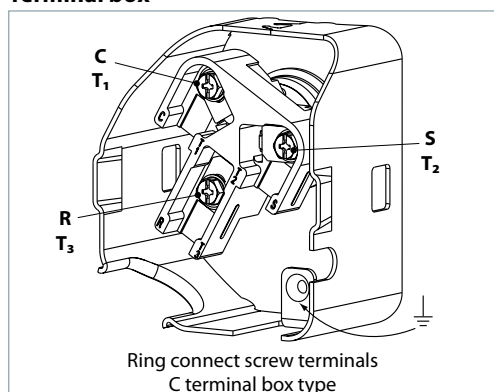
Refer to section 44 for overview of shipped mounting accessories

Dimensions

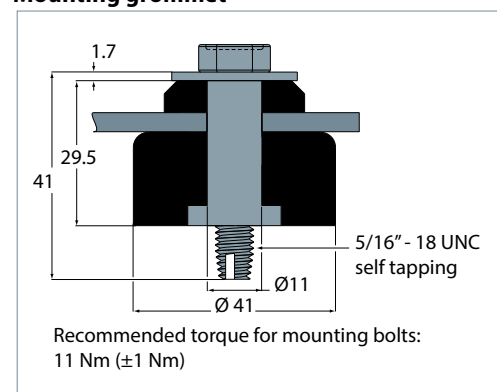
HCJ090-105-120



Terminal box



Mounting grommet



Refer to section 44 for overview of shipped mounting accessories

GENERAL INFORMATION

PRODUCT INFORMATION

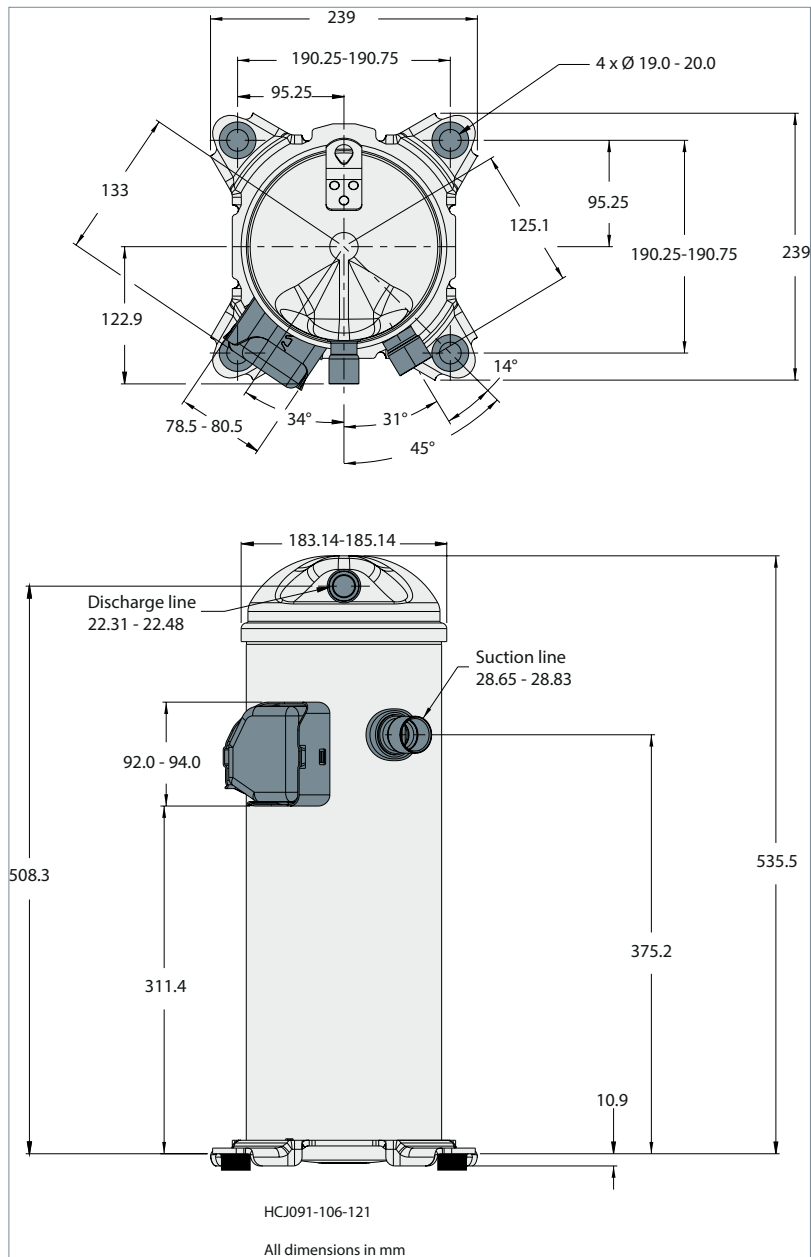
SYSTEM DESIGN

INTEGRATION INTO SYSTEM

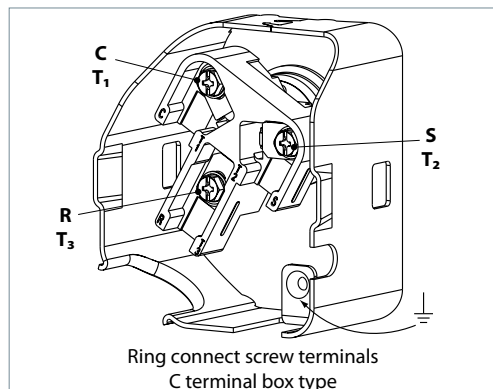
ORDERING INFORMATION

Dimensions

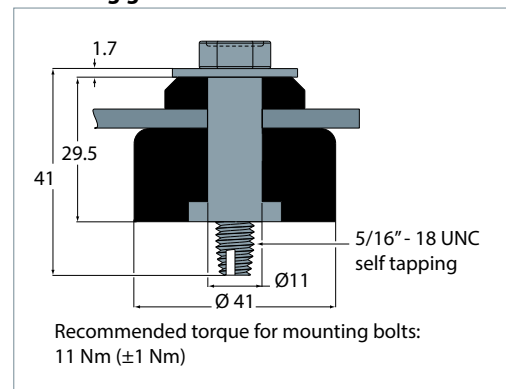
HCJ091-106-121



Terminal box



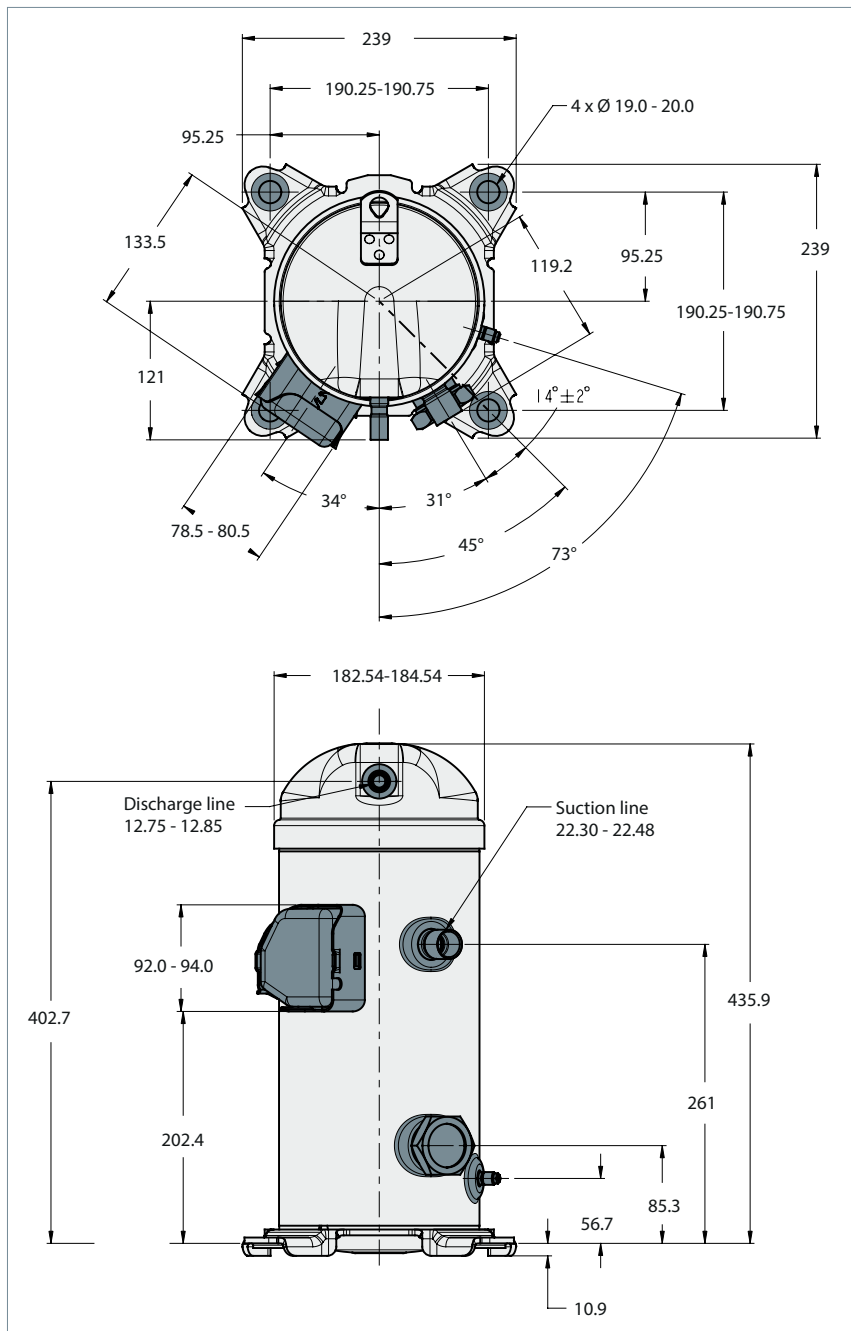
Mounting grommet



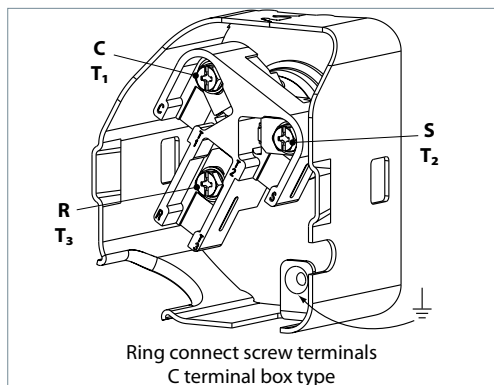
Refer to section 44 for overview of shipped mounting accessories

Dimensions

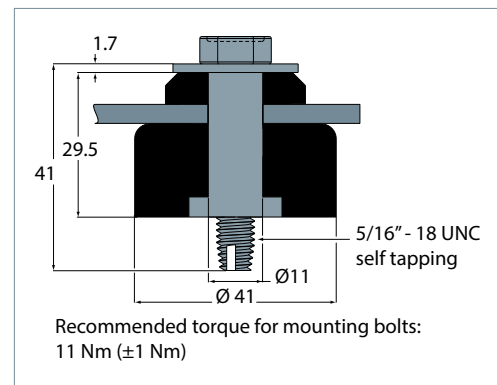
HLH061-HLJ072-HLJ083



Terminal box



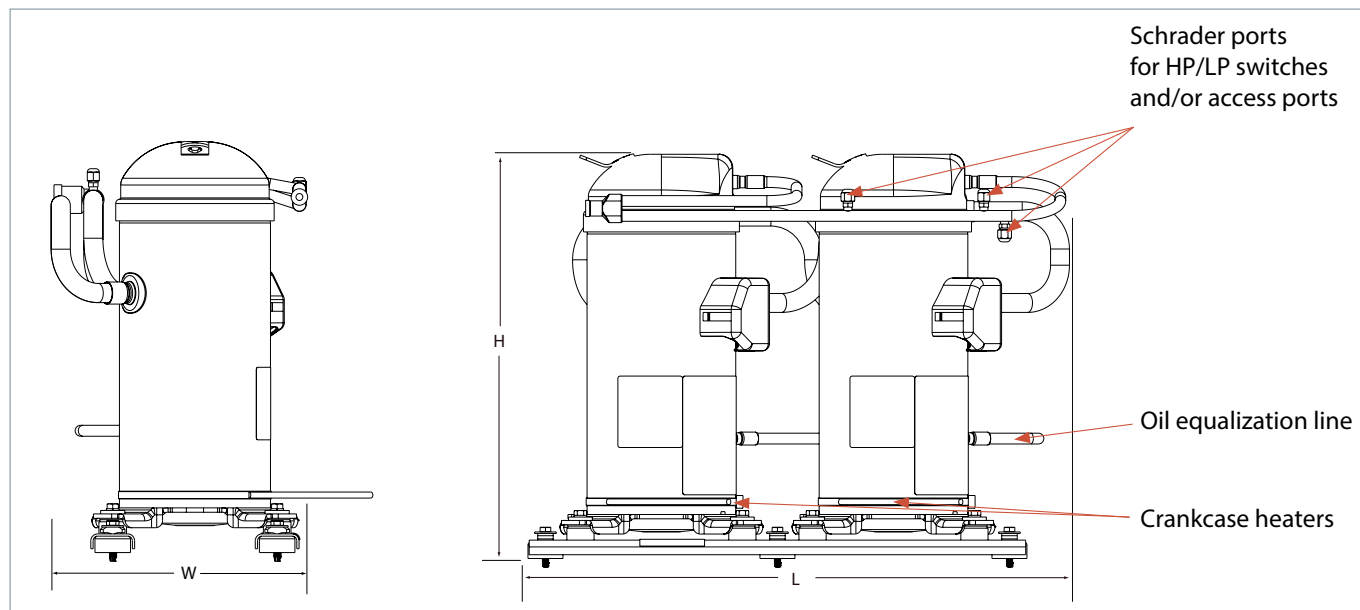
Mounting grommet



Refer to section 44 for overview of shipped mounting accessories

Version T compressors are built with a threaded oil equalization port to be used with our variable speed compressors range VZH.

