ENGINEERING
TOMORROW

Application Guide

Maneurop®
Reciprocating compressors
NTZ

50 – 60 Hz

www.danfoss.com

Contents

Safety and warnings

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

This icon indicates instructions to avoid safety risk.

This icon indicates instructions to avoid reliability risk.

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

Introduction

Product description

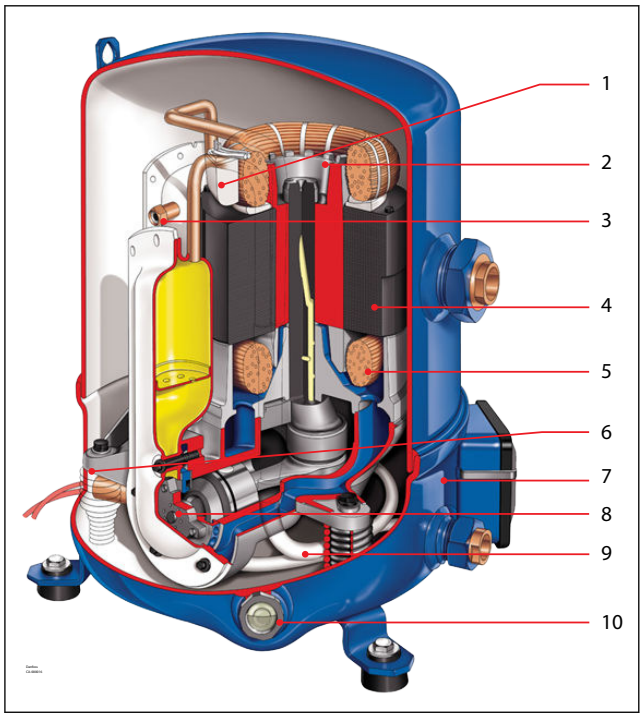
The Maneurop® NTZ series from DanfossCommercial Compressors is a range of hermetic reciprocating compressors for low evaporating temperature applications. These compressors replace the former LTZ range.

The NTZ series is engineered as a true low temperature compressor, optimised with R404A at -35°C with an extended evaporating temperature range from -45°C up to -10°C. The compressors can be operated at a return gas temperature (suction gas temperature) of 20°C even at low evaporating temperatures.

A liquid injection system is not required. All components are of high quality and precision to assure a long product life.

NTZ compressors have a large internal freevolume that helps to reduce the risk of liquid hammering. The electrical motor is fully suction gas cooled which means that no additional body cooling is required and it allows the compressor to be insulated with an acoustic hood when the installation requirements call for extra low sound characteristics.

Cut Away NTZ

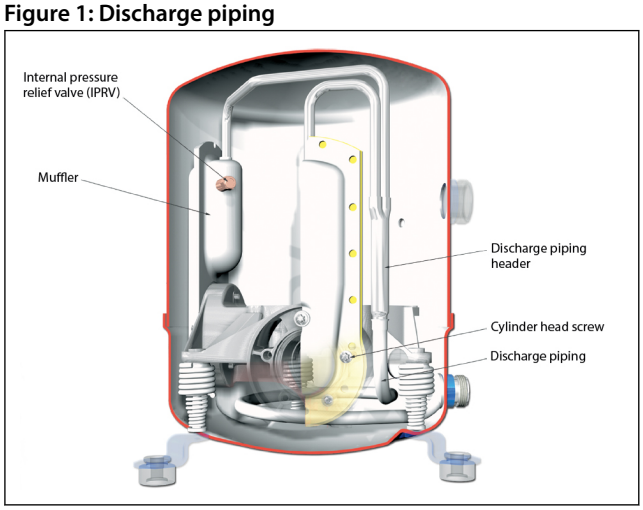


1	Internal motor protector
2	High level suction inlet
3	Internal pressure relief valve
4	100% gas cooled motor
5	Epoxy coated motor winding
6	PTC crankcase heater
7	Larger shell volume
8	Impact resistant valve
9	Discharge line sump heater
10	Oil sight glass

Features and benefits

Reliability due to shell size and gas flow

Figure 1: Discharge piping

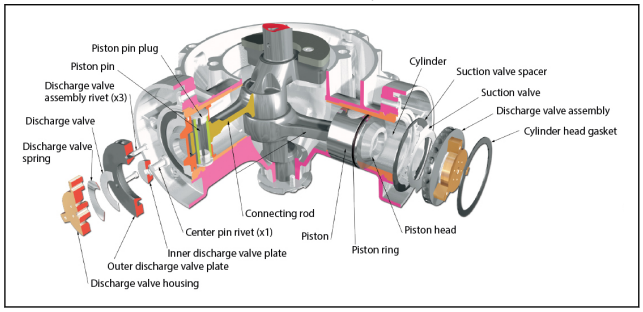


The NTZ compressors feature a large internal free volume that protects against the risk of liquid hammering when liquid refrigerant enters the compressor. These compressors are fully gas-cooled, meaning that all suction gas passes through the electrical motor, ensuring complete motor cooling in all applications. This design eliminates the need for additional compressor cooling and allows the compressors to be insulated with acoustic jackets to achieve lower sound levels without the risk of overheating.

Compressed gas is directed straight to the gas muffler for pulsation and noise reduction, and then through a tube to the discharge port. Before exiting the compressor through the discharge pipe, the gas heats the oil accumulated in the bottom shell.

The unique circular valve design

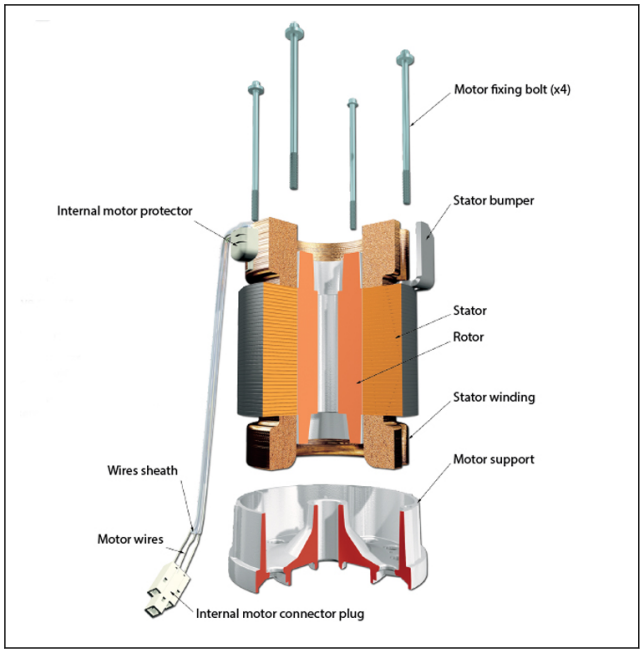
Figure 2: Compression sets assembly



The unique circular valve design benefits the compressor by improving volumetric efficiency through better gas management, reducing internal suction gas pressure losses, limiting heat transfer, reducing top cylinder dead volume, and reducing flow losses in the circular valve system.

Electrical Motor and Internal Overload Protection

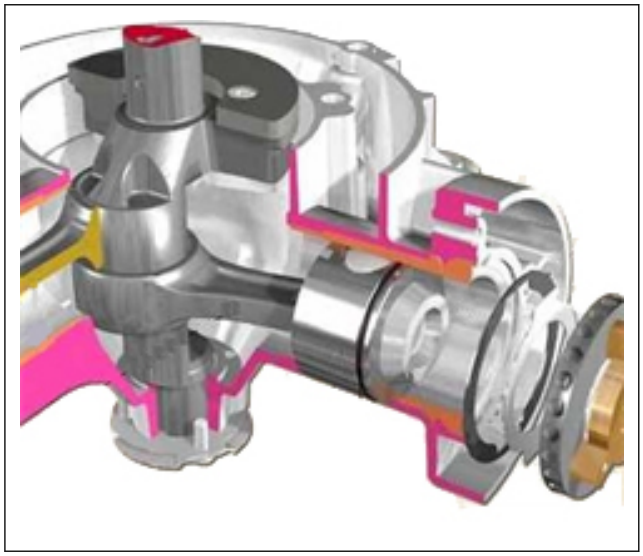
Figure 3: Motor



The NTZ compressors are available in seven different motor voltage ranges and support both single-phase and three-phase power supplies at 50 and 60 Hz. The motors are designed to cover all application areas, providing high torque with high efficiency. An internal motor protector secures the electrical motor against overheating and overloading conditions.

Lighter than others

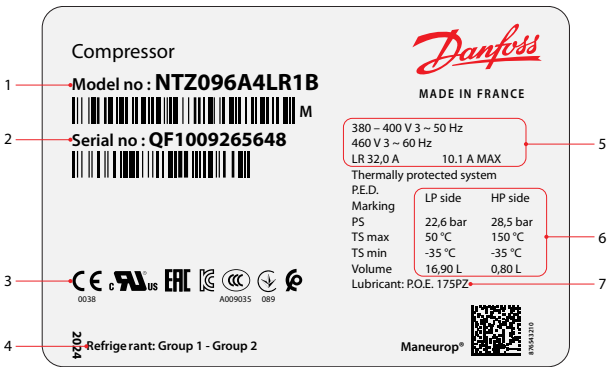
Figure 4: Bearing



The use of aluminum parts (motor support, crankcase, pistons, and connecting rods) offers benefits such as light weight, good heat dissipation, quick starts, and lower stresses on the compressor.

Product identification

Name Plate



1	Model number
2	Serial number
3	Approvals
4	Refrigerant
5	Supply voltage, Locked Rotor Amps (LRA), Maximun Continous Current (MCC)
6	Housing service pressure
7	Factory charged lubricant

Nomenclature

NT Z 048 A 4 L R1 B

NT: New low temperature reciprocating compressors

Z: Polyolester lubricant

Displacement in cm^3 / rev.

UL index indicator

Motor voltage code
1: 208 – 230 V/1~/60 Hz
3: 200 – 230 V/3~/60 Hz
4: 380 – 400 V/3~/50 Hz & 460 V/3~/60 Hz
5: 220 – 240 V/1~/50 Hz
9: 380 V/3~/60 Hz

Motor protection
(**L**: Internal Motor Protection)

Equipment version
(**R1**: Rotolock connections, oil equalisation connection and sight glass)

Evolution index,
B: R404A/R507A/R452A/R454C/R455A Oil Charged 175PZ
A: Phased out

Compressors serial number

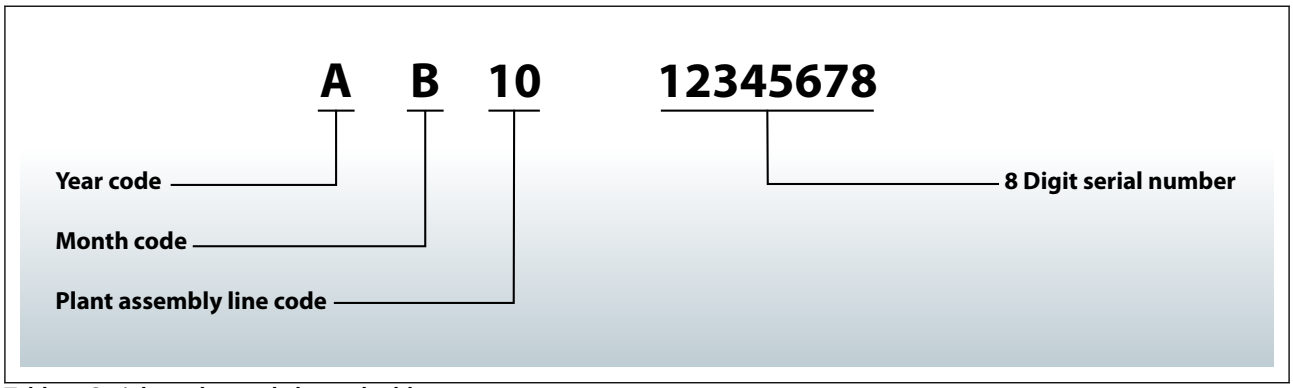


Table 1: Serial number code legend table

Year code		Month code		Plant assembly line code	
Year	Code	Month	Code	Plant	Code
1990, 2010	A	January	A	Trévoux, France	10
1991, 2011	B	February	B		
1992, 2012	C	March	C		
1993, 2013	D	April	D		
1994, 2014	E	May	E		
1995, 2015	F	June	F		
1996, 2016	G	July	G		
1997, 2017	H	August	H		
1998, 2018	J	September	J		
1999, 2019	K	October	K		
2000, 2020	L	November	L		
2001, 2021	M	December	M		
2002, 2022	N				
2003, 2023	P				
2004, 2024	Q				
2005, 2025	R				
2006, 2026	S				
2007, 2027	T				
2008, 2028	U				
2009, 2029	V				

Certificates, declarations and approvals

Approval and certificates

Maneurop® NTZ compressors comply with the following approvals and certificates. Other certificates/approvals please contact Danfoss.

Approval and certificates	Certification logo	Models
CE (European Directive)	CE	All models
UL (Underwriters Laboratories)	c UL us	All 60 Hz models (Except NTZ108/136/215/271 code 9)
CCC (China Compulsory Product Certification)	CCC	Models with motor voltage code 4 and 5. NTZ271-4 is out of CCC scope
EAC Eurasian conformity mark	EAC	All models voltage code 4 and 5

Pressure equipment directive 2014/68/EU

Products	NTZ 048 to 068	NTZ 048 to 068[2]	NTZ 096 to 271	NTZ096 to 136[3]
Refrigerant fluids [1]	Group 2	Group 1	Group 2	Group 1
PED Category	I	II	II	III
Evaluation module	D1	D1	H	H
Maximum/Minimum temperature - Ts	50 °C > Ts > -35 °C	50 °C > Ts > -35 °C	50 °C > Ts > -35 °C	50 °C > Ts > -35 °C
Maximum allowable pressure - PS	22.6 bar(g)	22.6 bar(g)	22.6 bar(g)	22.6 bar(g)

[1] Accordingto the PED classification Group1 contains hazardous fluids e.g. flammable, while Group 2 all other fluids
[2] NTZ048 to 068 - only motor code 1, 3, 4, 5
[3] NTZ096 to 136 - only motor code 4

Low voltage directive 2014/35/EU

Products	NTZ 048 to 271
Manufacturer's declaration	Contact Danfoss

Machines directive 2006/42/EC

Products	NTZ 048 to 271
Manufacturer's declaration	Contact Danfoss

Internal free volume

Products	Volume (liter)	
	Low side	High side
1 cylinder	7.5	0.4
2 cylinder	16.9	0.8
4 cylinder	33.7	1.5

Refrigerants

General information

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

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

Only Danfoss lubricant are allowed for Maneurop® NTZ compressors.

Additional points could influence the final choice:

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

The table below gives an overview of the different refrigerant - compressor combinations for Maneurop® NTZ compressors.

Model	Refrigerant	Fluid Group	GWP[1]	Temp. glide[2] [K]	Lubricant
NTZ	R404A	2	3922	0.7	175PZ POE charged
	R507A	2	3985	0	
	R452A	2	2141	3 - 4	
	R454C[3]	1	146	4.2 - 4.7	
	R455A[3]	1	145	10 - 12.8	

[1] Global Warning Potential
[2] Difference between saturated vapor temperature and saturated liquid temperature at constant pressure
[3] Only NTZ048 and 068 voltage motor code 1, 3, 4 and NTZ096 to NTZ0136 code 4

R404A

Refrigerant R404A is an HFC with zero ODP and a GWP of 3922. It is particularly suitable for low evaporating temperature applications but can also be used for medium evaporating temperature applications. R404A is a mixture with a very small temperature glide and must be charged in the liquid phase. For most other aspects, this small glide can be neglected.

R507A

Refrigerant R507A is an HFC with thermodynamic properties very similar to R404A but without temperature glide.

