MAKING MODERN LIVING POSSIBLE

MPZ - Refrigeration 1 cyl. range

Medium temperature 50 - 60 Hz
R404A / R507A

REFRIGERATION &
AIR CONDITIONING DIVISION

**SELECTION &
APPLICATION GUIDELINES**

CONTENTS

MPZ RECIPROCATING COMPRESSORS

The MPZ series from Danfoss Commercial Compressors is a range of hermetic reciprocating compressors for medium / high evaporating temperature applications.

The MPZ is engineered as a true refrigeration compressor, optimised at -10°C with an extended application range from -30°C to +10°C.

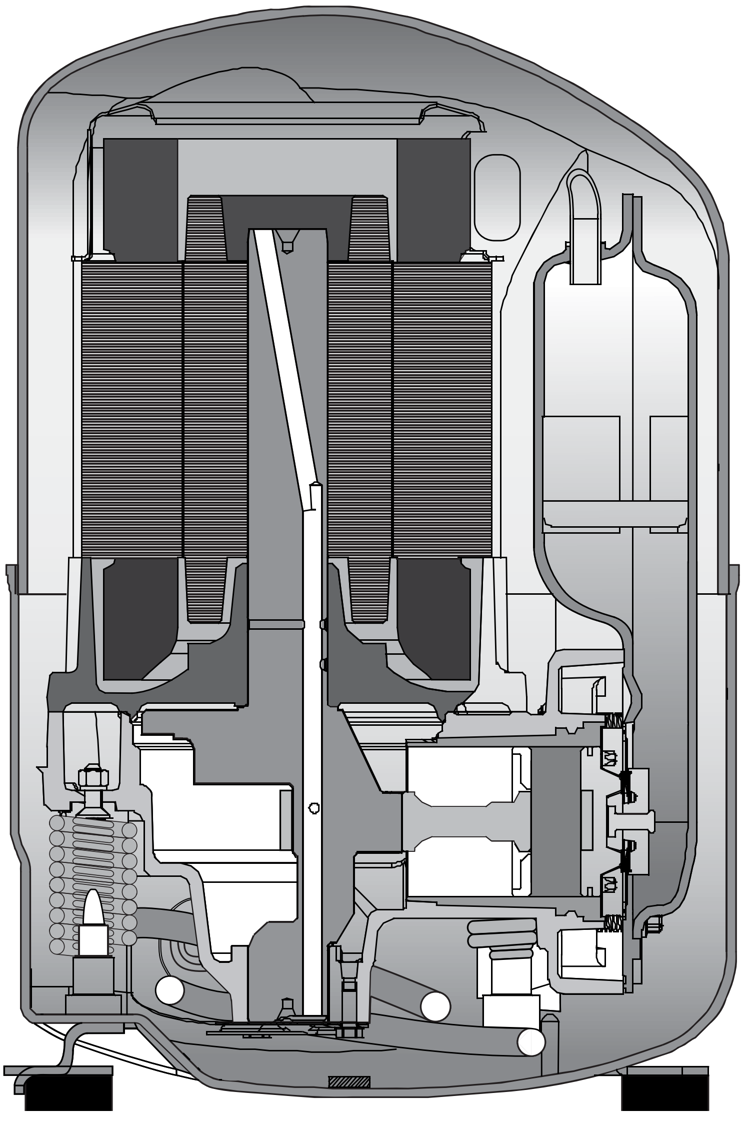
The Danfoss MPZ series is specifically designed for use with R404A / R507A, using 160MPZ polyolester oil as lubricant.

The level of performance combined with extra low sound characteristics rank the MPZ series among the best compressors in their class.

Further, its new shell housing with solder connections is designed to be as compact as possible.

The compressors can be operated at a return gas temperature (suction gas temperature) of 20°C on most of its application window.

The electrical motor is fully suction gas cooled which means that additional body cooling is not required. The compressors can therefore be installed in a sealed compartment or even be insulated with an acoustic insulation hood when the installation requirements call for extra low sound characteristics.



Compressor reference

MP Z 048 A 4 L B 2 A

- **MP**: Medium temperature compressor
- **Z**: POE lubricant & R404A / R507A refrigerant
- **048**: Displacement cm^3
- **A**: Certification index
- **4**: Motor voltage code
  - 1: 208-230 V / 1 ph / 60Hz
  - 3: 200-230 V / 3 ph / 60Hz
  - 4: 380-400 V / 3 ph / 50Hz & 460 V / 3 ph / 60Hz
  - 5: 230 V / 1 ph / 50Hz
- **L**: Protection type
  - L: internal line break protection
- **B**: Piping / connections
  - B: brazed / solder
- **2**: Further options
  - 2: no oil sight glass, no oil equalisation
- **A**: Evolution index

SPECIFICATIONS

Technical specifications

Compressor model	Displacement			Cyl. number	Oil charge	Net weight
	cm³/rev	m³/h at 2900 rpm	m³/h at 3500 rpm		dm³	kg
MPZ038	38	6.6	8.0	1	1.1	25.2
MPZ048	48	8.4	10.1	1	1.1	25.2
MPZ054	54	9.4	11.3	1	1.1	25.2
MPZ061	61	10.6	12.7	1	1.1	25.75
MPZ068	68	11.8	14.3	1	1.1	25.75

Approvals and certificates

Danfoss MPZ compressors comply with the following approvals and certificates.

Certificates are listed on the product datasheets: http://www.danfoss.com/odsg

CE (European Directive)	All models
UL (Underwriters Laboratories)	All 60 Hz models
CCC (China Compulsory Product Certification)	Depending on the model and motor voltage code.
Gost certificate (for Russia)	Depending on the model and motor voltage code.

