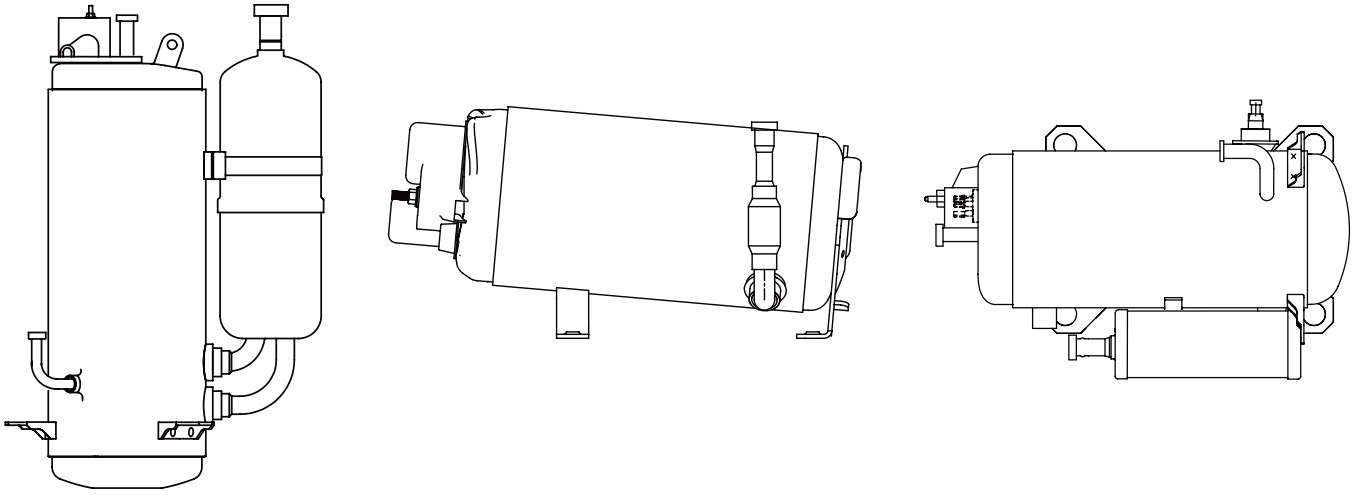
ENGINEERING
TOMORROW

Instructions

Danfoss Rotary compressors



Name plates

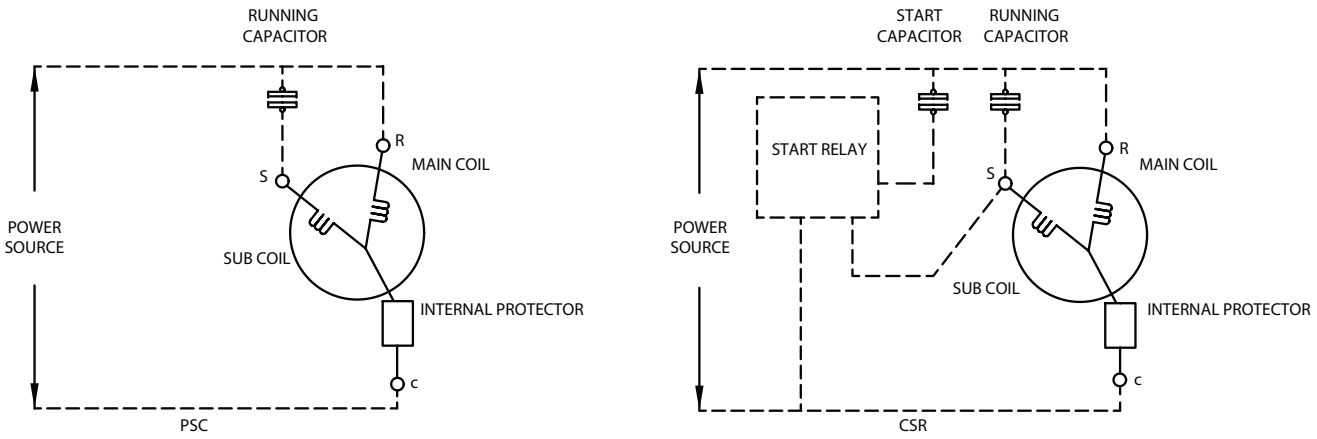
1: Model number
2: Serial number
3: QR code for Model number and serial number
4: Approvals
5: Refrigerant
6: Supply voltage, Starting current
7: Housing service pressure
8: Factory charged lubricant