R452A

R452A is an HFO/HFC blend with thermodynamic properties similar to R404A or R22. It is a zeotropic refrigerant with a temperature glide of about 4 K and a GWP of 2141.

R454C/R455A

R454C and R455A are an HFO blends with GWP below the 150 limit. These are zeotropic refrigerants with a temperature glide of about 6 to 12 K and must be charged in the liquid phase. These refrigerants are classified as A2L with low flammability properties. Please refer to European regulations and directives regarding the use of A2L safety group refrigerants (EN378, EN60335). Outside Europe, refer to local regulations.

All models approved for use with A2L refrigerants (belonging to PED classification Group 1) are marked with a flammable logo.

Zeotropic and azeotropic refrigerant mixtures

Refrigerant mixtures are classified as either zeotropic or azeotropic.

- An **azeotropic mixture** (e.g., R507A) behaves like a pure refrigerant. During a phase transition, such as evaporation or condensation, the composition of the vapor and liquid phases remains the same.
- In a **zeotropic mixture** (e.g., R454C), the composition of the vapor and liquid phases changes during a phase transition. When this effect is very small, the mixture is called a **near-azeotropic mixture** (e.g., R404A).

This change in composition in zeotropic mixtures leads to two important phenomena: compositional shift and temperature glide.

Temperature glide

Temperature glide is a key characteristic of zeotropic mixtures. During evaporation and condensation at a constant pressure, the refrigerant's temperature changes.

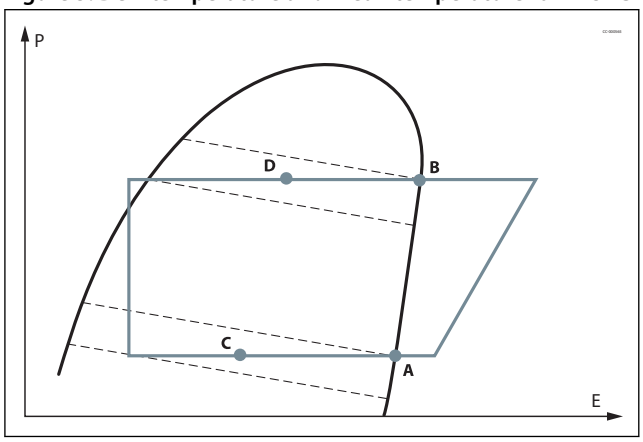
- In the **condenser**, the temperature will decrease as the refrigerant changes from vapor to liquid.
- In the **evaporator**, the temperature will rise as the refrigerant changes from liquid to vapor.

Because of this glide, it is crucial to specify which temperature is being referenced:

- **Dew Point (A, B):** The temperature at which the last of the vapor condenses (on the saturated vapor line).
- **Bubble Point:** The temperature at which the first bubble of vapor forms (on the saturated liquid line).
- **Mean Point (C, D):** The average of the dew point and bubble point temperatures, often used to represent the average temperature during the process.

As per ASERCOM recommendations, Danfoss Commercial Compressors uses **dew point temperatures** for its selection tables and application envelopes. To obtain exact capacity data using mean point temperatures, you must first convert them to dew point temperatures using the data tables provided by the refrigerant manufacturer. For an R454C cycle, mean point temperatures are typically about 2°C lower than dew point temperatures.

Figure 5: Dew temperature and Mean temperature for R454C



P	Pressure (log)
E	Enthalpy

Danfoss section software - Coolselector®2 allows selection at Mean-Temperatures or Dew-Temperatures.

Compositional changes and handling

In system components where both liquid and vapor are present (like the evaporator, condenser, or liquid receiver), the liquid and vapor phases of a zeotropic refrigerant will have different compositions. This requires special attention during system servicing and design.

- **Charging:** Zeotropic and near-azeotropic refrigerants must **always be charged in their liquid state** to ensure the correct composition enters the system.
- **System Design:** Flooded evaporators should not be used in systems with zeotropic or near-azeotropic refrigerants.

Liquid migration to the compressor

To prevent liquid refrigerant from migrating to the compressor, particularly when using refrigerants with a significant temperature glide such as R454C or R455A, several measures must be implemented. First, maintain a minimum superheat setting of 8-10 K. Second, it is recommended to install a solenoid valve on the liquid line and perform a pump-down cycle. Finally, utilize a crankcase heater to prevent the refrigerant from dissolving into the lubricant.

R These actions are critical for ensuring system reliability and preventing potential compressor damage.

Maximum Discharge Gas Temperature

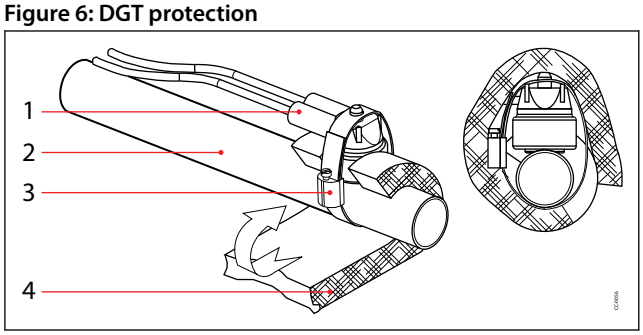
The discharge gas temperature is primarily determined by the evaporating temperature, condensing temperature, and suction gas superheat. To ensure accurate monitoring, an isolated thermocouple or thermostat should be attached to the discharge line, 15 cm (6 inches) from the compressor shell. While the compressor is operating within its approved envelope, the discharge gas temperature must not exceed 135°C (275°F).

Discharge Gas Temperature (DGT) Protection

R Discharge Gas Temperature (DGT) protection is mandatory if the existing high and low-pressure switch settings do not adequately protect the compressor from operating outside its specific application envelope.

The compressor must be prevented from cycling on the discharge gas thermostat, as continuous operation beyond the approved range will result in severe compressor damage. For this purpose, a DGT accessory is available from Danfoss; please refer to the “Spare parts & accessories” section for details.

Figure 6: DGT protection



1	Thermostat
2	Discharge line
3	Bracket
4	Insulation

Technical specifications

NTZ technical data

Compressor model	Swept volume cm³/rev	Displacement		Nominal ratings[1]				Number of cylinders	Oil charge litre	Net weight (kg)
		50 Hz	60Hz	50 Hz		60Hz				
		2900 rpm m³/hr	3500 rpm m³/hr	Cooling capacity (W)	COP (W/W)	Cooling capacity (W)	COP (W/W)			
NTZ048	48	8.4	10.1	995	1.15	1190	1.13	1	0.95	21
NTZ068	68	11.8	14.3	1749	1.15	2065	1.15	1	0.95	23
NTZ096	96	16.7	20.2	2002	1.15	2395	1.16	2	1.8	35
NTZ108	108	18.7	22.6	2465	1.16	2788	1.1	2	1.8	35
NTZ136	136	23.6	28.5	3225	1.11	3739	1.12	2	1.8	35
NTZ215	215	37.5	45.2	4948	1.19	5886	1.19	4	3.9	62
NTZ271	271	47.3	57	6955	1.24	8058	1.21	4	3.9	64

[1] Motor code 4 operating conditions: R404A, Evap. temp.: -35°C, Cond. temp.: 40°C, RGT: 20°C, SC: 0K

For full NTZ data details and capacity tables, Danfoss section software - Coolselector®2

Performances data

ARI capacity and power input data are +/- 5%.
Asercom: Association of European Refrigeration Compressor and Controls Manufacturers
ARI: Air Conditioning and Refrigeration Institute

To	Evaporating temperature at dew point (saturated suction temperature).
Tc	Condensing temperature at dew point (saturated discharge temperature).
SC	Subcooling
SH	Superheat

Nominal performance data for R404A

Table 2: Nominal performance data for R404A - 50Hz

R404A	Refrigeration							
Compressor model	50 Hz, EN12900 ratings				50 Hz, EN12900 ratings			
	To = -35°C, Tc = 40°C, SC = 0K, SH = 10K				To = -35°C, Tc = 40°C, SC = 0K, RGT = 20°C			
	Cooling capacity	Power input	Currentinput	COP	Cooling capacity	Power input	Currentinput	COP
	W	kW	A	W/W	W	kW	A	W/W
NTZ048-4	860	0.87	2.08	0.99	990	0.87	2.08	1.15
NTZ068-4	1510	1.52	3.42	1	1750	1.52	3.42	1.15
NTZ096-4	1730	1.73	3.29	1	2000	1.73	3.29	1.15
NTZ108-4	2130	2.08	4.53	1.02	2470	2.08	4.53	1.19
NTZ136-4	2790	2.9	6.1	0.96	3230	2.9	6.1	1.11
NTZ215-4	4280	4.15	7.52	1.03	4950	4.15	7.52	1.19
NTZ271-4	6010	5.62	9.65	1.07	6960	5.62	9.65	1.24

Table 3: Nominal performance data for R404A - 60Hz

R404A	Refrigeration							
Compressor model	60 Hz, EN12900 ratings				60 Hz, EN12900 ratings			
	To = -35°C, Tc = 40°C, SC = 0K, SH = 10K				To = -35°C, Tc = 40°C, SC = 0K, RGT = 20°C			
	Cooling capacity	Power input	Currentinput	COP	Cooling capacity	Power input	Currentinput	COP
	W	kW	A	W/W	W	kW	A	W/W
NTZ048-4	1030	1.06	1.99	0.97	1190	1.06	1.99	1.13
NTZ068-4	1790	1.79	3.42	1	2070	1.79	3.42	1.15
NTZ096-4	2070	2.06	3.3	1	2390	2.06	3.3	1.16
NTZ108-4	2410	2.53	4.5	0.95	2790	2.53	4.5	1.1
NTZ136-4	3230	3.35	5.67	0.96	3740	3.35	5.67	1.12
NTZ215-4	5050	4.9	7.52	1.03	5840	4.9	7.52	1.19
NTZ271-4	7090	6.64	9.65	1.07	8210	6.64	9.65	1.24

NOTE:
R404A data is also valid for refrigerant R507A

Nominal performance data for R452A

Table 4: Nominal performance data for R452A - 50Hz

R452A	Refrigeration							
Compressor model	50 Hz, EN12900 ratings				50 Hz, EN12900 ratings			
	To = -35°C, Tc = 40°C, SC = 0K, SH = 10K				To = -35°C, Tc = 40°C, SC = 0K, RGT = 20°C			
	Cooling capacity	Power input	Currentinput	COP	Cooling capacity	Power input	Currentinput	COP
	W	kW	A	W/W	W	kW	A	W/W
NTZ048-4	850	0.79	1.85	1.08	960	0.79	1.85	1.22
NTZ068-4	1490	1.28	3.31	1.16	1680	1.28	3.31	1.31
NTZ096-4	1820	1.65	3.25	1.1	2060	1.65	3.25	1.25
NTZ108-4	2090	1.98	4.32	1.06	2370	1.98	4.32	1.2

R452A	Refrigeration							
Compressor model	50 Hz, EN12900 ratings				50 Hz, EN12900 ratings			
	To = -35°C, Tc = 40°C, SC = 0K, SH = 10K				To = -35°C, Tc = 40°C, SC = 0K, RGT = 20°C			
	Cooling capacity	Power input	Currentinput	COP	Cooling capacity	Power input	Currentinput	COP
	W	kW	A	W/W	W	kW	A	W/W
NTZ136-4	2950	2.78	6.11	1.06	3350	2.78	6.11	1.21
NTZ215-4	4210	3.98	7.3	1.06	4780	3.98	7.3	1.2
NTZ271-4	5580	5	8.94	1.12	6330	5	8.94	1.27

Table 5: Nominal performance data for R452A - 60Hz

R452A	Refrigeration							
Compressor model	60 Hz, EN12900 ratings				60 Hz, EN12900 ratings			
	To = -35°C, Tc = 40°C, SC = 0K, SH = 10K				To = -35°C, Tc = 40°C, SC = 0K, RGT = 20°C			
	Cooling capacity	Power input	Currentinput	COP	Cooling capacity	Power input	Currentinput	COP
	W	kW	A	W/W	W	kW	A	W/W
NTZ048-4	1100	1.04	1.96	1.06	1250	1.04	1.96	1.2
NTZ068-4	1700	1.51	3.16	1.13	1930	1.51	3.16	1.28
NTZ096-4	2230	2.05	3.43	1.09	2530	2.05	3.43	1.24
NTZ108-4	2820	2.5	4.64	1.13	3190	2.5	4.64	1.28
NTZ136-4	3560	3.33	6.13	1.07	4030	3.33	6.13	1.21
NTZ215-4	5330	4.96	7.72	1.07	6050	4.96	7.72	1.22
NTZ271-4	7050	6.47	9.85	1.09	8000	6.47	9.85	1.24

Nominal performance data for R454C

Table 6: Nominal performance data for R454C

R454C	Refrigeration							
Compressor model	50 Hz, EN12900 ratings				60 Hz, EN12900 ratings			
	To = -35°C, Tc = 40°C, SC = 0K, SH = 10K				To = -35°C, Tc = 40°C, SC = 0K, SH = 10K			
	Cooling capacity	Power input	Current input	COP	Cooling capacity	Power input	Current input	COP
	W	kW	A	W/W	W	kW	A	W/W
NTZ048-4	604	0.67	1.81	0.9	680	0.83	1.71	0.82
NTZ068-4	1033	1.16	3.41	0.89	1177	1.25	3.11	0.94
NTZ096-4	1284	1.36	2.92	0.94	1387	1.52	2.74	0.91
NTZ108-4	1434	1.53	4.13	0.94	1592	1.73	3.71	0.92
NTZ136-4	2256	2.26	5.47	1	2685	2.66	5.06	1.01

Nominal performance data for R455A

Table 7: Nominal performance data for R455A

R455A	Refrigeration							
Compressor model	50 Hz, EN12900 ratings				60 Hz, EN12900 ratings			
	To = -35°C, Tc = 40°C, SC = 0K, SH = 10K				To = -35°C, Tc = 40°C, SC = 0K, SH = 10K			
	Cooling capacity	Power input	Current input	COP	Cooling capacity	Power input	Current input	COP
	W	kW	A	W/W	W	kW	A	W/W
NTZ048-4	677	0.72	1.88	0.95	807	0.94	1.86	0.86
NTZ068-4	1282	1.28	3.5	1	1438	1.35	3.28	1.07
NTZ096-4	1356	1421	2.95	0.95	1502	1.6	2.79	0.94
NTZ108-4	1531	1637	4.18	0.94	1765	1.86	3.79	0.95
NTZ136-4	2356	2442	5.7	0.96	2613	2.72	5.14	0.96