Nominal performance data - R404A

50 Hz

Compressor model	To = -10°C, Tc = 45°C, RGT= 20°C, SC = 0 K				To = -10°C, Tc = 45 °C , SH = 10 K, SC = 0 K				To = 5°C, Tc = 50°C , RGT = 20°C, SC = 0 K			
	Cooling capacity W	Power input W	Current input A	COP W/W	Cooling capacity W	Power input W	Current input A	COP W/W	Cooling capacity W	Power input W	Current input A	COP W/W
MPZ038	2995	1419	2.9	2.11	2795	1419	2.86	2.0	5049	1837	3.4	2.75
MPZ048	4005	1896	3.5	2.11	3738	1896	3.49	2.0	6446	2515	4.4	2.56
MPZ054	4464	2154	3.9	2.07	4167	2154	3.86	1.9	7329	2906	5.0	2.52
MPZ061	5030	2522	4.9	1.99	4695	2522	4.86	1.9	8080	3357	6.2	2.41
MPZ068	5707	2905	5.5	1.96	5327	2905	5.48	1.8	9027	3928	7.1	2.30

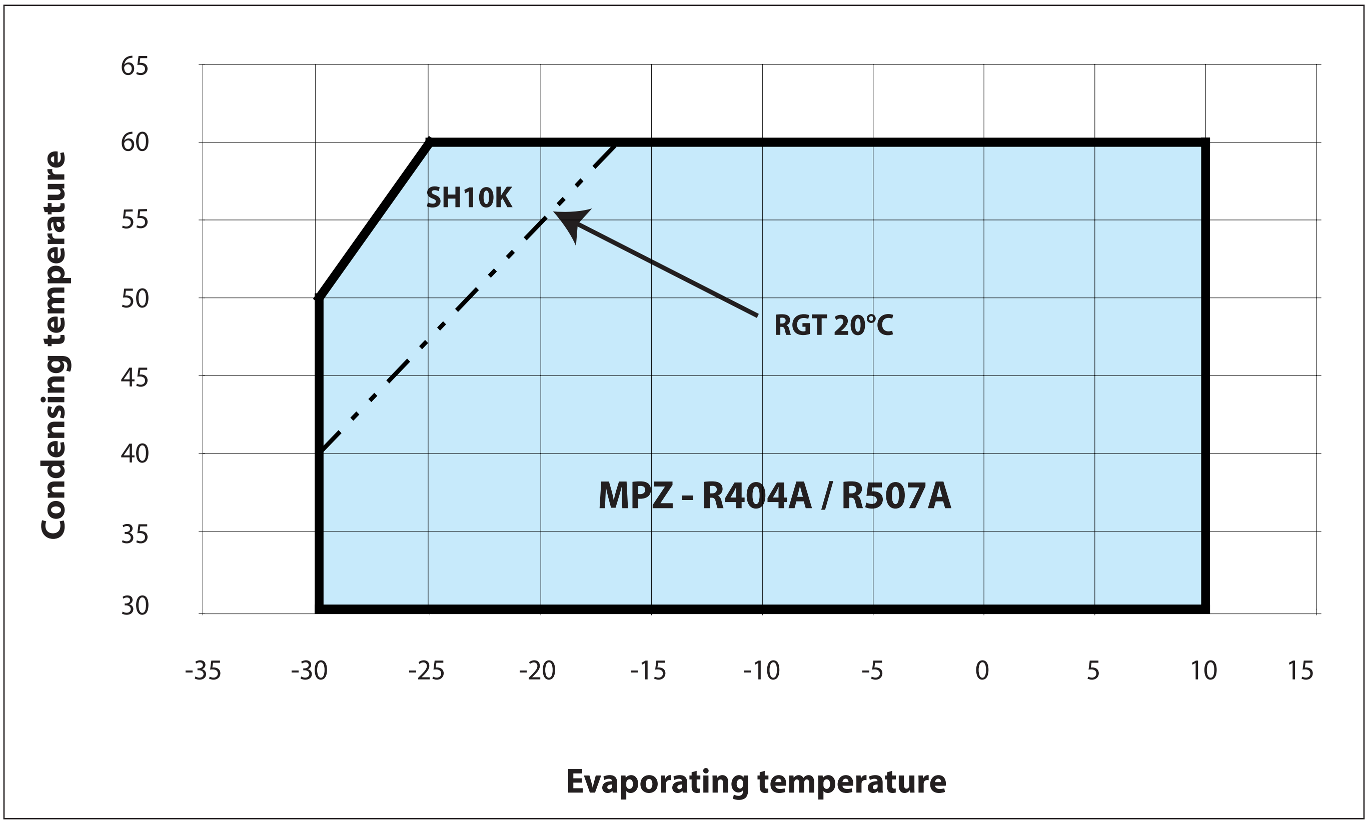
To: Evaporating temperature at dew point (saturated suction temperature)
Tc: Condensing temperature at dew point (saturated discharge temperature)
SC: Subcooling,
SH: Superheat

60 Hz

Compressor model	To = -10°C, Tc = 45°C, RGT= 20°C, SC = 0 K				To = -10°C, Tc = 45 °C , SH = 10 K, SC = 0 K				To = 5°C, Tc = 50°C , RGT = 20°C, SC = 0 K			
	Cooling capacity W	Power input W	Current input A	COP W/W	Cooling capacity W	Power input W	Current input A	COP W/W	Cooling capacity W	Power input W	Current input A	COP W/W
MPZ038	3545	1657	2.7	2.14	3309	1657	2.71	2.0	5925	2175	3.3	2.72
MPZ048	4680	2271	3.4	2.06	4368	2271	3.43	1.9	7554	2975	4.3	2.54
MPZ054	5306	2576	3.8	2.06	4952	2576	3.81	1.9	8593	3523	5.0	2.44
MPZ061	5912	2978	4.7	1.99	5518	2978	4.71	1.9	9581	3975	5.9	2.41
MPZ068	6765	3410	5.2	1.98	6314	3410	5.21	1.9	10773	4668	6.9	2.31