Dimensions



Tandems to be achieved by assembly of individual compressors, if they are the feature 8 compressor.

Tandem model	Composition	L (mm)	H(mm)	Wmm)	Outline drawing number
TLJ082	HRH041 + HRH041	636	476	297	8556080
TLJ098	HRH049 + HRH049	636	476	297	8556080
TLJ122	HLH061 + HLH061	636	476	297	8556080
TLJ136	HLH068 + HLH068	636	476	297	8556080
TLJ144	HLJ072 + HLJ072	636	476	297	8556080
TLJ166	HLJ083 + HLJ083	636	476	297	8556080
TCJ180	HCJ090 + HCJ090	676	558	312	8556081
TCJ181	HCJ091 + HCJ091	676	575	312	8556153
TCJ210	HCJ105 + HCJ105	676	558	312	8556081
TCJ211	HCJ106 + HCJ106	676	575	312	8556153
TCJ240	HCJ120 + HCJ120	676	558	312	8556081
TCJ241	HCJ121 + HCJ121	676	575	312	8556153

Electrical data, connections and wiring

Motor voltage

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

Motor voltage code	Code 1	Code 2	Code 4	Code 5	Code 7	Code 9
Nominal voltage 50 Hz	-	200-220 V - 3 ph	380-415V - 3 ph	220-240 V -1 ph	500 V - 3 ph	-
Voltage range 50 Hz	-	180 - 242 V	342 - 457 V	198 - 264 V	450 - 550 V	-
Nominal voltage 60 Hz	208-230 V - 1ph	208-230 V - 3 ph	460 V - 3 ph	-	575 V - 3 ph	380 V - 3 ph
Voltage range 60 Hz	187 - 253 V	187 - 253 V*	414 - 506 V	-	517 - 632 V	342 - 418 V

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:

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

V_{avg} = Mean voltage of phases 1, 2 and 3
 V_{1-2} = Voltage between phases 1 and 2

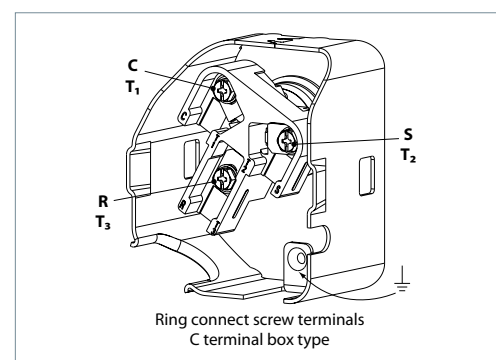
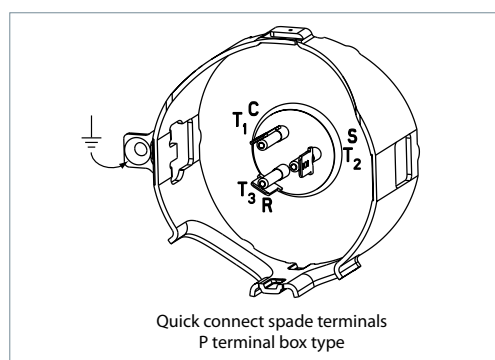
V_{1-3} = Voltage between phases 1 and 3
 V_{2-3} = Voltage between phases 2 and 3.

Wiring connections

Danfoss Scroll Compressors H-series will only compress gas while rotating counter-clockwise (when viewed from the compressor top). Since single-phase motors will start and run in only one direction, reverse rotation is not a major consideration. Three-phase motors, however, will start and run in either direction, depending on the phase angles of the supplied power. Care must be taken during installation to ensure that the compressor operates in the correct direction

(see "Phase sequence and reverse rotation protection").

The drawings below show electrical terminal labelling and should be used as a reference when wiring the compressor. For three phase applications, the terminals are labelled T1, T2, and T3. For single-phase applications the terminals are labelled C (common), S (start), and R (run).

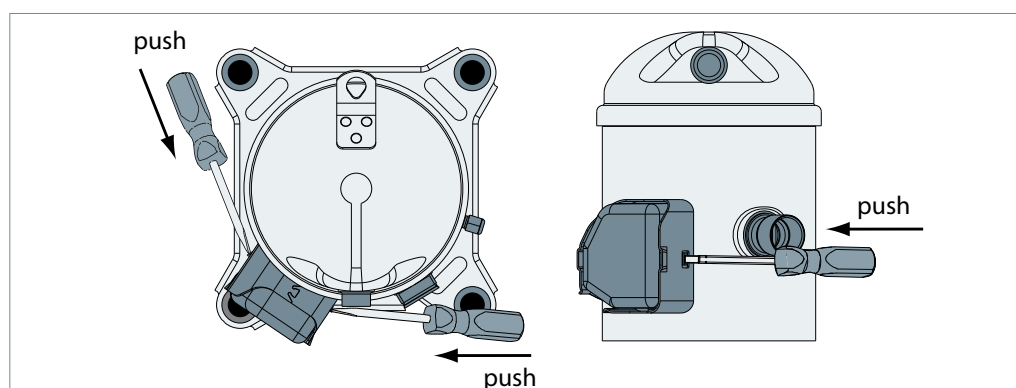


Terminal cover mounting

The terminal cover and gasket should be installed prior to operation of the compressor. The terminal cover has two outside tabs, 180 degrees apart, that engage the terminal fence.

When installing the cover, check that it is not pinching the lead wires. Both the inside of the terminal cover and the gasket have labels for the terminal pins: C (common), R (run), and S (start).

Terminal cover removal



Electrical data, connections and wiring

IP rating

The compressor terminal box IP rating according to CEI 529 is **IP22** for all models. IP ratings is only valid when correctly sized cable glands of the IP rating is applied.

- First numeral, level of protection against contact and foreign objects
2 protection against object size over 12.5 mm (fingers of similar)
- Second numeral, level of protection against water
2 protection against dripping water when tilted up to 15°

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.

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 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 (+15°C evaporating temperature and +68°C

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 indicated terminal pins at 25°C (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, the measured resistance must be corrected with following formula:

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

$t_{25^{\circ}\text{C}}$: reference temperature = 25°C

t_{amb} : temperature during measurement (°C)

$R_{25^{\circ}\text{C}}$: winding resistance at 25°C

R_{amb} : winding resistance at t_{amb}

coefficient $a = 234.5$

Motor protection

Danfoss Scroll Compressors H-Series are equipped with an internal line break protector mounted on the motor windings. The protector is an automatic reset device, containing a snap action bimetal switch.

Internal protectors respond to over-current and overheating. They are designed to interrupt

motor current under a variety of fault conditions, such as failure to start, running overload, and fan failure.

If the internal overload protector trips out, it must cool down to about 60°C to reset. Depending on ambient temperature, this may take up to several hours.

Phase sequence and reverse rotation protection

The compressor will only operate properly in a single direction. Use a phase meter to establish the phase orders and connect line phases L1, L2 and L3 to terminals T1, T2 and T3, respectively. For three-phase compressors, the motor will run equally well in both directions. Reverse rotation results in excessive noise; no pressure differential between suction and discharge; and suction line warming rather than immediate cooling.

A service technician should be present at initial start-up to verify that supply power is properly phased and that compressor and auxiliaries are rotating in the correct direction.

For H series compressors, phase monitors are required. The selected phase monitor should lock out the compressor from operation in reverse.

Electrical data, connections and wiring

Electrical connections

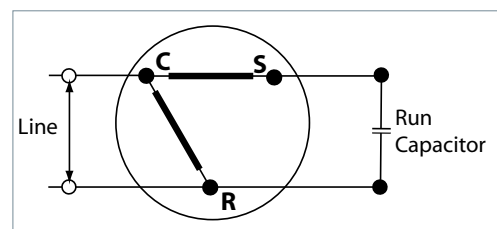
Danfoss scroll compressors are designed to operate without any assistance if running within

the defined nominal voltage. PSC wiring is sufficient (see below).

PSC wiring

The start winding (C-S) of the motor remains in circuit through a permanent (run) capacitor.

This permanent (run) capacitor is connected between the start winding (C-S) and the run winding (C-R).

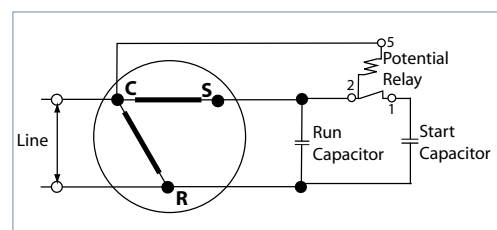


CSR wiring

If start assist is required, in case of operating below the nominal voltage, a CSR starting device is required.

During start-up, the start winding (C-S) is energised through an electromagnetic potential relay and a start capacitor.

A permanent (run) capacitor is wired between the start winding (C-S) and the run winding (C-R).



Nominal capacitor value and relays

		Models	PSC wiring Run capacitor	CSR wiring Start capacitor	Relay		
50 Hz, motor voltage code 5	R22	HRM025-032-034-038-040-042	70 µF	145-175 µF	3ARR3*3AL*	RVA 9CKL	
		HRM045-047	60 µF	145-175 µF	3ARR3*3AL*	RVA 9CKL	
		HRM051	50 µF	161-193 µF	3ARR3*24AP*	RVA 3EKL	
		HRM054	55 µF	161-193 µF	3ARR3*24AP*	RVA 3EKL	
		HRM058-060	55 µF	88-108 µF	3ARR3*25AS*	RVA 4GKL	
		HLM068-072-075-081	55 µF	88-108 µF	3ARR3*25AS*	RVA 4GKL	
	R407C	HRP025-034-038-040-042	70 µF	145-175 µF	3ARR3*3AL*	RVA 9CKL	
		HRP045-047	60 µF	145-175 µF	3ARR3*3AL*	RVA 9CKL	
		HRP051	50 µF	161-193 µF	3ARR3*24AP*	RVA 3EKL	
		HRP054	55 µF	161-193 µF	3ARR3*24AP*	RVA 3EKL	
		HRP058-060	55 µF	88-108 µF	3ARR3*25AS*	RVA 4GKL	
		HLP068-072-075-081	55 µF	88-108 µF	3ARR3*25AS*	RVA 4GKL	
	R410A	HRH029-031-032-034-036	70 µF	145-175 µF	3ARR3*3AL*	RVA 9CKL	
		HRH038-040	60 µF	145-175 µF	3ARR3*3AL*	RVA 9CKL	
		HRH051-054-056	55 µF	88-108 µF	3ARR3*25AS*	RVA 4GKL	
		HLH068, HLJ072-083	55 µF	88-108 µF	3ARR3*25AS*	RVA 4GKL	
	60 Hz, motor voltage code 1	R22	HRM025-032-034	45 µF	145-175 µF	3ARR3*3M*	RVA 2ACKL
			HRM038	55 µF	88-108 µF	3ARR3*3L*	RVA 2ABKL
HRM040-042-045-047			60 µF	88-108 µF	3ARR3*3L*	RVA 2ABKL	
HRM048			60 µF	161-193 µF	3ARR3*3L*	RVA 2ABKL	
HRM051-054			70 µF	161-193 µF	3ARR3*3L*	RVA 2ABKL	
HRM058T1-060T1 HRM058U1-060U1, HLM068-072-075-081			80 µF	189-227 µF	3ARR3*3L*	RVA 2ABKL	
R407C		HRP051	70 µF	161-193 µF	3ARR3*3L*	RVA 2ABKL	
		HLP068-072-075-081	80 µF	189-227 µF	3ARR3*3L*	RVA 2ABKL	
R410A		HRH031	45 µF	145-175 µF	3ARR3*3M*	RVA 2ACKL	
		HRH032-034	50 µF	88-108 µF	3ARR3*3L*	RVA 2ABKL	
		HRH036	55 µF	88-108 µF	3ARR3*3AL*	RVA 9CKL	
		HRH038-039-040	60 µF	88-108 µF	3ARR3*3L*	RVA 2ABKL	
	HRH041-044-048-049-050-051	70 µF	161-193 µF	3ARR3*3L*	RVA 2ABKL		
	HRH054-056, HLH068, HLJ072-083	80 µF	189-227 µF	3ARR3*3L*	RVA 2ABKL		