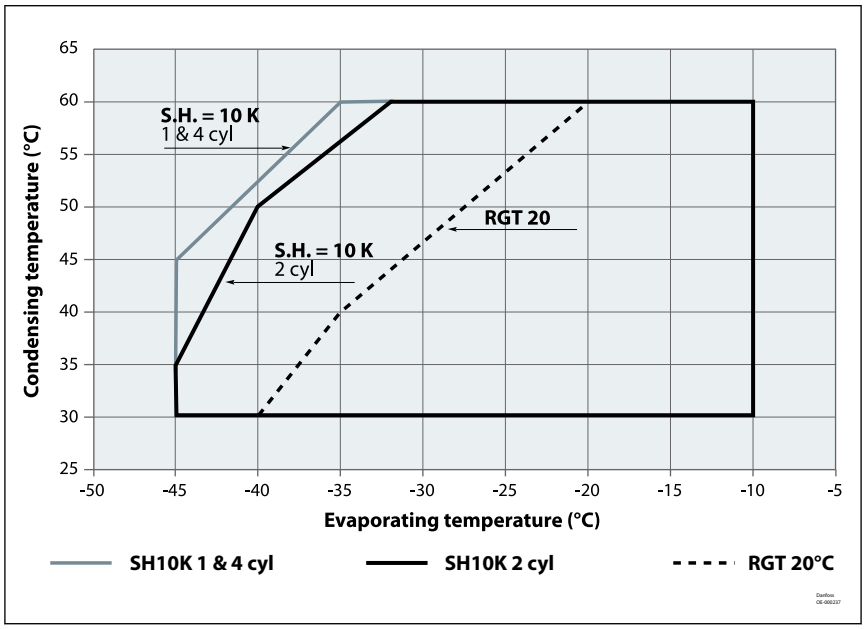
Operating envelope data

Operating envelopes

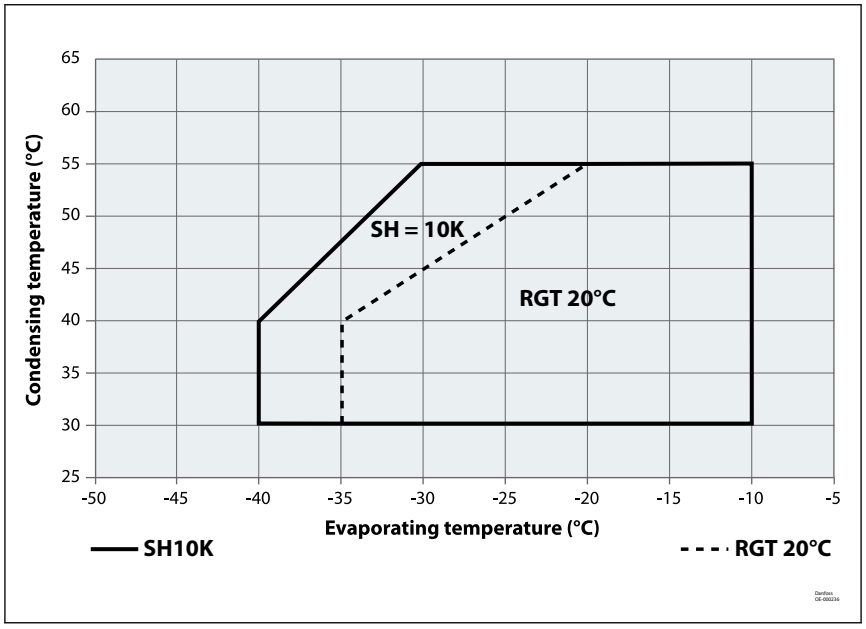
R The operating envelopes for NTZ compressors are given in the figures below and guarantees reliable operations of the compressor for steady-state operation. According to Asercom recommendations, Danfoss Commercial Compressors uses dew point temperatures for application envelopes for refrigerants with glide.

Danfoss selction software - Cool Selector 2 allows selection at Mean-Temperatures.

R404A / R507A

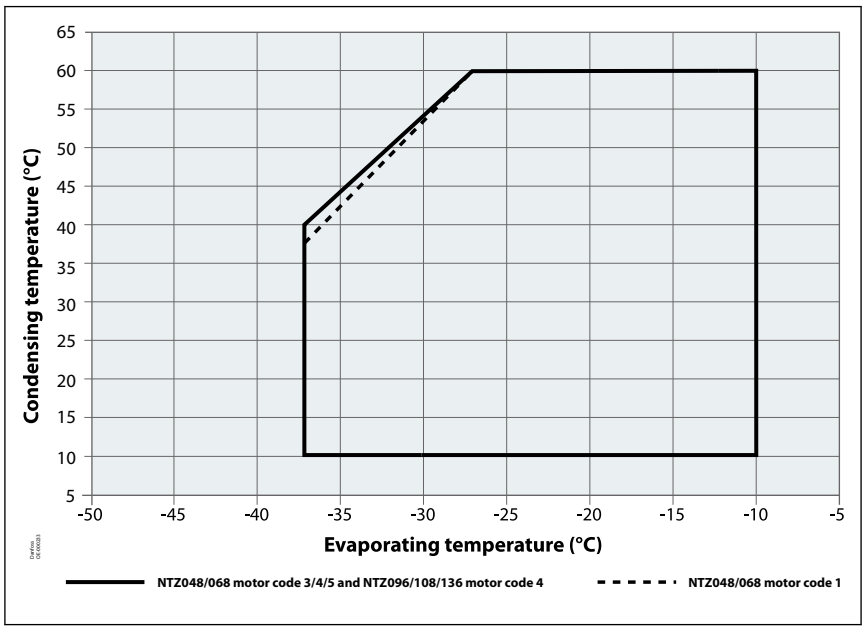


R452A

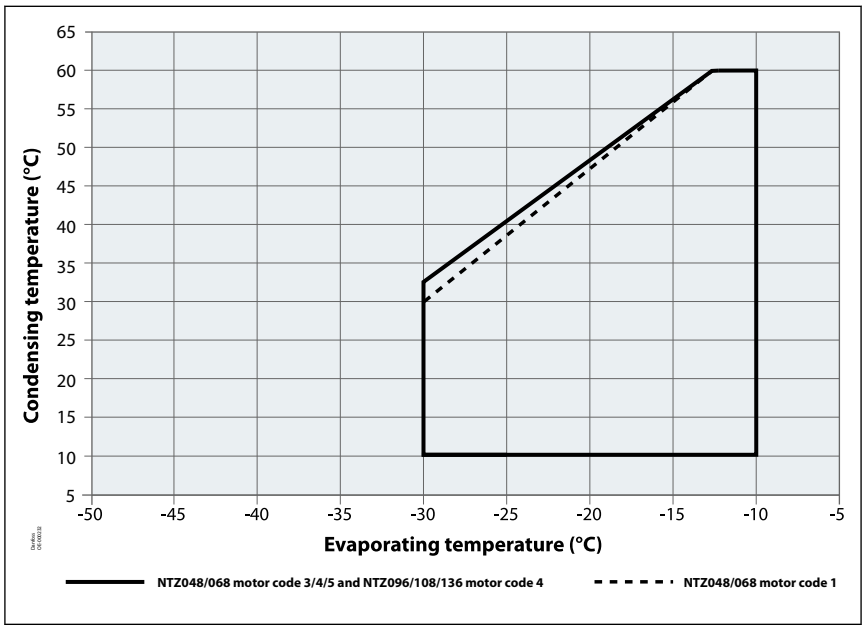


R454C

R454C - SH10K

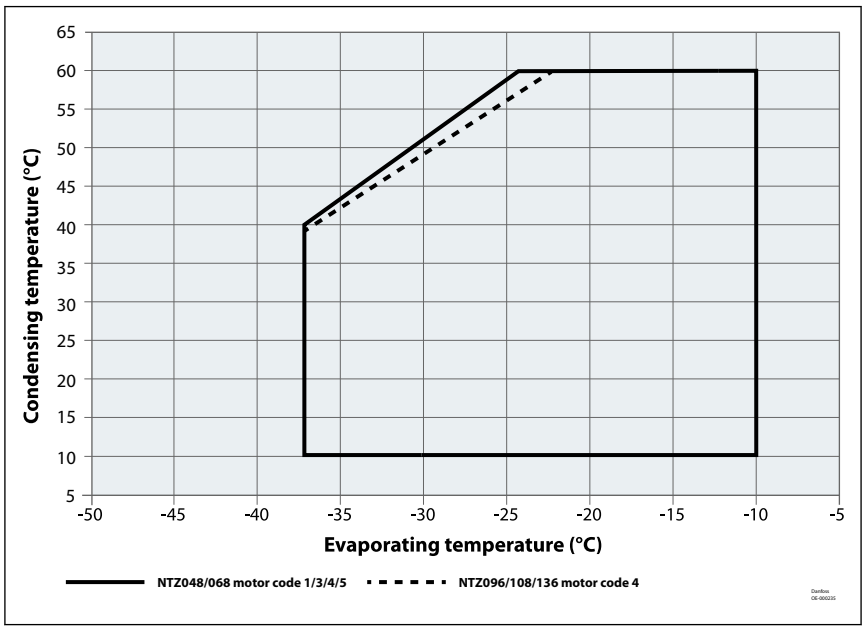


R454C - RGT20°C

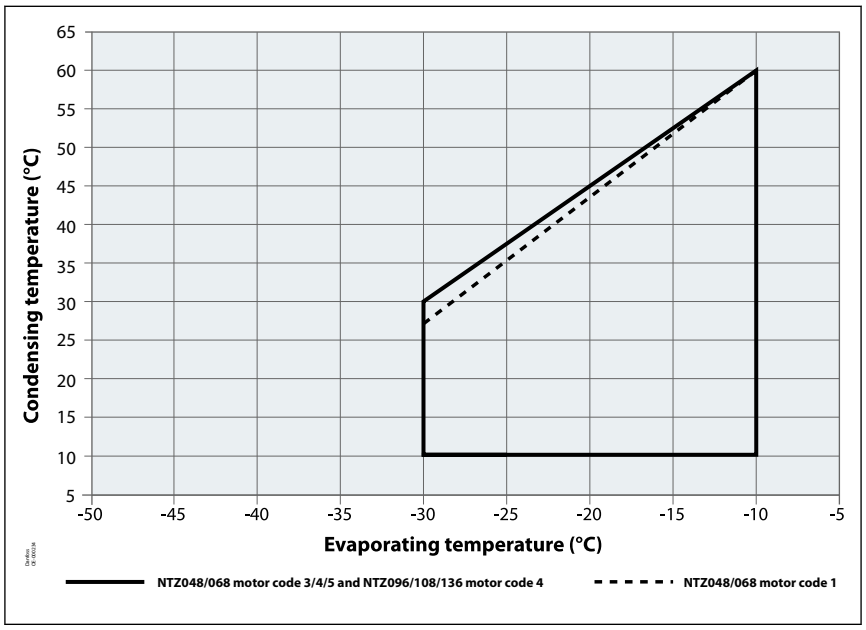


R455A

R455A - SH10K



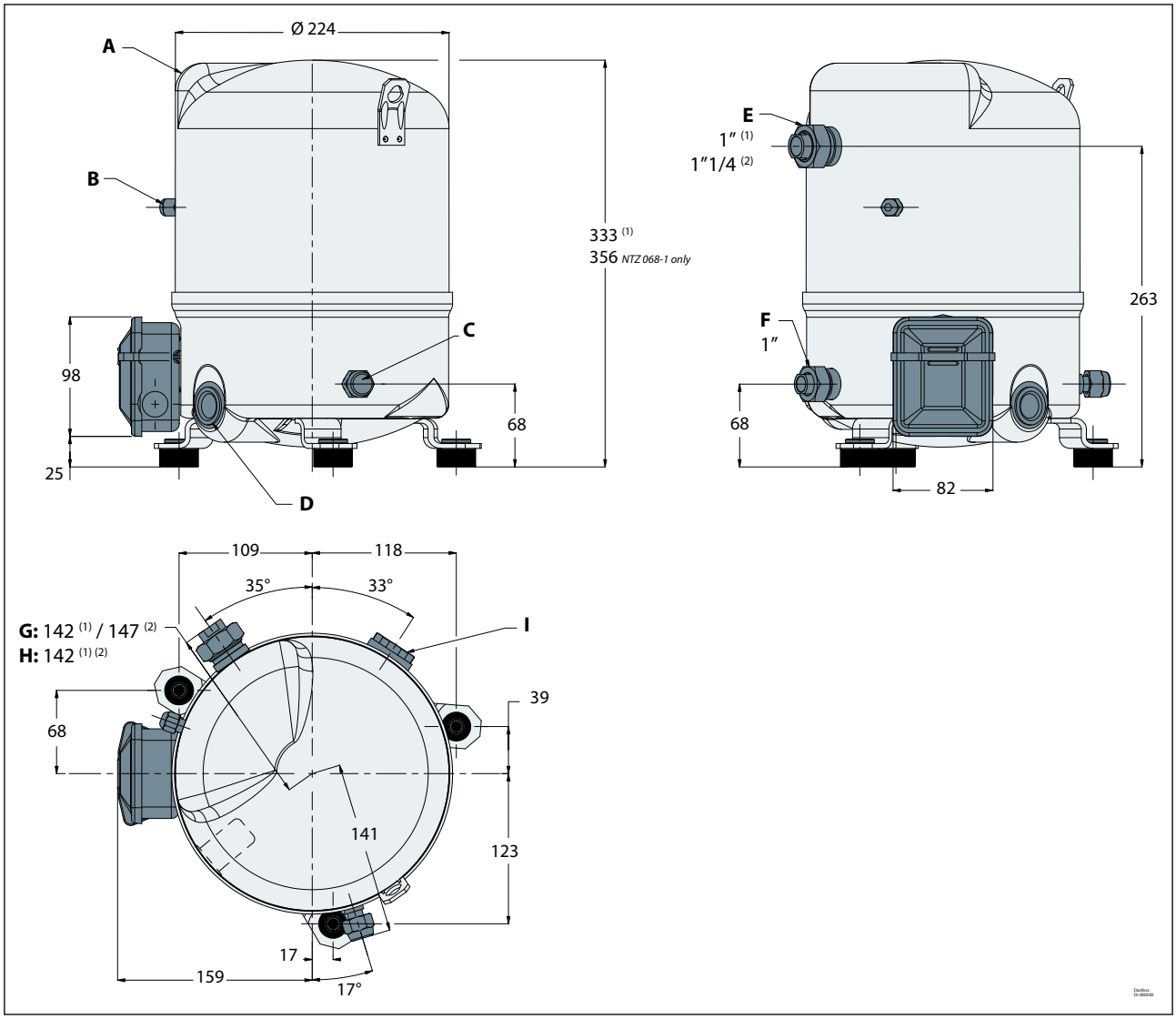
R455A - RGT20°C



Dimensions

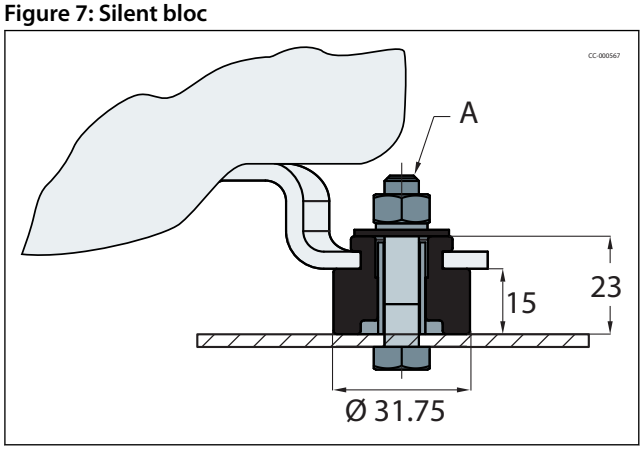
1 cylinder

All dimensions in mm.