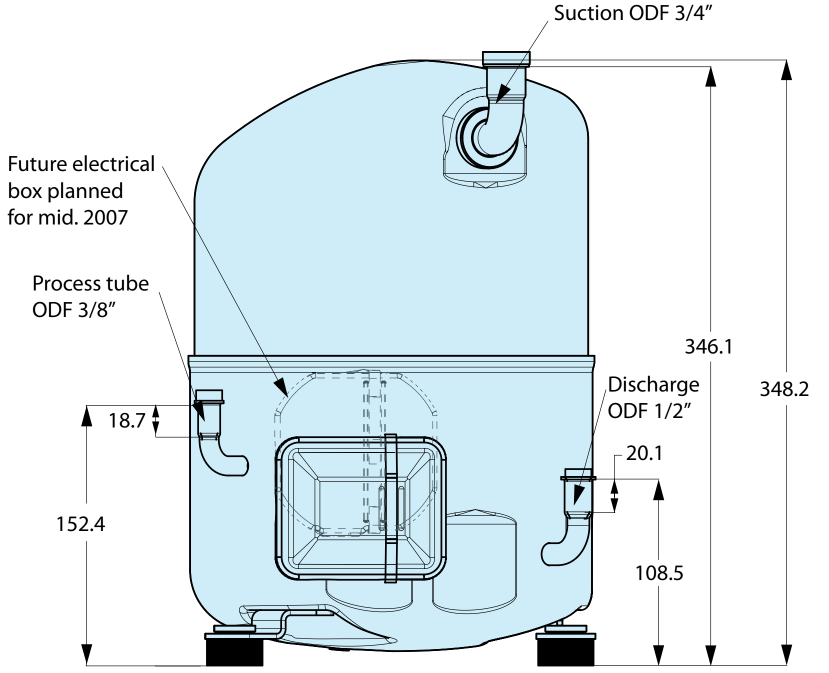
To: Evaporating temperature at dew point (saturated suction temperature)
Tc: Condensing temperature at dew point (saturated discharge temperature)
SC: Subcooling,
SH: Superheat