Approvals and certifications

Approvals and certificates Danfoss scroll H-series compressors comply with the following approvals and certificates. Certificates are listed on the product datasheets: <http://www.danfoss.com/odsg>

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

Pressure equipment directive 97/23/EC

Products	All models
Refrigerating fluids	Group 2
Category PED	I
Evaluation module	no scope

Low voltage directive 2014/35/EU

Products	All models
Declaration of conformity ref. Low voltage Directive 2014/35/EU	Contact Danfoss

Machines directive 2006/42/EC

Products	All models
Manufacturer's declaration of incorporation ref. EC Machines Directives 98/392/CE	Contact Danfoss

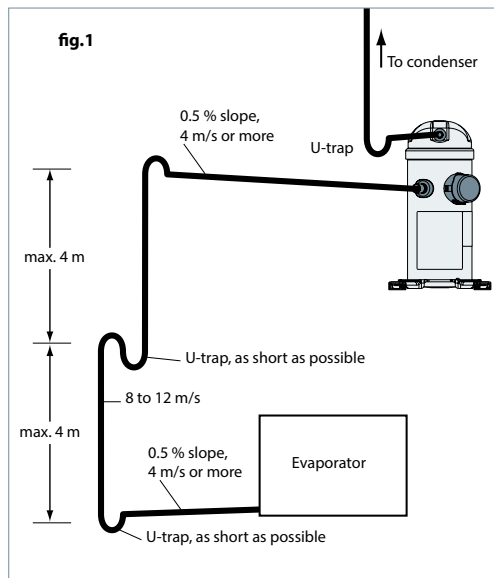
Internal free volume

Products	Internal free volume at LP side without oil (litre)	Internal free volume at HP side without oil (litre)
HRM/P032-034-038-040-042 HRH029-031-032-034-036-038	2.93	0.49
HRM/P045-047 HRH040	3.20	0.70
HRM/P048-051-054-058-060, HLM/P068-072-075-081 HRH044-049-051-054-056, HLLH/J061-068-072-075-083	3.44	0.71
HCM/P094-109-120 HCJ090-105-120	5.92	0.51
HCJ091-106-121	5.75	0.51

General requirements

Proper piping practices should be employed to:

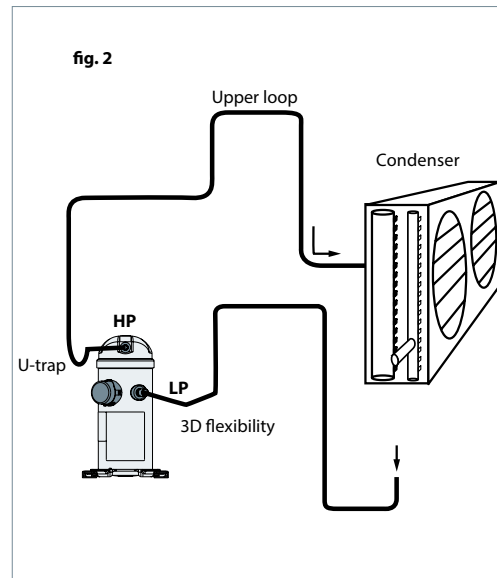
1. Ensure adequate oil return, even under minimum load conditions (refrigerant speed, piping slope). For validation tests see section "Manage oil in the circuit".



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

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:

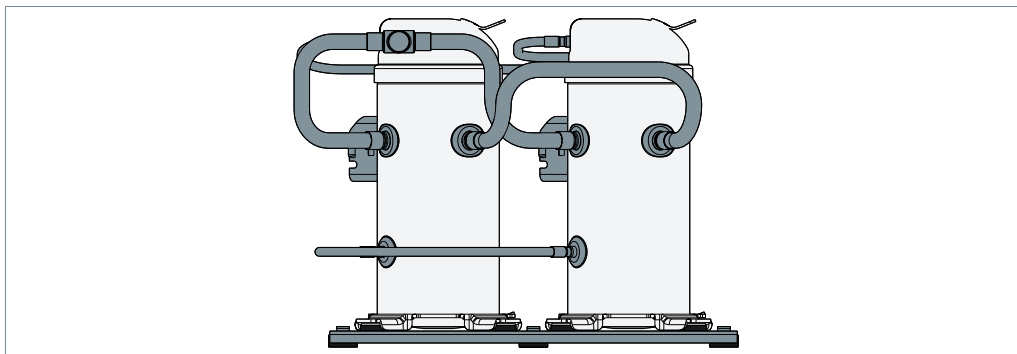


mount has been installed. For more information on noise and vibration, see section on: "MANAGE SOUND AND VIBRATION".

Tandem requirements

Danfoss scroll compressor H series tandem 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 designs.

The discharge line as no impact on oil balancing and is shown with tees, to indicate that both left and right side discharge header are possible



Danfoss scroll H series compressors in C8 version can be mounted in tandem assemblies.

Such manifolding applications require special design considerations that go beyond the scope of this document. Please contact Danfoss for further information.

For each tandem configuration, specific outline drawings are available as indicated in following tables.

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

Tandem model	Comp.1	Comp.2	Connection Sizes		Oil equalization (in)	Gas equalization (in)	Kit tandem Code No	Outline drawing number
			Suction (in)	Discharge (in)				
TLJ082	HRH041	HRH041	1-1/8"	3/4"	1/2"	7/8"	120Z0636	8556080
TLJ098	HRH049	HRH049	1-1/8"	3/4"	1/2"	7/8"	120Z0636	8556080
TLJ122	H LH061	H LH061	1-1/8"	3/4"	1/2"	7/8"	120Z0636	8556080
TLJ136	H LH068	H LH068	1-1/8"	3/4"	1/2"	7/8"	120Z0636	8556080
TLJ144	H LJ072	H LJ072	1-1/8"	3/4"	1/2"	7/8"	120Z0636	8556080
TLJ166	H LJ083	H LJ083	1-1/8"	3/4"	1/2"	7/8"	120Z0636	8556080
TCJ180	H CJ090	H CJ090	1-5/8"	1-1/8"	1/2"	1-1/8"	120Z0636	8556081
TCJ181	H CJ091	H CJ091	1-5/8"	1-1/8"	1/2"	1-1/8"	120Z0636	8556153
TCJ210	H CJ105	H CJ105	1-5/8"	1-1/8"	1/2"	1-1/8"	120Z0636	8556081
TCJ211	H CJ106	H CJ106	1-5/8"	1-1/8"	1/2"	1-1/8"	120Z0636	8556153
TCJ240	H CJ120	H CJ120	1-5/8"	1-1/8"	1/2"	1-1/8"	120Z0636	8556081
TCJ241	H CJ121	H CJ121	1-5/8"	1-1/8"	1/2"	1-1/8"	120Z0636	8556153

R Depending on manifold configuration, it is essential to equalize the pressure of compressor sumps.

Design compressor mounting

General requirements

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

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

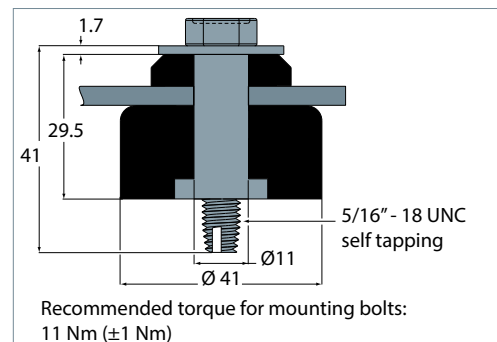
Compressors used in parallel application must be mounted with rigid mounting spacers onto rails

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

Single requirements

H-series compressors come delivered with flexible grommets, accessory Mounting kit 120Z5064.

The grommets must be compressed until contact between the flat washer and the steel mounting sleeve is established. The required bolt size for the H-series compressors is M8*40mm. This bolt must be tightened to a torque of 11 Nm.

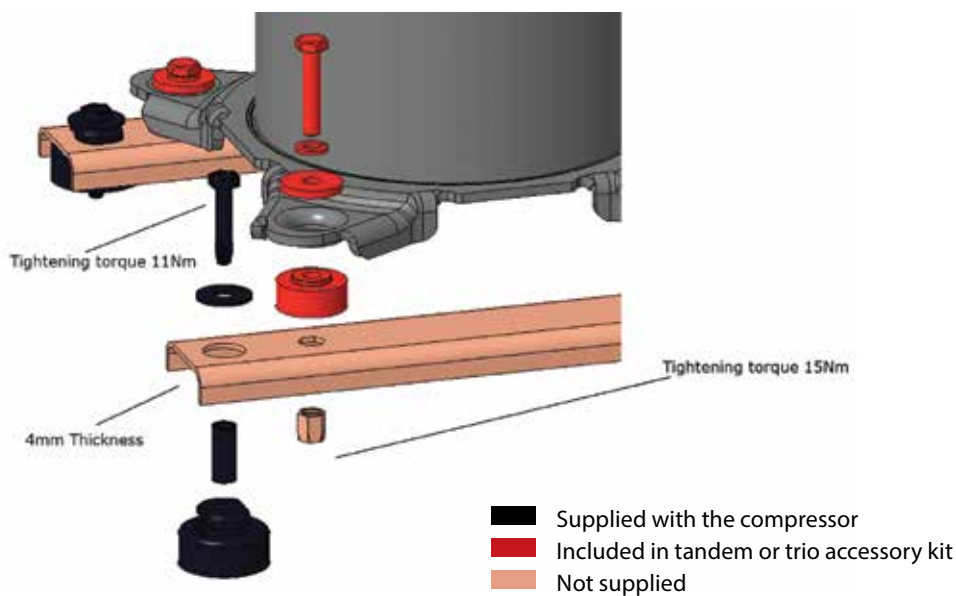


Tandem requirements

Parallel mounting feet

For parallel mounting, the compressor must be mounted with rigid mounting spacers (included in the tandem kit 120Z0636) on the rails.

Rubber grommets and sleeves (delivered with the compressor) must be installed below the rails.



Compressor sound radiation

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

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

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

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

Sound levels are as follows:

- For compressors running alone:

Compressor model	50 Hz		60 Hz		Acoustic hood code number
	Sound power dB(A)	Attenuation dBA ①	Sound power dB(A)	Attenuation dBA ①	
HRM025-038	66	5	69	5	120Z5043
HRM040-047	67	5	70	5	120Z5043
HRM048-054	68	5	71	5	120Z5044
HRM058-060	69	5	72	5	120Z5044
HLM068-081	70	5	73	5	120Z5044
HCM094	71	5	74	5	120Z5045
HCM109-120	74	5	78	5	120Z5045
HRH029-032	65	5	68	5	120Z5043
HRH034-040	66	5	69	5	120Z5043
HRH041-054	67	5	70	5	120Z5044
HLH061	70	5	73	5	120Z5044
HLH068-HLJ083	71	5	74	5	120Z5044
HCJ090-105-120	72	5	75	5	120Z5045
HCJ091-106-121	73	5	76	5	120Z5045

① Attenuation given with acoustic hood only
 Materials are UL approved and RoHS compliant
 Sound power and attenuation are given at ARI conditions, measured in free space
 H*P series same as H*M series

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.