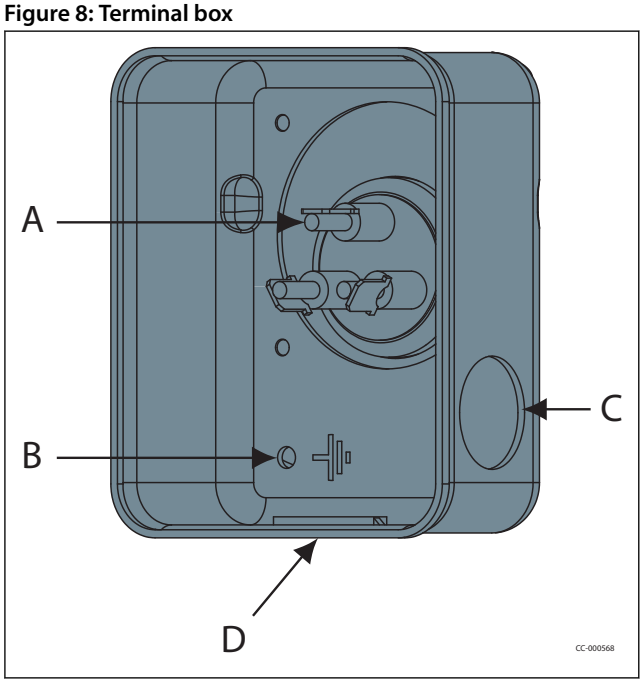
A	Bump on single phase
B	LP gauge port 1/4" (schrader)
C	3/8" oil equalisation
D	Mounting hole for PTC crankcase heater
E	Suction rotolock
F	Discharge rotolock
G	Suction
H	Discharge
I	Threaded oil sight glass

Figure 7: Silent bloc



A	Bolt HM8-40

Figure 8: Terminal box

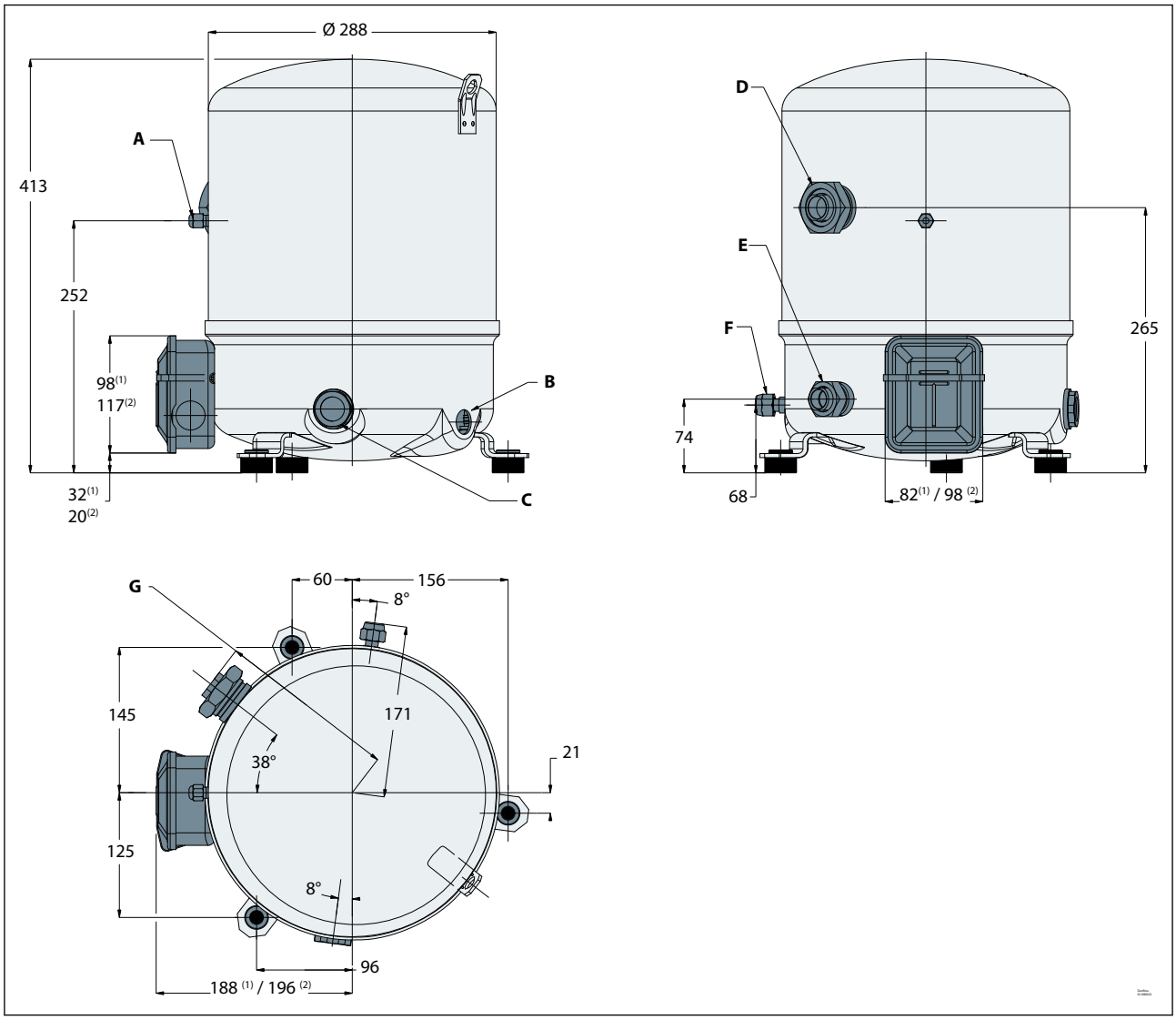


A	Spade connectors 1/4" AMP-AWE
B	Earth M4-12
C	Ø 21 mm
D	Knock-out Ø 21 mm

Type	Rotolock connections size		Pipe sizing		Rotolock valve	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
NTZ048 - NTZ068	1"1/4	1"	5/8"	1/2"	V09	V06

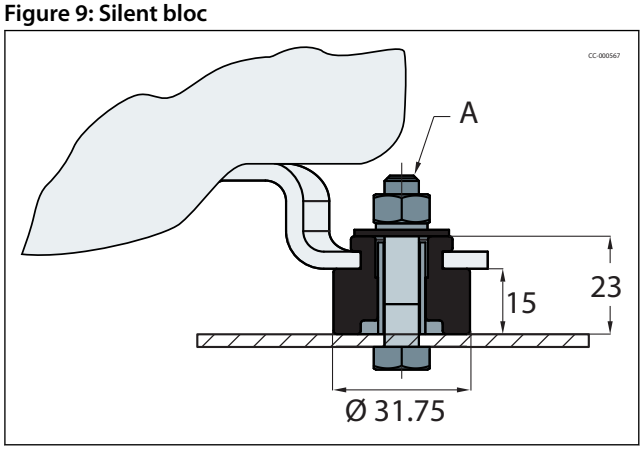
2 cylinders

All dimensions in mm.



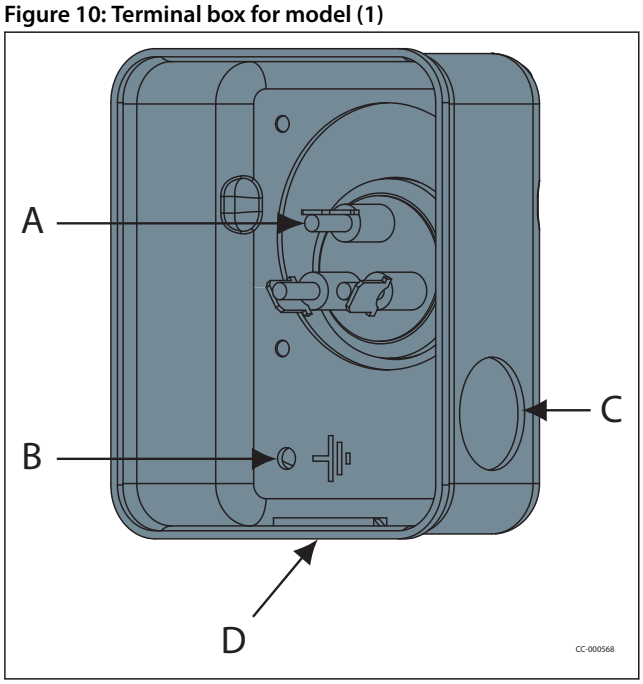
A	Schrader 1/4"
B	Mounting hole for PTC crankcase heater
C	Threaded oil sight glass
D	Suction rotolock 1"3/4
E	Discharge rotolock 1"1/4
F	Oil equalisation 3/8"
G	Suction 179, Discharge 176

Figure 9: Silent bloc



A	Bolt HM8-40

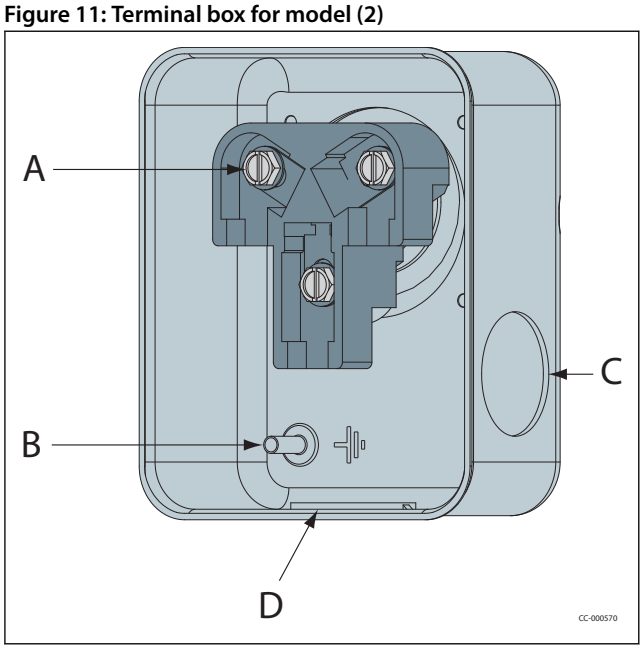
Figure 10: Terminal box for model (1)



A	Spade connectors 1/4" AMP-AWE
B	Earth M4-12
C	Ø 21 mm
D	Knock-out Ø 21 mm

IP rating: 55 (with cable gland).
Applied with NTZ096 - 136 except NTZ 136 code 1

Figure 11: Terminal box for model (2)



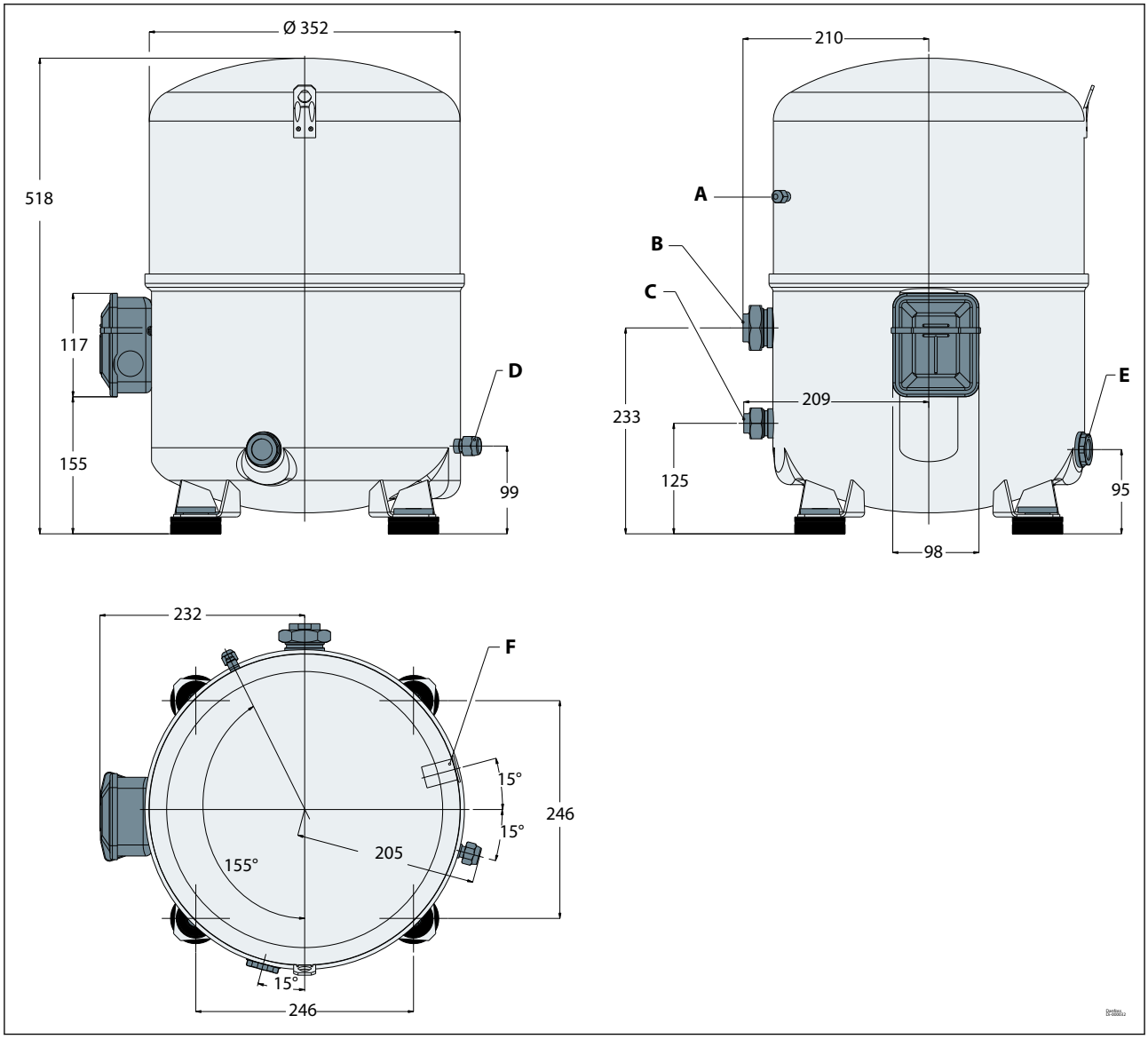
A	Screw 10-32 UNF x 9.5
B	Earth M4-12
C	Knock-out Ø 25.5 mm
D	Knock-out Ø 29 mm

IP rating: 54 (with cable gland).
Applied with NTZ136 code 1

Type	Rotolock connections size		Pipe sizing		Rotolock valve	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
NTZ096 - NTZ108	1"3/4	1"1/4	7/8"	3/4"	V07	V04
NTZ136	1"3/4	1"1/4	1"1/8	3/4"	V02	V04

4 cylinders

All dimensions in mm.



A	Schrader 1/4 "
B	Suction rotolock 1"3/4
C	Discharge rotolock 1"1/4
D	Oil equalisation 3/8"
E	Threaded oil sight glass
F	Mounting hole for PTC crankcase heater

Figure 12: Silent bloc

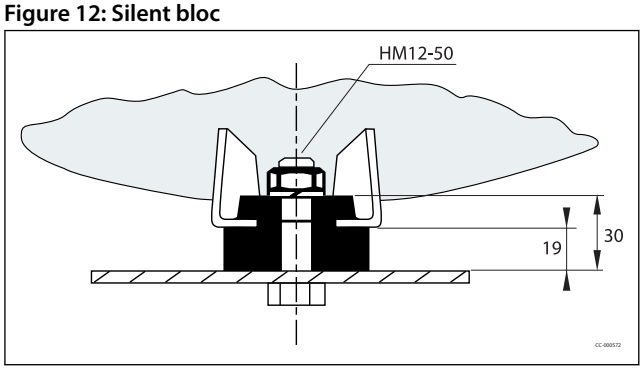
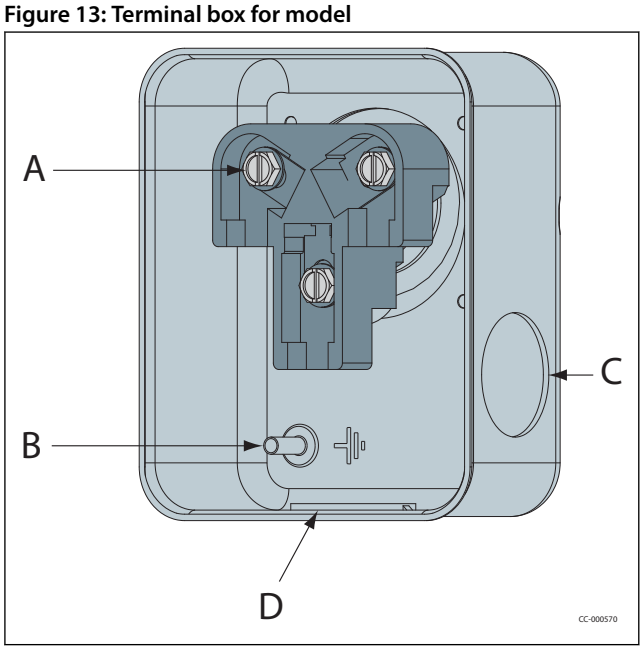


Figure 13: Terminal box for model



A	Screw 10-32 UNF x 9.5
B	Earth M4-12
C	Knock-out Ø 25.5 mm
D	Knock-out Ø 29 mm

IP rating: 54 (with cable gland).