OPERATING ENVELOPE

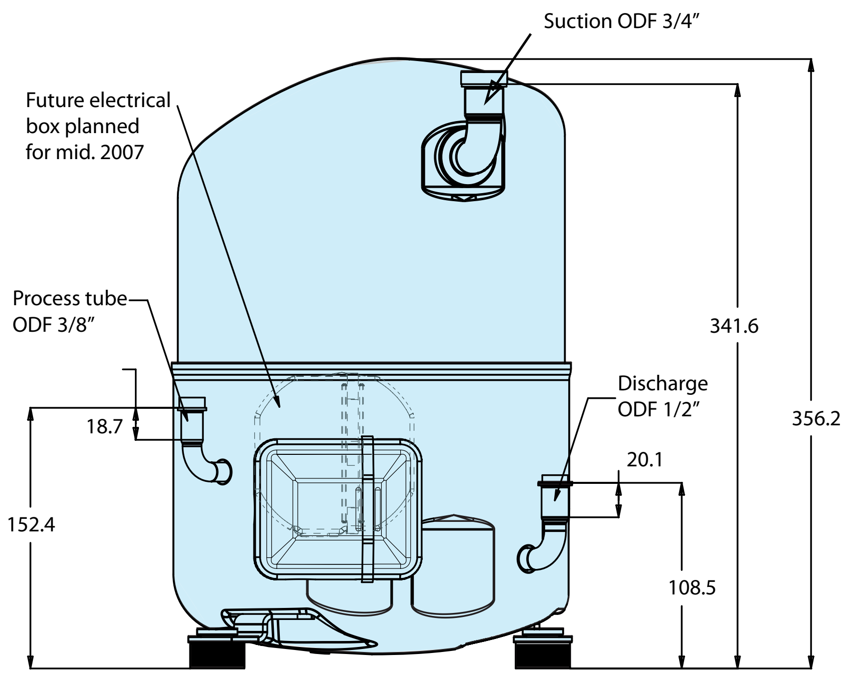


OUTLINE DRAWINGS

Side view, 3 phase models

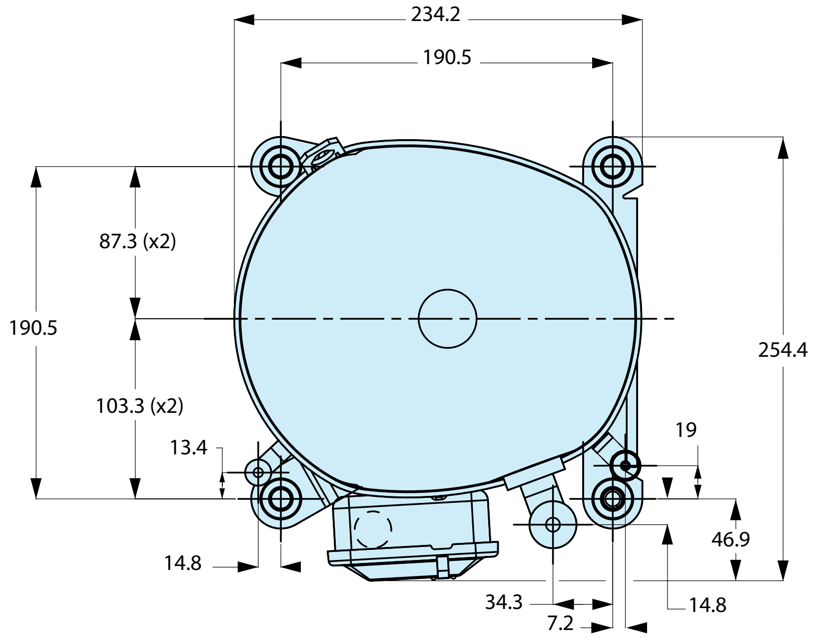


Side view, single phase models

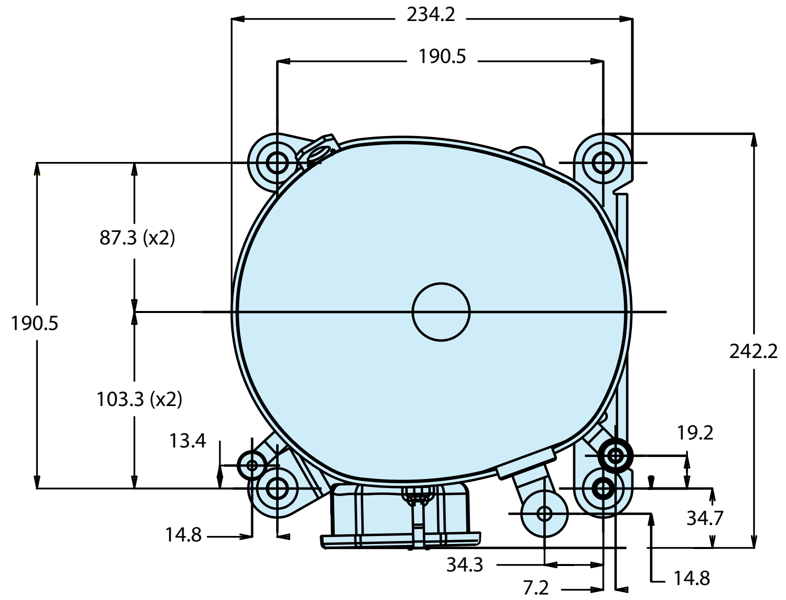


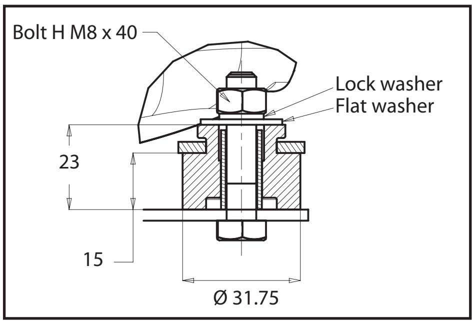
OUTLINE DRAWINGS

Top view, all models



Top view, all models, future electrical box (provisional data)





Silent block

Grommet compression not included (around 1 mm)

ELECTRICAL CONNECTIONS AND WIRING

Three phase electrical characteristics

	LRA - Locked Rotor Current (A)		MCC Maximum Continuous Current (A)		Winding resistance (Ω) (± 7 % at 20° C)	
Motor Code	**3**	**4**	**3**	**4**	**3**	**4**
MPZ038	71.6	29.2	11.5	6.3	1.15	5.6
MPZ048	71.6	29.2	12.2	6.0	1.15	5.6
MPZ054	71.6	29.2	12.5	6.4	1.15	5.6
MPZ061	95	38.1	19	8.5	0.9	4.3
MPZ068	95	38.1	19.6	9.0	0.9	4.3

Single phase electrical characteristics

	LRA - Locked Rotor Current (A)		MCC - Maximum Continuous Current (A)		Winding resistance (Ω) (± 7 % at 20° C)			
Motor Code	1	5	1	5	1		5	
Winding					run	start	run	start
MPZ038	70.5	56	16.7	14	0.63	2.13	0.75	2.54
MPZ048	70.5	56	17.1	17	0.63	2.13	0.75	2.54
MPZ054	70.5	56	24.6	19	0.63	2.13	0.75	2.54
MPZ061	87.5	61	30	26	0.56	1.73	0.69	1.95
MPZ068	87.5	61	32.2	25.5	0.56	1.73	0.69	1.95

Nominal capacitor values and relays

50 Hz / 60 Hz	**PSC/CSR***	**CSR only**	
Models	**Run capacitors (1) (A) µF**	**Start capacitors (2) (B) µF**	**Start relay**
MPZ038	40	100	3ARR3J4A4
MPZ048	40	100	
MPZ054	40	100	
MPZ061	45	100	
MPZ068	45	100	

* PSC: Permanent Split Capacitor
CSR: Capacitor Start Run
(1) Run capacitors: 440 volts
(2) Start capacitors: 330 Volts

Note: the single phase compressor motors are internally protected by a temperature / current sensing bimetallic protector, which senses the main and start winding currents, and also the winding temperature. Once the protector has tripped, it may take up to two to four hours to reset and restart the compressor.

Check that power supply corresponds to compressor characteristics (refer to compressor nameplate).

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

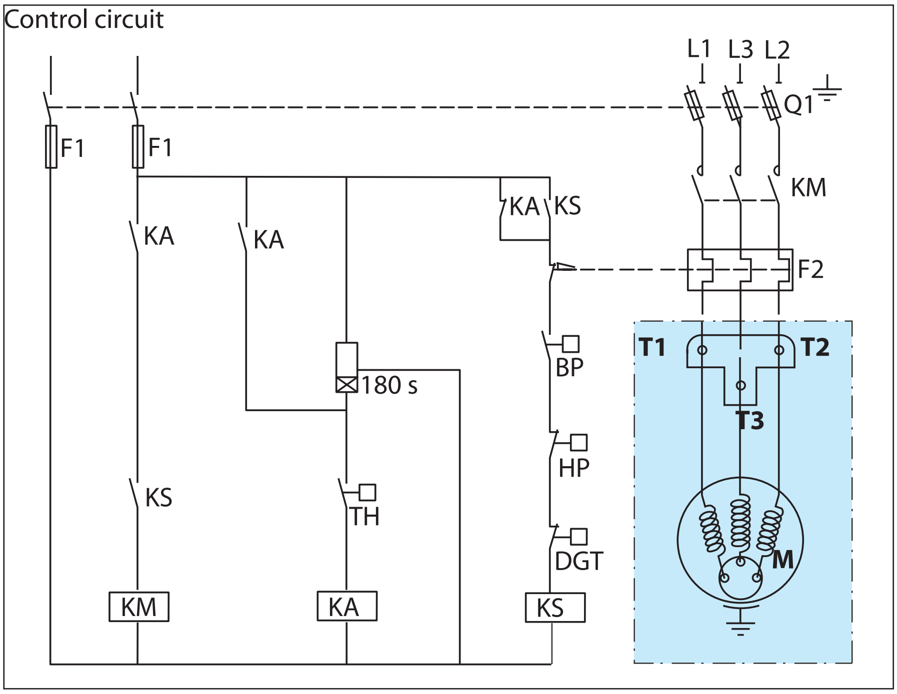
CSR wiring provides additional motor torque at start-up, by the use of a start capacitor in combination with the run capacitor. This system can be used for refrigerant circuits with capillary tubes or expansion valves. The start capacitor is only connected during the starting operation, a potential relay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