Fixed speed C-R-S identification

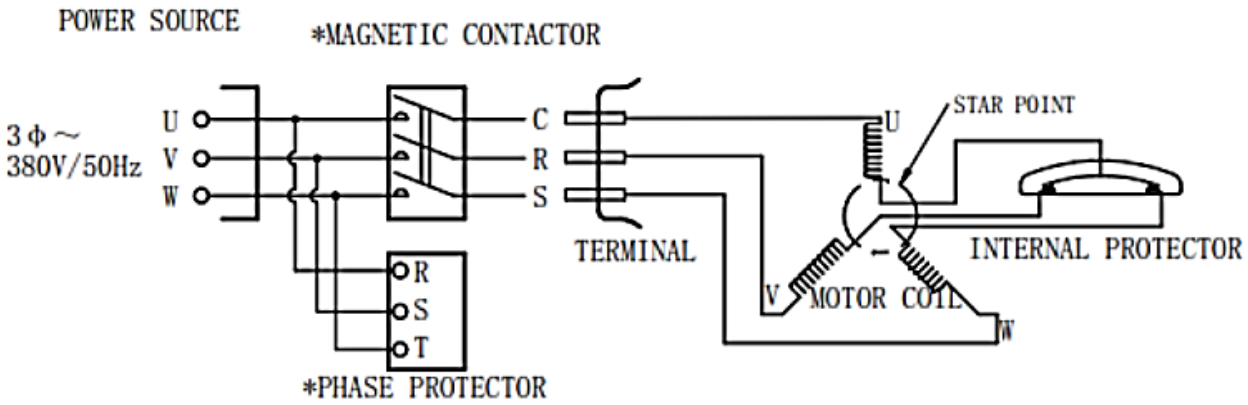
⚠ The compressor must only be used for its designed purpose(s) and within its scope of application (refer to «operating limits»). Consult Application guidelines and datasheet available from cc.danfoss.com	⚠ Under all circumstances, the EN378 (or other applicable local safety regulation) requirements must be fulfilled.	The compressor is delivered under nitrogen gas pressure (between 0.3 and 0.7 bar) and hence cannot be connected as is; refer to the «assembly» section for further details.	The compressor must be handled with caution in the vertical position (maximum offset from the vertical : 15°)