Type	Rotolock connections size		Pipe sizing		Rotolock valve	
	Suction	Discharge	Suction	Discharge	Suction	Discharge
NTZ215 - NTZ271	1"3/4	1"1/4	1"1/8	3/4"	V02	V04

Mechanical connections

Design piping

General information

Oil in a refrigeration circuit is required to lubricate moving parts in the compressor. During normal system operation small oil quantities will continuously leave the compressor, with the discharge gas. With good system piping design this oil will return to the compressor. As long as the amount of oil circulating through the system is small it will contribute to good system operation and improved heat transfer efficiency. However, too large amounts of oil in the system will have a negative effect on condenser and evaporator efficiency. If, in a poorly designed system, the amount of oil returning to the compressor is lower than the amount of oil leaving the compressor, the compressor will become starved of oil and the condenser, evaporator and/or refrigerant lines will become filled with oil. In such situations, additional oil charge will only correct the compressor oil level for a limited period of time and increase the amount of surplus oil in the rest of the system.

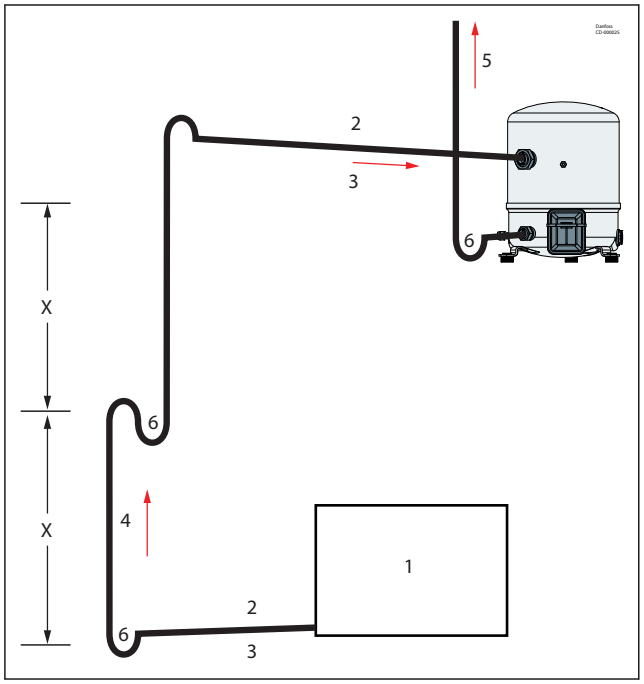
Only correct piping design can ensure a good oil balance in the system.

Suction lines

Horizontal suction line sections shall have a slope of 0.5% in the direction of refrigerant flow (5 mm per meter). The cross-section of horizontal suction lines shall be such that the resulting gas velocity is at least 4 m/s. In vertical risers, a gas velocity of 8 to 12 m/s is required to ensure proper oil return. A U-trap is required at the foot of each vertical riser. If the riser is higher than 4 m, additional U-traps are required for each additional 4 meters. The length of each U-trap must be as short as possible to avoid the accumulation of excessive quantities of oil (see figure below).

For compressors mounted in parallel, the common suction riser should be designed as a double riser. Also refer to the News bulletin "Mounting instructions for installation of Maneurop® compressors in parallel " and "Parallel application guidelines".

Gas velocities higher than 12 m/s will not contribute to significantly better oil return. However they will cause higher noise levels and result in higher suction line pressure drops which will have a negative effect on the system capacity.



1	Evaporator
2	0.5% slope
3	4 m/s (13 ft/s) or more
4	8 – 12 m/s (26 – 40 ft/s)
5	To condenser
6	U-trap, as short as possible
X	Max. 4 m (13 ft)

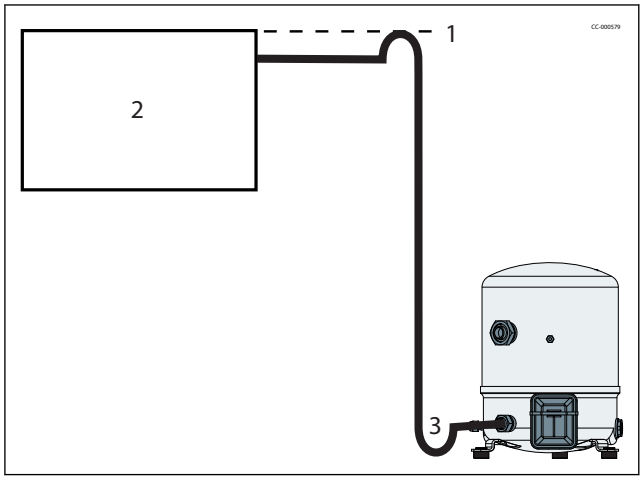
NOTE:
The suction rotolock valves, which can be ordered from Danfoss as accessories, are designed for average pipe sizes, selected for systems running at nominal conditions.

The pipe sizes selected for specific systems may differ from these recommended sizes.

It is recommended that the suction lines are insulated to limit suction gas superheat.

Discharge line

When the condenser is mounted above the compressor, a loop above the condenser and a U-trap close to the compressor are required to prevent liquid draining from the condenser into the discharge line during standstill.



1	Loop, as high as top of condenser
2	Condenser
3	U-trap

Oil charge and oil separator

In most installations the initial compressor oil charge will be sufficient. In installations with line runs exceeding 20 m, or with many oil traps or an oil separator, additional oil may be required. In installations with the risk of slow oil return such as in multiple evaporator or multiple condenser installations, an oil separator is recommended.

Filter driers

For new installations with NTZ compressors Danfoss recommends using the Danfoss DML 100%-molecular sieve, solid core filter drier. Molecular sieve filter driers with loose beads from third party suppliers shall be avoided.

For servicing of existing installations where acid formation is present the Danfoss DCL solid core filter driers containing activated alumina are recommended.

The drier is to be oversized rather than undersized. When selecting a drier, always take into account its capacity (water content capacity), the system refrigerating capacity and the system refrigerant charge.

Suction pressure control

To protect the compressor, the suction pressure must be limited to a maximum of 4 bar (relative), corresponding to -5°C. This can be achieved using either an expansion valve with a Maximum Operating Pressure (MOP) feature or a suction pressure regulator (e.g., Danfoss KVL).

Important: Do not use both a MOP-type expansion valve and a suction pressure regulator in the same system.

For multi-evaporator rack systems (such as those in supermarkets) or any application where evaporators operate at different temperatures, individual evaporator pressure regulators (e.g., Danfoss KVP) should be installed on the higher-temperature evaporators. A MOP-type expansion valve should not be used in this configuration.

Suction line heat exchanger

A suction line heat exchanger is recommended for low-temperature applications to improve system performance and efficiency.

R However, in high-ambient temperature environments, a heat exchanger can cause excessive suction gas superheat. This may lead to unacceptably high discharge temperatures and must be carefully evaluated during the system design phase.

Electrical connections

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.

MCC (Maximum Continuous Current)

The MCC is the current at which the motor protection trips under largest load and low voltage conditions. This MCC value is the maximum at which the compressor can be operated in transient conditions and out of the application envelope. Above this value, the internal protector will cut-out the compressor to protect the motor.

MOC (Maximum Operating Current)

The max. operating current is the current when the compressors run at maximum load of operating envelope within voltages printed on the nameplate. MOC can be used to select cables and contactors. In normal operation, the compressor current consumption is always less than the Max Oper. A value. When using the Max Operating Current to dene cables and contactors, a tolerance of +5% needs to be considered.

Single phase electrical characteristics

Compressor model	LRA - Locked Rotor Amp (A)		MCC - Maximum Continuous Current (A)		MOC - Maximum Operating Current (A)		Winding resistance (between phases +/- 7% at 25°C) Ohm			
Motor Code	1	5	1	5	1	5	1		5	
Winding							run	start	run	start
NTZ048	52	37	13.7	11	12	9	1.32	4.16	1.62	3.95
NTZ068	76	53	25	17	14	17	0.94	2.01	1.05	3.19
NTZ096	112		31		25		0.45	1.84		
NTZ108	97		33		28		0.45	1.84		
NTZ136	140		41		36		0.36	1.73		

Nominal capacitor values and relays

	Models	PSC/CSR		CSR only	
		Run capacitors[1]		Start capacitors[2]	Start
		(A) µF	(C) µF	(B) µF	relay
50 Hz	NTZ048	20	10	100	RVA6AMKL
	NTZ068	20	10	100	
60 Hz	NTZ048	15	10	100	
	NTZ068	25	25	135	
	NTZ096	30	15	135	
	NTZ108	30	15	135	
	NTZ136	30	15	135	

[1] Run capacitors: 440 volts
[2] Start capacitors: 330 Volts

PSC	Permanent Split Capacitor
CSR	Capacitor Start Run

NOTE:
Single-phase NTZ compressors require electrical accessories for proper operation, such as relays and capacitors. These electrical components are not included under the compressor code and must be ordered separately (see the list in section Accessories and Spare parts)

Trickle circuit

The trickle circuit heats the compressor crankcase by supplying a small current to the auxiliary winding and the run capacitor. For a visual representation, please refer to the wiring diagrams in the next pages.

R For single-phase compressor models larger than NTZ048–068, the use of a PTC crankcase heater is recommended.

PSC wiring

PSC wiring may be used for refrigerant circuits with capillary tubes or expansion valves with bleed ports. Pressure equalisation must be ensured before start-up because of the low starting torque characteristics of this system.

CSR wiring

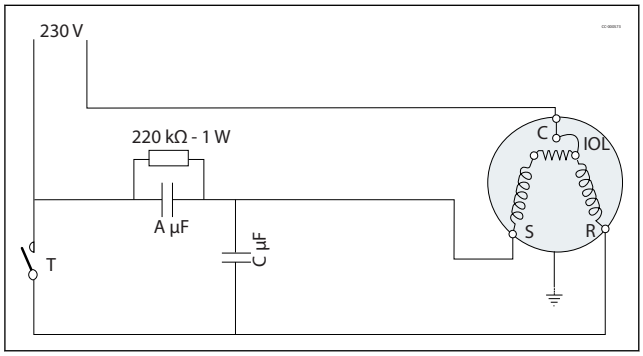
CSR wiring provides additional motor torque at start-up, by the use of a start capacitor in combination with the run capacitor. This system can be used for refrigerant circuits with capillary tubes or expansion valves. The start capacitor is only connected during the starting operation, a potential relay is used to disconnect it after the start sequence.

Some applications with high differential pressure can require a very high starting torque. For such cases the CSR starting kit can be converted to a very high starting torque kit by an additional start capcitor of 100 µF parallel to the start capacitor of the CSR kit. This configuration can also be used to reduce erratic starting at unfavourable conditions such as very low ambient temperature or weak voltage.

Wiring diagram

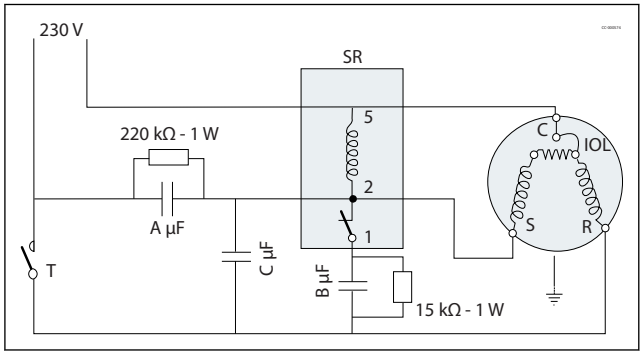
Motor protection and suggested wiring diagrams Single-phase compressor motors are internally protected by a bimetallic, temperature- and current-sensing protector. This device monitors the current in both the main and start windings, as well as the motor winding temperature.
NOTE: *Once the overload protector has tripped it may take up to 3 hours to reset and restart the compressor.*

Single phase – PSC wiring with trickle circuit



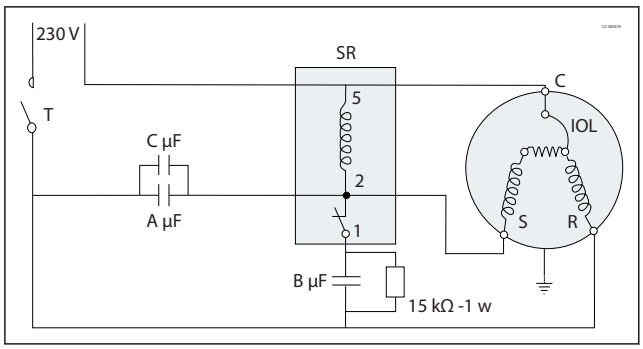
T	Thermostat
IOL	Motor protector
A & C	Run capacitors
C	Common
S	Start winding (auxiliary)
R	Run winding (main)

Single phase – CSR wiring with trickle circuit



T	Thermostat
SR	Start relay
IOL	Motor protector
A & C	Run capacitors
B	Start capacitor
C	Common
S	Start winding (auxiliary)
R	Run winding (main)

Single phase – CSR wiring without trickle circuit



T	Thermostat
SR	Start relay
IOL	Motor protector
A+C	Run capacitors
B	Start capacitor
C	Common
S	Start winding (auxiliary)
R	Run winding (main)

Capacitors A and C can be replaced by a single capacitor of size A+C.
B capacitor delivered in two parts for MT(Z)56 & 64-1.

Three phase electrical characteristics

Compressor model	LRA - Locked Rotor Amp (A)			MCC - Maximum Continuous Current (A)			MOC - Maximum Operating Current (A)			Winding resistance (between phases +/- 7% at 25°C) Ohm		
	3	4	9	3	4	9	3	4	9	3	4	9
NTZ048	32	16	22	10.1	4.8	5	7.6	3.8	4.8	2.8	11.55	7.3
NTZ068	48.5	25	29	14.8	8.4	8.5	11.6	6.1	7.7	1.58	6.67	9.7
NTZ096	72	32		20.4	10.1		15.1	7.1		1.2	5.03	
NTZ108	72	45	57	21.4	12.1	11	16.3	8.8	10.8	1.2	4	2.54
NTZ136	97.2	51	64	29	14.3	15	22	11.2	13.8	0.98	3.8	2.54
NTZ215	147.7	74	110	42.3	22.3	23	33	14.9	20.7	0.57	2.23	1.26
NTZ271	198	96	150	56.5	27	30	40.3	19.5	28.3	0.41	1.61	0.84

Winding resistance

Winding resistance is the resistance between indicated terminal pins at 20 °C (resistance value +/- 7%).

Winding resistance is generally low and it requires adapted tools for precise measurement.