ELECTRICAL CONNECTIONS AND WIRING

Suggested wiring diagrams

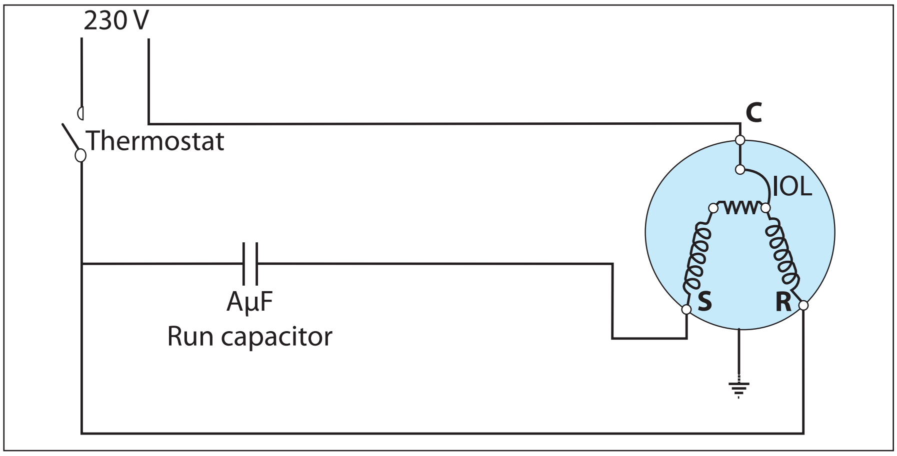
Three phase

Control device	TH
Optional short cycle timer (3 min) 5 pts	180 s
Control relay	KA
Compressor contactor	KM
Safety lock out relay	KS
H.P. switch	HP
Fused disconnect	Q1
Fuses	F1
External overload protection	F2
Compressor motor	M
Discharge gas thermostat	DGT

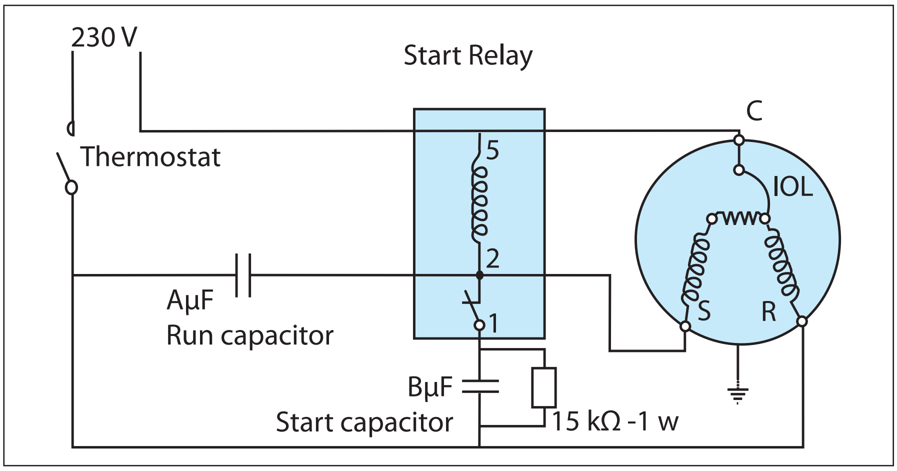


Single phase

PSC wiring



CSR wiring



Soft starters

Starting current of Danfoss MPZ 3-phase compressors can be reduced by using a Danfoss electronic soft starter. The starting current can be reduced by up to 50% depending on the compressor model. Also mechanical stresses that occur at starting are reduced which increases the life of the internal components.

For details of the Danfoss CI-tronic™ MCI soft starters, please refer to literature DKACT.PD.C50.

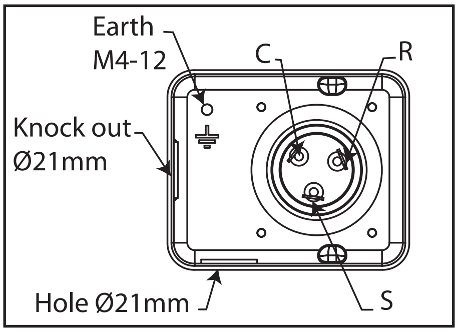
Using soft starters make the number of starts limited to 6 per hour. HP/LP pressure equalisation is required before starting.