Instructions

Single phase winding diagram

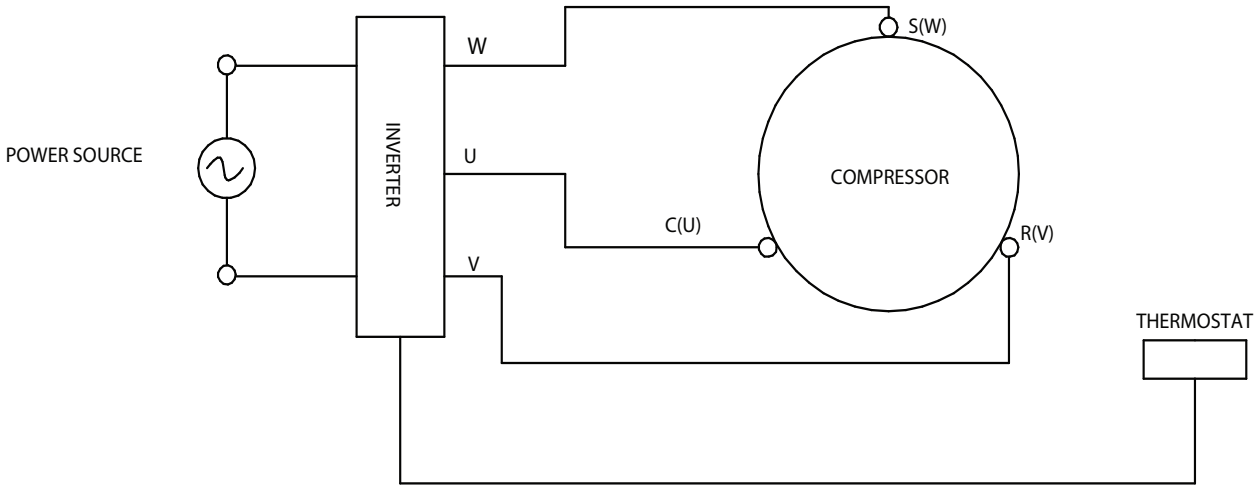


Three phase winding diagram

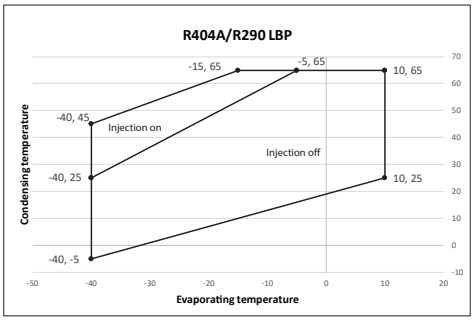


Fixed speed C-R-S identification

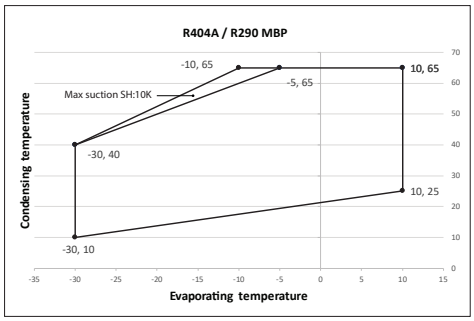
Variable speed winding diagram



Operating limits



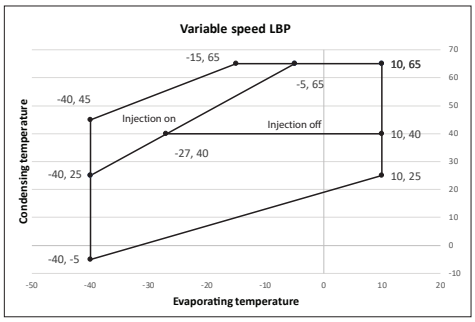
Refrigerant	Model	Application
R404A	LRZ254HSVCHA	MBP / LBP
	LRZ254HDV2EA	MBP / LBP
	LRZ307HBV2EA	MBP / LBP
	LRZ356HSVCLA	MBP / LBP
	LRZ254HDS2EA	MBP / LBP
	LRZ488WTVCMA	MBP / LBP
	LRZ488HTCCMA	MBP / LBP
	LRZ488HBC2EA	MBP / LBP
	LRZ550HTUBMA	MBP / LBP
R290	LRN122DDV1DC	MBP / LBP
	LRN145DDV1DC	MBP / LBP
	LRN160DDV1DC	MBP / LBP



Refrigerant	Model	Application
R404A	MRZ096DSVFFC	MBP
	MRZ193LSVCJA	MBP
	MRZ127DDV1AB	MBP
	MRZ160LDX2EA	MBP
	MRZ211LDX2EA	MBP

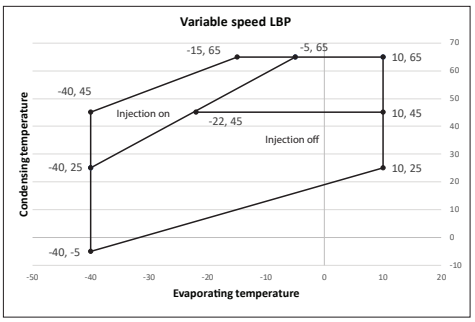
Refrigerant	Model	Application
R290	MRN084DDV1AB	MBP
	MRN102DDV1AB	MBP
	MRN135WSVFBC	MBP
	MRN160WSVDBC	MBP
	MRN307HSVBHD	MBP
	MRN470WTVCMA	MBP