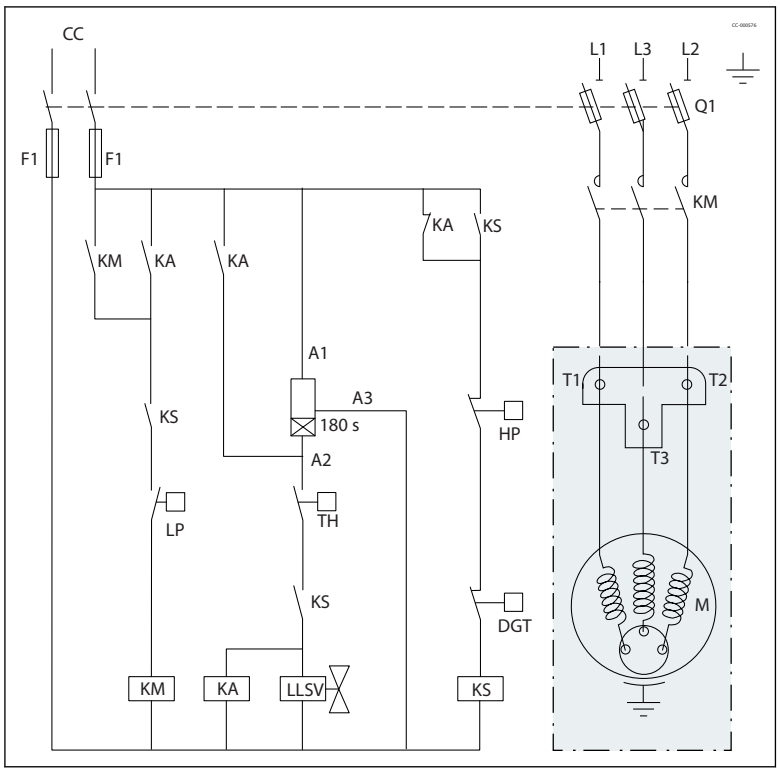
Motor protection and suggested wiring diagrams

The 3-phase compressors are equipped with an internal motor protector. This device is connected to the neutral point of the star-connected stator windings and will disconnect all three phases simultaneously in the event of an overload.

NOTE:
Once the overload protector has tripped it may take up to 3 hours to reset and restart the compressor.

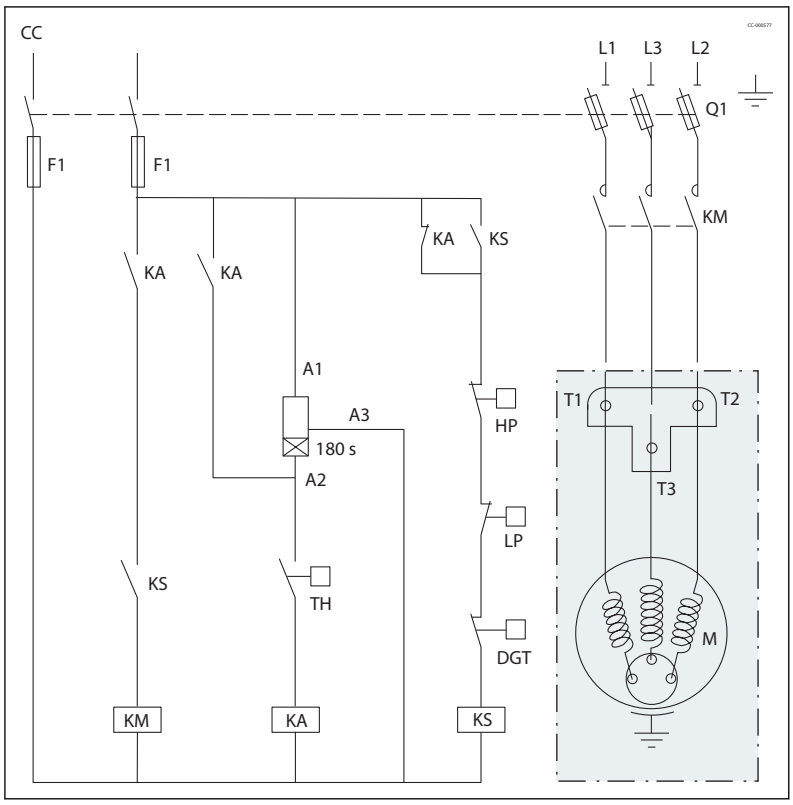
For all 3-phase compressors, a PTC crankcase heater is required.

Suggested wiring diagram with “one shot” pump-down cycle and safety lock-out relay



CC	Control circuit
TH	Control device
180s	Optional short cycle timer (3 min)
KA	Control relay
LLSV	Liquid Solenoid valve
KM	Compressor contactor
KS	Safety lock out relay
LP	Pump-down control & LP switch
HP	H.P. switch
Q1	Fused disconnect
F1	Fuses
M	Compressor motor
DGT	Discharge gas thermostat

Wiring diagram without pump-down cycle



CC	Control circuit
TH	Control device
180s	Optional short cycle timer (3 min)
KA	Control relay
KM	Compressor contactor
KS	Safety lock out relay
HP	High pressure switch
LP	Low pressure switch
Q1	Fused disconnect
F1	Fuses
M	Compressor motor
DGT	Discharge gas thermostat

Soft starters

Softstarters are designed to reduce the starting current of 3-phase AC motors. Softstarters can be used on NTZ compressor but, in order to ensure proper lubrication of compressor parts, the settings must ensure that the compressor start-up time is always less than 0.5 seconds. In case of use with R454C or R455A make sure that the softstarter selected is compatible with A2L refrigerants.

The number of starts should be limited to 6 per hour. HP/LP pressure equalization is required before starting.

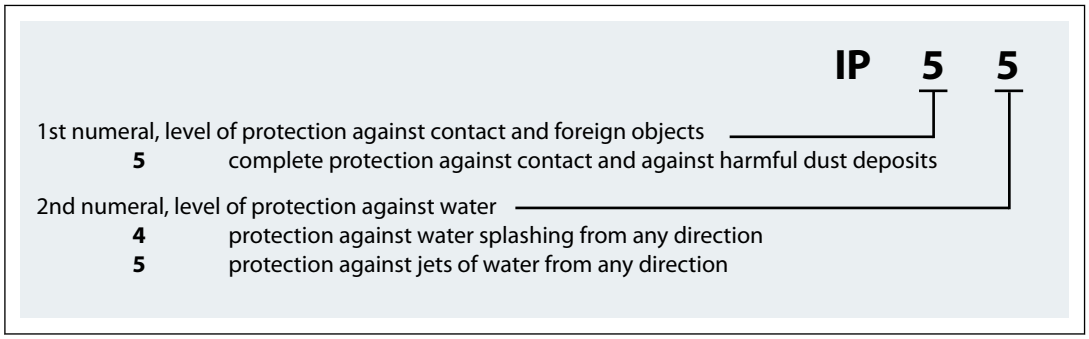
Voltage application range

Motor Code	Nominal voltage	Voltage application range
1	208 – 230 V / 1 ph / 60 Hz	187 – 253 V
3	200 – 230 V / 3 ph / 60 Hz	180 – 253 V
4	380 – 400 V / 3 ph / 50 Hz	340 – 440 V
	460 V / 3 ph / 60 Hz	414 – 506 V
5	220 – 240 V / 1 ph / 50 Hz	198 – 264 V
9	380 V / 3 ph / 60 Hz[1]	342 – 418 V

[1] Some models can be approved for 380 – 400 V / 3 ph / 60 Hz. Please check datasheet.

IP rating

The Ingress Protection (IP) ratings for the compressor terminal boxes, in accordance with the CEI 529 standard, are listed below. These IP ratings are only valid when the terminal box is fitted with correctly sized cable glands that have an equivalent or higher IP rating.



IP55	For models NTZ048–136 (excluding model NTZ136-1)
IP54	For models NTZ136-1, NTZ215, and NTZ271

Application

Operating limits

High pressure

A high-pressure (HP) safety switch is required to stop the compressor if the discharge pressure exceeds the maximum values shown in the table below. The switch can be set to lower values depending on the specific application and ambient conditions.

R To prevent the compressor from repeatedly cycling near its high-pressure limit, the HP switch must be a manual reset device or be wired into an electrical lockout circuit. For systems equipped with a discharge service valve, the HP switch must be connected to the gauge port on the service valve, as this connection point cannot be isolated from the compressor.

Low pressure

R A low-pressure (LP) safety switch is a mandatory component required to protect the compressor. Operating the compressor in a deep vacuum will result in component failure.

Minimum pressure setting: The absolute minimum setting for the LP safety switch (which also functions as a loss-of-charge switch) is 0 bar g (relative). The tolerance of the LP switch must be configured to strictly prevent the compressor from ever operating in a vacuum.

System specific requirements: For systems WITHOUT a pump-down cycle: The LP safety switch must be either a manual lockout device or an automatic switch that is wired into an electrical lockout circuit.

For systems WITH a pump-down cycle: Recommended settings for LP safety switches featuring an automatic reset are listed in the table below.

Pressure range	Unit	R404A / R507A	R452A	R454C	R455A
Working pressure range, high side	bar (g)	13.2 – 27.7	12.5 – 24.2	5.2 – 22.3	5.6 – 24.3
Working pressure range, low side	bar (g)	0.05 – 3.3	0.18 – 3	0.05 – 2.2	0.12 – 2.4
Minimum low pressure safety switch setting	bar (g)	0	0.13	0	0
Minimum low pressure pump-down switch setting	bar (g)	0.21	0.35	0.21	0.21
Relief valve opening pressure difference (2 and 4 cyl)	bar	30	30	30	30
Relief valve closing pressure difference	bar	8	8	8	8

Low ambient temperature operation

Operating in low ambient temperatures causes the condensing temperature and pressure in air-cooled condensers to decrease. This low pressure may be insufficient to supply an adequate flow of liquid refrigerant to the evaporator.

This can lead to a sequence of problems:

- The evaporator temperature will decrease significantly, creating a risk of frosting.
- System capacity will be reduced, and oil return to the compressor will be poor.
- At start-up, the compressor may pull a deep vacuum, causing the low-pressure (LP) safety switch to trip. This can lead to short cycling, depending on the LP switch and delay timer settings.

To prevent these issues, condenser capacity must be controlled. The following solutions are possible.

Methods for condenser capacity control

- Indoor condenser location: Placing the condenser indoors is a straightforward way to avoid low ambient conditions.
- Airflow Reduction (for Air-Cooled Systems):
  1. Fan Cycling: A head pressure controller can keep condenser fans off until the condensing pressure rises to the desired level.
  2. Variable Speed Fans: Using variable speed fans provides precise control over airflow to maintain a stable condensing pressure.
- Water Flow Control (for Water-Cooled Systems): A pressure-actuated water regulating valve can be used. The valve remains closed until the condensing pressure reaches the target level, at which point it opens to allow cooling water flow.
- Liquid Flooding / Head Pressure Control: In very low ambient conditions, a head pressure control valve (which floods the condenser with liquid) can be used.

  NOTE:
  This solution requires careful design. It necessitates an additional refrigerant charge, a non-return (check) valve in the discharge line is required, and the discharge line design needs special attention.

The minimum condensing pressure must be set to correspond with the minimum saturated condensing temperature shown in the compressor's application envelope.

Additional recommendations for low ambient conditions

When a compressor is shut down in a low-temperature environment, liquid refrigerant can migrate into the cold compressor.

- **Crankcase Heater:** To prevent liquid migration during off-cycles, the use of a belt-type crankcase heater is strongly recommended.
- **Compressor Insulation:** Maneurop® compressors, which feature 100% suction-gas-cooled motors, can be externally insulated. For more details, refer to the "Liquid Refrigerant Migration & Charge Limits" section.

Operating voltage and cycle rate

Operating voltage range

The operating voltage limits are shown in the table from section “Compressor model designation”. The voltage applied to the motor terminals must always be within these table limits. The maximum allowable voltage unbalance for 3-phase compressors is 2%. Voltage unbalance causes high current draw on one or more phases, which in turn leads to overheating and possible motor damage. Voltage unbalance is given by the formula:

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

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

Cycle rate limit

There may be no more than 12 starts per hour (6 when a soft start accessory is used). A higher number reduces the service life of the motor-compressor unit. If necessary, use an anti-short-cycle timer in the control circuit. A time-out of six minutes is recommended.

The system design must ensure a minimum compressor runtime to guarantee adequate oil return and sufficient motor cooling following startup. For most compact circuits, a five-minute runtime is generally sufficient. It should be noted that the oil return rate is dependent on the specific system design.

Liquid refrigerant control and charge limit

Refrigeration compressors are basically designed as gas compressors. Depending on the compressor design and operating conditions, most compressors can also handle a limited amount of liquid refrigerant. Maneurop® NTZ compressors have a large internal volume and can therefore handle relatively large amounts of liquid refrigerant without major problems. However even when a compressor can handle liquid refrigerant, this will not be favourable to its service life.

Liquid refrigerant can dilute the oil, wash oil out of bearings and result in high oil carry over, resulting in loss of oil from the sump. Good system design can limit the amount of liquid refrigerant in the compressor, which will have a positive effect on the compressor service life. Liquid refrigerant can enter a compressor in different ways, with different effects on the compressor.

To prevent liquid migration to the compressor, Danfoss recommends maintaining a minimum superheat setting of 8-10 K.

Off-cycle migration

During system standstill and after pressure equalisation, refrigerant will condense in the coldest part of the system. The compressor can easily be the coldest spot, for example when it is placed outside in low ambient temperatures. After a while, the full system refrigerant charge can condense in the compressor crankcase. A large amount will dissolve in the compressor oil until the oil is completely saturated with refrigerant. If other system components are located at a higher level, this process can be even faster because gravity will assist the liquid refrigerant to flow back to the compressor. When the compressor is started, the pressure in the crankcase decreases rapidly.

At lower pressures the oil holds less refrigerant, and as a result part of the refrigerant will violently evaporate from the oil, causing the oil to foam. This process is often called “boiling”.

The negative effects from migration on the compressor are:

- oil dilution by liquid refrigerant
- oil foam, transported by refrigerant gas and discharged into the system, causing loss of oil and in extreme situations risk for oil slugging
- in extreme situations with high system refrigerant charge, liquid slugging could occur (liquid entering the compressor cylinders).

Liquid floodback during operation

During normal and stable system operation, refrigerant will leave the evaporator in a superheated condition and enter the compressor as a superheated vapour.

Normal superheat values at compressor suction are 5 – 30 K. However the refrigerant leaving the evaporator can contain an amount of liquid refrigerant due to different reasons:

- wrong dimensioning, wrong setting or malfunction of expansion device
- evaporator fan failure or blocked air filters.

In these situations, liquid refrigerant will continuously enter the compressor.

The negative effects from continuous liquid floodback are:

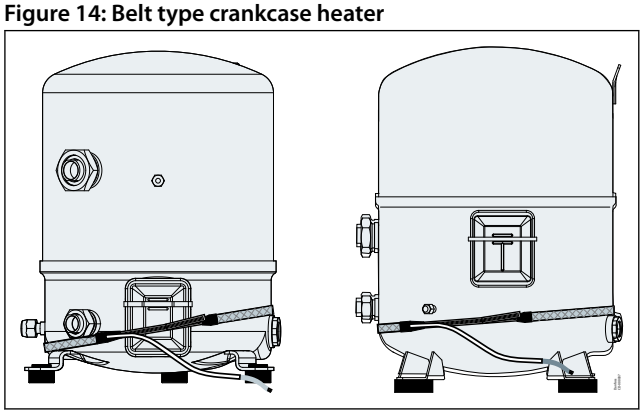
- permanent oil dilution
- in extreme situations with high system refrigerant charge and large amounts of floodback, liquid slugging could occur.

Crankcase heater

A crankcase heater protects against the off-cycle migration of refrigerant and proves effective if oil temperature is maintained min. 10K above the saturated LP temperature of the refrigerant. Tests must thereby be conducted to ensure that the appro-priate oil temperature is maintained under all ambient conditions. A PTC crankcase heater is recommended on all stand-alone compressors and split systems. PTC crankcase heaters are self-regulating.

Under extreme conditions such as very low ambient temperature a belt type crankcase heater could be used in addition to the PTC heater, although this is not a preferred solution for 1 and 2 cylinder compressors. The belt crankcase heater must be positioned on the compressor shell as close as possible to the oil sump to ensure good heat transfer to the oil.

Figure 14: Belt type crankcase heater



Belt crankcase heaters are not self-regulating. Control must be applied to energise the belt heater once the compressor has been stopped and then to de-energise it while the compressor is running. The belt heater must be energised 12 hours before restarting the compressor following an extended down period.

