ENGINEERING
TOMORROW

Application guidelines

Optyma™ Plus INVERTER

Stepless capacity modulation from 30 to 100 rps in a simple plug and play package

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1.1 Symbols are shown left of the text

There are 3 symbols, used for different degrees of danger:

⚠WARNING

Warning! Risk of serious injury or death to person!

⚠CAUTION

Caution! Danger which can lead to serious damages!

NOTICE

Notice! Risk of damage to equipment!

This guideline is intended to enable users to ensure the safe installation, starting, operation and maintenance of Optyma™ Plus INVERTER condensing units. This guideline is not intended to replace the system expertise available from system manufacturers.

In addition to this instruction application instructions of compressor drive, controller and other internal components must be taken into consideration as well.

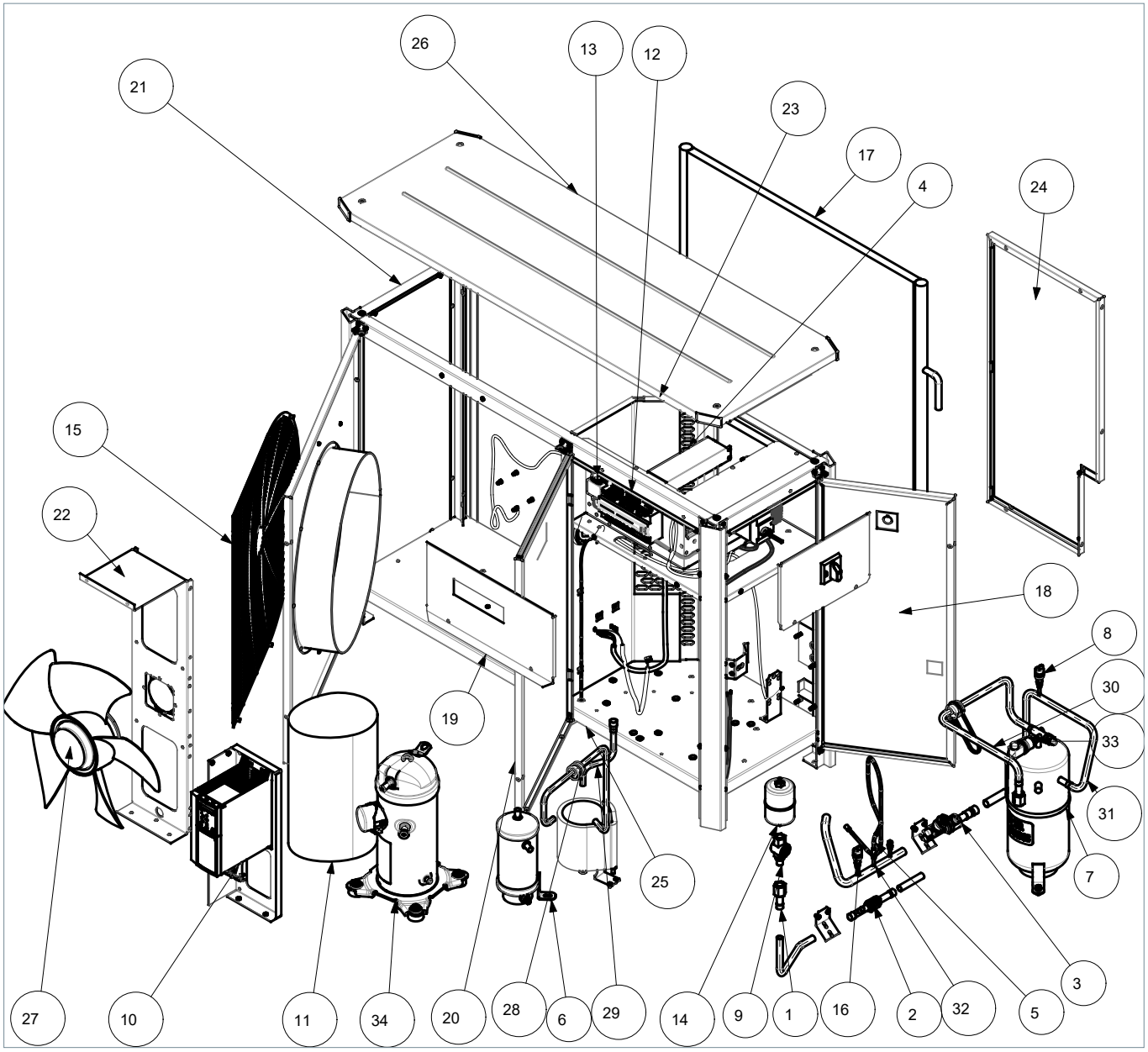
2.1 Optyma™ Plus INVERTER condensing unit

Optyma™ Plus INVERTER combines our market leading expertise in condensing unit design with the unique benefits of stepless inverter scroll technology. The result is 20-30% higher energy efficiency in a flexible plug-and-play package, for medium and high temperature refrigeration applications in the range of 2kW to 9kW.

Standard equipment features:

- Variable speed compressor (scroll) with acoustic housing and crankcase heater
- Compressor drive (with EMI filter)
- MCHX condenser
- Condenser fan motor
- Oil separator with oil heater
- Receiver with stop valve
- Ball valves
- Sight glass
- HP and LP switches
- Filter drier
- Optyma™ Plus controller
- Circuit Breaker MCB, compressor contactor with overload relay
- Robust weather proof housing

2.2 Exploded view
Optyma™ Plus INVERTER



Legend:

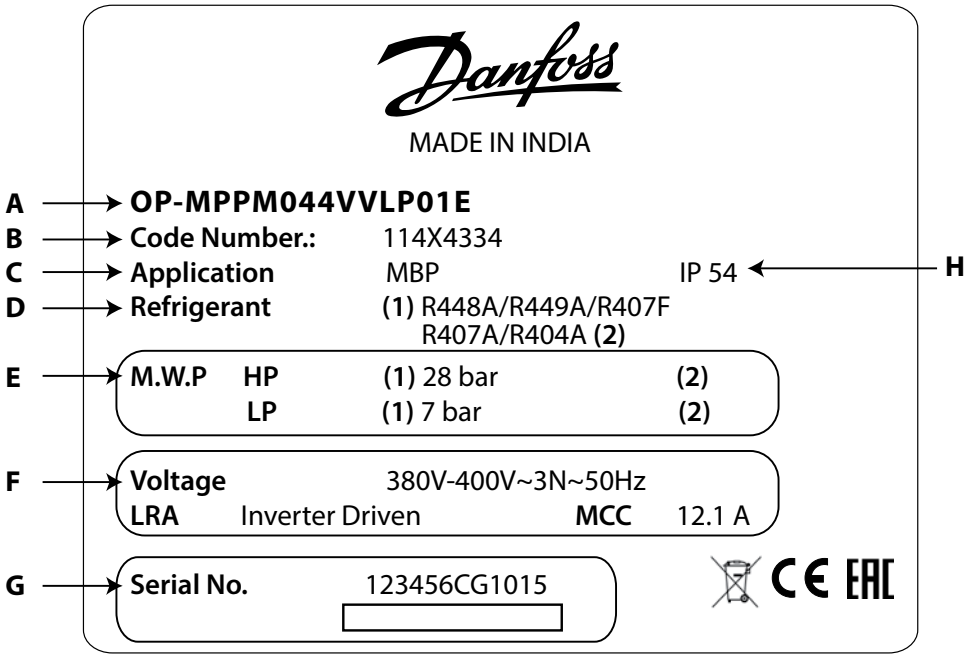
1: FSA Adaptor
2: Liquid line valve (with schrader)
3: Suction line valve + Extra service connection
4: EMI filter (drive)
5: Oil return pipe
6: Oil separator
7: Receiver
8: High pressure switch
9: Sight glass
10: Compressor drive
11: Acoustic hood
12: Optyma™ Plus controller
13: EMI filter (controller)
14: Refrigerant filter
15: Fan guard
16: Low pressure switch
17: Microchannel heat exchanger
18: Right side door
19: E-box cover
20: Front door, right side
21: Unit frame
22: Fan bracket
23: Separation panel
24: Back panel
25: Base plate
26: Top panel
27: Fan assembly
28: Discharge pipe
29: Condenser outlet pipe
30: Receiver outlet pipe
31 Oil separator outlet pipe
32: Suction line
33: Rotalock valve
34: Compressor

2.3 Condensing unit nomenclature system

OP - M P L M 028 VVL P01 E
1 2 3 4 5 6 7 8

1	Application	M = MBP
2	Design	P = Packaged units
3	Refrigerant	L = R404A, R407A, R407F P= R404A, R407A, R407F, R448A, R449A
4	Condenser type	M = Standard with micro channel heat exchanger Tambient max 43 deg C
5	Displacement	028 = 28 cm^3/rev
6	Compressor platform	VVL = variable speed scroll VLZ compressor
7	Version	P01
8	Electrical code	E = Compressor 400 V/3 phase/50 Hz, fan 230 V/1 phase/ 50 Hz

2.4 Label



A: Model
B: Code number
C: Application
D: Refrigerant
E: Housing Service Pressure
F: Supply voltage, M§aximum Current Consumption
G: Serial Number and bar code
H: Protection

Serial-no.: XXXXXXCGWWYY
XXXXXX = ascending number
CG = manufacturing plant
WW = week of production
YY = year of production

For more information related to EcoDesign compliance, please refer to Coolselector®
coolselector.danfoss.com or contact Danfoss

2.5 Approvals and certificates

CE	All models OP-MPLM, OP-MPPM
EAC	All models OP-MPLM, OP-MPPM
Other	Contact Danfoss

2.6 Technical specifications

Unit	Condenser coil			Condenser fan	Receiver	Dimensions					Weight [kg]	
	Type	Air flow [m³/h]	Internal volume [dm³]	Fan blade Ø [mm]	Volume [L] (without valve)	Depth D [mm]	Width W [mm]	Height H [mm]	Suction line	Liquid line	Gross	Net
OP-MPLM028 OP-MPPM028	G7	5200	1.62	1x500	6.2	481	1406	965	3/4"	5/8"	150	124
OP-MPLM035 OP-MPPM035	G7	5200	1.62	1x500	6.2	481	1406	965	3/4"	5/8"	151	125
OP-MPLM044 OP-MPPM044	G7	5200	1.62	1x500	6.2	481	1406	965	3/4"	5/8"	151	125

Unit	MCC compressor [A] 400V/3phase	Max cont. power consumption [kW]	MCC Fan [A] 230V/1 phase	Fan power output [W]	Fan power consumption [W]
OP-MPLM028 OP-MPPM028	8.1	3.98	0.96	1x130	1x220
OP-MPLM035 OP-MPPM035	9.8	4.94	0.96	1x130	1x220
OP-MPLM044 OP-MPPM044	12.0	6.33	0.96	1x130	1x220

2.7 Spare part codes

Unit	Compressor	Condenser	Fan assembly	Receiver	Filter	Sight glass	Liquid line valve	Suction line valve	High pressure transmitter	Low pressure transmitter	Suction and ambient temperature	Discharge temperature sensor	Fan grill
OP-MPLM028 OP-MPPM028	120G0162	118U3494	118U3829	118U3476	023Z504591	014F0174	009G7053	009G7054	118U4021	118U4025	084N0003	084N2007	118U3485
OP-MPLM035 OP-MPPM035	120G0159	118U3494	118U3829	118U3476	023Z504591	014F0174	009G7053	009G7054	118U4021	118U4025	084N0003	084N2007	118U3485
OP-MPLM044 OP-MPPM044	120G0156	118U3494	118U3829	118U3476	023Z504591	014F0174	009G7053	009G7054	118U4021	118U4025	084N0003	084N2007	118U3485

Unit	Controller*	Main switch	Compressor contact	Door handle	Crankcase heater	High pressure switch	Low pressure switch	Acoustic hood	Compressor drive CDS803	EMI filter (Drive)	EMI filter (Controller)	Compressor oil	Oil separator
OP-MPLM028 OP-MPPM028	118U3465	118U3852 118U3854	118U3847	118U3858	120Z5040	118U3718	118U3720	120Z5043	118U3973	118U3972	118U3974	120Z5034 120Z0648	118U3981
OP-MPLM035 OP-MPPM035	118U3465	118U3852 118U3854	118U3847	118U3858	120Z5040	118U3718	118U3720	120Z5043	118U3973	118U3972	118U3974	120Z5034 120Z0648	118U3981
OP-MPLM044 OP-MPPM044	118U3465	118U3852 118U3854	118U3847	118U3858	120Z5040	118U3718	118U3720	120Z5043	118U3973	118U3972	118U3974	120Z5034 120Z0648	118U3982

Unit	Top panel	Fan Panel	Back panel	Front panel	Access panel	Left side panel
OP-MPLM028 OP-MPPM028	118U5131	118U5132	118U5133	118U5134	118U5135	118U5165
OP-MPLM035 OP-MPPM035	118U5131	118U5132	118U5133	118U5134	118U5135	118U5165
OP-MPLM044 OP-MPPM044	118U5131	118U5132	118U5133	118U5134	118U5135	118U5165

* For service replacement of controller in Optyma™ Plus INVERTER only new version of controller can be used: code number on the controller is 084B8080.

NOTICE For service purpose original components (spare parts) recommended by Danfoss should be used.