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 to a great extent. Acoustic hoods are available from Danfoss as accessories. Refer to the table above for sound levels, attenuation and code numbers.
2. Use of sound-insulation materials on the inside of unit panels is also an effective means to reduce radiation.

Sound and vibration management

Mechanical vibrations

Vibration isolation constitutes the primary method for controlling structural vibration. H-series scroll compressors are designed to produce minimal vibration during operations. The use of rubber isolators on the compressor base plate or on the frame of a manifolded unit is very effective in reducing vibration being transmitted from the compressor(s) to the unit. Rubber grommets are supplied with all H-series scroll compressors.

Once the supplied rubber grommets have been properly mounted, vibration transmitted from the compressor base plate to the unit

are held to a strict minimum. In addition, it is extremely important that the frame supporting the mounted compressor be of sufficient mass and stiffness to help dampen any residual vibration potentially transmitted to the frame. The tubing should be designed so as to both reduce the transmission of vibrations to other structures and withstand vibration without incurring any damage. Tubing should also be designed for three-dimensional flexibility. For more information on piping design, please see the section entitled "Essential piping design considerations".

Gas pulsation

The Danfoss Scroll Compressors H-series has been designed and tested to ensure that gas pulsation has been optimised for the most commonly encountered air conditioning pressure ratio. Manifolded compressors are equivalent 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.

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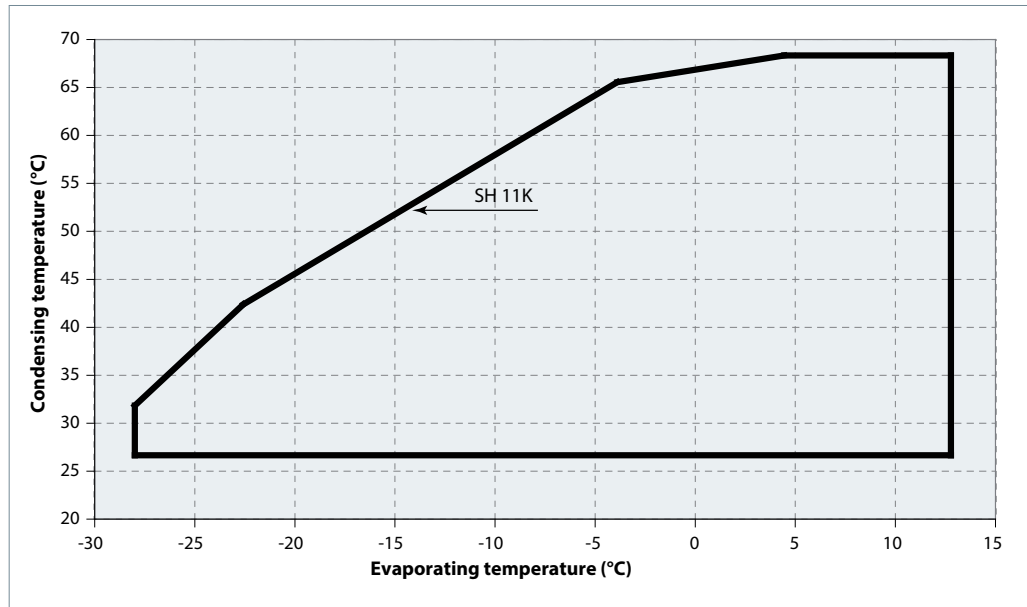
Manage operating envelope

Requirement

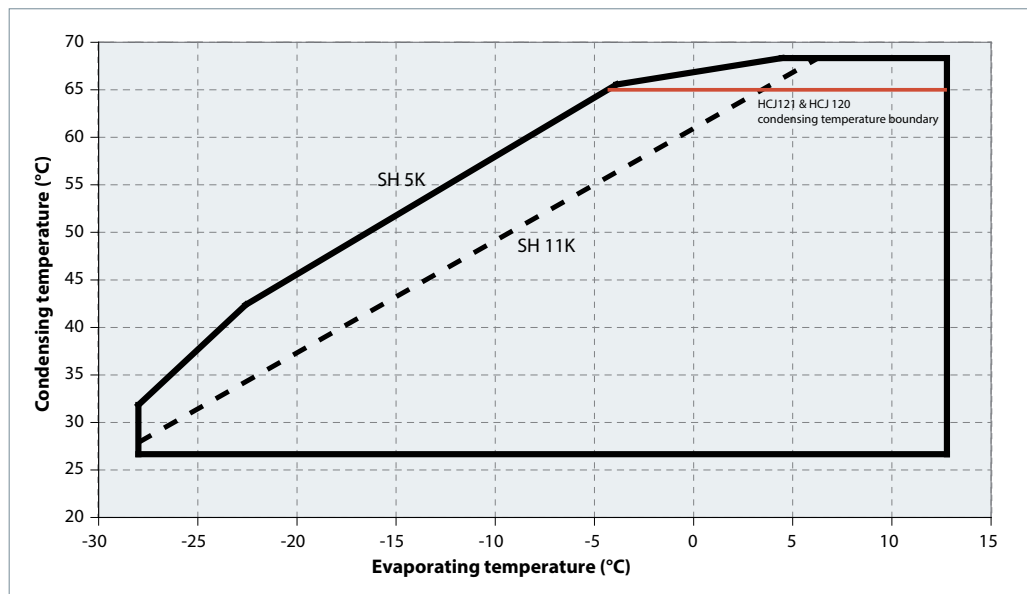
R The operating envelope for H-series scroll compressors is given in the figures below and guarantees reliable operations of the compressor for steady-state and transient operation.

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

R22, R407C Model variation T



R410A Model variation T



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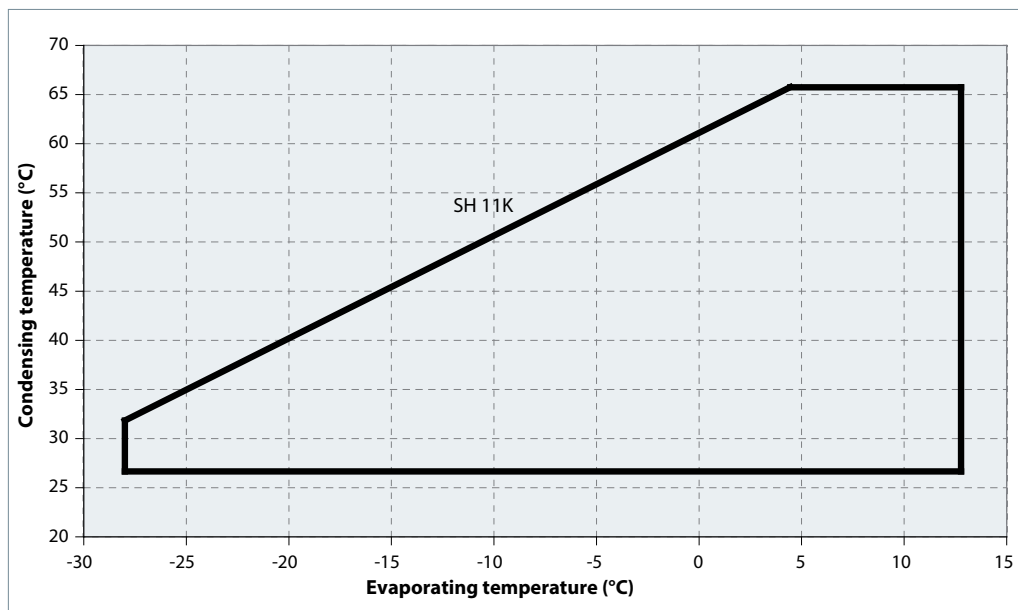
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R22, R410A
Model variation U



	R22	R407C	R410A
Working pressure range high side	bar (g) 10.9 - 27.7	10.5 - 29.1	15.8 - 44.5
Working pressure range low side	bar (g) 1.4 - 6.9	1.1 - 6.4	1.9 - 10.8
Maximum high pressure safety switch setting*	bar (g) 29	30	45
Minimum low pressure safety switch setting	bar (g) 0.5	0.5	1.5
Minimum low pressure pump-down switch setting**	bar (g) 1.5	1.3	2.3

* Maximum allowable pressure on high pressure side according to PED regulation.
 ** Recommended pump-down switch settings: 1.5 bar (R22,R407C) and 2.5 bar (R410a) below nominal evap.

R LP and HP safety switches must never be bypassed nor delayed and must stop all the compressors.

When caused low by LP safety switch, limit the number of auto-restart to maximum 5 times within 12 hours.

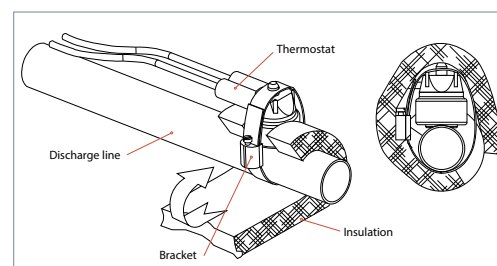
! HP safety switch must be manual reset

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

For H-series 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:

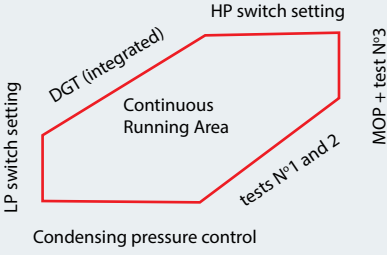
- The thermostat must be attached to the discharge line within 150 mm from the compressor discharge port and must be thermally insulated and tightly fixed on the pipe.
- The DGT should be set to open at a discharge gas temperature of 135°C.



Manage operating envelope

Evaluate the risk

We consider two types of operating envelope management:

<p>Basic:</p> <ul style="list-style-type: none"> • HP and LP switch • MOP (Max Operating Pressure) ensured by expansion device • Condensing pressure control • (DGT Integrated) 	<p>Advanced:</p> <ul style="list-style-type: none"> • HP and LP sensor • Operating envelope limits (permanent and transient) integrated into control logic • (DGT Integrated)
<p>See "Test, criteria and solutions"</p> 	<p>No additional test are required</p>

Test, criteria and solutions

Test N°	Purpose	Test condition	Pass criteria	Solutions
1	Check the compressor operation in the "continuous running area".	Start test at minimum foreseeable evaporating temperature (minimum ambient temperature)	Confirmed compressor stable working in the continuous running area.	Work on compressor staging, fan staging, water flow etc.
2		Perform a defrost test if reversible unit		
3		Perform a start-up test at maximum foreseeable evaporating temperature (max ambient temperature, or start up with hot water)		Improve MOP function. Work on compressor staging, fan staging, water flow etc.

Manage superheat

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

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

Requirement

In steady state conditions,

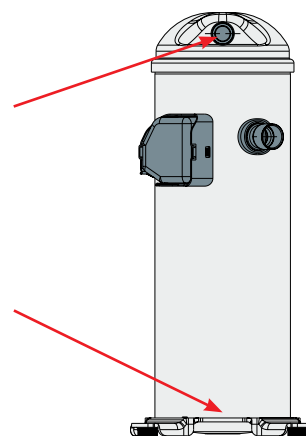
- Suction superheat must remain within 5K to 30K
- Discharge superheat must be higher than 15K
- Oil superheat must be higher than 10K

In transient conditions,

- Discharge superheat must be higher than 5K
- Oil superheat must be higher than 10K

Discharge temperature sensor must be placed onto the discharge fitting and be insulated.

Oil temperature sensor must be placed on the mid shell, closed to the lower shell, and be insulated.



Evaluate the risk

Use the tables below in relation with the system charge and the application to quickly evaluate the risk and potential tests to perform.