If the crankcase heater is not able to maintain the oil temperature at 10 K above the saturated LP temperature of the refrigerant during off cycles or if repetitive floodback is present a the Liquid Line Solenoid Valve (LLSV) + pump-down cycle is required, eventually in conjunction with a suction accumulator.

Crankcase heater or PTC crankcase heater has to be used with refrigerant R454C/R455A.

Liquid line solenoid valve & pump-down

In refrigeration applications, the Liquid Line Solenoid Valve (LLSV) is highly recommended. During the off-cycle, the LLSV isolates the liquid charge in the condenser side, thus preventing against refrigerant transfer or excessive migration of refrigerant into the compressor. Furthermore, when using a LLSV in conjunction with a pump-down cycle, the quantity of refrigerant in the low-pressure side of the system will be reduced.

A pump-down cycle design is required when evaporators are fitted with electric defrost heaters.

Liquid line solenoid valve and pump down have to be use with zeotropic refrigierants e.g. R454C/R455A.

Suction accumulator

A suction accumulator offers considerable protection against refrigerant floodback at start-up, during operation or after the defrost operation. This device also helps to protect against off-cycle migration by means of providing additional internal free volume to the low pressure side of the system.

The suction accumulator must be selected in accordance with the accumulator manufacturer recommendations. As a general rule, Danfoss recommends to size the accumulator for at least 50% of the total system charge. Tests however must be conducted to determine the optimal size.

Sound and vibration management

Sound

Running compressors cause sound and vibration. Both phenomena are closely related.

Sound produced by a compressor is transmitted in every direction by the ambient air, the mounting feet, the pipework and the refrigerant in the pipework.

The easiest way to reduce the sound transmitted through ambient air is to fit a Danfoss acoustic hood accessory.

Because Maneurop® compressors are 100% suction gas cooled, and require no body cooling, they can be insulated. Values for the sound reduction achieved with acoustic hoods are shown also in the table on the right. For inside mounted compressors, sound insulation of the plantroom is an alternative to sound insulation of the compressor.

Sound transmitted by mounting feet, pipework and refrigerant should be treated the same way as for vibration. Please refer to the next section.

Sound power in dB(A)

Table 8: Sound power in dB(A)

Compressor model	R404A		R452A		R454C/R455A	
	50Hz	60Hz	50Hz	60Hz	50Hz	60Hz
NTZ048-4	72	75	73	75	68	69
NTZ068-4	69	74	71	74	71	72
NTZ096-4	82	85	80	82	80	82
NTZ108-4	76	80	78	80	78	80
NTZ136-4	77	80	78	80	78	80
NTZ215-4	86	88	83	84	-	-
NTZ271-4	86	88	82	84	-	-

Operating conditions: Evap temp -35°c, Cond temp 40°c, SH10K

NOTE:
Acoustichood available as accessory can reduce noise level by 6 to 10dBA

Vibration

The mounting grommets delivered with the compressor should always be used. They will largely attenuate the compressor vibration transmitted to the base frame. These rubber grommets have been selected and calculated in accordance with the vibration frequencies that are typical for the compressor. For that reason other grommet types or brands shall not be used.

The base on which the compressor is mounted should be sufficiently rigid and of adequate mass to ensure the full effectiveness of the mounting grommets. The compressor should never be rigidly mounted to the base frame otherwise high vibration transmission would occur and the service life reduced. Suction and discharge lines must have adequate flexibility in 3 planes. Eventually vibration absorbers may be required.

Vibration is also transmitted by the refrigerant gas. Maneurop® NTZ compressors have built-in mufflers to reduce pulsation. To further reduce vibration an extra discharge line muffler can be installed.

Danfoss doesn't warrant these compressors for use in mobile applications, such as trucks, railways, subways, etc...

NOTE:
Maneurop® NTZ compressors have been designed and qualified for stationary equipment used in Refrigeration applications

Installation and service

System cleanliness

System contamination is one of the main factors affecting equipment reliability and compressor service life.

Therefore it is important to ensure system cleanliness when manufacturing a refrigeration system. During the manufacturing process, system contamination can be caused by:

- Brazing and welding oxides
- Filings and particles from removing burrs from pipe-work
- Brazing flux
- Moisture and air.

Only use clean and dehydrated refrigeration grade copper tubes and silver alloy brazing material. Clean all parts before brazing and always purge nitrogen or CO2 through the pipes during brazing to prevent oxidation. If flux is used, take every precaution to prevent leakage into the piping. Do not drill holes (e.g. for schräder valves) in parts of the installation that are already completed, when filings and burrs can not be removed. Carefully follow the instructions below regarding brazing, mounting, leak detection, pressure test and moisture removal. All installation and service work shall only be done by qualified personnel respecting all procedures and using tools (charging systems, tubes, vacuum pump, etc.) dedicated for the refrigerant that will be used.

Compressor handling, mounting and connection to the system

Compressor handling

Maneurop® NTZ compressors are provided with a lifting lug. This lug should always be used to lift the compressor. Once the compressor is installed, the compressor lifting lug should never be used to lift the complete installation.

Keep the compressor in an upright position during handling.

Compressor mounting

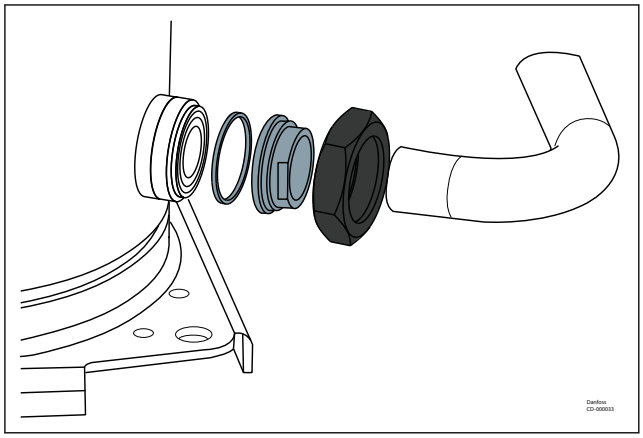
Mount the compressor on a horizontal plane with a maximum slope of 3 degrees. All compressors are supplied with three or four rubber mounting grommets, each complete with metal sleeves and nuts and bolts. Refer to the section Dimensions.

These grommets largely attenuate the compressor vibration transmitted to the base frame. The compressor must always be mounted with these grommets. Refer to the table below for torque values.

Component	Torque (Nm)	
	Min.	Max.
Rotolock suction valve, NTZ048 - NTZ068	80	100
Rotolock suction valve, NTZ096 - NTZ271	100	120
Rotolock discharge valve, NTZ048 – NTZ068	70	90
Rotolock discharge valve, NTZ096 - NTZ271	80	100
Electrical T-block screws HN°10-32 UNF x 9.5	-	3
Earth screw	-	3
Oil sight glass (with black chloroprene gasket)	40	50
3/8" flare oil equalisation nut	45	50
Schrader nut	11.3	17
Schrader valve (internal)	0.4	0.8
Mounting grommet bolt, NTZ048 – NTZ136	12	18
Mounting grommet bolt, NTZ215 – NTZ271	40	60
Belt crankcase heater	-	4

Compressor connection to the system

Compressor suction and discharge ports are equipped with rotolock connectors, which can be used for direct mounting of rotolock valves or through attached solder sleeves to the piping. The gasket and solder adapter provided in the mounting kit, together with the compressor, must be used.



	Mounted on the compressor
	Supplied together with compressor in mounting kit

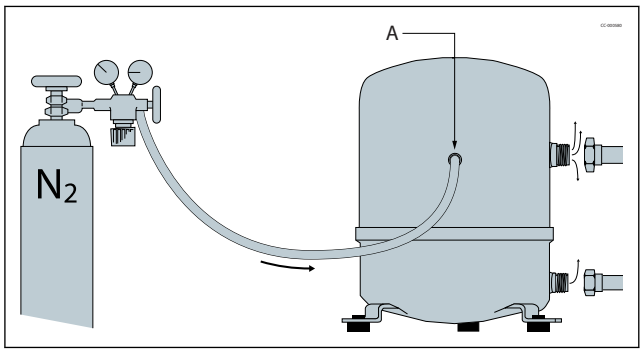
New compressors have a protective nitrogen holding charge. The suction and discharge caps should only be removed just before connecting the compressor to the installation to avoid air and moisture entering the compressor.

Whenever possible the compressor must be the last component to be integrated in the system. It is advisable to braze the solder sleeves or service valves to the pipework before the compressor is mounted. When all brazing is finished and when the total system is ready, the compressor caps can be removed and the compressor can be connected to the system with a minimum exposure to ambient air.

If this procedure is not possible, the sleeves or valves may be brazed to the pipes when mounted on the compressor.

In this situation nitrogen or CO_2 must be purged through the compressor via the schrader valve to prevent air and moisture ingress. Purging must start when the caps are removed and proceeded during the brazing process. When rotolock valves are used on the compressor, they shall be closed immediately after mounting, thus keeping the compressor isolated from atmosphere or from a not yet dehydrated system.

NOTE:
When the compressor is built into a "pack" or "rack" configuration which is not installed immediately on its final location, a vacuum pull-down and moisture removal must be performed to this pack (rack) as if it were a complete system (see below). The pack must be charged with nitrogen or CO_2 and open tubes must be blocked with caps or plugs.



A	Schrader

System pressure test

It is recommended that an inert gas such as nitrogen be used for pressure testing. Dry air may also be used but care should be taken since it can form an inflammable mixture with the compressor oil.

⚠ When performing a system pressure test, the maximum allowed pressure for the different components should not be exceeded.

For NTZ compressors the maximum test pressures are shown in the table beside.

Pressure level	1-2-4 cylinder compressors
Maximum compressor test pressure at low pressure side (suction side)	25 bar (g)
Maximum compressor test pressure at high pressure side (discharge side)	30 bar (g)
Maximum test pressure difference between high and low pressure side (to avoid that the internal compressor relief valve will open)	30 bar

Do not exceed 30 bar pressure difference between high pressure side and low pressure side of the compressor because this will open the internal compressor relief valve.

Leak detection

Whenever possible the compressor must be kept isolated from the system during leak detection by closing the suction and discharge valves. Use a mixture of nitrogen and the final refrigerant (eg. R404A or R507A) and use a leak detector for the applied refrigerant. A spectrometric detection system using helium can also be applied. Note that leak detection with refrigerant may not be allowed in some countries. Do not use other gasses such as oxygen, dry air or acetylene as these gasses can form an inflammable mixture with the compressor oil.

Never use CFC or HCFC refrigerants for leak detection of HFC systems. Leak detecting additives shall not be used as they may affect the lubricant properties. Warranty may be voided if leak detection additives have been used.

Eventual leaks shall be repaired respecting theinstructions written above.

Vacuum pull-down moisture removal

Moisture obstructs the proper functioning of the compressor and the refrigeration system.

Air and moisture reduce service life and increase condensing pressure, and cause excessively high discharge temperatures, which can destroy the lubricating properties of the oil. Air and moisture also increase the risk of acid formation, giving rise to copper platting. All these phenomena can cause mechanical and electrical compressor failure.

To eliminate these factors, a vacuum pull-down according to the following procedure is recommended:

Step 1: Whenever possible (if valves are present) the compressor must be kept isolated from the system.

Step 2: After the leak detection, the system must be pulled-down under a vacuum of 500 microns (0.67 mbar). A two stage vacuum pump shall be used with a capacity appropriate to the system volume. It is recommended to use connection lines with a large diameter and to connect these to the service valves and not to the schrader connection to avoid too high pressure losses.

Step 3: When the vacuum level of 500 micron is reached, the system must be isolated from the vacuum pump. Wait 30 minutes during which the system pressure should not rise. When the pressure rapidly increases, the system is not leak tight.

A new leak detection must be performed and the vacuum pull-down procedure should be restarted from step 1. When the pressure slowly increases, this indicates the presence of moisture. In this case step 2 and 3 should be repeated.

Step 4: Connect the compressor to the system by opening the valves. Repeat step 2 and 3.

Step 5: Break the vacuum with nitrogen or the final refrigerant.

Step 6: Repeat step 2 and 3 on the total system. At commissioning, system moisture content may be up to 100 ppm. During operation the filter drier must reduce this to a level < 20 ppm.

⚠ WARNING:
- Do not use a megohmmeter or apply power to the compressor while it is under vacuum, as this may cause motor winding damage.
- Never run the compressor under vacuum as it may cause compressor motor burn-out.

Start-up

Before initial start-up or after a prolonged shut down period, energise the crankcase heater (if fitted) 12 hours prior to start-up, or turn on power for single phase compressors with trickle circuit.

Refrigerant charging

It is recommended that charging be done to the high side of the system. Charge refrigerant asclose as possible to the nominal system charge before starting the compressor. Then slowly add refrigerant on the low pressure side as far away as possible from the compressor suction connection. The refrigerant charge quantity must be suitable for both winter and summer operation. All zeotropic mixtures must be charged in the liquid phase.

⚠ WARNING:
When a liquid line solenoid valve is used, the vacuum in the low pressure side must be broken before applying power to the system.

Oil charge and oil level

The oil charge must be checked before commissioning (1/4 to 3/4 of the oil sight glass). Check the oil level again after a minimum of 2 hours operation at nominal conditions. In most installations the initial compressor oil charge will be sufficient. In installations with line runs exceeding 20 m or with many oil traps or an oil separator, additional oil may be required. Normally the quantity of oil added should be no more than 2% of the total refrigerant charge (this percentage does not take into account oil contained in accessories such as oil separators or oil traps). If this amount has already been added and the oil level in the compressor keeps decreasing, the oil return in the installation is insufficient. Refer also to section Design piping.

In installations where slow oil return is likely such as in multiple evaporator or multiple condenser installations, an oil separator is recommended. Refer to the table section Refrigerants to select the correct oil.

Suction gas superheat

The optimum suction gas superheat is 10 K. A lower superheat value will contribute to better system performance (higher mass flow and more efficient use of evaporator surface). Low superheat values however increase the risk of unwanted liquid floodback to the compressor.

For very low superheat values an electronically controlled expansion valve is recommended.

The maximum allowable superheat is about 30 K. Higher values can be accepted but in these cases, tests have to be performed to check that the maximum discharge temperature of 130 °C will not be exceeded. Note that high superheat values decrease the compressor application envelope and system performance.

Packaging

Single pack

Table 9: Single pack

Compressor model	Dimensions (mm)			Gross weight (kg)
	Length	Width	Height	
NTZ048	385	258	370	23
NTZ068	385	258	370	25
NTZ096	385	375	450	38
NTZ108	385	375	450	38
NTZ136	385	375	450	38
NTZ215	470	400	650	72
NTZ271	470	400	650	73

One compressor in a cardboard box.

In some publications this packaging may be indicated as individual packaging.

All single pack of 4 cylinder are shipped with a small 1/4 euro pallet (570 x 400 x 117 mm) under the individual box.

Multipack

Table 10: Multipack

Compressor model	Dimensions (mm)			Gross weight (kg)	Number of compressors	Static stacking
	Length	Width	Height			
NTZ048	1150	800	510	197	8	4
NTZ068	1150	800	510	213		
NTZ096	1150	800	600	238	6	
NTZ108	1150	800	600	238		
NTZ136	1150	800	600	238		
NTZ215	1150	800	800	299	4	
NTZ271	1150	800	800	303		

A full pallet of compressors, each individually packed in a cardboard box. Mainly dedicated to wholesalers and Danfoss distribution centres.

Industrial pack

Table 11: Industrial pack

Compressor model	Dimensions (mm)			Gross weight (kg)	Number of compressors	Static stacking
	Length	Width	Height			
NTZ048	1150	800	500	278	12	4
NTZ068	1150	800	500	302		
NTZ096	1150	800	600	230	6	
NTZ108	1150	800	600	230		
NTZ136	1150	800	600	230		
NTZ215	1150	800	710	393	6	
NTZ271	1150	800	710	399		

A full pallet of unpacked compressors. Mainly dedicated to OEM customers.