Voltage application range

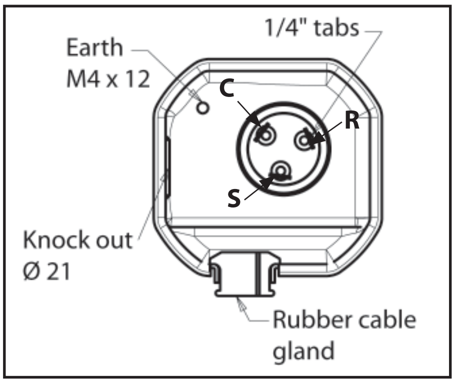
Motor Code	Nominal voltage	Voltage application range
1	208 - 230 V / 60 Hz	187 - 253 V
3	200 - 230 V / 60 Hz	180 - 253 V
4	380 - 400 V / 50 Hz	340 - 440 V
	460 V / 60 Hz	414 - 506 V
5	230 V / 50 Hz	207 - 253 V

Terminal box

The MPZ terminal box has 1/4 " faston terminal tabs for power supply. Note the C, S & R positions which are different from those in MTZ series compressors.
The main cable entry is a Ø 21 mm hole in the bottom side. A Ø 21 mm knock-out at the left side can be used for additional cable entry. The terminal box IP rating according to CEI 529 is IP54 provided that correctly sized cable glands of the same IP class are applied.
In order to reduce the overall compressor dimensions, the terminal box dimensions and location are due to change during 2007 provisional data of the future terminal box are indicated below.



Current terminal box



Future electrical box (mid.2007)

Piping design

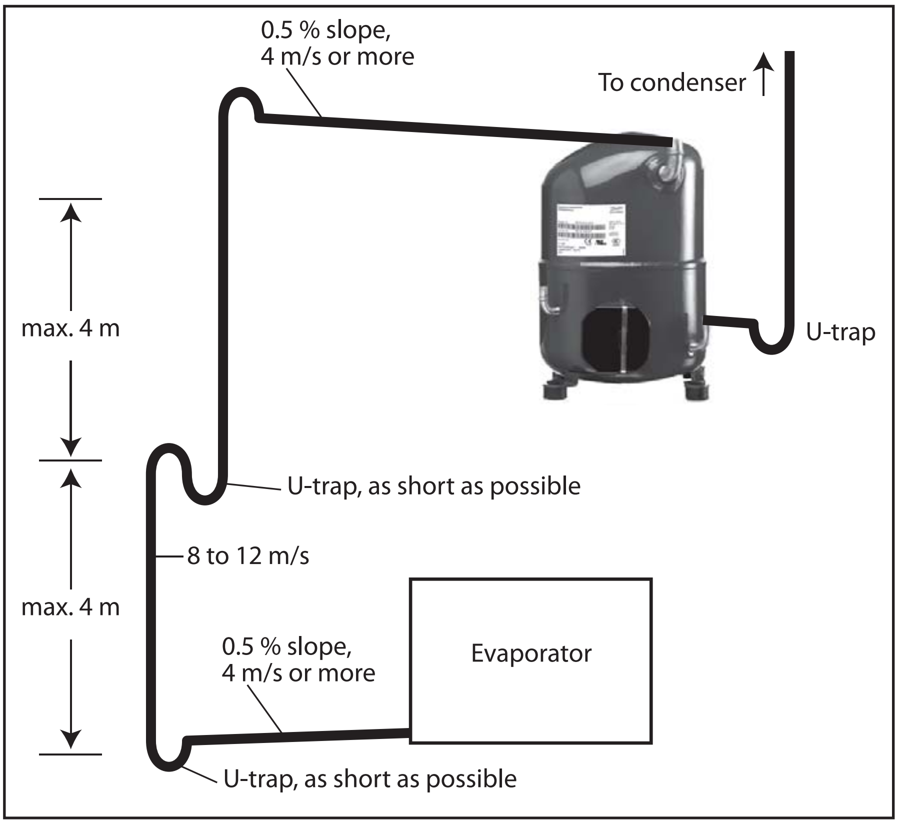
Oil in a refrigeration circuit is required to lubricate moving parts in the compressor. During normal system operation small oil quantities will continuously leave the compressor, with the discharge gas. With good system piping design this oil will return to the compressor. As long as the amount of oil 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).

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.



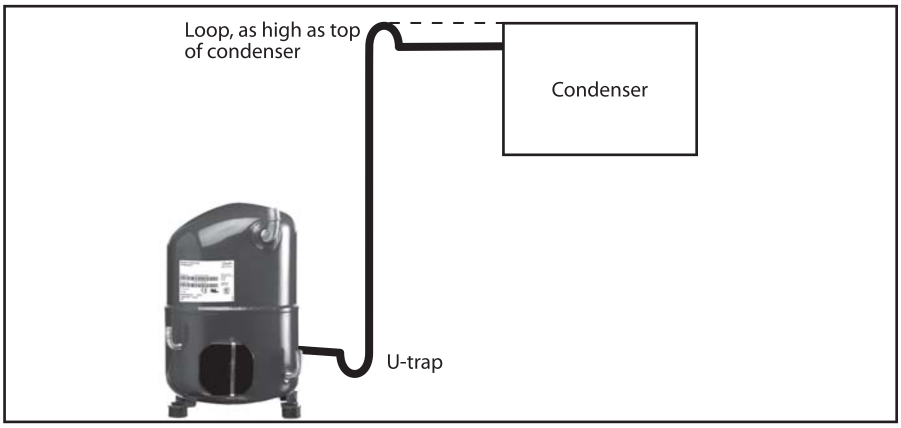
SYSTEM DESIGN RECOMMENDATIONS

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.



Filter driers

For new installations with MPZ 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.

Operating limits

High Pressure

A high pressure safety switch is required to stop the compressor, should the discharge pressure exceed the values shown in the table below. The high pressure switch can be set to lower values depending on the application and ambient conditions.

The HP switch must either be in a lockout circuit, or be a manual reset device to prevent compressor cycling around the high pressure limit. When a discharge valve is used, the HP switch must be connected to the service valve gauge port, which cannot be isolated.

Low pressure

A low pressure safety switch is recommended to avoid compressor operation at too lower suction pressures.