Instructions

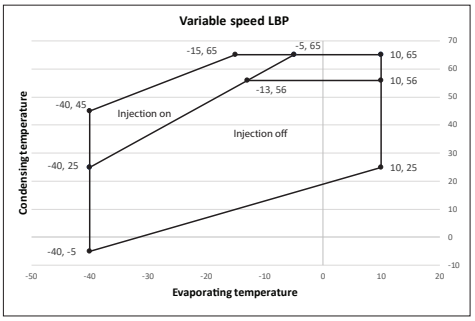


Refrigerant	Model	Speed range (rpm)						Application
		Zone A		Zone B		Zone C		
		Min	Max	Min	Max	Min	Max	
R404A	VRV150DBQ1CE	2400	5400	2400	5400	1800	5400	MBP / LBP
	VRZ163DTQAKE	2100	7200	2100	5400	1000	7200	MBP / LBP
	VRZ752ETTENA	2100	6600	2100	5400	900	6600	MBP / LBP

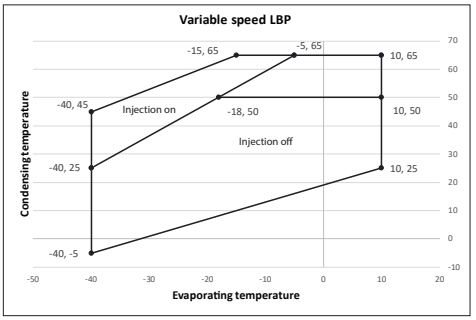
Refrigerant	Model	Speed range (rpm)						Application
		Zone A		Zone B		Zone C		
		Min	Max	Min	Max	Min	Max	
R290	VRN163DTQAKE	2100	7200	2100	5400	1000	7200	MBP / LBP
	VRN356HTRBMA	2000	7200	2000	5400	900	7200	MBP / LBP



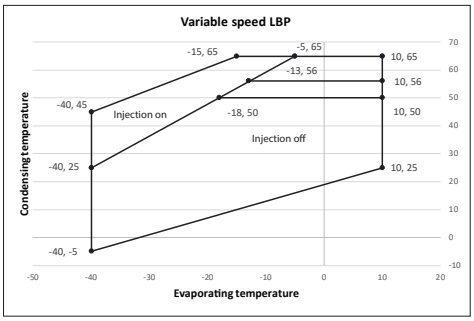
Refrigerant	Model	Speed range (rpm)						Application
		Zone A		Zone B		Zone C		
		Min	Max	Min	Max	Min	Max	
R404A	VRZ254HTRBMA	2000	7200	2000	5400	900	7200	MBP / LBP
	VRZ356HTRBMA	2000	7200	2000	5400	900	7200	MBP / LBP
	VRZ420HTRBMA	2000	7200	2000	5400	900	7200	MBP / LBP



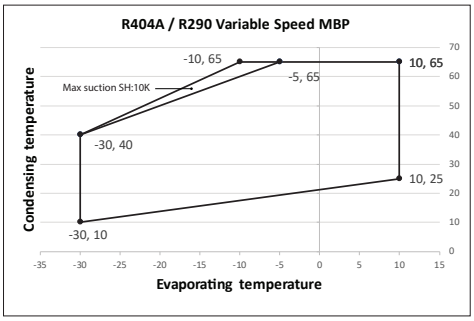
Refrigerant	Model	Speed range (rpm)						Application
		Zone A		Zone B		Zone C		
		Min	Max	Min	Max	Min	Max	
R290	VRN150DBQ1CE	1800	5400	2400	5400	1800	7200	MBP / LBP



Refrigerant	Model	Speed range (rpm)						Application
		Zone A		Zone B		Zone C		
		Min	Max	Min	Max	Min	Max	
R290	VRN420HTRBMA	900	7200	2000	5400	900	7200	MBP / LBP

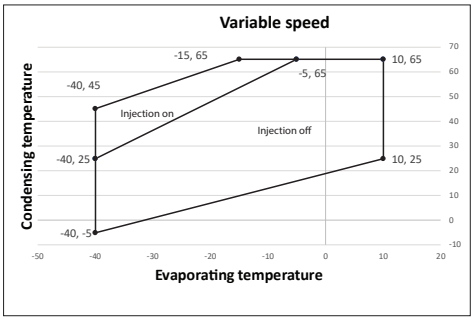


Refrigerant	Model	Speed range (rpm)								Application
		Zone A		Zone B		Zone C		Zone D		
		Min	Max	Min	Max	Min	Max	Min	Max	
R290	VRN550HTWBMA	900	6000	2000	5400	2000	6000	900	6000	MBP / LBP