In some publications this packaging may be indicated as ‘Multiple packaging.

Ordering

Single pack

Table 12: Single pack

Compressor model	Motor voltage code				
	1[1]	3	4	5[1]	9
	208-230/1/60	200-230/3/60	460/3/60 400/3/50	230/1/50	380/3/60
NTZ048	120F0293	120F0279	120F0226	120F0228	120F0302
NTZ068	120F0294	120F0280	120F0230	120F0232	120F0303
NTZ096	120F0295	120F0281	120F0234	-	-
NTZ108	120F0296	120F0282	120F0238	-	120F0304
NTZ136	120F0297	120F0283	120F0236	-	120F0305
NTZ215	-	120F0284	120F0240	-	120F0306
NTZ271	-	120F0285	120F0242	-	120F0307

[1] For single phase compressors electrical components need to be ordered separately

Industrial pack

Table 13: Industrial pack

Compressor model	Motor voltage code		
	3	4	5[1]
	200-230/3/60	460/3/60 400/3/50	230/1/50
NTZ048	120F0286	120F0227	120F0229
NTZ068	120F0287	120F0231	120F0233
NTZ096	120F0288	120F0235	-
NTZ108	120F0289	120F0239	-
NTZ136	120F0290	120F0237	-
NTZ215	120F0291	120F0241	-
NTZ271	120F0292	120F0243	-

[1] For single phase compressors electrical components need to be ordered separately

Accessories and Spare parts

Rotolock service valves and valve sets (without gasket)

Table 14: Rotolock service valves and valve sets (without gasket)

Type	Code no	Description	Application	Packaging	Pack size
V01	8168027	Rotolock valve, V01 (1" Rotolock, 3/8" ODF)	Models with 1" rotolock connection	Multipack	6
V06	8168031	Rotolock valve, V06 (1" Rotolock, 1/2" ODF)	Models with 1" rotolock connection	Multipack	6
V04	8168029	Rotolock valve, V04 (1"1/4 Rotolock, 3/4" ODF)	Models with 1"1/4 rotolock connection	Multipack	6
V04	7968006	Rotolock valve, V04 (1"1/4 Rotolock, 3/4" ODF)	Models with 1"1/4 rotolock connection	Industry pack	42
V05	8168030	Rotolock valve, V05 (1"1/4 Rotolock, 7/8" ODF)	Models with 1"1/4 rotolock connection	Multipack	6
V05	7968007	Rotolock valve, V05 (1"1/4 Rotolock, 7/8" ODF)	Models with 1"1/4 rotolock connection	Industry pack	36
V09	8168033	Rotolock valve, V09 (1"1/4 Rotolock, 5/8" ODF)	Models with 1"1/4 rotolock connection	Multipack	6
V09	7968005	Rotolock valve, V09 (1"1/4 Rotolock, 5/8" ODF)	Models with 1"1/4 rotolock connection	Industry pack	50
V02	8168028	Rotolock valve, V02 (1"3/4 Rotolock, 1"1/8 ODF)	Models with 1"3/4 rotolock connection	Multipack	6
V02	7968009	Rotolock valve, V02 (1"3/4 Rotolock, 1"1/8 ODF)	Models with 1"3/4 rotolock connection	Industry pack	24
V07	8168032	Rotolock valve, V07 (1"3/4 Rotolock, 7/8" ODF)	Models with 1"3/4 rotolock connection	Multipack	6
V07	7968008	Rotolock valve, V07 (1"3/4 Rotolock, 7/8" ODF)	Models with 1"3/4 rotolock connection	Industry pack	36
V10	8168022	Rotolock valve, V10 (1"3/4 Rotolock, 1-3/8" ODF)	Models with 1"3/4 rotolock connection	Single pack	1
V09, V06	7703005	Valve set, V09 (1"1/4~5/8"), V06 (1"~1/2")	NTZ048-068	Multipack	4
V07, V04	7703006	Valve set, V07 (1"3/4~7/8"), V04 (1"1/4~3/4")	NTZ096-108	Multipack	6
V02, V04	7703009	Valve set, V02 (1"3/4~1"1/8), V04 (1"1/4~3/4")	NTZ136-271	Multipack	6

Gaskets and gasket sets

Table 15: Gaskets and gasket sets

Type	Code no	Description	Application	Packaging	Pack size
G01	8156130	Gasket, 1"	Models with 1" rotolock connection	Multipack	10
G01	7956001	Gasket, 1"	Models with 1" rotolock connection	Industry pack	50
G09	8156131	Gasket, 1"1/4	Models with 1"1/4 rotolock connection	Multipack	10
G09	7956002	Gasket, 1"1/4	Models with 1"1/4 rotolock connection	Industry pack	50
G07	8156132	Gasket, 1"3/4	Models with 1"3/4 rotolock connection	Multipack	10
G07	7956003	Gasket, 1"3/4	Models with 1"3/4 rotolock connection	Industry pack	50
	8156009	Gasket set, 1", 1"1/4, 1"3/4, OSG gaskets black & white	All 1-2-4 cylinder models	Multipack	10

Rotolock nuts

Table 16: Rotolock nuts

Type	Code no	Description	Application	Packaging	Pack size
	8153122	Rotolock nut, 1"	Models with 1" rotolock connection	Multipack	10
	8153123	Rotolock nut, 1"1/4	Models with 1"1/4 rotolock connection	Multipack	10
	8153124	Rotolock nut, 1"3/4	Models with 1"3/4 rotolock connection	Multipack	10

Solder sleeves

Table 17: Solder sleeves

Type	Code no	Description	Application	Packaging	Pack size
P01	8153010	Solder sleeve, P01 (1" Rotolock, 3/8" ODF)	Models with 1" rotolock connection	Multipack	10
P06	8153007	Solder sleeve, P06 (1" Rotolock, 1/2" ODF)	Models with 1" rotolock connection	Multipack	10
P09	8153011	Solder sleeve, P09 (1"1/4 Rotolock, 5/8" ODF)	Models with 1"1/4 rotolock connection	Multipack	10
P04	8153008	Solder sleeve, P04 (1"1/4 Rotolock, 3/4" ODF)	Models with 1"1/4 rotolock connection	Multipack	10
P05	8153012	Rotolock connector, P05 (1"1/4 Rotolock, 7/8" ODS)	Models with 1"1/4 rotolock connection	Multipack	10
P07	8153013	Solder sleeve, P07 (1"3/4 Rotolock, 7/8" ODF)	Models with 1"3/4 rotolock connection	Multipack	10
P02	8153004	Solder sleeve, P02 (1"3/4 Rotolock, 1"1/8 ODF)	Models with 1"3/4 rotolock connection	Multipack	10
P10	8153003	Solder sleeve, P10	Models with 1"3/4 rotolock connection	Multipack	10

Crankcase heaters

Table 18: Crankcase heaters

Type	Code no	Description	Application	Packaging	Pack size
	7773106	Belt type crankcase heater, 54 W, 230 V, CE mark, UL	NTZ048-068	Multipack	4
	7773013[1]	Belt type crankcase heater, 54 W, 400 V, UL		Multipack	4
	120Z0891	Belt type crankcase heater, 65W, 400V, CE mark, UL		Multipack	6
	7773109	Belt type crankcase heater, 65 W, 110 V, CE mark, UL	NTZ096-108-136	Multipack	6
	7973001	Belt type crankcase heater, 65 W, 110 V, CE mark, UL		Industry pack	50
	7773107	Belt type crankcase heater, 65 W, 230 V, CE mark, UL		Multipack	6
	7973002	Belt type crankcase heater, 65 W, 230 V, CE mark, UL		Industry pack	50
	120Z0466	Belt type crankcase heater, 65 W, 460 V, CE mark, UL		Multipack	6
	120Z0467	Belt type crankcase heater, 65 W, 575 V, CE mark, UL		Multipack	6
	7773110	Belt type crankcase heater, 75 W, 110 V, CE mark, UL	NTZ215-271	Multipack	6
	7773108	Belt type crankcase heater, 75 W, 230 V, CE mark, UL		Multipack	6
	7973005	Belt type crankcase heater, 75 W, 230 V, CE mark, UL		Industry pack	50
	7773118	Belt type crankcase heater, 75 W, 400 V, CE mark, UL		Multipack	6
	120Z0464	Belt type crankcase heater, 75 W, 460 V, CE mark, UL		Multipack	6
	120Z0465	Belt type crankcase heater, 75 W, 575 V, CE mark, UL		Multipack	6

[1] Codes available for NAM and LAM only (distribution form USA)

PTC heaters

Table 19: PTC heaters

Type	Code no	Description	Application	Packaging	Pack size
PTC27W	120Z0459	PTC heater 27W	All models	Multipack	10
PTC27W	120Z0460	PTC heater 27W	All models	Industry pack	50

Discharge thermostat kits

Code no.	Description	Application	Packaging	Pack size
7750009	Discharge thermostat kit	All models	Multipack	10
7973008	Discharge thermostat kit	All models	Industry pack	50

Mounting kits

Table 20: Grommets, sleeves, bolts, washers, Ebox cover, T-block, Solder sleeves, gaskets and T-block

Type	Code no	Description	Application	Packaging	Pack size
	8156001	Mounting kit 1 cyl high	NTZ 048 - 068	Single pack	1
	120Z0964[1]	Mounting kit 2 cyl hp	NTZ 136(1)	Single pack	1
	120Z0763	Mounting kit 2 cyl	NTZ 096-108	Single pack	1
	120Z0764	Mounting kit 2 cyl HP	NTZ 136(3,4,9)	Single pack	1
	120Z0968[1]	Mounting kit 4 cyl	NTZ215-271	Single pack	1

[1] Mounting kits with T-block

Lubricants / oils

Table 21: Lubricants / oils

Type	Code no	Description	Application	Packaging	Pack size
175PZ	120Z0638	POE lubricant, 175PZ, 1 litre can	NTZ-B with R404A, R452A, R507A	Multipack	12
175PZ	120Z0639	POE lubricant, 175PZ, 2.5 litre can	NTZ-B with R404A, R452A, R507A	Multipack	8

Single phase PSC starting kits

Table 22: Single phase PSC starting kits

Type	Code no	Description	Application	Packaging	Pack size
PSC	7701026	Permanent capacitors 440V, 20 µF, 10 µF	NTZ 048-5, 068-5	Multipack	4
PSC	7701035	Permanent capacitors 440V, 30 µF, 15 µF	NTZ096-1, 108-1, 136-1	Multipack	4
PSC	7701151	Permanent capacitors 440V, 25 µF, 25 µF	NTZ 068-1	Multipack	4

Single phase CSR starting kits

Table 23: Single phase CSR starting kits

Type	Code no	Description	Application	Packaging	Pack size
CSR	7701021	Relay + Capacitors : run (15 + 10 µF), start (98 µF)	NTZ 048-1	Multipack	4
CSR	7701022	Relay + Capacitors : run (20 + 10 µF), start (98 µF)	NTZ 048-5, 068-5	Multipack	4
CSR	7701154	Relay + Capacitors : run (25 + 25 µF), start (140 µF)	NTZ 068-1	Multipack	4
CSR	7701042	Relay + Capacitors : run (30 + 15 µF), start (140 µF)	NTZ096-1, 108-1, 136-1	Multipack	6

Single phase CSR starting kits, prewired box

Table 24: Single phase CSR starting kits, prewired box

Type	Code no	Description	Application	Packaging	Pack size
	7701028	Relay + Capacitors : run (20 + 10 µF), start (98 µF)	NTZ 048-5, 068-5	Single pack	1
	7701049	Relay + Capacitors : run (30 + 15 µF), start (140 µF)	NTZ096-1, 108-1, 136-1	Single pack	1

Relays and capacitors

Table 25: Relays and capacitors

Type	Code no	Description	Application	Packaging	Pack size
	8173022	Starting relay type RVA6AMKL	All Single pack phase models (code 1 & 5)	Single pack	1
	8173001	Start capacitor 330V, 98 µF	CSR starting kits	Multipack	10
	8173002	Start capacitor 330V, 140 µF	CSR starting kits	Multipack	10

Acoustic hoods

Table 26: Acoustic hood

Type	Code no	Description	Application	Packaging	Pack size
1 cyl	120Z0575	Acoustic hood for 1 cyl	NTZ048-068	Single pack	1
2 cyl	120Z0576	Acoustic hood for 2 cyl	NTZ096-136	Single pack	1
4 cyl	120Z0577	Acoustic hood for 4 cyl	NTZ215-271	Single pack	1

Terminal boxes, covers & T-block connectors

Table 27: Terminal boxes, covers & T-block connectors

Type	Code no	Description	Application	Packaging	Pack size
	8156134	Cover 80 x 96 mm ; clamp	NTZ048-136 (except 136-1)	Multipack	10
	8173230	T-block 52 x 57 mm, 3 screws H10-32 UNF9.5	NTZ136-1, NTZ215-271	Multipack	10
	8156135	Covers 96 x 115 mm, clamp	NTZ136-1, NTZ215-271	Multipack	10

Miscellaneous

Table 28: Miscellaneous

Type	Code no	Description	Application	Packaging	Pack size
	8156145	Oil sight glass gasket (black)	1-2-4 cyl models produced since 2002	Multipack	10
	8156019	Oil sight glass + gaskets	1-2-4 cylinder VE versions	Multipack	4
	8154001	Blue spray paint	All models	Single pack	1

Updates

Page no.	List of changes
7	Features and Benefit section is added
11	Pressure Equipment Directive information is updated
18	Nominal performance data for R454C and R455A are updated
25	MOC values for single phase electrical characteristics are added
27	MOC values for three phase electrical characteristics are added
42 – 46	Accessories and Spare parts chapter is updated

ENGINEERING
TOMORROW

Online support

Danfoss offers a wide range of support along with our products, including digital product information, software, mobile apps, and expert guidance. See the possibilities below.

The Danfoss Product Store

The Danfoss Product Store is your one-stop shop for everything product related—no matter where you are in the world or what area of the cooling industry you work in. Get quick access to essential information like product specs, code numbers, technical documentation, certifications, accessories, and more.
Start browsing at store.danfoss.com.

Find technical documentation

Find the technical documentation you need to get your project up and running. Get direct access to our official collection of data sheets, certificates and declarations, manuals and guides, 3D models and drawings, case stories, brochures, and much more.

Start searching now at www.danfoss.com/en/service-and-support/documentation.

Danfoss Learning

Danfoss Learning is a free online learning platform. It features courses and materials specifically designed to help engineers, installers, service technicians, and wholesalers better understand the products, applications, industry topics, and trends that will help you do your job better.

Create your Danfoss Learning account for free at www.danfoss.com/en/service-and-support/learning.

Get local information and support

Local Danfoss websites are the main sources for help and information about our company and products. Find product availability, get the latest regional news, or connect with a nearby expert—all in your own language.

Find your local Danfoss website here: www.danfoss.com/en/choose-region.

Coolselector®2 - find the best components for you HVAC/R system

Coolselector®2 makes it easy for engineers, consultants, and designers to find and order the best components for refrigeration and air conditioning systems. Run calculations based on your operating conditions and then choose the best setup for your system design.

Download Coolselector®2 for free at coolselector.danfoss.com.

Ref Tools – essential tools for HVACR professionals

Get the guidance, support, information, and tools you need—on the job and in field. Ref Tools is a free, powerful app that contains essential tools every air conditioning and refrigeration technician needs in their digital toolbelt.

Download Ref Tools for free at coolapps.danfoss.com

Danfoss A/S
Climate Solutions • danfoss.com • +45 7488 2222