Test pressure low side.................................... 25 bars(g)
Working pressure range high side............ 13.2 - 27.7 bars(g)
Working pressure range low side.............. 1 - 7.2 bars(g)
Free internal volume at low side................ 6.72 litres

Low ambient temperature operation

At low ambient temperatures, the condensing temperature and condensing pressure in air cooled condensers will decrease.

This low pressure may be insufficient to supply enough liquid refrigerant to the evaporator. As a result the evaporator temperature will strongly decrease with the risk of frosting. At compressor start-up, the compressor can pull a deep vacuum and it can be switched off by the low pressure protection. Depending on the low pressure switch setting and delay timer short cycling can occur. To avoid these problems, several solutions are possible, based on reducing condenser capacity:

• Indoor location of condensers

• Liquid flooding of condensers (note: this solution requires extra refrigerant charge, which can introduce other problems. A non-return valve in the discharge line is required and special care should be taken when designing the discharge line.)
• Reduce air flow to condensers.

Other problems can also occur when the compressor is operating at low ambient temperature. During shut down periods, liquid refrigerant can migrate to a cold compressor.

For such conditions a belt-type crankcase heater is strongly recommended.

Note that with 100% suction gas cooled motors, Danfoss MPZ compressors can be externally insulated.

Refer to section "Liquid refrigerant migration & charge limits" for more details.

Operating voltage and cycle rate

Operating voltage range

The operating voltage limits are shown in the table on page 4. 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:

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

Vavg = Mean voltage of phases 1, 2 and 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 three minutes is recommended. The system must be designed in such a way to guarantee a minimum compressor running time in order to provide proper oil return and sufficient motor cooling after starting.

Note that the oil return rate varies as a function of the system design.

Liquid refrigerant control and charge limits

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. Danfoss MPZ 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.

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 refrigerant amount can be dissolved in the compressor oil as HFC and POE have a complete miscibility. 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 cylinder).

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 to 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.

Liquid floodback at change over cycles in reversible heat pumps

In heat pumps, change over from cooling to heating cycles, defrost and low load short cycles may lead to liquid refrigerant floodback or saturated refrigerant return conditions.

The negative effects are:
• oil dilution
• in extreme situations with high system refrigerant charge and large amounts of floodback, liquid slugging could appear.

Crankcase heater

Tests must be conducted to ensure that the appropriate oil temperature is maintained under all ambient conditions.

According our standard recommendation oil temperature has to be maintained 10K above the saturated LP temperature of the refrigerant.

Under extreme conditions such as very low ambient temperature a belt type crankcase heater could be used. The belts 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.

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 shutdown 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 Liquid Line Solenoid Valve (LLSV) + pump-down cycle is required, possibly in conjunction with a suction accumulator.

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 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.

Suction accumulator

A suction accumulator offers considerable protection against refrigerant floodback at start-up, during operation or hot gas defrost cycle.

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

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.

Danfoss MPZ compressors are 100% suction gas cooled, and require no body cooling, thus they can be insulated. For inside mounted compressors, sound insulation of the enclosed location of the compressor 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 level at 50 Hz dB(A)	Sound power level at 60 Hz dB(A)
MPZ038	71	74
MPZ048	68	71
MPZ054	68	71
MPZ061	68	71
MPZ068	68	71

Sound power level for Danfoss MPZ with R404A, motor code 4, Te = -10°C, TC = 45°C

Vibrations

Vibrations are part of acoustic feeling, there are transmitted to the application through the grommet and tubes connections. There is best practise to check whether exit paths are designed in the better way.

Grommet: the mounting grommets delivered with the compressor should always be used. They reduce the vibration transmitted by the compressor mounting feet to the base frame.

The compressor should never be directly mounted to the base frame without the grommets, otherwise high vibration transmission would occur and the compressor service life reduced.

The base on which the compressor is mounted should be sufficiently rigid and link to the main frame of the application to ensure the full effectiveness of the mounting grommets.

Tubes: suction and discharge lines must have adequate flexibility in 3 planes. Eventually vibration absorbers may be required. Take care of the tubes are correctly bended and located in front of the connector before fitting to avoid any constraint on the compressor. Using shock loop with lay high bending diameter is a good mean to reduce the vibrations transmission through the piping. Soft cupper and smaller diameter should be use to make smooth flexible connection.

Care must be taken to avoid tubing having resonant frequencies close to those of the compressor frequency.

Vibration is also transmitted by the refrigerant gas pulsation. Danfoss MPZ compressors have built in mufflers to reduce this vibration.

Note: MPZ compressors have been designed and qualified for stationary equipment used in refrigeration applications.

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

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 the leakage of flux into the piping. The use of flux core or flux coated braze wire or rod instead of brush applied paste flux is strongly recommended. 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 used.

Compressor handling, mounting and connection to the system

Compressor handling

Danfoss MPZ 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 shipping and handling.

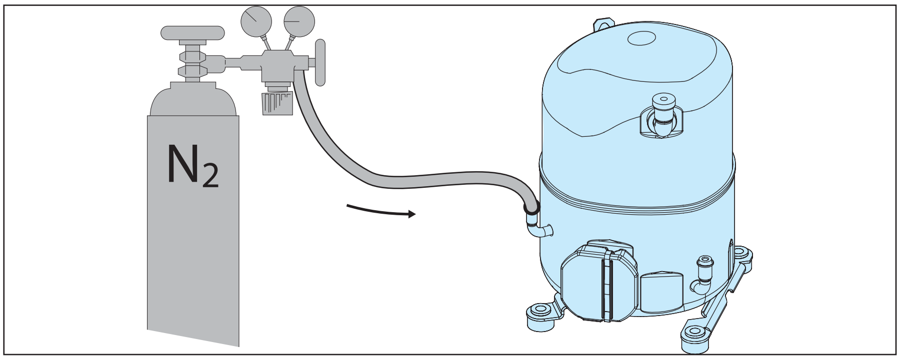
Compressor mounting

Mount the compressor on a horizontal plane with a maximum slope of 3 degrees. All compressors are supplied with four rubber mounting grommets, each complete with metal sleeves and nuts and bolts. Refer to the outline drawings on page 8 & 9. These grommets largely attenuate the compressor vibration transmitted to the base frame. The compressor must always be mounted with these grommets. Recommended mounting torque: 12 - 18 Nm.