2.8 Cooling capacities, sound data, power consumption

Optyma™ Plus INVERTER, R407A

Model number	Code number	Compressor	Compressor speed, rps	Tamb [°C]	Cooling capacity Q [kW] Te [°C] -15 °C	-10 °C	-5 °C	0 °C	5 °C	P [kW] -10°C	COP (1)	EcoDesign (2) Q [kW]	P [kW]	COP_A	SEPR	Sound power level dB(A)	Sound pressure level 10 m dB(A)
OP-MPPM028VVLP01E	114X4302	VLZ028TGA	30	27	1435	1797	2227	2732	3320							72.8	41.8
				32	1345	1686	2092	2570	3128	899	1.88						
				38	-	1557	1934	2380	2902								
				43	-	-	-	-	-								
			50	27	2382	2994	3711	4543	5499							73.4	42.4
				32	2243	2829	3515	4310	5224	1333	2.12						
				38	-	2622	3267	4015	4876								
				43	-	2442	3050	3757	4571								
			75	27	3499	4412	5470	6686	8069							74.0	43.0
				32	3306	4177	5183	6339	7654	2005	2.08						
				38	-	3879	4821	5901	7131								
				43	-	3618	4503	5519	6676								
			100	27	4549	5740	7106	8660	10413							75.3	44.3
				32	4313	5438	6726	8192	9847	2830	1.92	5539	2834	1.95	3.49		
				38	-	5067	6261	7621	9158								
				43	-	4747	5864	7135	8575								
OP-MPPM035VVLP01E	114X4316	VLZ035TGA	30	27	1806	2259	2796	3426	4157							71.7	40.7
				32	1692	2119	2626	3223	3916	1057	2.00						
				38	-	1956	2427	2983	3632								
				43	-	-	-	-	-								
			50	27	2988	3751	4643	5674	6854							72.3	41.3
				32	2812	3542	4393	5378	6504	1599	2.22						
				38	-	3279	4079	5003	6061								
				43	-	3051	3803	4674	5674								
			75	27	4374	5503	6805	8291	9973							72.9	41.9
				32	4128	5203	6439	7849	9443	2445	2.13						
				38	-	4824	5977	7292	8779								
				43	-	4492	5573	6806	8201								
			100	27	5666	7124	8782	10652	12744							74.6	43.6
				32	5367	6741	8302	10064	12035	3488	1.93	6876	3494	1.97	3.63		
				38	-	6270	7715	9345	11172								
				43	-	5864	7212	8734	10442								
OP-MPPM044VVLP01E	114X4334	VLZ044TGA	30	27	2303	2877	3556	4350	5268							72.6	41.6
				32	2159	2699	3339	4091	4962	1278	2.11						
				38	-	2491	3085	3785	4600								
				43	-	-	-	-	-								
			50	27	3796	4757	5876	7163	8629							73.1	43.1
				32	3569	4487	5553	6779	8175	1974	2.27						
				38	-	4148	5146	6294	7602								
				43	-	3852	4790	5870	7101								
			75	27	5527	6933	8542	10363	12405							73.7	43.7
				32	5208	6543	8067	9790	11720	3073	2.13						
				38	-	6052	7468	9069	10862								
				43	-	5620	6944	8440	10117								
			100	27	7125	8914	10926	13170	15649							74.4	43.4
				32	6738	8421	10311	12419	14750	4434	1.90	8612	4446	1.94	3.71		
				38	-	7813	9557	11502	13656								
				43	-	7288	8911	10721	12728								

[1] Nominal conditions, Evaporating temperature -10°C. Ambient air temperature +32°C. Superheat 10K.
[2] Rated conditions, Evaporating temperature -10°C. Ambient air temperature +32°C. Return Gas Temperature 20°C

SEPR, Seasonal Energy Performance Ratio
Q [W], Cooling Capacity
P [W], Power Input

For more information related to EcoDesign compliance, please refer to Coolselector®
coolselector.danfoss.com or contact Danfoss

Optyma™ Plus INVERTER, R407F

Model number	Code number	Compressor	Compressor speed, rps	Tamb [°C]	Cooling capacity Q [kW] Te [°C] -15 °C	-10 °C	-5 °C	0 °C	5 °C	P [kW] -10°C	COP (1)	EcoDesign (2) Q [kW]	P [kW]	COP_A	SEPR	Sound power level dB(A)	Sound pressure level 10 m dB(A)
OP-MPPM028VVLP01E	114X4302	VLZ028TGA	30	27	1534	1915	2363	2888	3496							71.7	40.7
				32	1447	1808	2234	2733	3313	945	1.91						
				38	-	1679	2078	2547	3092								
				43	-	-	-	-	-								
			50	27	2598	3258	4022	4900	5902							72.3	41.3
				32	2450	3083	3815	4655	5613	1410	2.19						
				38	-	2862	3555	4349	5254								
				43	-	2669	3328	4083	4943								
			75	27	3826	4792	5901	7163	8590							72.9	41.9
				32	3612	4539	5600	6806	8169	2121	2.14						
				38	-	4220	5223	6362	7647								
				43	-	3942	4895	5977	7197								
			100	27	4950	6174	7573	9158	10939							74.2	43.2
				32	4689	5857	7191	8703	10400	2977	1.97	5905	2979	1.98	3.58		
				38	-	5470	6724	8145	9742								
				43	-	5141	6327	7671	9182								
OP-MPPM035VVLP01E	114X4316	VLZ035TGA	30	27	1931	2408	2969	3623	4380							71.2	40.2
				32	1820	2272	2805	3428	4149	1115	2.04						
				38	-	2110	2609	3193	3871								
				43	-	-	-	-	-								
			50	27	3258	4080	5029	6116	7351							71.9	40.9
				32	3069	3858	4766	5804	6984	1698	2.27						
				38	-	3577	4435	5416	6529								
				43	-	3330	4147	5078	6135								
			75	27	4776	5970	7334	8878	10612							72.5	41.5
				32	4503	5648	6951	8425	10079	2594	2.18						
				38	-	5242	6472	7860	9417								
				43	-	4888	6055	7372	8847								
			100	27	6156	7655	9358	11274	13409							73.55	42.5
				32	5825	7254	8876	10699	12731	3679	1.97	7326	3682	1.99	3.71		
				38	-	6764	8286	9996	11902								
				43	-	6347	7783	9397	11198								
OP-MPPM044VVLP01E	114X4334	VLZ044TGA	30	27	2464	3068	3778	4603	5555							72	41
				32	2322	2895	3568	4354	5260	1353	2.14						
				38	-	2686	3316	4052	4903								
				43	-	-	-	-	-								
			50	27	4135	5170	6359	7714	9244							72.6	41.6
				32	3891	4882	6019	7311	8771	2105	2.32						
				38	-	4519	5591	6809	8184								
				43	-	4200	5218	6374	7677								
			75	27	6024	7510	9195	11089	13196							73.2	42.2
				32	5670	7092	8700	10503	12509	3271	2.17						
				38	-	6567	8080	9774	11658								
				43	-	6107	7540	9143	10924								
			100	27	7723	9567	11641	13951	16496							74	43
				32	7298	9052	11023	13215	15631	4694	1.93	9164	4701	1.95	3.78		
				38	-	8421	10265	12315	14574								
				43	-	7884	9618	11548	13675								

[1] Nominal conditions, Evaporating temperature -10°C. Ambient air temperature +32°C. Superheat 10K.
[2] Rated conditions, Evaporating temperature -10°C. Ambient air temperature +32°C. Return Gas Temperature 20°C

SEPR, Seasonal Energy Performance Ratio
Q [W], Cooling Capacity
P [W], Power Input

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EcoDesign 2018

Optyma™ Plus INVERTER, R404A

Model number	Code number	Compressor	Compressor speed, rps	Tamb [°C]	Cooling capacity Q [kW] Te [°C] -15 °C	-10 °C	-5 °C	0 °C	5 °C	P [kW] -10°C	COP (1)	EcoDesign (2) Q [kW]	P [kW]	COP_A	SEPR	Sound power level dB(A)	Sound pressure level 10 m dB(A)
OP-MPPM028VVLP01E	114X4302	VLZ028TGA	30	27	1597	1990	2446	2972	3573							71.2	40.2
				32	1484	1854	2284	2780	3349	1002	1.85						
				38	-	-	-	-	-								
				43	-	-	-	-	-								
			50	27	2700	3340	4080	4929	5894							71.9	40.9
				32	2505	3106	3802	4601	5510	1537	2.02						
				38	2266	2820	3168	4198	5039								
				43	2060	2574	3168	3853	4636								
			75	27	3994	4916	5976	7181	8542							72.5	41.5
				32	3707	4574	5569	6701	7981	2349	1.95						
				38	3354	4151	4633	6110	7290								
				43	3048	3785	4633	5600	6698								
			100	27	5202	6381	7724	9241	10939							73.7	42.7
				32	4832	5939	7198	8620	10214	3317	1.79	6250	3328	1.88	3.47		
				38	4368	5384	5965	7845	9310								
				43	3962	4899	5965	7171	8528								
OP-MPPM035VVLP01E	114X4316	VLZ035TGA	30	27	2027	2517	3085	3739	4485							73.1	42.1
				32	1878	2339	2875	3491	4196	1159	2.02						
				38	-	-	-	-	-								
				43	-	-	-	-	-								
			50	27	3402	4193	5108	6153	7338							73.8	42.8
				32	3158	3899	4755	5735	6846	1794	2.17						
				38	2854	3533	3937	5215	6236								
				43	2590	3215	3937	4766	5711								
			75	27	4962	6087	7381	8853	10511							74.4	43.4
				32	4610	5659	6866	8240	9790	2813	2.01						
				38	4169	5126	5672	7481	8899								
				43	3784	4662	5672	6826	8133								
			100	27	6354	7768	9389	11226	13287							75.4	44.4
				32	5901	7218	8727	10438	12360	4070	1.77	7614	4088	1.86	3.77		
				38	5331	6529	7183	9460	11214								
				43	4828	5926	7183	8614	10227								
OP-MPPM044VVLP01E	114X4334	VLZ044TGA	30	27	2620	3236	3949	4767	5698							73.1	42.1
				32	2426	3008	3681	4453	5334	1391	2.16						
				38	-	-	-	-	-								
				43	-	-	-	-	-								
			50	27	4322	5303	6426	7700	9134							73.9	42.9
				32	4012	4932	5987	7183	8532	2288	2.16						
				38	3623	4470	4964	6541	7784								
				43	3284	4067	4964	5985	7139								
			75	27	6267	7656	9231	10997	12960							74.5	43.5
				32	5812	7111	8583	10234	12070	3618	1.97						
				38	5243	6432	7078	9289	10972								
				43	4744	5839	7078	8472	10027								
			100	27	8008	9755	11715	13888	16273							75.5	44.5
				32	7406	9033	10856	12879	15102	5190	1.74	9560	5220	1.83	3.76		
				38	6648	8128	8852	11626	13651								
				43	5980	7335	8852	10539	12399								

[1] Nominal conditions, Evaporating temperature -10°C. Ambient air temperature +32°C. Superheat 10K.
[2] Rated conditions, Evaporating temperature -10°C. Ambient air temperature +32°C. Return Gas Temperature 20°C

SEPR, Seasonal Energy Performance Ratio
Q [W], Cooling Capacity
P [W], Power Input

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Optyma™ Plus INVERTER, R448A/R449A

Model number	Code number	Compressor	Compressor speed, rps	Tamb [°C]	Cooling capacity Q [kW] Te [°C] -15 °C	-10 °C	-5 °C	0 °C	5 °C	P [kW] -10°C	COP (1)	EcoDesign (2) Q [kW]	P [kW]	COP_A	SEPR	Sound power level dB(A)	Sound pressure level 10 m dB(A)
OP-MPPM028VVLP01E	114X4302	VLZ028TGA	30	27	1465	1839	2276	2783	3365							71.2	40.2
				32	1375	1732	2149	2633	3190	939	1.84						
				38	-	-	-	-	-								
				43	-	-	-	-	-								
			50	27	2494	3107	3816	4629	5553							71.9	40.9
				32	2346	2930	3605	4379	5259	1415	2.07						
				38	-	2706	3338	4064	4891								
				43	-	2510	3106	3790	4571								
			75	27	3656	4527	5536	6695	8013							72.5	41.5
				32	3443	4270	5226	6324	7573	2159	1.98						
				38	-	3949	4842	5866	7032								
				43	-	3670	4509	5472	6569								
			100	27	4686	5774	7041	8502	10171							73.7	42.7
				32	4421	5451	6648	8028	9605	3054	1.78	5548	3058	1.81	3.38		
				38	-	5056	6170	7454	8922								
				43	-	4713	5761	6967	8346								
OP-MPPM035VVLP01E	114X4316	VLZ035TGA	30	27	1836	2301	2845	3476	4201							73.1	42.1
				32	1722	2166	2684	3284	3974	1081	2.00						
				38	-	-	-	-	-								
				43	-	-	-	-	-								
			50	27	3091	3846	4713	5699	6812							73.8	42.8
				32	2896	3616	4442	5381	6441	1748	2.07						
				38	-	3327	4102	4983	5977								
				43	-	3076	3806	4637	5577								
			75	27	4505	5569	6792	8183	9752							74.4	43.4
				32	4227	5238	6396	7713	9200	2718	1.93						
				38	-	4827	5907	7136	8523								
				43	-	4472	5487	6641	7945								
			100	27	5773	7090	8615	10361	12338							75.4	44.4
				32	5439	6683	8119	9765	11631	3839	1.74	6814	3837	1.78	3.29		
				38	-	6185	7518	9045	10779								
				43	-	5757	7006	8436	10061								
OP-MPPM044VVLP01E	114X4334	VLZ044TGA	30	27	2364	2954	3637	4422	5317							73.1	42.1
				32	2213	2776	3429	4180	5037	1316	2.11						
				38	-	-	-	-	-								
				43	-	-	-	-	-								
			50	27	3894	4834	5915	7145	8532							73.9	42.9
				32	3650	4544	5570	6739	8058	2051	2.22						
				38	-	4185	5144	6238	7473								
				43	-	3876	4779	5808	6973								
			75	27	5674	7003	8510	10203	12087							74.5	43.5
				32	5308	6572	8003	9609	11397	3243	2.03						
				38	-	6034	7371	8873	10544								
				43	-	5566	6825	8237	9810								
			100	27	7289	8959	10828	12899	15173							75.5	44.5
				32	6786	8375	10149	12112	14265	4739	1.77	8558	4753	1.8	3.73		
				38	-	7634	9291	11123	13130								
				43	-	6982	8539	10260	12145								