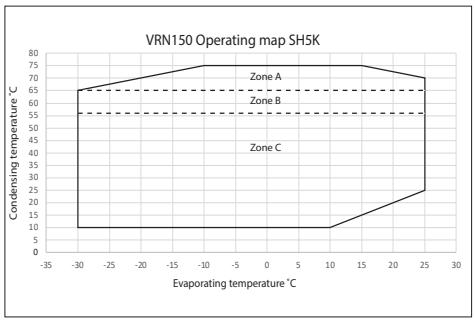


Refrigerant	Model	Min speed (rpm)	Max speed (rpm)	Application
R404A	VRZ110DTMADE	1000	6600	MBP
	VRV420HBR2PA	1800	5400	MBP

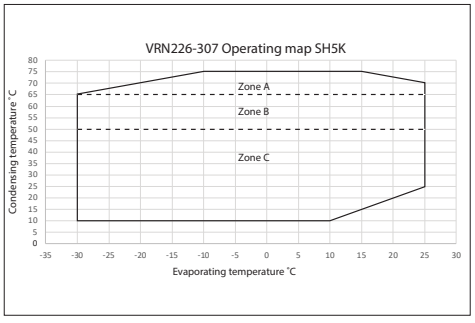
Refrigerant	Model	Min speed (rpm)	Max speed (rpm)	Application
R290	*VRN110DTM***	1000	6600	MBP
	*VRN226DTP***	900	7200	MBP



Refrigerant	Model	Min speed (rpm)	Max speed (rpm)	Application
R404A	VRZ250HBR2EA	1800	4800	MBP / LBP
	VRZ356HBR2EA	1800	4800	MBP / LBP



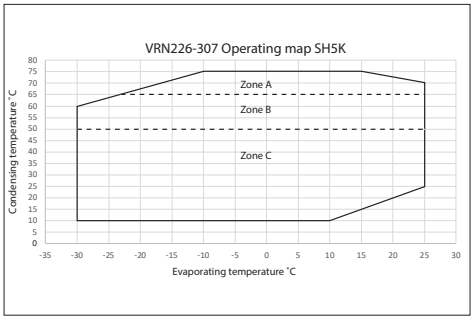
Refrigerant	Model	Speed range (rpm)						Application
		Zone A		Zone B		Zone C		
		Min	Max	Min	Max	Min	Max	
R290	VRN150WSQASE	2100	5000	2100	7200	1000	7200	Heat pump



Refrigerant	Model	Speed range (rpm)						Application
		Zone A		Zone B		Zone C		
		Min	Max	Min	Max	Min	Max	
R290	VRN226WTPAGE	2400	5400	2400	7200	900	7200	Heat pump
	VRN307WTRBQA	2000	5400	2000	7200	900	7200	

For VRN307WT, when operation with single phase drive, at lower voltage you can observe a derating of the compressor

Instructions



Refrigerant	Model	Speed range (rpm)						Application
		Zone A		Zone B		Zone C		
		Min	Max	Min	Max	Min	Max	
R290	VRN418WTRBQA	2000	5400	2000	7200	900	7200	Heat pump
	VRN548WTRBRA	2000	5400	2000	6600	900	6600	

PS TS Information

Fixed speed

Refrigerant	TS Max (°c)		PS (bar)(a)		Models
	LP Side	HP Side	LP Side	HP Side	
R290	125	125	25.0	31.3	LRN122DD~LRN160DD/MRN084DD/MRN102DD/MRN307HS/MRN135WS/MRN160WS
	125	125	25.0	34.0	MRN470WT
R404A	125	125	8.2	34.1	LRZ254HD/LRZ254HS/LRZ307HB/LRZ356HS/LRZ488HB/LRZ488HT/LRZ488WT/LRZ550HT/MRZ096DS/MRZ127DD/MRZ160LD/MRZ193LS/MRZ211LD