	BELOW CHARGE LIMIT	ABOVE CHARGE LIMIT
Non reversible	No test or additional safeties required	Liquid flood back test
Reversible	Defrost test	Liquid flood back test Defrost test

Charge limit is defined in table below:

	Models	Refrigerant charge limit (kg)
Single	HRM032-034-038-040-042-045-047 HRP034-038-040-042-045-047 HRH029-031-032-034-036-038-039-040-047-048	3.6
	HRM048-051-054-058-060/HLM068-072-075-078-081 HRP048-051-054-058-060/HLP068-072-075-078-081 HRH041-044-049-051-054-056/ HLH061-068-HLJ072-075-083	5.4
	HCM094-109-120 HCP094-109-120 HCJ090 - 091-105-106-120 -121	7.2

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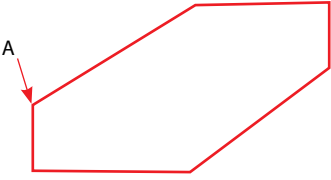
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Manage superheat

Test, criteria and solutions

Test N°	Purpose	Test condition	Pass criteria	Solutions
Liquid flood back test	Steady-state	<p>Liquid flood back testing must be carried out under expansion valve threshold operating conditions: a high pressure ratio and minimum evaporator load (A).</p> 	Oil superheat>10K Steady-state discharge superheat>15K	<ol style="list-style-type: none"> 1. Check expansion valve selection and setting. 2. Add a suction accumulator*.
	Transient	<p>Tests must be carried out with most unfavorable conditions :</p> <ul style="list-style-type: none"> • fan staging, • compressor staging • ... 	Oil superheat>10K Transient discharge superheat >5K	<ol style="list-style-type: none"> 1. Check expansion valve selection and setting. <ul style="list-style-type: none"> -For Thermostatic expansion valve (TXV) check bulb position... -For Electronic expansion valve (EXV) check measurement chain and PID.... 2. Add a suction accumulator*.
Defrost test	Check liquid floodback during defrost cycle	Defrost test must be carried out in the most unfavorable condition (at 0°C evaporating temperature).	Oil superheat>10K Transient discharge superheat >5K	In reversible systems, the defrost logic can be worked out to limit liquid floodback effect. (for more details see "Control Logic").

*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".

Manage off cycle migration

- R** Off-cycle refrigerant migration happens:
- when the compressor is located at the coldest part of the installation, refrigerant vapor condenses in the compressor.
 - or directly in liquid-phase by gravity.

When the compressor starts running again, the refrigerant diluted in the oil generates poor lubrication conditions. In extreme situations, this leads to liquid slugging that can damage compression parts.

Requirement

Amount of liquid refrigerant in the compressors must not overpass the charge limit (refer to charge limit table in section "Manage superheat").

Evaluate the risk

Use the table below in relation with the system charge (refer to charge limit table in section "Manage superheat") and the application to

quickly define necessary safeties to implement and test to perform:

	BELOW CHARGE LIMIT	ABOVE CHARGE LIMIT
Non split	No test or additional safeties required (Internal Non-Return Valve integrated)	<ul style="list-style-type: none"> • Crank Case Heater* • Migration test • External Non Return Valve
Split	Since each installation is unique, no test can fully evaluate off-cycle migration, therefore the following safeties are required: <ul style="list-style-type: none"> • Crank Case Heater * • Liquid Line Solenoid Valve**+ pump-down cycle*** • (Internal Non-Return Valve integrated) 	

Manage off cycle migration

Test, criteria and solutions

Test N°	Purpose	Test condition	Pass criteria	Solutions
Migration test	Check that there is no migration of refrigerant into the compressor (either liquid or vapour condensating)	Energize CCH*. Stabilize the non-running system at a pressure equivalent to 5°C. Raise the system pressure equivalent to 20°C. When saturated condensing temperature reaches 20°C then start the unit.	When all compressors are idle: <ul style="list-style-type: none"> • Check in liquid line sight glass that there is no liquid refrigerant transfer • Oil superheat must be >10K during off-cycle After compressors has started: <ul style="list-style-type: none"> • Oil superheat must remain >10K 	<ol style="list-style-type: none"> 1. Check bulb position, tightness of expansion device, 2. add LLSV** 3. add pump down cycle*** 4. Check Crank Case Heater efficiency

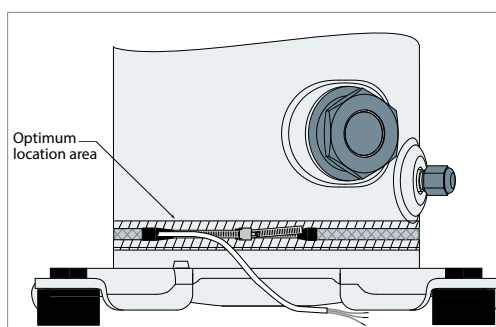
Oil temperature sensor must be placed between oil sight glass and compressor baseplate and be insulated.

* Crank case heater (CCH)

The Crank case heaters are designed to protect the compressor against off-cycle migration of refrigerant.

Additional heater power or thermal insulation might be needed in case of ambient temperature below -5°C and a wind speed above 5m/second. The heater must be energized whenever all the compressors are off.

Crank case heater accessories are available from Danfoss (see section "Accessories").



! Provide separate electrical supply for the heaters so that they remain energized even when the machine is out of service (e.g. seasonal shutdown).

It's recommended that the heater be turned on for a minimum of 12 hours prior to starting the compressor.

**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:

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

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

Provide power supply and electrical protection

Wiring information

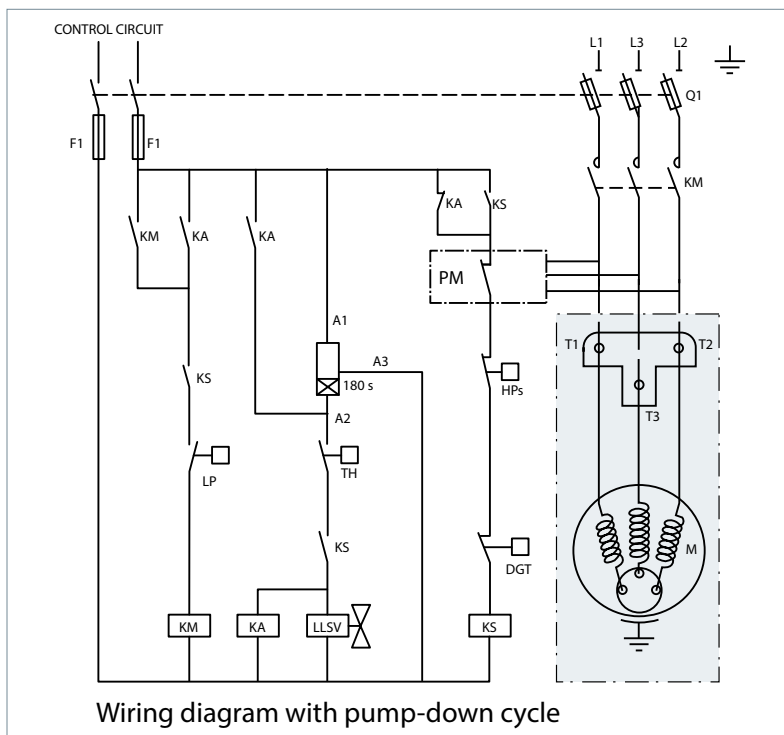
Requirements:

- An additional external overload protection is still advisable for either alarm or manual reset. For overload setting, take the max current you can face on the application and add 10%. Setting must always be lower than Max Operating Current (see table “Three phase electrical characteristics” from the section “Electrical data, connections and wiring”)

- HP safety switch and DGT 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:

Control device.....	TH
Optional short cycle timer (3 min)	180 s
Control relay.....	KA
Liquid Line Solenoid valve.....	LLSV
Compressor contactor.....	KM
Phase monitor.....	PM
Safety lock out relay.....	KS
Pump-down control low pressure switch ..	LP
High pressure safety switch.....	HPs
Fused disconnect	Q1
Fuses	F1
Compressor motor	M
Discharge gas thermostat.....	DGT



Note:

For H-series compressor, phase monitors are mandatory. The selected phase monitor should lock out the compressor from operation in reverse.

Control logic

Safety control logic requirements

	Tripping conditions		Re-start conditions	
	Value	Time	Value	Time
HP 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)				

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 service life is based on a maximum of 12 starts per hour.

Therefore, to guarantee these 2 requirements, a three-minute (180- sec) time out is recommended.

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 to run all compressors simultaneously during one minute every hour in order to boost oil return. Time and delay can be fine-tuned by oil return test N°1 §Manage oil in the circuit. During oil boost, pay special attention to superheat management to avoid liquid flood back and foaming.

If after running long time in full load, oil unbalance appears, then a function can be in control to stop all compressors in manifold during one minute every two hours in order to balance oil between compressors. Time and delay can be fine-tuned by Oil balancing test N°2 §Manage oil in the circuit.

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Control logic

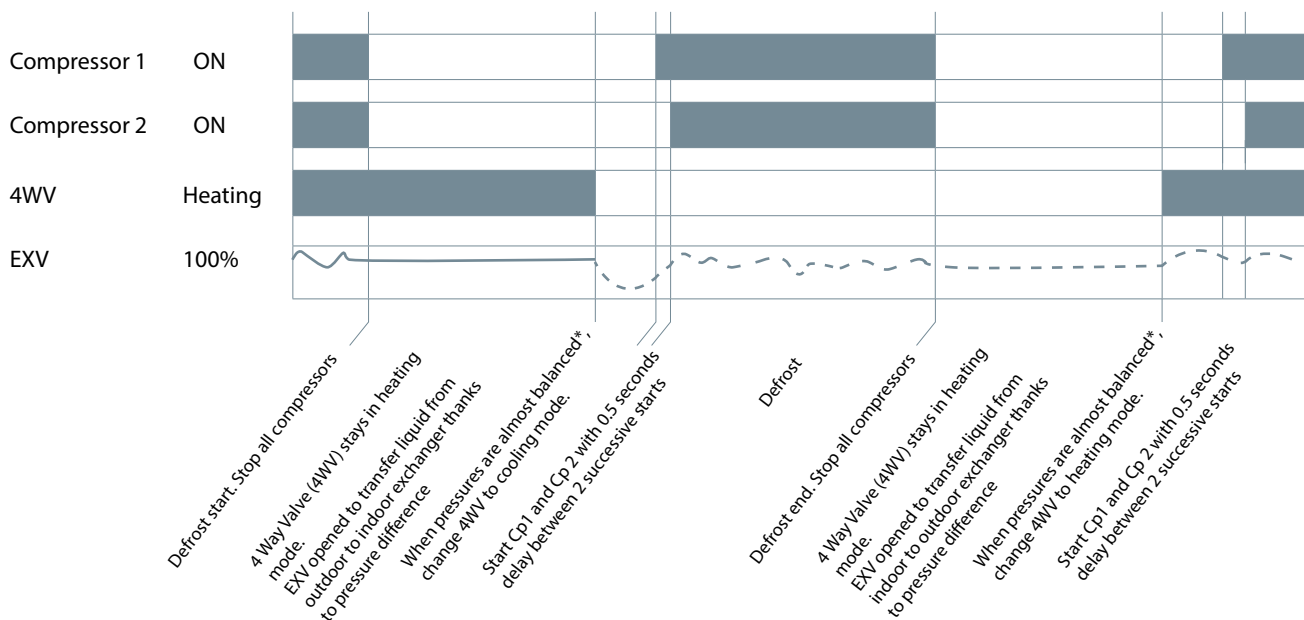
Defrost logic recommendations

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. Transferring liquid refrigerant from one exchanger to the other one thanks to 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".

Pump-down logic recommendations

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

Two types of pump-down exist:

- One shot pump down (preferred): when last compressor of the circuit stops, suction pressure is decreased 1.5 bar (R22,R407C), 2.5 bar (R410A) below nominal evaporating pressure. Even if suction pressure increases again, the compressor will not restart.
- Continuous pump-down: traditional pump-down, Compressor restarts automatically when suction pressure increases. A non-return valve in the discharge line is recommended.

Reduce moisture in the system

GENERAL INFORMATION	<p>Excessive air and moisture</p> <ul style="list-style-type: none"> • can increase condensing pressure and cause excessively high discharge temperatures. • can create acid giving rise to copper plating. 	<ul style="list-style-type: none"> • can destroy the lubricating properties of the oil. <p>All these phenomena can reduce service life and cause mechanical and electrical compressor failure.</p>
Requirements	<p>H-series compressors are delivered with < 100 ppm moisture level.</p> <p>At the time of commissioning, system moisture content may be up to 100 ppm.</p>	<p>During operation, the filter drier must reduce this to a level between 20 and 50 ppm.</p>
PRODUCT INFORMATION	<p>Solutions</p> <p>To achieve this requirement, a properly sized and type of drier is required. Important selection criteria's include:</p> <ul style="list-style-type: none"> • driers water content capacity, • system refrigeration capacity, • system refrigerant charge. 	<p>For new installations with H-series compressors with polyolester oil, Danfoss recommends using the Danfoss DML (100% molecular sieve) solid core filter drier.</p>
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Assembly line procedure

Compressor storage

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

between -35°C and 52°C when charged with refrigerant.