[1] Nominal conditions, Evaporating temperature -10°C. Ambient air temperature +32°C. Superheat 10K.
[2] Rated conditions, Evaporating temperature -10°C. Ambient air temperature +32°C. Return Gas Temperature 20°C

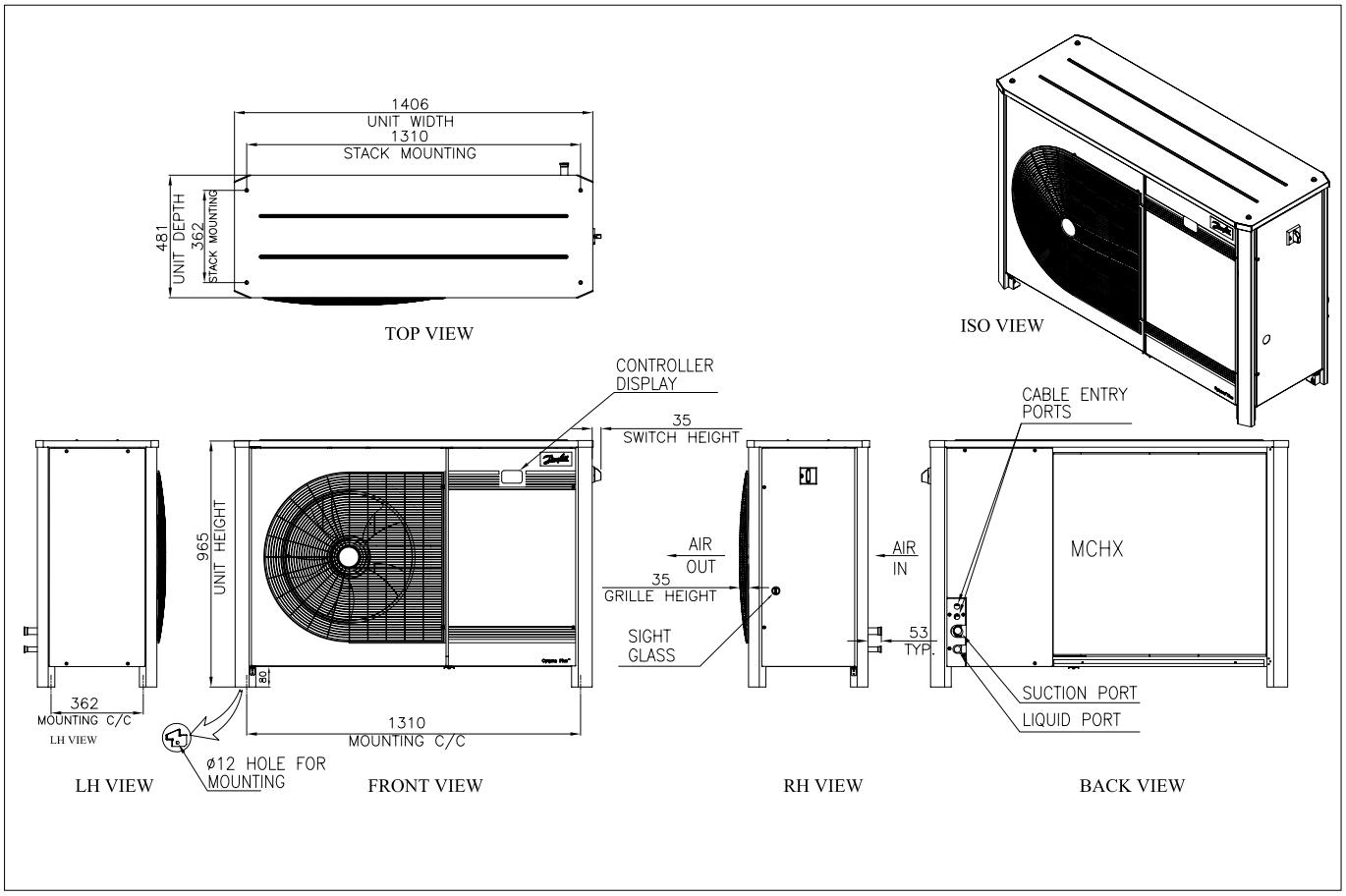
SEPR, Seasonal Energy Performance Ratio
Q [W], Cooling Capacity
P [W], Power Input

For more information related to EcoDesign compliance, please refer to Coolselector®
coolselector.danfoss.com or contact Danfoss

EcoDesign 2018

2.9 Layout

OP-MPLM028-035-044, OP-MPPM028-035-044



3.1 Main applications

Optyma™ Plus INVERTER is a perfect cooling solution for typical MBP applications like food retail, petrol forecourt sites, cold rooms ,and display cases. All units are fully wired and factory tested. They have one cabinet sizes and are equipped with one fan.

Optyma™ Plus INVERTER outdoor condensing units are released for R448A/R449A, R407A/F and R404A.

3.2 Condensing unit selection

Inverter technology offers more flexibility in condensing unit selection than fixed-speed units. Selection of the right inverter condensing unit size can be made by next method:
Select a condensing unit size which achieves the peak load system cooling capacity demand at its maximum speed.

NOTICE It is compulsory to secure that condensing unit capacity at minimum speed (30 rps) will not be higher than necessary cooling capacity for the smallest evaporator!

In case minimum (at 30 rps) condensing unit capacity is higher than capacity of smallest evaporator it can cause work of condensing unit outside its application envelope and as consequence reduce lifetime.

Example1 (evaporating temperature -10 °C, ambient temperature 32 °C, R404A):
Evaporator1= 3 kW
Evaporator2= 3 kW
Evaporator3= 3 kW
Total Q = 9 kW (maximum cooling capacity)
Minimum cooling capacity = minimum evaporator capacity = minimum evaporating capacity = 3kW
According to the capacities at evaporating -10 °C, ambient 32 °C and refrigerant R404A condensing unit OP-MPPM044 (maximum capacity 9 kW) achieves the peak load system cooling capacity (9,3 kW) demand at its maximum speed and at the same time condensing unit capacity at minimum speed (minimum capacity 3 kW) is not higher than necessary cooling capacity for the smallest evaporator (3 kW).

Example2 (evaporating temperature -10 °C, ambient temperature 32 °C, R404A):
Evaporator1= 1 kW
Evaporator2= 2,1 kW
Evaporator3= 2,5 kW
Evaporator4=1,5 kW
Total Q = 7,1 kW (maximum cooling capacity)
Minimum cooling capacity = minimum evaporator capacity = Evaporator1 = 1 kW.

According to the capacities at evaporating -10 °C, ambient 32 °C and refrigerant R404A condensing unit OP-MPPM035 (maximum capacity 7,2 kW) achieves the peak load system cooling capacity (7,1 kW) demand at its maximum speed but at the same time condensing unit capacity at minimum speed (minimum capacity 2,3 kW) is higher than necessary cooling capacity for the smallest evaporator (1 kW).

In this case it is recommended to connect few evaporators together (regulated by one thermostat) to achieve smallest required capacity higher than minimum capacity of condensing unit: by managing Evaporator1 and Evaporator4 via one thermostat minimum required capacity will be 2,5 kW (Evaporator2) which is higher than minimum capacity of condensing unit at low speed (2,3 kW).

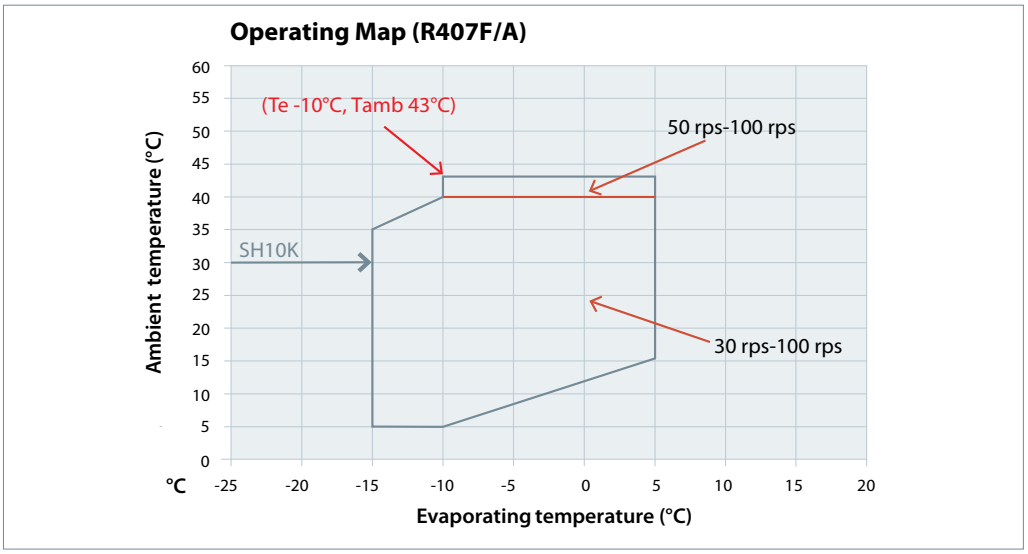
NOTICE Compressor of Optyma™ Plus INVERTER is equipped with a IPM (Interior Permanent Magnet) motor. The compressor cannot operate without frequency converter. It will be destroyed immediately if connected directly to public network. The applied frequency from the inverter will be 60 Hz for 30 rps (1800 rpm) up to 200 Hz for 100 rps (6000 rpm).

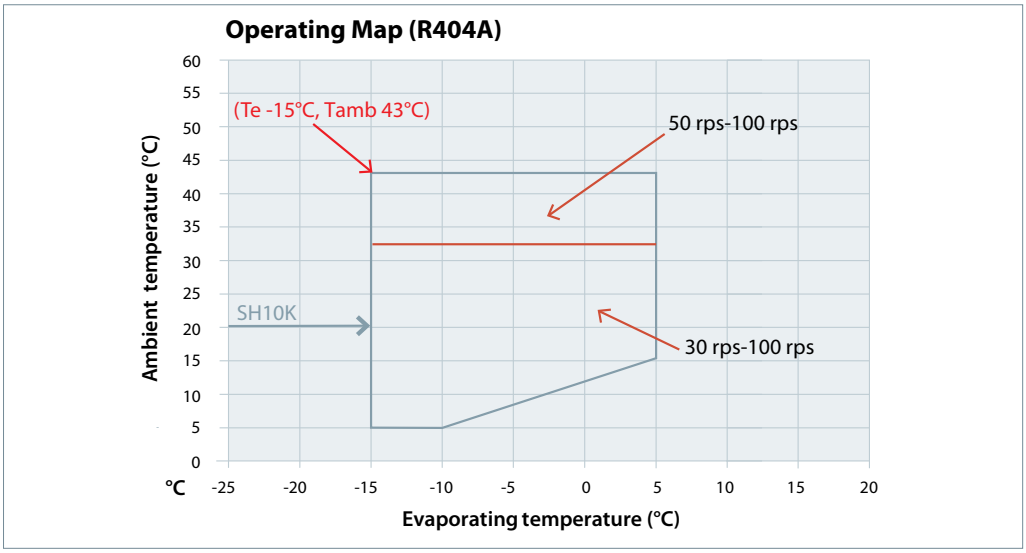
Please refer to the table below

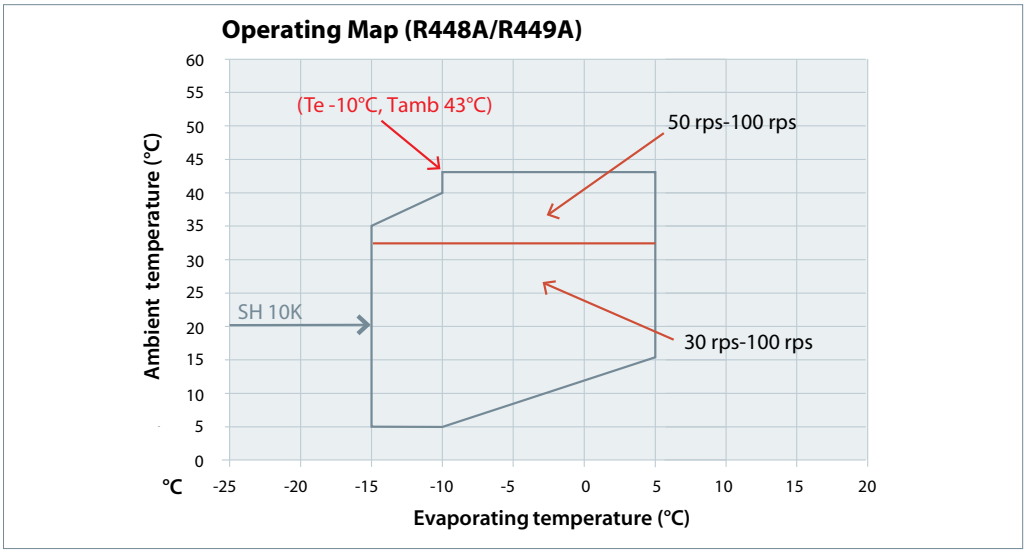
Compressor speed	Min	Max
rps	30	100
rpm	1800	6000
Drive output frequency Hz	60	200

3.3 Application envelopes

The operating envelopes of Optyma™ Plus INVERTER are given in the figures below, where the ambient and evaporating temperatures represent the range for steady state operation. The figures below show the operating envelopes for condensing units with refrigerants R448A/R449A, R407A/F and R404A. The operating limits serve to define the envelopes within which reliable operation of the condensing units are guaranteed.