Variable speed

Refrigerant	TS Max (°c)		PS (bar)(a)		Models
	LP Side	HP Side	LP Side	HP Side	
R290	125	125	25.0	31.3	VRN110DT/VRN150DB/VRN163DT~VRN226DT/VRN150WS/VRN226WT~VRN548WT
	125	125	25.0	43.0	VRN356HT~VRN550HT/VRN752WT
R404A	125	125	8.2	34.1	VRV150DB/VRV420HB/VRZ110DT~VRZ163DT/VRZ250HB/VRZ254HT~VRZ420HT/VRZ356HB/VRZ752ET

Installation and servicing of the compressor by qualified personnel only. Follow these instructions and sound refrigeration engineering practice relating to installation, commissioning, maintenance, and service.

1 - Introduction

These instructions pertain to the Danfoss rotary compressors used for stationary refrigeration and climatization systems. They provide necessary information regarding safety and proper usage of this product.

2 – Handling and storage

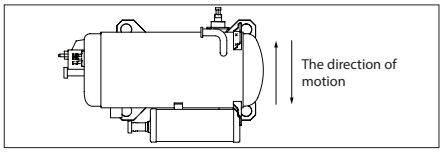
- The compressor should be carried carefully to avoid drop, drag, impact and should not apply partial force on projection parts such as pipe, hermetic terminals, foot during carrying and processing.
- Don't expose the compressor and the packaging to rain or corrosive atmosphere.

3 – Safety measures before assembly

- Never use the compressor in a ATEX zone.
- Verify that the power supply corresponds to the compressor motor characteristics (see nameplate).
- Use the refrigerant of specified brand. When the refrigerant not specified used, it will possibly cause trouble of the performance and reliability of the compressor by the impurities in the refrigerant.
- Use clean and dehydrated refrigeration-grade copper tubes and silver alloy brazing material.
- Use clean and dehydrated system components.
- The piping connected to the compressor must be flexible in 3 dimensions to dampen vibrations.

4 - Assembly

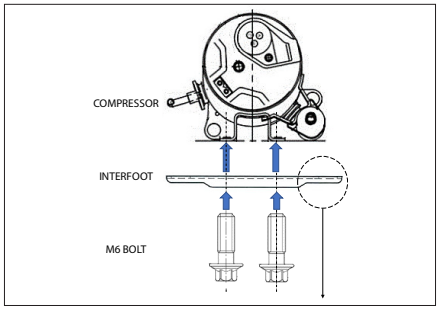
- Vertical compressors shall be installed and run with the rotational axis within 5° at all directions from vertical.
- Horizontal compressor without any additional vibration weaken must not be applied for transportation equipment directly, and the compressor should be perpendicular to the direction of motion. No matter at which condition, the discharge tube must be above the oil level.

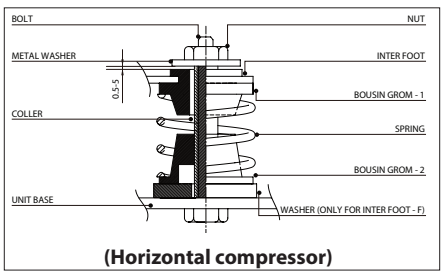


- Rubber grommets are designed soft to provide the noise isolation and to lessen vibration energy transmission. Stud bolt should be designed to provide sufficient clearance for noise and vibration isolation and to prevent compressor from coming off its mount.
- The compressor should not be left opened in the atmosphere for more than 5 minutes.
- The pipe and hermetic pens attached to the compressor should not be bent.
- The hermetic terminals of compressor should not be inserted slantingly and not be applied twisting force after inserting to avoid reducing of terminal fixed force.
- Dust of compressor hermetic terminals
- Compressor hermetic terminals should be mounted with specified cover in right way to prevent dust entering, and should be used in direction which dust is hard to enter in.
- Lead wire of compressor hermetic terminals
- Measuring the temperature of hermetic terminals, lead wire should be resisted to the temperature and be clamped so as not in touch with the surface of compressor and pipe.
- Impurities in refrigerating system