Compressor holding charge

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

- !** Respect the following sequence:
- Remove the nitrogen holding charge via the suction Schrader valve to avoid an oil mist blow out.

• Remove the suction plug first and the discharge plug afterwards to avoid discharge check valve gets stuck in open position.

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

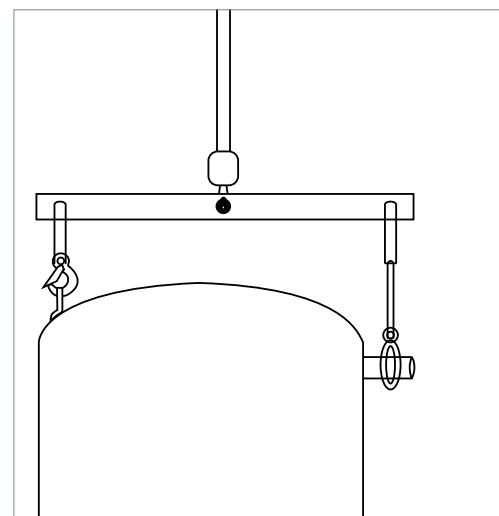
Handling

- !** Each Danfoss H-series scroll compressor is equipped with the lift ring on the top shell and ring for the discharge port.
- 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 service life.

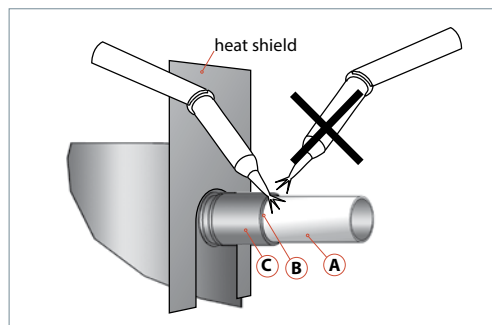
System cleanliness

Circuit contamination possible cause:	Requirement:
Brazing and welding oxides	During brazing, flow nitrogen through the system
Filings and particles from the removal of burrs in pipe-work	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 POE 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:

Maximum compressor test pressures	
Maximum compressor test pressure high side (HP)	45 bar (g), Do keep the low side pressure not exceed 31.3bar(g)
Maximum compressor test pressure low side (LP)	31.1 bar (g)

* On H-series models with internal non return valve in discharge fitting or if an external non return valve is present on the discharge line, maximum pressurizing speed must be respected to ensure pressure equalization between LP and HP side over scroll elements.

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Assembly line procedure

Vacuum evacuation and moisture removal

Requirements:

- Never use the compressor to evacuate the system.
- Connect a vacuum pump to both the LP and HP sides.
- Evacuate the system to a pressure of 500 $\mu\text{m Hg}$ (0.67 mbar) absolute.

Recommendations:

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

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

Refrigerant charging



Initial charge:

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

If needed, a complement of charge can be done:

- In liquid phase while compressor is running by slowly throttling liquid in.
- On the low pressure side, as far away as possible from the compressor suction connection.
- 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

The tests are performed on each compressor at the factory between each phase and ground.

- Dielectric strength test is done with a high potential voltage (hi-pot) of $2U_n + 1000\text{V AC}$ at least, and leakage current must be less than 5 mA. Additional tests of this type are not recommended as it may reduce motor lifetime. Nevertheless, if such a test is necessary, it must be performed at a lower voltage.

- Insulation resistance is measured with a 500 V DC megohm tester and must be higher than 1 megohm.

• The presence of refrigerant around the motor windings will result in lower resistance values to ground and higher leakage current readings. Such readings do not indicate a faulty compressor. To prevent this, the system can be first operated briefly to distribute refrigerant.



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

Commissioning

Preliminary check

- ⚠ Check electrical power supply:
 - Phase order: For H-series 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

- Crank case heaters must be energized at least 12 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 new cans. For more detailed information see "Lubricants filling in instructions for Danfoss Commercial Compressors" TI 2-025-0402.

GENERAL INFORMATION

PRODUCT INFORMATION

SYSTEM DESIGN

INTEGRATION INTO SYSTEM

ORDERING INFORMATION

Dismantle and disposal



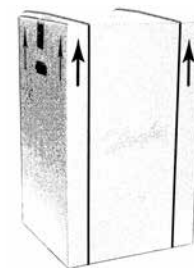
Danfoss recommends that compressors and compressor oil should be recycled by a suitable company at its site.

Ordering information and packaging

Packaging

Single pack

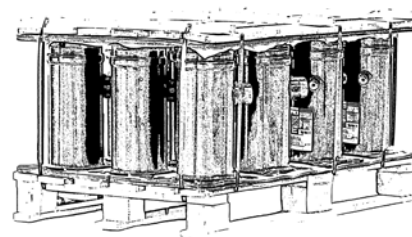
Compressors are packed individually in a cardboard box. They can be ordered in any quantity. Minimum ordering quantity = 1. As far as possible, Danfoss will ship the boxes on full pallets of 8,9, or 16 compressors according below table.



- Each box also contains following accessories:
- 4 grommets
- 4 assemblies of self tapping US thread bolts, washers and sleeves
- 4 additional sleeves
- 1 screw for earth connection
- Run capacitors are not provided

Industrial pack

Compressors are not packed individually but are shipped all together on one pallet. They can be ordered in quantities of full pallets only, multiples of 12 or 16 compressors, according below table.



Each industrial pack pallet contains following accessories:

- 4 grommets per compressor
- 4 sleeves per compressor

Packaging details

According to delivery region, packaging dimensions and compressor quantities are different.

See below for details. For US made H-series compressors (code number starting with 120U)

Delivered region	Packaging	Nbr	Pallet type	Comments
Americas Asia Pacific Middle East	Single pack	16	US pallet	Optimised for overseas container loading
	Industrial pack	16	US pallet	
Europe	Single pack	8	Danfoss pallet	-
	Industrial pack	12	Danfoss pallet	

* Nbr : number of compressors/pallet

For CN made H series compressors (code number starting with 121L)

Delivered region	Packaging	Nbr	Pallet type	Comments
All	Single pack	9	Danfoss pallet	-
	Industrial pack	12	Danfoss pallet	

* Nbr : number of compressors/pallet

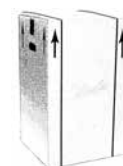
Ordering information and packaging

Compressor code numbers

Danfoss H-series scroll compressors can be ordered in either industrial packs or in single packs.

Please use the code numbers from below tables for ordering.

R22 Single pack

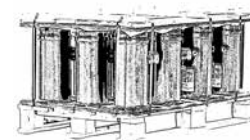


Compressors	Model Variation	Connections	Features	Code no.					
				1	2	4	5	7	9
HRM032	U	P	6	120U0921	120U2029	120U0996			
	T	P	6				120U0956		
HRM034	U	P	6	120U0926	120U1081	120U1001		120U2232	
	T	P	6			120U2367	120U2122		120U2087
HRM038	U	P	6	120U0931	120U1091	120U1011	120U0966	120U1056	
	T	P	6			120U2372	120U2137		120U2092
HRM040	U	P	6	120U0936	120U1101	120U1021	120U2147	120U1061	
	T	P	6			120U2377	120U2142		120U2462
HRM042	U	P	6	120U0941	120U1111	120U1031	120U0971	120U1066	
	T	P	6			120U2127	120U2152		120U2107
HRM045	U	P	6	120U0946	120U1121	120U1041	120U0981	120U1071	
HRM047	U	P	6	120U0951	120U1131	120U1051	120U0991	120U1076	
	T	P	6			120U2132	120U2162		120U2097
HRM048	U	C	8			120U1671			
	U	P	6	120U1496		120U1666		120U1791	
HRM051	T	P	6			120U1676	120U2187		120U2382
	U	P	6	120U1506	120U1866	120U1686	120U2252	120U1801	
HRM054	U	C	6	120U1516					
	U	P	6	120U1511	120U1871	120U1696	120U2257	120U1811	
HRM058	T	P	6						120U2292
	T	C	6	120U1526					
	T	P	6	120U1521					120U2112
	U	C	6	120U1536					
HRM060	U	P	6	120U1531	120U1876	120U1711	120U1601	120U1821	
	T	P	6	120U1541		120U1721			120U2082
	T	C	6	120U2242					
	U	C	6	120U1551	120U2077				
HLM068	U	C	8			120U1741			
	U	P	6	120U1546	120U1881	120U1736	120U1611	120U1831	
	T	C	6		120U1891	120U1746		120U2598	120U2392
HLM072	T	P	6	120U1556			120U1616		
	T	C	6		120U1896	120U1751		120U2602	120U1856
	T	C	8		120U2202	120U2067			
HLM075	T	P	6	120U1566			120U1626		
	T	C	6		120U1901	120U1761		120U1836	
HLM078	T	P	6	120U1576			120U1636		
	T	C	6		120U1906	120U1771			
HLM081	T	C	6		120U1911	120U1776		120U1846	120U2102
	T	C	8			120U2009			
	T	P	6	120U1586			120U1646		
HCM094	T	C	6		120U0891	120U0581		120U0711	120U0746
	T	C	7			120U0586			
	T	C	8		120U0901	120U0596		120U0721	120U0756
HCM109	T	C	6		120U2506	120U0366			
	T	C	7			120U0371			
HCM120	T	C	8			120U1924			
	T	C	6		120U0761	120U0391			
	T	C	7		120U2212	120U0396			
	T	C	8		120U2217	120U2207			

Made in US

Ordering information and packaging

R22 Industrial pack

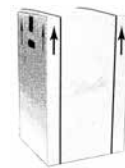


Compressors	Model Variation	Connections	Features	Code no.					
				1	2	4	5	7	9
HRM032	U	P	6	120U0918	120U2026	120U0993			
	T	P	6				120U0953		
HRM034	T	P	6			120U2364	120U2119		120U2084
	U	P	6	120U0923	120U1078	120U0998		120U2229	
HRM038	T	P	6			120U2369	120U2134		120U2089
	U	P	6	120U0928	120U1088	120U1008	120U0963	120U1053	
HRM040	T	P	6			120U2374	120U2139		120U2459
	U	P	6	120U0933	120U1098	120U1018	120U2144	120U1058	
HRM042	T	P	6			120U2124	120U2149		120U2104
	U	P	6	120U0938	120U1108	120U1028	120U0968	120U1063	
HRM045	U	P	6	120U0943	120U1118	120U1038	120U0978	120U1068	
HRM047	T	P	6			120U2129	120U2159		120U2094
	U	P	6	120U0948	120U1128	120U1048	120U0988	120U1073	
HRM048	U	C	8			120U1668			
	U	P	6	120U1493		120U1663		120U1788	
HRM051	T	P	6			120U1673	120U2184		120U2379
	U	P	6	120U1503	120U1863	120U1683	120U2249	120U1798	
HRM054	T	P	6						120U2289
	U	C	6	120U1513					
HRM058	U	P	6	120U1508	120U1868	120U1693	120U2254	120U1808	
	T	C	6	120U1523					
	T	P	6	120U1518					120U2109
	U	C	6	120U1533					
	U	C	8			120U1716			
HRM060	U	P	6	120U1528	120U1873	120U1708	120U1598	120U1818	
	T	C	6	120U2239					
	T	P	6	120U1538		120U1718			120U2079
	U	C	6	120U1548	120U2074				
	U	C	8			120U1738			
HLM068	T	C	6		120U1888	120U1743		120U2595	120U2389
	T	P	6	120U1553			120U1613		
HLM072	T	C	6		120U1893	120U1748		120U2599	120U1853
	T	C	8		120U2199	120U2064			
HLM075	T	P	6	120U1563			120U1623		
	T	C	6		120U1898	120U1758		120U1833	
HLM078	T	P	6	120U1573			120U1633		
	T	C	6		120U1903	120U1768			
HLM081	T	C	6		120U1908	120U1773		120U1843	120U2099
	T	C	8			120U2006			
HCM094	T	P	6	120U1583			120U1643		
	T	C	6		120U0888	120U0578		120U0708	120U0743
	T	C	7			120U0583			
HCM109	T	C	8		120U0898	120U0593		120U0718	120U0753
	T	C	6		120U2503	120U0363			
	T	C	7			120U0368			
HCM120	T	C	8			120U1921			
	T	C	6		120U0758	120U0388			
	T	C	7		120U2209	120U0393			
	T	C	8		120U2214	120U2204			