Red line on the application envelope indicates maximum safe ambient temperature for low load (30-50 rps) and high ambient conditions (above 32 °C for R448A/R449A, 32 °C for R404A and above 40 °C for R407A/F.

In case low unit capacity required (30-50 rps) at high ambient temperatures controller will increase compressor speed up to minimum safe speed at high temperature. This minimum safe speed at high temperature is factory preset to 50 rps (controller parameter c47: Start speed of the compressor). It is not recommended to decrease setting of parameter c47 below 50 rps as this can lead to work of compressor at low speed during high ambient conditions which can reduce lifetime of the unit.

Minimum and maximum evaporating and condensing temperatures as per the operating envelopes – compressor should work inside application envelope.

Other operating limits:	Recommendation
Discharge gas temperature	125 °C maximum
Evaporator outlet superheat	above 6K (to avoid liquid flood back)
Suction gas superheat at compressor inlet	within the limits shown on the application envelope

Special attention to suction line insulation will have to be secured in order to:

- Avoid too high superheat during high ambient conditions that can create too high discharge gas temperature.
- Avoid too low superheat during low ambient conditions that can create condensation of refrigerant in suction line.

3.4 Ambient conditions

Optyma™ Plus INVERTER units can be used with ambient temperature from -15°C to 43°C. For altitudes above 2000 m, contact Danfoss. The other working conditions should be within the limits of application envelope.

To assure that the unit can start during cold conditions the parameter "c94 LpMinOnTime" can be used. If this parameter is set to a value that is higher than 0 and the ambient temperature (Tamb) is below 5°C, the internal transmitter "LP switch c75" and "pump down limit c33" will be overridden for the number of seconds defined in "c94 LpMinOnTime". And the value for Min on time for the compressor will be set to the largest of the values of "c94 MinLpOnTime" and "c01 Min. on time".

The CDS803 drive forces the compressor to 50rps (see Optyma Controller parameter c47) for 30s always at compressor start, to ensure proper oil return at low load and short runtimes. The start delay time can be modified via drive parameter 1-71, if a proper oil return is always ensured without or by modifying this start delay function.

In order to change 1-71, a separate LCP panel needs used to change the settings on the drive, the LCP panel has the ordering code 120Z0581.

When changing 1-71, a value not lower as 10 seconds should get applied.

3.5 Limits for voltage supply

Voltage limits: Min: 360 V Max 440 V
Phase asymmetry: ±3%
Frequency limits: 50Hz ±1%

⚠CAUTION Optyma™ Plus INVERTER unit has to be installed by competent authorized personnel and the installation shall comply to applicable local laws and rules.

4.1 Location & fixings

The unit is to be placed in such a way that it is not blocking or expose an obstacle for walking areas, doors, windows etc. The foundation where the unit is to be placed upon has to be strong enough to carry the entire weight, see unit data. Ensure adequate space around the unit for air circulation. Avoid installing the unit in locations which are exposed to direct sunshine daily for long periods. Unit has to be placed on a horizontal surface - less than 3° slope, which has to be strong and stable enough to eliminate vibrations and interference. It is recommended to install the unit on rubber grommets or vibration dampers (not part of the Danfoss supply). Installation of unit shall not be done in aggressive and dusty environments.

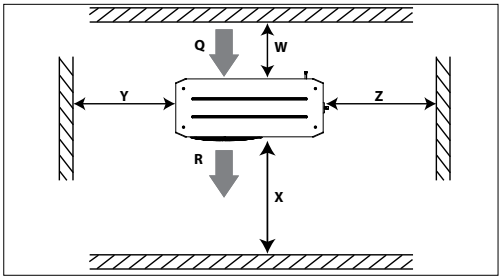
Furthermore the installation of the unit shall not be done in facilities containing flammable gasses or in installation containing flammable gasses.

NOTICE Special attention should be paid if unit needs to be installed close to the sea as this can reduce unit lifetime due to corrosion of metal parts.

Where multiple units are to be installed in the same location, please consider each individual case carefully. Air by-pass around each condenser and between the units should be avoided at all times.

Optyma™ Plus INVERTER condensing units can also be used for wall mounting on suitable brackets. Wall mounting brackets are not supplied by Danfoss.

Another factor to consider in finding a good installation site is the direction of the prevailing wind. For example if the air leaving the condenser faces the prevailing wind, the air flow through the condenser can be impeded, causing high condensing temperatures, improper functioning of the unit and ultimately resulting in reducing the life of the unit. A baffle is a remedy for this situation.



Picture 1: Minimum mounting distances

Q: Air in **R**: Air out

Unit	W [mm]	X [mm]	Y [mm]	Z [mm]
Housing 3	250	760	580	580

4.2 Electrical connection

⚠WARNING Ensure that power supply cannot be switched on during installation.

Below table lists recommended wiring sizes for the condensing unit power supply cables. These wiring sizes are valid for a cable length up to 30 m.

Model	Cable size, mm² (from network to unit main switch)
OP-MPLM028 OP-MPPM028	4
OP-MPLM035 OP-MPPM035	4
OP-MPLM044 OP-MPPM044	4

Note: 1.The wire size here is the guideline. In each specific case required cable size should be specified by the installer depending on the system design, ambient temperature, the wire material, current, etc.

In order to ensure a safe and problem free operation of the unit it is recommended to:

- Ensure that the power supply corresponds to the unit and that the power supply is stable (see nominal values on unit label and power supply limits in paragraph 3.5).
- Make the power supply according to present norm and legal requirements. Ensure that the unit is properly connected to ground.

The unit is equipped with a main switch with overload protection. Overload protection is preset from factory. Value for overload protection can be found in the wiring diagram. Wiring diagram can be found in front door of unit. Unit is equipped with high and low pressure switches, which directly cuts the power supply of the compressor contactor in case of activation.

Unit is equipped with an electronic controller and compressor drive.

The controller and compressor drive are pre-programmed with parameters ready for use with the actual unit.

As standard the parameters for operation with refrigerant R449A set. If another refrigerant is to be used refrigerant parameter (o30) needs to be changed (refer to description in Controller application manual). Parameters for high and low pressure cut outs are preset in the controller adapted to the compressor and refrigerant installed in the unit.

4.2.1 Power supply protection

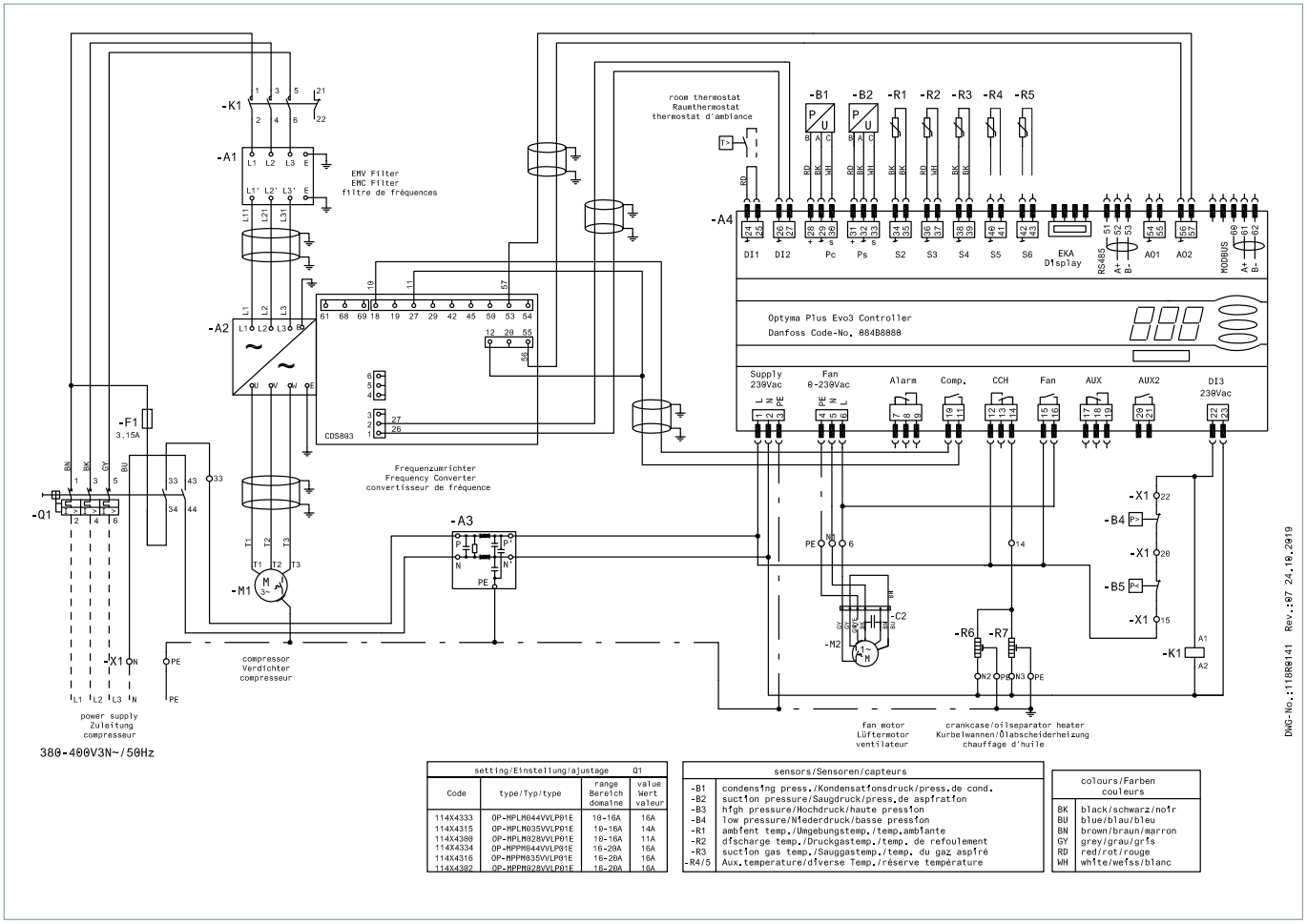
You should use only original circuit breaker, min. short circuit breaking capacity needs to be 100kA. Please refer to spare part section for selection of components for service replacement.

4.2.2 Protection and features

- Electronic thermal compressor protection against overload.
- Temperature monitoring of the heat sink ensures that the frequency converter trips in case of overtemperature.
- The frequency converter is protected against short-circuits between compressor terminals U, V, W.
- When a compressor phase is missing, the frequency converter trips and issues an alarm.
- When a mains phase is missing, the frequency converter trips or issues a warning (depending on the load).
- Monitoring of the intermediate circuit voltage ensures that the frequency converter trips, when the intermediate circuit voltage is too low or too high.
- The frequency converter is protected against ground faults on compressor terminals U, V, W.
- Occurring alarms will be shown in the controller display and by the red LED in front of the frequency converter.
- The root cause of an individual alarm can be shown with an optional LCP (local control panel, code 120Z0581) or the MCT10 setup software.

4.3 Wiring diagrams

OP-MPLM028-035-044, OP-MPPM028-035-044



setting/Einstellung/ajustage Q1			
Code	type/Typ/type	range Bereich domaine	value Wert valeur
114X4333	OP-MPLM044VVLP01E	10-16A	16A
114X4315	OP-MPLM035VVLP01E	10-16A	14A
114X4380	OP-MPLM028VVLP01E	10-16A	11A
114X4334	OP-MPPM044VVLP01E	16-20A	16A
114X4316	OP-MPPM035VVLP01E	16-20A	16A
114X4382	OP-MPPM028VVLP01E	16-20A	16A

sensors/Sensoren/capteurs	
-B1	condensing press./Kondensatfonsdruck/press.de cond.
-B2	suction pressure/Saugdruck/press.de aspfratfon
-B3	high pressure/Hochdruck/haute pressfon
-B4	low pressure/Niederdruck/basse pressfon
-R1	ambfent temp./Umgebungstemp./temp.ambiante
-R2	dfscharge temp./Druckgastemp./temp. de refoulement
-R3	suction gas temp./Sauggastemp./temp. du gaz aspiré
-R4/5	Aux.temperature/dfverse Temp./réserve température

colours/Farben couleurs	
BK	black/schwarz/noir
BU	blue/blau/bleu
BN	brown/braun/marron
GY	grey/grau/gris
RD	red/rot/rouge
WH	white/weiss/blanc

A1 : EMC/RFI Filter (Compressor) **A2 :** Frequency Converter **A3 :** EMI Filter (Controls) **A4 :** Optyma™ Plus Controller
B1 : Condensing Pressure Transducer **B2 :** Suction Pressure Transducer **B3 :** High Pressure Switch **B4 :** Low Pressure Switch
C1 : Run Capacitor (Fan) **F1 :** Fuse (Control Circuit) **K1 :** Contactor **M1 :** Compressor
M2 : Fan Motor **Q1 :** Main Switch **R1 :** Ambient Temp. Sensor **R2 :** Discharge Temp. Sensor
R3 : Suction Temp. Sensor **R4,R5 :** Auxiliary Temp. Sensor (optional) **R6 :** Crankcase Heater **R7 :** Oil Separator Heater
S1 : Room Thermostat (optional) **X1 :** Terminal

Supply : Supply **Fan :** Fan **Alarm :** Alarm **Comp. :** Compressor
CCH : Crankcase Heater **Aux :** Auxiliary

4.3.1 Emergency running without controller

In case of controller failure, the condensing unit can still be operated when the controller standard wiring (WD1) is modified into a temporary wiring (WD2) as described below.