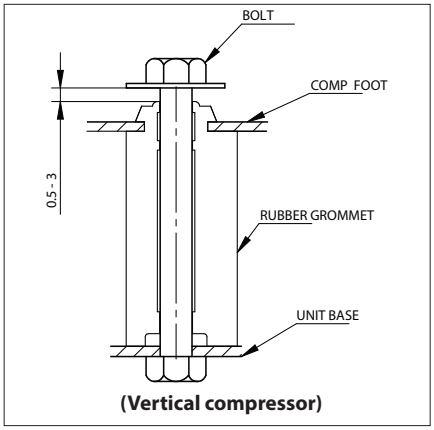
Prevent the impurities from entering the enclosed unit system. When the impurities entered the enclosed system, it will damage the moving mechanism parts and result in the capillary depositing.
Eliminate all system contaminants such as trichlorethylene, alkalies, soaps, oil, acids & washing fluid used at machining heat exchanger and tubes.

- Purge parts with dry nitrogen or dry air to remove remains in parts (dust, detergent, etc.) before assembly of system.
- Time fur purging: over one second for pipe; over three seconds for heat exchanger.
- Purging pressure: 0.9±0.1MpaG.
- Dew point of dry air: Below –20 °C.
- Dry nitrogen should be charged in compressor before assembly of system.
- Welding should be finished within one minute after charge of nitrogen.
- Dry nitrogen needs to be charged again and weld if over one minute.
- Always purge the compressor with dry nitrogen during assembly of system.
- To avoid water and impurity into the refrigeration system and make sure no leakage of refrigerant during the operating course. It's required to direct the erector and maintenance man of air-conditioner.
- The compressor should not be splashed with water intentionally. Prevent moisture from entering the enclosed unit system. When the moisture entered the unit of the refrigerant R290, the refrigerant oil and the organic compound material presented in the hermetic motor will possibly decompose on the affecting of water. It will result in the capillary depositing and the reducing of insulation resistance.
- It is necessary to install a dryer to dehumidify the residual moisture mixed in the refrigerant in the cycling system.
- The specially defined molecular-sieve dryer is advised.
- There should be adequate clearance between the lower surface of bolt flange and the upper surface of rubber grommets.



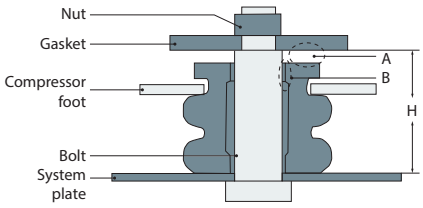


(Horizontal compressor)



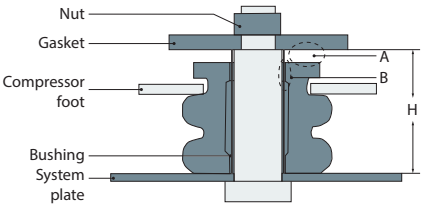
(Vertical compressor)

Support structure 1: Use reducing bolts

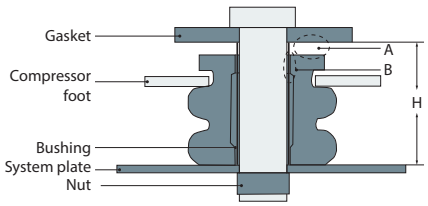


A: The clearance between the top of the rubber foot and the gasket is 1-2mm.
B: The radial clearance between the inder diameter of the rubber foot and the outer diameter of the bushing is 0.5-1mm.

Support structure 2: Use ordinary bolt + steel sleeve



A: The clearance between the top of the rubber foot and the gasket is 1-2mm. That is, the height between the rubber foot and the bushing is 1-2mm.
B: The radial clearance between the inner diameter of the rubber foot and the outer diameter of the bushing is 0.5-1mm.



A: The clearance between the top of the rubber foot and the gasket is 1-2mm. That is, the height between the rubber foot and the bushing is 1-2mm.
B: The radial clearance between the inner diameter of the rubber foot and the outer diameter of the bushing is 0.5-1mm.