Compressor connection to the system

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. 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.
In this situation nitrogen or CO_2 must be purged through the compressor via the process tube to prevent air and moisture ingress. Purging must start when the caps are removed and maintained during the brazing process.



System pressure test

It is recommended that an inert gas such as nitrogen be used for pressure testing. Always use the appropriate pressure regulator with gas cylinders. Any attempt to use a high pressure gaz supply without a suitable pressure regulator can lead to personal injury or death as well as system damage. 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 Danfoss MPZ compressors the maximum test pressure is 25 bars(g).

Leak detection

Perform a leak detection test on the complete system by means of electronic detector after circuit pressurization with nitrogen and R404A.

The low side test pressure must not exceed 25 bar g. Should a leak be discovered, proceed with repair steps and repeat the leak detection.

It is forbidden to use other gasses such as oxygen, dry air or acetylene as these gasses can form an inflammable mixture. Never use CFC or HCFC refrigerants for leak detection of HFC systems.

Note 1: Leak detection with refrigerant may not be allowed in some countries. Check local regulations.
Note 2: Leak detecting additives shall not be used as they may affect the lubricant properties.

Warranty may be voided if leak detecting additives have been used.

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 procedure below is recommended:

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

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 3/8" process tube connection.

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.

4. If suction and discharge line valves are used, connect the compressor to the system by opening the valves. Repeat step 2 and 3.

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

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.

Refrigerant charging

"Near-azeotropic" refrigerant mixtures such as R404A must always be charged in liquid phase. For the initial charge, the compressor must not run. Charge refrigerant as close as possible to the nominal system charge before starting the compressor. Then slowly add refrigerant in the liquid phase, on the low pressure side as far away as possible from the running compressor.

The refrigerant charge quantity must be suitable for both winter and summer operation. Refer also to section "Protection against flooded starts and liquid floodback" for information about refrigerant charge limits.

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.

Suction gas superheat

The minimum suction gas superheat measured on the suction tube 20 cm far from the compressor body is 8K. Lower superheat values increase the risk of unwanted liquid floodback to the compressor.

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

High superheat 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.

ORDERING INFORMATION AND PACKAGING

Ordering - Single pack

Compressor model	Code no.			
	Motor voltage code			
	1	3	4	5
	Nominal voltage			
	208-230/1/60	200-230/3/60	460/3/60 400/3/50	230/1/50
MPZ038	120F0093	120F0118	120F0047	120F0143
MPZ048	120F0094	120F0119	120F0048	120F0144
MPZ054	120F0095	120F0120	120F0049	120F0145
MPZ061	120F0096	120F0121	120F0050	120F0146
MPZ068	120F0097	120F0122	120F0051	120F0147

Ordering - Industrial pack

Compressor model	Code no.			
	Motor voltage code			
	1	3	4	5
	Nominal voltage			
	208-230/1/60	200-230/3/60	460/3/60 400/3/50	230/1/50
MPZ038	120F0103	120F0128	120F0057	120F0153
MPZ048	120F0104	120F0129	120F0058	120F0154
MPZ054	120F0105	120F0130	120F0059	120F0155
MPZ061	120F0106	120F0131	120F0060	120F0156
MPZ068	120F0107	120F0132	120F0061	120F0157

Packaging

<table>
<tr><th rowspan="2">Model</th><th colspan="2">Single pack</th><th colspan="4">Multipack</th><th colspan="4">Industrial pack</th></tr>
<tr><th>Dimensions (mm)</th><th>Gross weight (kg)</th><th>Nbr</th><th>Dimensions (mm)</th><th>Gross weight (kg)</th><th>Static stacking</th><th>Nbr</th><th>Dimensions (mm)</th><th>Gross weight (kg)</th><th>Static stacking</th></tr>
<tr><td>MPZ038</td><td rowspan="5">385
x
280
x
360</td><td rowspan="3">26.3</td><td rowspan="5">8</td><td rowspan="5">1150
x
800
x
510</td><td rowspan="3">223</td><td rowspan="5">4</td><td rowspan="5">12</td><td rowspan="5">1150
x
800
x
520</td><td rowspan="3">317</td><td rowspan="5">4</td></tr>
<tr><td>MPZ048</td></tr>
<tr><td>MPZ054</td></tr>
<tr><td>MPZ061</td><td rowspan="2">26.9</td><td rowspan="2">227</td><td rowspan="2">323</td></tr>
<tr><td>MPZ068</td></tr>
</table>

Single pack: One compressor in a cardboard box.
Multipack: A full pallet of single packs.
Industrial pack: A full pallet of unpacked compressors.
Nbr: Number of compressors per pallet.

The Danfoss product range for the refrigeration and air conditioning industry

Danfoss Refrigeration & Air Conditioning is a worldwide manufacturer with a leading position in industrial, commercial and supermarket refrigeration as well as air conditioning and climate solutions.

We focus on our core business of making quality products, components and systems that enhance performance and reduce total life cycle costs – the key to major savings.

Controls for Commercial Refrigeration

Controls for Industrial Refrigeration

Electronic Controls & Sensors

Industrial Automation

Household Compressors

Commercial Compressors

Sub-Assemblies

Thermostats

We are offering a single source for one of the widest ranges of innovative refrigeration and air conditioning components and systems in the world. And, we back technical solutions with business solution to help your company reduce costs, streamline processes and achieve your business goals.

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