This modification may be done by authorized electricians only. Country legislations have to be followed.

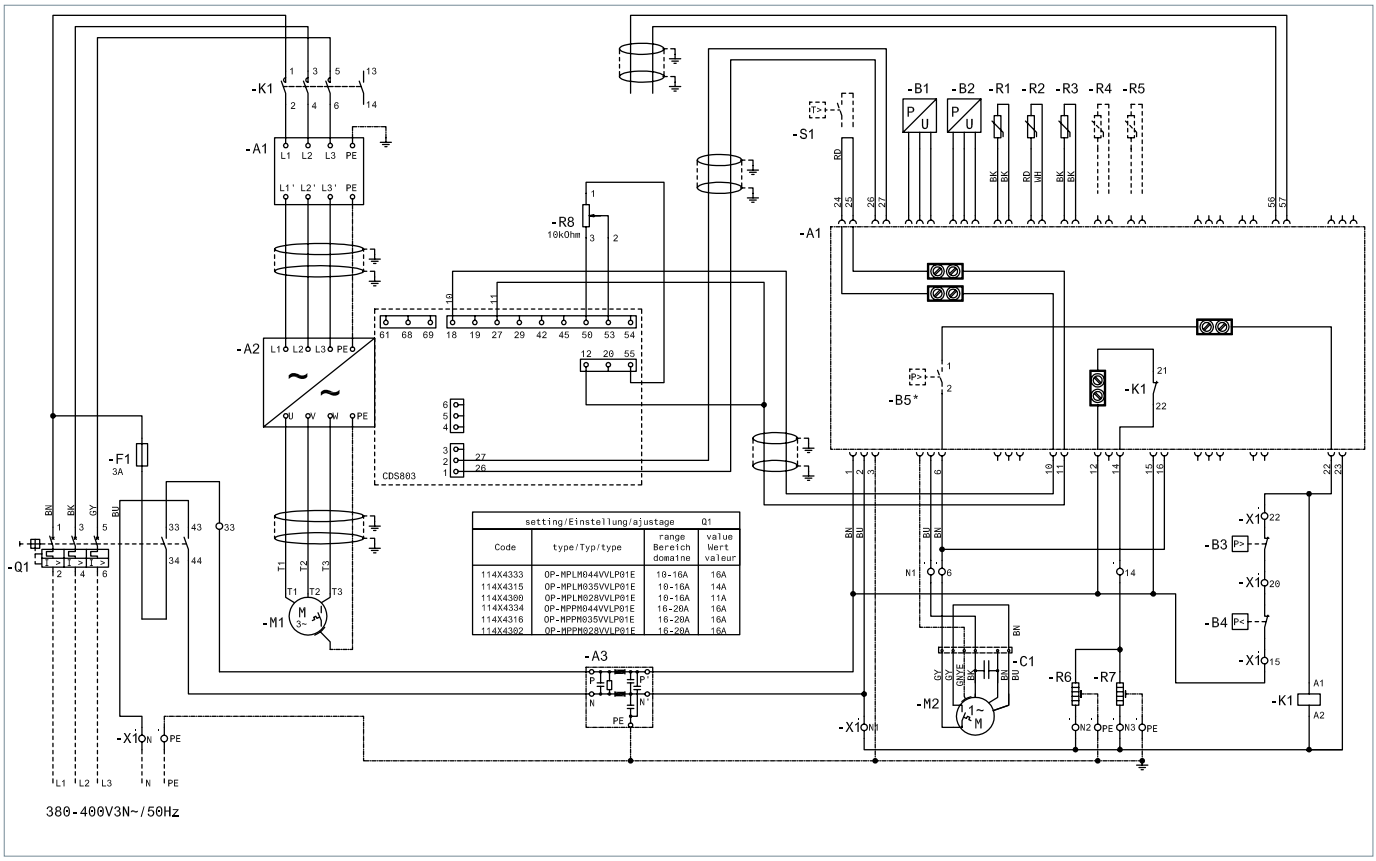
Disconnect the condensing unit from power supply (turn hardware main switch off).

- Contact of Room Thermostat must be possible to switch 250VAC.
- Remove wire 22 (safety input DI3) and wire 6 (fan supply) and put them together. A fan pressure switch (e.g. KP5) or a fan speed controller (e.g. XGE) can be connected in series to wire 6.
- Remove wire 10 (drive start) and wire 24 (room thermostat) and put them together.
- Remove wire 11 (drive start) and wire 25 (room thermostat) and put them together.
- Remove wire 53 and 55 from drive terminals and connect the attached 10kOhm potentiometer (R8) as below:

  wire 1 to drive terminal 55
  wire 2 to drive terminal 53
  wire 3 to drive terminal 50

- Turn the knob of the potentiometer to middle position, which corresponds approximately compressor speed 50rps.
- Remove wire 14 (crankcase and oil separator heaters) and connect it to the compressor contactor terminal 22.
- Remove wire 12 (supply crankcase and oil separator heaters), extend this wire by using an 250 Vac 10mm^2 terminal bridge and 1,0mm^2 brown cable and connect it to compressor contactor terminal 21.
- Remove the large terminal block from the controller terminals 10 to 19.
- Connect the condensing unit to power supply (turn hardware main switch on).
- Adjust the potentiometer to get the desired speed.
- Replace the controller as soon as possible.

OP-MPLM028-035-044, OP-MPPM028-035-044- Emergency Wiring



A1 : EMC/RFI Filter (Compressor)
A2 : Frequency Converter
A3 : EMI Filter (Controls)
A4 : Optyma™ Plus Controller
B1 : Condensing Pressure Transducer
B2 : Suction Pressure Transducer
B3 : High Pressure Switch
B4 : Low Pressure Switch
B5* : Fan Speed Controller / Pressure Switch
C1 : Run Capacitor (Fan)
F1 : Fuse (Control Circuit)
K1 : Contactor
M1 : Compressor
M2 : Fan Motor
Q1 : Main Switch
R1 : Ambient Temp. Sensor
R2 : Discharge Temp. Sensor
R3 : Suction Temp. Sensor
R4,R5 : Auxiliary Temp. Sensor (optional)
R6 : Crankcase Heater
R7 : Oil Separator Heater
R8 : Compressor Speed Potentiometer
S1 : Room Thermostat (optional)
X1 : Terminal

Supply : Supply
Fan : Fan
Alarm : Alarm
Comp. : Compressor
CCH : Crankcase Heater
Aux : Auxiliary

Picture1. Normal wiring

Picture2. Emergency wiring

4.4 Electrical protection standard (protection class)

- Scroll compressors: IP22
- Fan: IP54
- Controller: IP20
- Drive: IP20
- Complete unit: IP54

⚠WARNING Power connections under voltage and can cause danger by electrical shock.

Optyma™ Plus INVERTER units are fully wired and factory tested. Electrical connection compromises only power supply.

4.5 EMC compliance

All necessary actions are taken to secure EMC compliance of complete condensing unit!

4.5.1 Warning when touching unit when OFF

⚠WARNING Frequency converters contain DC-link capacitors that can remain charged even when the frequency converter is not powered. To avoid electrical hazards, disconnect AC mains and wait 15 min for the capacitors to fully discharge before performing any service or repair work. Failure to wait the specified time after power has been removed before doing service or repair could result in death or serious injury.

The digital inputs are not a safety switch. They do not disconnect the frequency converter from the mains.

Do not remove mains connections, compressor connections or other power connections while the frequency converter is connected to power.

⚠CAUTION **Leakage Current**
The ground leakage current from the frequency converter exceeds 3.5 mA. According to IEC 61800-5-1 a reinforced Protective Earth connection must be ensured with a min. 10 mm2 Cu or an additional PE wire – with the same cable cross-section as the mains wiring - must be terminated separately.

Residual Current Device
This product can cause a DC current in the protective conductor. Where a residual current device (RCD) is used for extra protection, only an RCD of Type B (time delayed) shall be used on the supply side of this product.

Recommended Brand & Model Number :

Make	RCCB Model Number
Doepke	DFS 4B SK, Type B
ABB	F 804 B, Type B
ABL	RA4403, Type B

Protective earthing of the frequency converter and the use of RCDs must always follow national and local regulations.

4.6 Phase sequence

Optyma™ Plus INVERTER units are equipped with variable speed scroll compressors for which proper phase sequence is compulsory in order to secure rotation in right direction and therefore compression.

The phase sequence has to be secured between the drive and compressor.
(The phase sequence between network and unit drive is of no influence on the compressor rotation direction).

4.7 Brazed connections

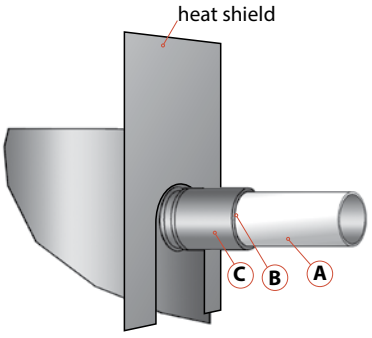
NOTICE Refrigerant connections, brazing and flange connections has to be done by a qualified installer according to EN378.

The unit is supplied with an positive protective pressure of Nitrogen (1 bar).
The use of substances containing chlorine, mineral oil or other chemicals is not allowed.

Piping has to be designed to avoid vibrations, either through flexibility or piping brackets. Furthermore piping has to be done in such a way that oil return for the compressor is ensured and the risk of liquid slug over in compressor is eliminated.

Only use clean and dehydrated refrigeration grade copper tubing. Tube-cutting must be carried out so as not to deform the tubing roundness and to ensure that no foreign debris remains within the tubing. Only refrigerant grade fittings should be used and these must be of both a design and size to allow for a minimum pressure drop through the completed assembly. Follow the brazing instructions bellow. Never drill holes into parts of the pipe-work where filings and particles cannot be removed. Even during installation, if the system is left for any reasonable period of time (say 1 hour), pipes should be re-capped to prevent moisture and contaminant from entering the system.

Liquid/suction tubes are extended from the condensing unit housing, therefore we recommend to isolate the housing by using a heat shield and/or a heat-absorbent compound (e.g. wet cloth) on the copper tubing. Use a double-tipped torch.



For brazing the suction and liquid line connections, the following procedure is advised:

- Make sure that no electrical wiring is connected to the compressor.
- Use brazing material with a minimum of 5% silver content.
- Fit the copper tube into the unit tube.
- Apply heat evenly to area A until the brazing temperature is reached. Move the torch to area B and apply heat evenly until the brazing temperature has been reached there as well, and then begin adding the brazing material. Move the torch evenly around the joint, in applying only enough brazing material to flow the full circumference of the joint.
- Move the torch to area C only long enough to draw the brazing material into the joint.
- Remove all remaining flux "once the joint has been soldered" with a wire brush or a wet cloth.

Remaining flux would cause corrosion of the tubing. Ensure that no flux is allowed to enter into the tubing. Flux is acidic and can cause substantial damage to the internal parts of the system and compressor.

The polyolester oil used in VLZ compressors is highly hygroscopic and will rapidly absorb moisture from the air. Condensing unit must therefore not be left open to the atmosphere for a long period of time. Unit fitting plugs shall be removed just before brazing. Condensing unit should always be the last component brazed into the system.
Before eventual unbrazing of the compressor or any system component, the refrigerant charge must be removed from both the high- and low-pressure sides. Failure to do so may result in serious personal injury. Pressure gauges must be used to ensure all pressures are at atmospheric level.
For more detailed information on the appropriate materials required for brazing or soldering, please contact the product manufacturer or distributor. For specific applications not covered herein, please contact Danfoss for further information.

It is compulsory to braze with a protective atmosphere of nitrogen inside the piping. Nitrogen displaces the air and prevents the formation of copper oxides in the system.

(Copper oxide could block capillary tubes, thermal expansion valves and generate damage of compressor).

Furthermore it is recommended to insulate the suction pipe up to the compressor inlet.

(Insulation should be at least 19 mm thick and is not a part of Danfoss supply). Use only dry pipes and components in order to avoid moisture in the system.

NOTICE Maximum test pressure is 28 bar.

4.8 High pressure transmitter connection

NOTICE Do not open the receiver Rotalock valve entirely, it must be turned 1 round (360°) to the closed direction to provide system pressure to the transmitter!

1. Valve In (from receiver).
2. Valve Out (to evaporator).
3. Service port (for safety devices).
4. Service port (for transmitter or service only).