Made in US

Ordering information and packaging

R407C Single pack

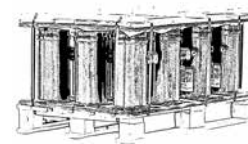


Compressors	Model Variation	Connections	Features	Code no.					
				1	2	4	5	7	9
HRP034	T	P	6			120U2024	120U2019		
HRP038	T	P	6		120U1086	120U1006	120U0961		
HRP040	T	P	6		120U1096	120U1016	120U1929		
HRP042	T	P	6		120U1106	120U1026	120U2157		
HRP045	T	P	6		120U1116	120U1036	120U0976		
HRP047	T	P	6		120U1126	120U1046	120U0986		
HRP048	T	C	8			120U1661			
HRP048	T	P	6			120U1656			
HRP051	T	P	6	120U1501	120U1861	120U1681	120U2192	120U1796	
HRP054	T	P	6			120U1691	120U2197	120U1806	
	T	C	8			120U2004			
HRP058	T	C	8			120U1706			
	T	P	6			120U1701	120U1596	120U1816	
HRP060	T	C	8			120U1731			
	T	P	6		120U2297	120U1726	120U1606	120U1826	
HLP068	T	C	6			120U2014			
	T	P	6	120U1561			120U1621		
HLP072	T	C	6			120U1756			
	T	C	8			120U2072			
	T	P	6	120U1571			120U1631		
HLP075	T	C	6			120U1766		120U1841	
	T	P	6	120U1581			120U1641		
HLP078	T	C	6		120U2458	120U2454			
HLP081	T	C	6		120U1916	120U1781		120U1851	
	T	C	8			120U1786			
	T	P	6	120U1591			120U1651		
HCP094	T	C	6		120U0906	120U0601			
	T	C	7		120U0911	120U0606			
	T	C	8		120U0916	120U0611			
HCP109	T	C	6			120U0376			
	T	C	7			120U0381			
	T	C	8			120U0386			
HCP120	T	C	6		120U0766	120U0401			
	T	C	7		120U2222	120U0406			
	T	C	8		120U2227	120U0411			

Made in US

Ordering information and packaging

R407C Industrial pack

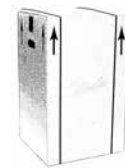


Compressors	Model Variation	Connections	Features	Code no.						
				1	2	4	5	7	9	
HRP034	T	P	6			120U2021	120U2016			
HRP038	T	P	6		120U1083	120U1003	120U0958			
HRP040	T	P	6		120U1093	120U1013	120U1926			
HRP042	T	P	6		120U1103	120U1023	120U2154			
HRP045	T	P	6		120U1113	120U1033	120U0973			
HRP047	T	P	6		120U1123	120U1043	120U0983			
HRP048	T	C	8			120U1658				
HRP048	T	P	6			120U1653				
HRP051	T	P	6	120U1498	120U1858	120U1678	120U2189	120U1793		
HRP054	T	P	6			120U1688	120U2194	120U1803		
	T	C	8			120U2001				
HRP058	T	C	8			120U1703				
	T	P	6			120U1698	120U1593	120U1813		
HRP060	T	C	8			120U1728				
	T	P	6		120U2297	120U1723	120U1603	120U1823		
HLP068	T	C	6			120U2011				
	T	P	6	120U1558			120U1618			
HLP072	T	C	6			120U1753				
	T	C	8			120U2074				
	T	P	6	120U1568			120U1628			
HLP075	T	C	6			120U1763		120U1838		
	T	P	6	120U1578			120U1638			
HLP078	T	C	6		120U2455	120U2451				
HLP081	T	C	6		120U1913	120U1778		120U1848		
	T	C	8			120U1783				
	T	P	6	120U1588			120U1648			
HCP094	T	C	6		120U0903	120U0598				
	T	C	7		120U0908	120U0603				
	T	C	8		120U0913	120U0608				
HCP109	T	C	6			120U0373				
	T	C	7			120U0378				
	T	C	8			120U0383				
HCP120	T	C	6		120U0763	120U0398				
	T	C	7		120U2219	120U0403				
	T	C	8		120U2224	120U0408				

Made in US

Ordering information and packaging

R410A Single pack

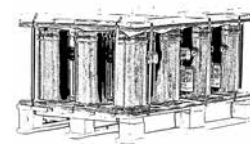


Compressors	Model Variation	Connections	Features	Code no.					
				1	2	4	5	7	9
HRH029	U	P	6	120U2277	120U2282	120U2287			
HRH031	U	P	6	120U1136	120U1251	120U1191	120U1166	120U1216	
HRH032	U	P	6	120U1141	120U1256	120U1196	120U1171	120U1221	
HRH034	U	P	6	120U1146	120U1261	120U2446	120U2650	120U1226	120U2654
HRH036	U	P	6	120U1151	120U1266	120U1201	120U1176	120U1231	
HRH038	U	P	6	120U1156	120U1271	120U1206	120U1181	120U1236	120U2658
HRH039	U	P	6	120U2466					
HRH040	U	P	6	120U1161	120U1276	120U1211	120U1186	120U1241	
HRH041	U	P	6	120U1281	120U1451	120U1356		120U1406	
	U	C	6		120U2412				
	U	C	8		120U2407	120U2397		120U2402	
HRH044	U	P	6	120U1286	120U1456	120U1361		120U1411	
HRH047	U	P	6	120U2362					
HRH048	U	P	6	120U2582					
HRH049	U	P	6	120U1291	120U1461	120U1366		120U1416	
	U	C	8		120U2482	120U2474		120U2478	
HRH050	U	P	6	120U2470					
HRH051	U	P	6	120U1296	120U1466	120U1371	120U1326	120U1421	
HRH054	U	P	6	120U1301	120U1471	120U1376	120U1331	120U1426	
HRH056	U	C	6			120U1386		120U2237	
	U	P	6	120U1306	120U1476	120U1381	120U1336	120U1431	
HLH061	T	C	6		120U2062	120U2052		120U2057	120U2450
	T	P	6	120U2042			120U2047		
	T	C	8		120U2494	120U2486		120U2490	
HLH068	T	C	T		121L3169	121L3167			
	T	C	6		120U1481	120U1391		120U1436	
	T	P	6	120U1311			120U1341		
HLJ072	T	C	8		120U2427	120U2417		120U2422	
	T	C	6		120U1486	120U1396		120U2037	
	T	P	6	120U1316			120U1346		
HLJ075	T	C	8		120U2177	120U2167		120U2498	
	T	C	T		121L3173	121L3171			
	T	C	6		120U2272	120U2267		120U2262	
HLJ083	T	C	8		120U2442	120U2432		120U2437	
	T	C	6		120U1491	120U1401		120U1441	120U2387
	T	P	6	120U1321			120U1351		
HCJ090	T	C	8		120U2182	120U2172		120U2502	
	T	C	T		121L3177	121L3175			
	T	C	6		120U2307	120U2302		120U2312	
HCJ091	T	C	7		120U2542	120U2534		120U2510	
	T	C	8		120U2546	120U2538		120U2514	
	T	C	6			121L3113			
HCJ105	T	C	8			121L3119			
	T	C	6		120U2327	120U2322		120U2332	
	T	C	7		120U2550	120U2574		120U2518	
HCJ106	T	C	8		120U2554	120U2578		120U2522	
	T	C	6			121L3115			
	T	C	8			121L3121			
HCJ120	T	C	6		120U2347	120U2342		120U2352	
	T	C	7		120U2566	120U2558		120U2526	
	T	C	8		120U2570	120U2562		120U2530	
HCJ121	T	C	6			121L3117			
	T	C	8			121L3123			

Made in US

Ordering information and packaging

R410A Industrial pack



Compressors	Model Variation	Connections	Features	Code no.					
				1	2	4	5	7	9
HRH029	U	P	6	120U2274	120U2279	120U2284			
HRH031	U	P	6	120U1133	120U1248	120U1188	120U1163	120U1213	
HRH032	U	P	6	120U1138	120U1253	120U1193	120U1168	120U1218	
HRH034	U	P	6	120U1143	120U1258	120U2443	120U2647	120U1223	120U2651
HRH036	U	P	6	120U1148	120U1263	120U1198	120U1173	120U1228	
HRH038	U	P	6	120U1153	120U1268	120U1203	120U1178	120U1233	120U2655
HRH039	U	P	6	120U2463					
HRH040	U	P	6	120U1158	120U1273	120U1208	120U1183	120U1238	
HRH041	U	P	6	120U1278	120U1448	120U1353		120U1403	
	U	C	6		120U2409				
	U	C	8		120U2404	120U2394		120U2399	
HRH044	U	P	6	120U1283	120U1453	120U1358		120U1408	
HRH047	U	P	6	120U2359					
HRH048	U	P	6	120U2579					
HRH049	U	P	6	120U1288	120U1458	120U1363		120U1413	
	U	C	8		120U2479	120U2471		120U2475	
HRH050	U	P	6	120U2467					
HRH051	U	P	6	120U1293	120U1463	120U1368	120U1323	120U1418	
HRH054	U	P	6	120U1298	120U1468	120U1373	120U1328	120U1423	
HRH056	U	C	6			120U1383		120U2234	
HRH056	U	P	6	120U1303	120U1473	120U1378	120U1333	120U1428	
HLH061	T	P	6	120U2039			120U2044		
	T	C	6		120U2059	120U2049		120U2054	120U2447
	T	C	8		120U2491	120U2483		120U2487	
	T	C	T		121L3168	121L3166			
HLH068	T	C	6		120U1478	120U1388		120U1433	
	T	C	8		120U2424	120U2414		120U2419	
	T	P	6	120U1308			120U1338		
HLJ072	T	C	6		120U1483	120U1393		120U2034	
	T	C	8		120U2174	120U2164		120U2495	
	T	P	6	120U1313			120U1343		
HLJ075	T	C	T		121L3172	121L3170			
	T	C	6		120U2269	120U2264		120U2259	120U1443
HLJ083	T	C	8		120U2439	120U2429		120U2434	
	T	C	6		120U1488	120U1398		120U1438	120U2384
	T	C	8		120U2179	120U2169		120U2499	
	T	P	6	120U1318			120U1348		
HCJ090	T	C	T		121L3176	121L3174			
	T	C	6		120U2304	120U2299		120U2309	
	T	C	7		120U2539	120U2531		120U2507	
HCJ091	T	C	8		120U2543	120U2535		120U2511	
	T	C	6			121L3112			
HCJ105	T	C	8			121L3118			
	T	C	6		120U2324	120U2319		120U2329	
	T	C	7		120U2547	120U2571		120U2515	
HCJ106	T	C	8		120U2551	120U2575		120U2519	
	T	C	6			121L3114			
HCJ120	T	C	8			121L3120			
	T	C	6		120U2344	120U2339		120U2349	
	T	C	7		120U2563	120U2555		120U2523	
HCJ121	T	C	8		120U2567	120U2559		120U2527	
	T	C	6			121L3116			
	T	C	8			121L3122			