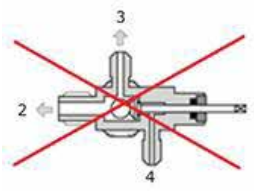


Fig A: Fully closed Condition
Port 2 and 3 is fully open
port 4 is fully closed

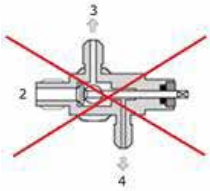


Fig B: Fully Opened Condition
Port 3 and 4 is fully open
port 2 is fully closed

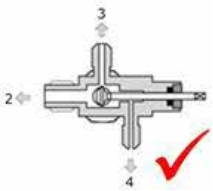


Fig C: Partially Opened Condition
Port 2, 3, 4 is fully opened.

⚠WARNING Transmitter failure: Valve shall be opened entirely to disconnect transmitter port from the others.

⚠WARNING Rotolock spindle should be rotated by 5.5 turns/rotation in anticlockwise(from valve fully closed position) to open the valve.

5.1 Piping design

Connection sizes! Unsuitable refrigerant flow rate!

NOTICE Do not assume that the liquid/ suction connection sizes on the unit are in fact the correct sizes to run your interconnecting refrigeration pipes!

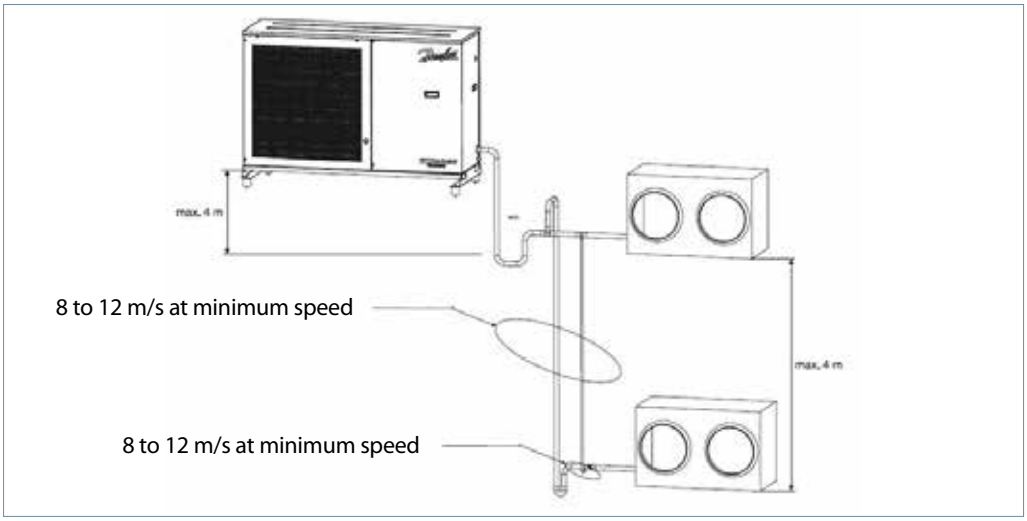
The pipes should be sized to ensure optimum performance and good oil return. The sizing must also take into account the full capacity range through which this particular unit will need to operate.

Pipe runs should be kept as short as possible, using the minimum number of directional changes. Use large radius bends and avoid trapping of oil and refrigerant. This is particularly important for the suction line.
All pipes should be adequately supported to prevent sagging which can create oil traps. The recommended pipe clamp support distance is shown in Table below:

Tube size	Distance between 2 clamp supports
12 mm (1/2")	1 m
16 mm (5/8")	1,5 m
19 mm (3/4")	1,8 m
22 mm (7/8")	2 m

The suction line should:
- secure gentle slope towards the unit (recommended slope minimum 0,5/100).
- have P traps, double risers and reduced pipe diameters where long vertical risers cannot be avoided.

The suction gas velocity must be sufficient to ensure a good oil return, within 8 to 12 m/s in vertical risers. In horizontal pipes this velocity can decrease down to 4 m/s. The use of U-trap and double suction risers is often required. These suction risers must always be fitted with a U-trap at the bottom and a P-trap at the top and never be higher than 4 m unless a second U-trap system is fitted.



If the evaporator lies above the CU, a pump-down cycle is strongly recommended. If a pump-down cycle were to be omitted, the suction line must have a loop at the evaporator outlet to prevent refrigerant from draining into the compressor during off-cycles. If the evaporator are situated below the CU, the suction riser must be trapped so as to prevent liquid refrigerant from collecting at the outlet of the evaporator while the system is idle, which would mislead the expansion valve's sensor (thermal bulb) at start-up.

Maximum safety length of pipes between CU and last evaporator is 20 m.

If pipes length is more than 20 m special adjustment of complete system is needed (oil and refrigerant charge adjustments).

Diameter of separate suction lines from evaporators to condensing unit manifold should be with appropriate size according evaporator capacity (securing recommended speed for proper oil return). Common manifold tube should be as close as possible to condensing unit.

NOTICE The installer is responsible for the installation of the unit and complete refrigeration system design according particular conditions of each application as this is not scope of current Guideline.

5.2 Evacuation

Moisture obstructs the proper functioning of both the compressor and the refrigeration system. Air and moisture reduce service life and increase condensation pressure, which causes abnormally high discharge temperatures that are then capable of degrading the lubricating properties of the oil. The risk of acid formation is also increased by air and moisture, and this condition can also lead to copper plating. All these phenomena may cause both mechanical and electrical compressor failures. The typical method for avoiding such problems is a vacuum pump-down executed with a vacuum pump, thus creating a minimum vacuum of 500 microns (0.67 mbar).

NOTICE The evacuation procedure is based upon achieving an actual system Vacuum standard and is NOT TIME DEPENDENT!

Evacuate the installation down to 0,67 mbar to ensure quality vacuum.
It is recommended to evacuate on both high and low pressure side to achieve fast and uniform vacuum in the entire refrigeration system.

When the vacuum level has been reached, the system must be isolated from the pump.
A vacuum of 0.67mbar has to be reached and maintained for 4 hours. This pressure is to be measured in the refrigeration system, and not at the vacuum pump gauge.

If pressure increases rapidly, the system is not airtight. Locate and repair leaks. Restart the vacuum procedure.
If pressure increases slowly, the system contains moisture inside. Break the vacuum with nitrogen gas and restart the vacuum process again.

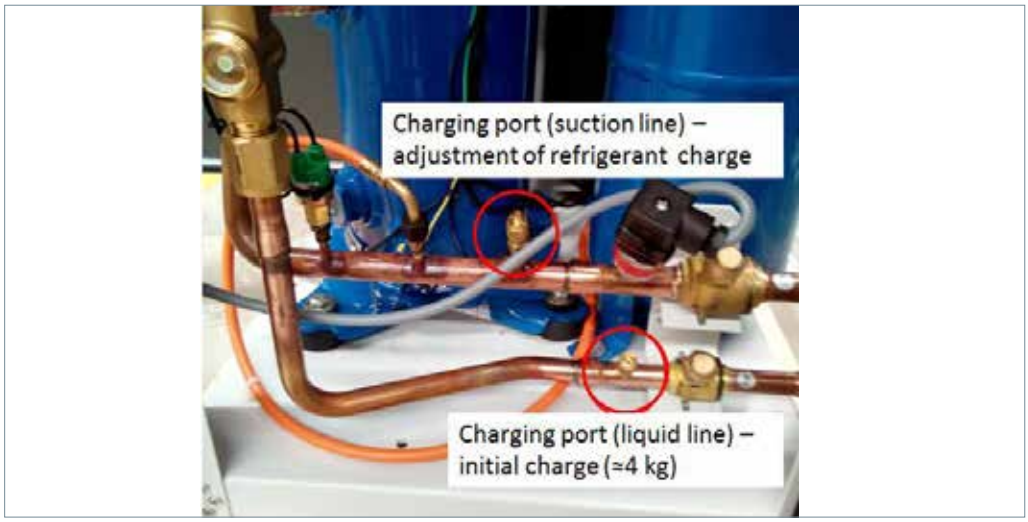
⚠CAUTION Do not use a megohmmeter nor apply power to the compressor while it is under vacuum as this may cause internal damage.

⚠CAUTION Leak detection must be carried out using a mixture of nitrogen and refrigerant or nitrogen and helium. Never use other gasses such as oxygen, dry air or acetylene as these may form an inflammable mixture. Pressurize the system on HP side first then LP side.

5.3 Refrigerant charge

For the initial charge condensing must not run and eventual service valves must be closed. Charge refrigerant as close as possible to the nominal system charge before starting the compressor. As maximum safe refrigerant charge for compressor is 3,6 kg initial charge can be considered close to 4 kg (will depend on tube sizes, lengths of each individual system). This initial charging operation must be done in liquid phase as far away as possible from the compressor.

Never start the compressor under vacuum, ensure a progressive charge of the system to 4– 5 bar.



For the initial refrigerant charge service port on liquid line ball valve can be used. This port is equipped with Schrader valve.

For the adjustment of refrigerant charge port on the suction line can be used (located between oil return port and suction ball valve port). This port is also equipped with Schrader valve.

Refrigerant charge should secure stable work at minimum and maximum heat load within the limits of condensing unit application envelope!

The remaining charge is done until the installation has reached a level of stable nominal condition during operation.

Next steps can be followed for proper charging or the system:

- keep system working under the max load conditions (all evaporators working, maximum air/liquid flow via evaporator(s)).

- slowly throttling liquid in on the low pressure side as far away as possible from the compressor suction connection by default via the port on suction line as described before.

- keep under the control evaporating pressure, condensing pressure, suction superheat.

- charge system until reaching suction superheat 6-12 K at desired evaporating temperature.

Suction superheat as well as suction, condensing pressures (temperatures) can be read from controller display.

To avoid system overcharging (which can cause higher energy consumption, high pressure alarms) maximum refrigerant charge can be calculated as follows:

Mmax = (Vrec + VliqL) * 0.9,
Where
Mmax = approximate maximum refrigerant charge, kg
Vrec = receiver volume, L, for Optyma™ Plus INVERTER 6,2 L
VliqL = internal volume of liquid line, L (specific for each system)
0.9 – correlation coefficient due to refrigerant density.

Liquid line – Dimension			Liquid line - Volume	
OD [inch]	OD [mm]	ID [mm]	VliqL [L/1m]	VliqL [L/10m]
3/8	9.5	7.9	0.05	0.5
1/2	12.7	11.1	0.10	1.0
5/8	15.9	14.1	0.16	1.6
3/4	19.1	17.3	0.23	2.3
7/8	22.2	19.9	0.31	3.1

During all of the charge procedure keep the oil heaters ON and keep an eye on the oil sight glass, so that it doesn't change color, density or appearance and it doesn't start foaming. Refrigerant charge quantity must be suitable for maximum load conditions as well as for minimum load conditions for both summer and winter operations.

It means that refrigerant charge should be enough to feed all evaporators during the peak load conditions and condenser should not be flooded by liquid refrigerant during minimum load conditions.

Receiver and liquid lines should be able to contain remaining refrigerant during low load conditions.

Only refrigerant for which the unit is designed for has to be charged, see unit data.

In case of refrigerant blend charging has to be done in liquid form in order to avoid chemical changes of the refrigerant.

NOTICE Don't judge the refrigerant charge by the liquid sight glass as 100% correct way. It may mislead you!

⚠CAUTION When Optyma™ Plus INVERTER unit has to be scraped, refrigerant has to be disposed for destruction. Local laws and rules have to be followed for disposal of refrigerant.

5.4 Oil level

Optyma™ Plus INVERTER condensing units are supplied with POE oil, the oil separator is pre-charged with 0,3l oil. In case of adding oils always use original Danfoss POE oil from new cans.

After commissioning, the oil level should be checked and topped up if necessary.

When the compressor is running under stabilized conditions, the oil level must be visible in the sight glass. The presence of foam filling in the sight glass indicates large concentration of refrigerant in the oil and / or presence of liquid returning to the compressor. The oil level can also be checked a few minutes after the compressor stops, the level must be between ¼ and ¾ of sight glass. When the compressor is off, the level in the sight glass can be influenced by the presence of refrigerant in the oil.

In installations with good oil return and line runs up to 20 m, no additional oil is required. If installation lines exceed 20 m, additional oil may be needed. Oil charge has to be adjusted based on the oil level in the compressor sight glass.

Top-up the oil while the compressor is idle. Use the schrader connector or any other accessible connector on the compressor suction line and a suitable pump.

The oil fills connection and gauge port is a 1/4" male flare connector incorporating a Schrader valve.

Oil changing is not normally necessary for package units.

5.5 Check before start

1. Compliance between unit and power supply.
2. Check that valves are opened.
Remark: Do not open receiver valve entirely to get correct pressure to the discharge pressure transmitter. Turn valve spindle one round (360°) in close direction.
3. Check that crankcase and oil separator heaters are working.
4. Check that fan can rotate freely.
5. Check for possible faults in the installation.
6. Check main switch overload protection setting.

5.6 Startup of the unit

After below steps are completed:
1) System is completely installed.
2) All electrical connections are done.
3) System is charged.

Next steps are needed to start the unit:

The controller of the condensing unit is set for R449A. If this factory setting of refrigerant as well as other factory settings of parameters fits for the requirement of your application, no controller parameter must be changed.
• For a refrigerant change go into the parameter menu (press upper button 5 seconds).
• Select parameter "r12" (software main switch) with a short press on lower button.
• Activate parameter "r12" with middle button and change the value to 0 (zero).
• Confirm the value with a short press on the middle button (the 3 LED's start flashing).
• Go to the parameter "o30" (Refrigerant).
• Change the value of parameter "o30" to 21 if R407A, 37 if R407F will be used.
• Confirm the value with a short press on the middle button.
Press short the upper (or lower) button to go to the next Parameter of the Parameter menu, e.g. Parameter r23 for suction pressure setpoint or r82 for Min Condensing Pressure. Scroll fast through the Parameters with a long press on these buttons.
• Press short the middle button to show the value of the selected Parameter.
• Press afterwards the upper (or lower) button to change the value of the selected parameter. A long press on these buttons will change the value fast
• Select parameter "r12" again.
• Change the value to 1 (one).
• Confirm the value with a short press on the middle button (the 3 LED-signs stop flashing and the condensing unit will start if required).
• After 20 seconds the display returns to the evaporation temperature in °C, the new refrigerant and all relevant parameters are changed.

It is compulsory to energize crankcase and oil separator heaters at least 1 hour before initial start-up and start-up after prolonged shutdown to remove refrigerant in liquid phase from the compressor.

Condensing unit is factory preset for quick installation and start up. Compressor drive is fully managed by condensing unit controller and therefore all parameters settings should be done only via condensing unit controller.

5.7 Check after start

After a couple of hours of stable operation following has to be checked via service parameters U :
1. Unit current consumption.
2. Rotation of fan (suction through condenser).
3. Check for leakages in refrigerant system.
4. Check superheat.
5. Check oil level.
6. Check for abnormal noises.
7. Check for abnormal vibrations.
8. Suction and discharge pressures.

	In order to provide the highest level of compressor protection, energy efficiency and adaptation to	variable conditions condensing unit is equipped with specific controller.
6.1 Advantages	• Condensing pressure control in relation to outside temperature. • Fan speed regulation. • On/off and variable speed regulation of the compressor. • Crankcase heating element control. • Day/night controller operation.	• Built-in clock function with power reserve . • Built-in Modbus data communication. • Monitoring discharge temperature td. • Oil return management control at variable speed operation.
6.2 Controller's regulation logic	The controller receives a signal for demanded cooling, and it then starts the compressor. If compressor is controlled by variable speed, the suction pressure (converted to temperature) will be controlled according to the set evaporating temperature. Condenser pressure regulation is performed following a signal from the ambient temperature	sensor and the set reference corresponding to difference between condensing and ambient temperatures. The controller will then control the fan, which allows the condensing temperature to be maintained at the desired value. The controller can also control the heating element in the crankcase so that oil is kept separate from the refrigerant.
6.3 Functions	• Control of condensing temperature. • Control of fan speed. • On/off control or speed regulation of the compressor. • Control of heating element in crankcase. • Liquid injection into economizer port.	• Raising the condenser pressure regulation reference during night operation. • Both internal and external start/stop cooling. • Safety cut-out activated via signal from automatic safety control.
6.4 Regulation reference for condensing temperature	The controller controls the condensing temperature in relation to the ambient temperature. This difference is preset in the	controller. It can also, via another parameter, get increased at night.
6.5 Fan operation	The controller will control the fan so that the condensing temperature is maintained at the desired value above the ambient temperature.	
6.6 Compressor control	The compressor is controlled by a signal at the DI1 input. The compressor will start once the input is connected. Three restrictions have been implemented to avoid frequent start/stops: - minimum ON time. - minimum OFF time. - time elapsed between two starts. These three restrictions have the highest priority during regulation, and the other functions will wait until they are complete before regulation can continue. When the compressor is 'locked'	by a restriction, this can be seen in a status notification. DI3 input is used as a safety stop for the compressor, an insufficient input signal will immediately stop the compressor. The compressor is speed-controlled with a voltage signal at the AO2 output. If the compressor has been running for a long period at low speed, the speed is increased for a short moment for the purpose of oil return.

6.7 Maximum discharge gas temperature

The temperature is recorded by sensor Td. If variable speed control is chosen for the compressor, this control will initially reduce the compressor capacity if the Td temperature approaches the set maximum value. If higher temperature is detected than the set max. temperature, the fan's speed will be set to 100%. If this does not cause the temperature to drop, and if the temperature remains high after the set delay time, the compressor will be stopped. The compressor will only be re-started once the temperature is 10 K lower than the set value. The above mentioned re-start restrictions must also be complete before the compressor can start once again. If the delay time is set to '0', the function will not stop the compressor. The Td sensor can be deactivated (o63).

6.8 High pressure monitoring

During regulation, the internal high pressure monitoring function is able to detect an over the limit condensing pressure so that the regulation can continue.
However, if the C73 setting is exceeded, the compressor will be stopped.
If, on the other hand, the signal comes from the interrupted safety circuit connected to DI3, the compressor will immediately be stopped and the fan will be set to 100%.
When the signal is once again 'OK' at the DI3 input, the regulation will resume.

6.9 Low pressure monitoring

During regulation, the internal low pressure monitoring function will cut out the compressor upon detecting a suction pressure that falls below the lower limit, but only once the minimum ON time is exceeded. An alarm will be issued. This function will be time delayed, if the compressor starts at low ambient temperature.

6.10 Pump down limit

The compressor will be stopped if a suction pressure that falls below the set value is registered, but only once the minimum ON time is exceeded.

6.11 Data communication

The controller is delivered with built-in MODBUS data communication and can be connected to an ADAP KOOL® network. If a different form of data communication is requested, a LON RS-485 module can be inserted in the controller.
The connection will then be made on terminal RS 485.

Important:
All connections to the data communication must comply with the requirements for data communication cables.

All condensing units are delivered with controllers which are factory pre-set.
See below table with factory setting of controllers integrated into condensing units and controllers supplied separately for service replacement (when controller is supplied as spare part for service replacement its factory settings are slightly different and should be adjusted according to controller unit specific settings in paragraph 6.12 and application specific requirements).

6.12 Controller settings

NOTE! In case of controller replacement beware that unit controller settings are different from default controller factory settings!

Function		Code	Min.value	Max.value	Default controller settings	Unit controller settings
Normal operation						
Set point Tc (regulation reference follows the number of degrees above the outside temperature Tamb)		---	2.0 K	20.0 K	8.0 K	
Regulation						
Select SI or US display. 0=SI (bar and °C). 1=US (Psig and °F)		r05	0/ °C	1/F	0/ °C	
Internal Main Switch. Manual and service = - 1, Stop regulation = 0, Start regulation =1		r12	-1	1	0	1
Offset during night operation. During night operation the reference is raised by this value		r13	0 K	10 K	2 K	
Set point for suction pressure Ts		r23	-25 °C	10°C	-7°C	
Readout of reference for Tc		r29	-	-	-	
Thermostat cut-in value for an external heating element (069=2 and o40=1)		r71	-30.0°C	0.0°C	-25°C	
Min. condensing temperature (lowest permitted Tc reference)		r82	0°C	40°C	30°C	
Max. condensing temperature (highest permitted Tc reference)		r83	20°C	50°C	40°C	
Max. discharge gas temperature Td		r84	50°C	140°C	125°C	125°C
Alarms						
Alarm time delay on signal on the DI2 input		A28	0 min.	240 min.	30 min.	
Alarm for insufficient cooling in condenser. Set temperature difference.		A70	3.0 K	20.0 K	10.0 K	
Delay time for A70 alarm		A71	5 min.	240 min.	30 min.	
Compressor						
Min. ON-time		c01	1 s	240 s	5 s	
Min. OFF-time		c02	3 s	240 s	120 s	
Min. time between compressor starts		c07	0 min.	30 min.	5 min.	
Pump down limit at which the compressor is stopped (setting 0.0 = function dis-activated)		C33	0.0 bar	6.0 bar	0.0 bar	2.3
Min. compressor speed		c46	30 rps	70 rps	30 rps	
Start speed for compressor and min. speed for high condensing temperatures		c47	30 rps	70 rps	50 rps	
Max. compressor speed		c48	50 rps	100 rps	100 rps	
Max. compressor speed during night operation (% value of c48)		c69	50%	100%	70%	
Definition of compressor control: 0: No compressor - Condensing unit OFF 1: Fixed speed - Input DI1 used to start / stop of fixed speed compressor 2: Variable speed - Input DI1 used for start / stop of variable speed-controlled compressor with a 0-10 V signal on AO2		c71	0	2	1	2
Time delay for high Td. The compressor will stop when time expires		c72	0 min.	20 min.	1 min.	
Max. pressure. Compressor stops if a higher pressure is recorded		c73	7.0 bar	31.0 bar	23.0 bar	25.8
Difference for max. pressure (c73)		c74	1.0 bar	10.0 bar	3.0 bar	
Min. suction pressure Ps. Compressor stops if a lower pressure is recorded		c75	-0.3 bar	6.0 bar	1.4 bar	2
Difference for min. suction pressure and pump down		c76	0.1 bar	5.0 bar	0.7 bar	
Amplification factor Kp for compressors PI regulation		c82	3.0	30.0	20.0	
Integration time Tn for compressors PI regulation		c83	30 s	360 s	60 s	
Liquid Injection Offset		c88	0.1 K	20.0 K	5.0 K	
Liquid Injection hysteresis		c89	3.0 K	30.0 K	15.0 K	
Compressor stop delay after Liquid injection		c90	0 s	10 s	3 s	
Desired compressor speed if the signal from the pressure transmitter Ps fails		c93	25 Hz	70 Hz	60 Hz	
Min On time during Low Ambient LP		c94	0 s	120 s	0 s	
Measured Tc for which the Comp min speed is raised to StartSpeed		c95	10.0°C	70.0°C	50.0°C	
Control parameters						
Amplification factor Kp for PI regulation		n04	1.0	20.0	7.0	
Integration time Tn for PI regulation		n05	20	120	40	
Kp max for PI regulation when the measurement is far from reference		n95	5.0	50.0	20.0	

Function		Code	Min.value	Max.value	Default controller settings	Unit controller settings
Fan						
Readout of fan speed in %		F07	-	-	-	
Permitted change in fan speed (to a lower value) % per second		F14	1.0%	5.0%	5.0%	
Jog speed (speed as a % when the fan is started)		F15	10%	100%	40%	
Jog speed at low temperature		F16	0%	40%	10%	
Definition of fan control: 0=Off; 1=Internal control. 2=External speed control		F17	0	2	1	
Minimum fan speed. Decreased need will stop the fan		F18	0%	40%	10%	
Maximum fan speed		F19	40%	100%	100%	
Manual control of the fan's speed. (Only when r12 is set to -1)		F20	0%	100%	0%	
Phase compensation (should only be changed by specially trained personnel.)		F21	0	50	20	
Real time clock						
Time at which they switch to day operation		t17	0 hrs	23 hrs	0	
Time at which they switch to night operation		t18	0 hrs	23 hrs	0	
Clock - Setting of hours		t07	0 hrs	23 hrs	0	
Clock - Setting of minute		t08	0 min.	59 min.	0	
Clock - Setting of date		t45	1 day	31 day	1	
Clock - Setting of month		t46	1 mon.	12 mon.	1	
Clock - Setting of year		t47	0 year	99 year	0	
Miscellaneous						
Network address		o03	0	240	0	
On/Off switch (Service Pin message) IMPORTANT! o61 must be set prior to o04 (used at LON 485 only)		o04	0/Off	1/On	0/Off	
Access code (access to all settings)		o05	0	100	0	
Readout of controllers software version		o08				
Select signal for display view. 1=Suction pressure in degrees, Ts 2=Condensing pressure in degrees, Ts		o17	1	2	1	
Pressure transmitter working range Ps - min. value		o20	-1 bar	5 bar	-1	
Pressure transmitter working range Ps- max. value		o21	6 bar	200 bar	12	
Refrigerant setting: 13=User defined. 19=R404A. 20=R407C 21=R407A. 37=R407F. 40=R448A. 41=R449A	*	o30	0	42	0	41
Input signal on DI2. Function: 0=not used, 1=External safety function. Regulate when closed, 2=external main switch, 3=Night operation when closed, 4=alarm function when closed, 5=alarm function when open, 6=on/off Status for monitoring 7=Alarm from speed regulation		o37	0	7	0	
			0	3	1	
Pressure transmitter working range Pc– min. value		o47	-1 bar	5 bar	0 bar	
Pressure transmitter working range Pc – max. value		o48	6 bar	200 bar	32 bar	
Setting of condensing unit type (is factory set when the controller is mounted and cannot be subsequently changed)	*	o61	0	69	0	55 or 56 or 57*
The sensor input S3 is to be used to measure the discharge gas temperature (1=yes)		o63	0	1	1	
Replace the controllers factory settings with the present settings		o67	Off (0)	On (1)	Off (0)	
Defines the use of the Taux sensor: 0=not used; 1=measuring of oil temperature; 2=other optional use		o69	0	3	0	
Period time for heating element in crankcase (ON + OFF period)		P45	30 s	255 s	240 s	
Difference for heating elements 100% ON point		P46	-20 K	-5 K	-10 K	
Difference for heating elements 100% OFF point		P47	5 K	20 K	10 K	
Read-out of operating time for condenser unit. (Value must be multiplied by 1,000). The value can be adjusted		P48	-	-	0 h	
Read-out of compressor operating time. (Value must be multiplied by 1,000). The value can be adjusted		P49	-	-	0 h	