Made in US

Ordering information and packaging

Model	Model variation	Voltage code	Connections	Features	Industrial pack	Single pack	
R22	HRM025	T	4	P	6	121L2781	121L2784
	HRM034	T	4	P	6	121L2364	121L2367
	HRM034	T	5	P	6	121L2119	121L2122
	HRM038	T	9	P	6	121L2089	121L2092
	HRM042	T	4	P	6	121L2124	121L2127
	HRM051	T	4	P	6	121L1673	121L1676
	HRM054	T	4	P	6	121L2749	121L2752
	HRM060	T	4	P	6	121L1718	121L1721
	HRM060	T	2	P	6	121L2757	121L2760
	HRM060	T	9	P	6	121L2079	121L2082
	HRM060	T	4	C	8	121L3071	121L3072
	HLM072	T	4	C	6	121L1748	121L1751
	HLM072	T	9	C	6	121L1853	121L1856
	HLM081	T	4	C	6	121L1773	121L1776
	HLM081	T	2	C	6	121L1908	121L1911
	HLM081	T	9	C	6	121L2099	121L2102
	HCM094	T	4	C	6	121L0578	121L0581
	HCM109	T	4	C	6	121L0363	121L0366
HCM120	T	4	C	6	121L0388	121L0391	
R407C	HRP054	T	4	P	6	121L1688	121L1691
	HRP060	T	4	P	6	121L1723	121L1726
	HLP072	T	4	C	6	121L1753	121L1756
	HLP081	T	4	C	6	121L1778	121L1781
	HCP094	T	4	C	6	121L0598	121L0601
	HCP109	T	4	C	6	121L0373	121L0376
	HCP120	T	4	C	6	121L0398	121L0401
R410A	HRH047	U	4	P	6	121L2848	121L2851
	HRH049	U	4	P	6	121L1363	121L1366
	HRH051	U	4	P	6	121L1368	121L1371
	HRH054	U	4	P	6	121L1373	121L1376
	HRH054	U	4	C	8	121L3030	121L3033
	HLH061	T	9	C	6	121L2447	121L2450
	HLH061	T	4	C	6	121L2049	121L2052
	HLH061	T	4	C	8	121L2483	121L2486
	HLH068	T	4	C	6	121L1388	121L1391
	HLJ072	T	9	C	6	121L2989	121L2992
	HLJ072	T	4	C	6	121L1393	121L1396
	HLJ072	T	4	C	8	121L2164	121L2167
	HLJ075	T	4	C	6	121L2264	121L2267
	HLJ083	T	4	C	6	121L1398	121L1401
	HCJ091	T	4	C	6	121L3112	121L3113
	HCJ091	T	4	C	8	121L3118	121L3119
	HCJ106	T	4	C	6	121L3114	121L3115
	HCJ106	T	4	C	8	121L3120	121L3121
HCJ121	T	4	C	6	121L3116	121L3117	
HCJ121	T	4	C	8	121L3121	121L3123	

Industrial pack: 12 compressors per pallet

Single pack: 1 compressor in cardboard box, 9pcs on a full pallet

Made in China

GENERAL INFORMATION

PRODUCT INFORMATION

SYSTEM DESIGN

INTEGRATION INTO SYSTEM

ORDERING INFORMATION

Spare parts & accessories

Run capacitors for PSC wiring



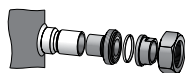
Type	Code n°	Description	Application	Packaging	Pack size
70 µF	120Z0051	PSC wiring Run Capacitor 70 µF, motor voltage code 5 - 220-240V / 1 / 50Hz	HRM032-034-038-040-042 - HRP034-038-040-042 - HRH031-032-036	Multipack	10
60 µF	120Z0050	PSC wiring Run Capacitor 60 µF, code 5	HRM045-047 - HRP045-047 - HRH038-040	Multipack	10
55 µF	8173234	PSC wiring Run Capacitor 55 µF, motor voltage code 5 - 220-240V / 1 / 50Hz	HRM054-058-060 / HLM068-072-075-081 - HRP054-058-060 / HLP068-072-075-081 - HRH051-054-056 / HLH068 / HLJ072-083 / HLH061	Multipack	10

Start capacitors and starting relay for CSR wiring



Type	Code n°	Description	Application	Packaging	Pack size
145-175 µF	120Z0399	CSR wiring Start Capacitor 145-175 µF, motor voltage code 5 - 220-240V / 1 / 50Hz	HRM/P032-034-038-040-042-045-047 HRH029-031-032-036-038-040	Multipack	10
161-193 µF	120Z0400	CSR wiring Start Capacitor 161-193 µF, motor voltage code 5 - 220-240V / 1 / 50Hz	HRM/P051-054	Multipack	10
88-108 µF	8173001	CSR wiring Start Capacitor 88-108 µF, motor voltage code 5 - 220-240V / 1 / 50Hz	HRM/P058-060 HLM/P068-072-075-081 HRH051-054-056 HLH068 HLJ072-083	Multipack	10
RVA9CKL	120Z0393	CSR wiring Starting Relay, motor voltage code 5 - 220-240V / 1 / 50Hz	HRM/P032-034-038-040-042-045-047 HRH029-031-032-036-038-040	Multipack	10
RVA3EKL	120Z0394	CSR wiring Starting Relay, motor voltage code 5 - 220-240V / 1 / 50Hz	HRM/P051-054	Multipack	10
RVA2ACKL	120Z0396	CSR wiring Starting Relay, motor voltage code 1 -208-230V / 1 / 60Hz	HRM/P032-034 HRH031	Multipack	10
RVA2ABKL	120Z0397	CSR wiring Starting Relay, motor voltage code 1 -208-230V / 1 / 60Hz	HRM/P038-040-042-045-047-048-051-054-058U-060U HLM/068-072-075-081 HRH032-034-038-040-041-044-048-049-050-051-054-056, HLH068,HLJ072-083	Multipack	10
RVAA4IKL	120Z0398	CSR wiring Starting Relay, motor voltage code 1 -208-230V / 1 / 60Hz	HRM058T1-060T1	Multipack	10
RVA4GKL	120Z0395	CSR wiring Starting Relay, motor voltage code 5 - 220-240V / 1 / 50Hz	HRM/P058-060 HLM/P068-072-075-081 HRH051-054-056 HLH068 HLJ072-083 HLH061	Multipack	10

Rotolock adaptor set



Type	Code n°	Description	Application	Packaging	Pack size
	120Z0126	Rotolock adaptor set (1-1/4" ~ 3/4") , (1" ~ 1/2")	HRP/HRM025-034-038-040-042 HRH029-031-032-034-036038 - group 1	Multipack	6
	120Z0127	Rotolock adaptor set (1-1/4" ~ 7/8") , (1" ~ 1/2")	HRP/HRM045-047-051-057-058-060-068-072-075 HRH040-041-044-049-051-056-061-068-072-075-083 - group 2	Multipack	6
	120Z0128	Rotolock adaptor set (1-1/4" ~ 7/8") , (1-1/4" ~ 3/4")	HRM/HRP078-081 - group 3	Multipack	6
	120Z0129	Rotolock adaptor set (1-3/4" ~ 1-1/8") , (1-1/4" ~ 7/8")	HCM/P094-109-120 HCJ090-091-105-106-120-121 - group 4	Multipack	6

Spare parts & accessories

Rotolock adaptor



Type	Code n°	Description	Application (see above group)	Packaging	Pack size
	120Z0366	Rotolock adaptor (1-1/4" ~ 3/4")	Group 1 suction	Multipack	10
	120Z0367	Rotolock adaptor (1-1/4" ~ 7/8")	Group 2 & 3 suction	Multipack	10
	120Z0364	Rotolock adaptor (1-3/4" ~ 1-1/8")	Group 4 suction	Multipack	10
	120Z0365	Rotolock adaptor (1" ~ 1/2")	Group 1 & 2 discharge	Multipack	10
	120Z0366	Rotolock adaptor (1-1/4" ~ 3/4")	Group 3 discharge	Multipack	10
	120Z0367	Rotolock adaptor (1-1/4" ~ 7/8")	Group 4 discharge	Multipack	10

Crankcase heater



Type	Code No	Description	Application	Packaging	Pack Size
	120Z0055	Belt type crankcase heater, 40 W, 230 V, CE mark	HRM032-034-038-040-042-045-047 - HRP025-038-040-042-045-047 - HRH029-032-034-036-038-040	Multipack	6
	120Z0056	Belt type crankcase heater, 40 W, 400 V, CE mark		Multipack	6
	120Z0057	Belt type crankcase heater, 50 W, 230 V, CE mark	HRM048-051-054-058-060 / HLM068-072-075 - HRP048-051-054-058-060 / HLP068-072-075 - HRH041-049-051-054-056 / HLH061-068 / HLJ072 / HLJ075	Multipack	6
	120Z0058	Belt type crankcase heater, 50 W, 400 V, CE mark		Multipack	6
	120Z0059	Belt type crankcase heater, 65 W, 230 V, CE mark, UL		Multipack	6
	120Z5011	Belt type crankcase heater, 70 W, 230 V, UL, CE mark		Multipack	6
	120Z0060	Belt type crankcase heater, 65 W, 400 V, CE mark, UL	HLM078-081 / HCM094-109-120 - HLP081 / HCP094-109-120 - HLJ083 - HCJ090-091-105-106-120-121	Multipack	6
	120Z5012	Belt type crankcase heater, 70 W, 460 V, UL, CE mark		Multipack	6
	120Z5013	Belt type crankcase heater, 70 W, 575 V, UL, CE mark		Multipack	6

Discharge temperature protection



Type	Code No	Description	Application	Packaging	Pack Size
	7750009	Discharge thermostat kit	All models	Multipack	10
	7973008	Discharge thermostat kit	All models	Industry pack	50

Spare parts & accessories

Lubricant



Type	Code No	Description	Application	Packaging	Pack Size
	120Z5034	PVE (0.95 liter can) 320HV (FVC68D)	HRH, HLH, HLJ, HCJ, HRP, HLP & HCP	Multipack	1

Mounting hardware



Type	Code No	Description	Application	Packaging	Pack Size
	120Z5017	Mounting grommet	All models	Single pack	1
	120Z5014	Mounting sleeve	All models	Single pack	1
	120Z5031	Mounting kit, including 1 bolt, 1 sleeve, 1 washer	All models	Single pack	1
	120Z5064	Mounting kit for 1 scroll compressor including 4 grommets, 4 sleeves, 4 bolts, 4 washers	All models	Single pack	1

Acoustic hoods



Type	Code No	Description	Application	Packaging	Pack Size
	120Z5043	Acoustic hood	HRM032-047, HRP 032-047, HRH 031-040, HRH047, HRH048, HRH050	Single pack	1
	120Z5044	Acoustic hood	HRM048-081, HRP048-081, HRH044, HRH049, HRH051-056, HLH061-068, HLJ072-083	Single pack	1
	120Z5045	Acoustic hood	HRM094-120, HCP094-120, HCJ090-121	Single pack	1

IP54 upgrade kit



Type	Code No	Description	Application	Packaging	Pack Size
	118U0056	IP54 upgrade kit for round terminal box	HRM, HLM, HCM, HRP, HLP, HCP, HRH, HLH, HLJ	Multipack	6
	118U0057	IP54 upgrade kit for square terminal box	HRM, HLM, HCM, HRP, HLP, HCP, HRH, HLH, HLJ, HCJ	Multipack	6

Terminal box



Code No	Description	Application	Packaging	Pack Size
120Z5015	Round terminal box (P & T version)	P and T version	Multipack	10
120Z5018	Square terminal box (C & Q version)	C and Q version	Multipack	10

Previous version

- Page 9-10: Technical specifications
- Page 17: Motor voltage
- Page 19: Nominal capacitor value and relays
- Page 20: Approvals and certifications

- Page 44-45: Spare parts & accessories

Current version

- Updated Layout
- Page 6: Added General information
- Page 9-11: Updated Technical specifications
- Page 18: Added Tandem dimensions
- Page 19: Updated Motor voltage with Voltage unbalance formula
- Page 21: Updated Nominal capacitor value and relays
- Page 22: Added Machines directive 2006/42/EC to Approvals and certifications
- Page 23-25: Added Design piping & Design compressor mounting
- Page 26: Added Manage sound and vibratio
- Page 28-30: Added Manage operating envelope
- Page 31-32: Added Manage superheat
- Page 33-34: Added Manage off cycle migration
- Page 35-38: Added Provide power supply and electrical protection & Control logic & Reduce moisture in the system
- Page 39-41: Added Assembly line procedure.
- Page 42-43: Added Commissioning & Dismantle and disposal
- Page 52-54: Updated Start capacitors and starting relay for CSR wiring, Lubricant, Mounting hardware & added Acoustic hoods, IP54 upgrade kit in Spare parts & accessories

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Danfoss Scrolls



Danfoss Inverter Scrolls



Danfoss Turbocor Compressors



Danfoss Light Commercial Refrigeration Compressors



Danfoss Maneurop Reciprocating Compressors



Danfoss Optyma Condensing Units

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Danfoss Commercial Compressors, BP 331, 01603 Trévoux Cedex, France | +334 74 00 28 29



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