Function		Code	Min.value	Max.value	Default controller settings	Unit controller settings
Read-out of operating time of heating element in crankcase. (Value must be multiplied by 1,000). The value can be adjusted		P50	-	-	0 h	
Read-out of number of HP alarms. The value can be adjusted		P51	-	-	0	
Read-out of number of LP alarms. The value can be adjusted		P52	-	-	0	
Read-out of number of Td alarms. The value can be adjusted		P53	-	-	0	
Oil return management. Compressor speed for the counter starting point		P77	25 rps	70 rps	40 rps	
Oil return management. Limit value for counter		P78	5 min.	720 min.	20 min.	
Oil return management. Boost-speed		P79	40 Rps	100 Rps	50 Rps	
Oil return management. Boost-time		P80	10 s	600 s	60 s	
Service						
Readout pressure on Pc		u01	bar			
Readout temperature Taux		u03	°C			
Status on DI1 input. 1=on=closed		u10				
Status on night operation (on or off) 1=on=night operation		u13				
Readout superheat		u21	K			
Readout temperature at S6 sensor		u36	°C			
Status on DI2 input. 1=on=closed		u37				
Readout the compressor capacity in %		u52	%			
Status on relay to compressor. 1=on=closed	**	u58				
Status on relay to fan. 1=on=closed	**	u59				
Status on relay to alarm. 1=on=closed	**	u62				
Status on relay "Aux". 1=on=closed	**	u63				
Status on relay to heating element in crank case. 1=on=closed	**	u71				
Status on high voltage input DI3. 1=on=230 V		u87				
Readout condensing pressure in temperature		U22	°C			
Readout pressure Ps		U23	bar			
Readout suction pressure in temperature		U24	°C			
Readout ambient temperature Tamb		U25	°C			
Readout discharge temperature Td		U26	°C			
Readout suction gas temperature Ts		U27	°C			
Readout the voltage on the output AO1		U44	V			
Readout the voltage on the output AO2		U56	V			

NOTICE Following controller parameters are modified from factory setting by condensing unit production.
All Other parameters in «unit controller setting» are same as "Default controller setting"
- r12: 1 (main switch = ON).
- c71: 2 (compressor type = variable speed compressor).
- c73: 25.8 (max. condensing pressure = 25.8bar(g)).
- c75: 2.0 (min. suction pressure = 2.0 bar(g)).
- o30: 41 (refrigerant: 19=R404A, 21=R407A, 37=R407F, 40=R448A, 41=R449A).
- o61: 55, 56 or 57 (compressor size: 55=VLZ028, 56=VLZ035, 57=VLZ044).

Following parameter should be modified by installer if controller is used as pump down device.
- c33: 2.3 (pump down limit, should be min. 0.3bar higher than c75 to avoid unwanted alarms).

Modification of controller parameters shall be done by qualified persons only.

In case of any problems with controller it is possible to connect unit bypassing it: see details in chapter 4.3.1 of this guideline.

7.1 General recommendations

⚠WARNING Even if main switch of condensing unit is in position OFF power still available at income terminals of main switch.

In case of any service related to electrical components inside condensing unit it is recommended to disconnect condensing unit from the power by switch located before condensing unit.

It is recommend to check the unit for leakages minimum once a year and in accordance with national requirements.

Furthermore following should be checked:
1. Electrical and refrigerant connections for damages, corrosion etc.
2. The mounting devices (bolts, nuts, etc) of the unit.
3. Vibrations: if it is on the same level as after installation or any signs of abnormal vibration.
4. Operation conditions.
5. Airflow across the condenser.
6. Oil level.
7. Tightness of electrical connections.
8. Operation of the crankcase and oil separator heaters.

Compressor must always be warmer than any other component in the circuit, even if the circuit is switched off for seasonal stop.

7.2 Condenser

Condenser should at least once a year be checked for clogging and be cleaned if deemed necessary. Access to internal side of condenser takes place through fan door. Remember to switch off the unit at main switch before opening the fan door.

In comparison to fin and tube heat exchangers, microchannel coils tend to accumulate more of the dirt on the surface and of the less dirt inside which can make them easier to clean.
Step 1: Remove surface debris
Remove surface dirt, leaves, fibres, etc. with a vacuum cleaner (preferably with a brush or other soft attachment rather than a metal tube), compressed air blown from the inside out, and/or a soft bristle (not wire!) brush. Do not impact or scrape the coil with the vacuum tube, air nozzle, etc.

Step 2: Rinse
Do not use any chemicals (including those advertised as coil cleaners) to wash microchannel heat exchangers. They can cause corrosion. Rinse only with water.
Hose the MCHE off gently, preferably from the inside out and top to bottom, running the water through every fin passage until it comes out clean. Microchannels fins are stronger than traditional tube & fin coil fins but still need to be handled with care. Do not bang the hose into the coil.
Step 3: Optional blow dry
Microchannel heat exchangers, because of their fin geometry, tend to retain water more than traditional fin & tube coils. It may be beneficial to blow or vacuum out the rinse water from your unit to speed drying and prevent pooling.

7.3 Service and safety advice

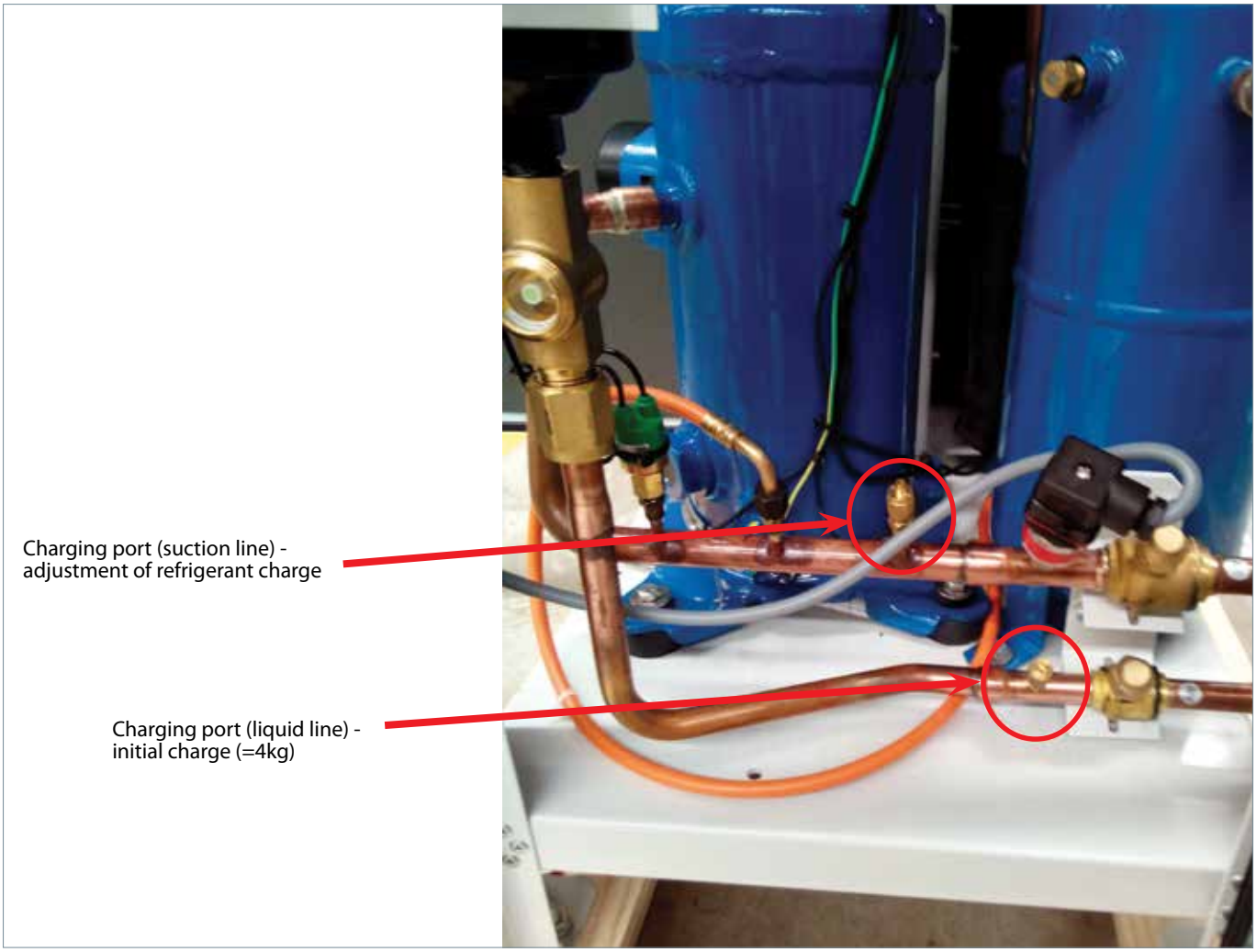
If the refrigerant system has been opened the system has to be flushed with dry air or nitrogen to remove moisture and a new filter dryer has to be installed. If evacuation of refrigerant has to be done, it shall be done in such a way that no refrigerant can escape to the environment. Beware of hot and cold components in the refrigeration system. The components in the refrigeration system are pressurized; as a consequence special attention has to be paid during operation on these components.

⚠CAUTION Do not operate condensing unit without refrigerant charge or without being connected to the system.

Safety goggles, gloves, protective clothing, safety boots, hard hats or another safety equipment should be worn when necessary.
Never install a system in the field and leave it unattended when it has no charge, a holding charge, or with the service valves closed without electrically locking out the system.
Do not touch the compressor until it has cooled down. Ensure that other materials in the area of the compressor do not get in touch with it.

⚠WARNING Before Starting Repair Work
- Disconnect from mains
- Wait as stated before for discharge of the DC-link. (Refer section 4.5.1 Warning when touching unit when OFF)
- Remove compressor cable.

7.4 Access ports



8.1 Unpacking

When unit reaches your warehouse, inspect the packing for any visible damage and make sure it is in good condition. In the event you detect any damage, please contact your forwarder immediately: send a registered letter to the shipping company claiming the suffered damage, a copy of which should be sent responsible contact in Danfoss.

8.2 Transportation and handling

Move the condensing unit only with appropriate mechanical or handling equipment according to weight. It is recommended not to open the packaging before the unit is at the final place for installation. Handle the unit with care. The packaging allows for the use of a forklift or pallet jack. Use appropriate and safe lifting equipment. Store and transport the unit in an upright position. Store the unit between -35°C and 50°C. Don't expose the packaging to rain or corrosive atmosphere. After unpacking, check that the unit is complete and undamaged.

8.3 Disposal Instruction

Equipment containing electrical components must not be disposed of together with domestic waste. It must be separately collected with electrical and electronic waste according to local and currently valid legislation.

9.1 Warranty conditions

Always transmit the model number and serial number with any claim filed regarding this product. The product warranty may be void in following cases:

- Absence of nameplate.
- External modifications, in particular drilling, welding, broken feet and shock marks.
- Compressor opened or returned unsealed.
- Rust, water or leak detection dye inside the compressor.
- Use of a refrigerant or lubricant not approved by Danfoss.
- Any deviation from recommended instructions pertaining to installation, application or maintenance.
- Use in mobile applications.
- Use in explosive atmospheric environment.
- No model number or serial number transmitted with the warranty claim.

NOTICE Charging of refrigerant or oil not specified by Danfoss as suitable for the unit will lead to annulment of warranty from Danfoss A/S side (if the refrigerant or oil are not approved in writing by Danfoss). Annulment of warranty from Danfoss side will also take place if the unit is altered without written approval from Danfoss.

Warranty is governed by the Danfoss general terms of warranty.

9.2 Unauthorized changes

Warranty can also be rejected in case of unauthorized modifications of the condensing unit:

- Modification of electrical box.
- Modification of internal piping system of the condensing unit.
- Direct changes of drive parameter setting (all parameter changes should be limited to controller setting changes. No changes allowed on the drive itself).
- Replacement of drive, compressor, fan or other components on the condensing unit by similar components which are not Danfoss original components or approved by Danfoss.

Identification				
Country				
Installation reference (shop name)				
City of installation				
Installer Company				
Unit Code/Type				
Serial N° of unit				
Installation Date				
Commission Date				
Installation				
Refrigerant				
Number of evaporators connected to the variable speed condensing unit				
Expected maximum Ambient temperature °C				
Expected minimum Ambient temperature °C				
Evaporators				
Evaporator N°	1	2	3	4
Type of application (cold room, cabinet, process cooling, etc.)				
Distance to the unit [m]				
Vertical position of the unit (+ if above or - if below)				
Evaporator Cooling capacity [kW]				
Evaporating pressure [bar] / temperature [°C]				
Superheat at evaporator outlet [K]				
Type of expansion valve used : Thermostatic (TEV) - electronic (EEX)				
Compressor				
Suction gas temperature [°C] or pressure [bar] at compressor inlet				
Frequency observed at stabilised condition				
Oil level in oilsightglass after start-up (1/4 - 1/2 - 3/4)				
Oil topup [L]				
Refrigerant charge [kg]				
Electrics & controls				
Has the installation a stable power supply				
Voltage (between L1/L2/L3)	U1:	U2:	U3:	
What's the type of grid (IT, TT, TN)				
If system-manager used (AK-SM, AK-SC….), type				

Kind request to provide after start-up completed copy of this page to your wholesaler of purchase, as part of warranty modalities.

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Danfoss Commercial Compressors

is a worldwide manufacturer of compressors and condensing units for refrigeration and HVAC applications. With a wide range of high quality and innovative products we help your company to find the best possible energy efficient solution that respects the environment and reduces total life cycle costs.

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

Danfoss Turbocor Compressors

Danfoss Inverter Scrolls

Danfoss Scrolls

Danfoss Optyma Condensing Units

Danfoss Maneurop Reciprocating Compressors

Danfoss Light Commercial Refrigeration Compressors

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

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