- In designing and routing tubing that connect from the compressor to the other parts of the system, following should be considered.
- Moving tubes to the moving parts; minimum clearance 12.7mm (1/2")

- Moving tubes to non-moving parts; minimum clearance 9.5mm ((3/8″)
- Moving tubes never touch to lead wire.
- The tube thickness as followed

Outer diameter (mm)	Thickness
6.35 MIN	0.5 MIN
6.35 - 11.0	0.5 MIN
11.0 - 13.0	0.6 MIN
13.0 - 15.0	0.6 MIN
15.0 - 19.0	0.8 MIN

4 - Leak detection.

- Never pressurize the circuit with oxygen or dry air. This could cause fire or explosion.
- Do not use leak detection dye.
- Perform a leak detection test on the complete system.

The leakage test pressure should be less than
R404A: 3.20 MPa.
R290: 2.343MPa.

- When a leak is discovered, repair the leak, and repeat the leak detection.

6 - Vaccum dehydration

- The compressor should not be operated to form a vacuum and to absorb air.
- Never use the compressor to evacuate the system.
- Do not use a megohmmeter nor apply power to the compressor while it is under vacuum as this may cause internal damage.
- The degree of vacuum in refrigerating system should be less than 20Pa (150×10^3mmHg) at room temperature just before charging refrigerant. The quantity of water should be less than 0.15ml.

7 - Electrical connections

- The compressor only can run in one direction which according to lead routing wiring diagram. Never reversion otherwise the compressor will be in trouble.
- For variable speed, specified inverter is linked up with compressor terminals. Applied voltage of this inverter should be voltage specified in this "compressor specification". Alternating voltage should never be applied on terminals (for example: commercial alternating voltage of 1ph 100V, 200V, 3ph 200V). This is because that if applied alternating current the direct current motor will demagnetize.
- For variable speed, the compressor should be operated in the range of rated voltage±10%, under standard condition and overload condition of rated frequency (applied voltage to inverter).
- It must be satisfied with the temperature and pressure requirement in this instruction and the overload condition should not be continuous.
- But the standard condition and overload condition mentioned here refer to condition that specified in GB/T 7725.(The standard condition refers to the rating cooling condition and the overload condition refers to the maximum operating condition.)
- For fixed speed compressor, voltage applied to hermetic terminal should be equal to the rated voltage +/-10%.In the case of three phase, the phase imbalance should be within 3% among the compressor terminals.

The phase imbalance should be calculated according to the follow formula.

$$\text{the phase imbalance} = \frac{(V)\text{max} - (V)\text{mean}}{(V)\text{ mean}} \times 100\%$$

(V)max: Maximum voltage among the three terminals.
(V)mean: Average voltage among the three terminals.

- The main electric circuit should be equipped with fuse or breaker.
- All electrical components must be selected as per local standards and compressor requirements.

8 - Filling the system

- Keep the compressor switched off.
- Refrigerant should be charged from the end of condenser of refrigerating systems. Never charge refrigerant to the compressor directly. The refrigerant should always be charged in liquid state. When the refrigerant is charged in gas state, the percent component will possibly be changed. Do not recharge with the remaining refrigerant in the system when leakage happened. Because the percent component of the refrigerant in the unit system had possibly been changed.
- Refrigerant R-290 99.9% in purity should be used for apparatus. 99.95% is recommended, if possible.

9 - Verification before commissioning

- The trouble of cross valve, electromagnetic valve, defroster, refrigerant controller, fan motor used in refrigerating system may cause compressor accident. So, their reliability should be ensured completely. Moreover, the way of design, manufacture, application of refrigeration cycle with less-leak should be adopted.
- The units of refrigerating system should be connected to earth.
- The operating temperatures and pressures of a compressor should be within the range shown in the operation limit.
- Compressor can be used when ambient temperature is higher than -10 °C. Confirm the start-up of compressor if the temperature of compressor surface is below -10 °C. Heat up compressor to reach the temperature higher than -10 °C with heater if the ambient temperature is below -10 °C.
- Set a thermostat on the case cover of compressor to provide complementary reaction in case of refrigerant leakage. The thermostat can stop the operation of compressor when compressor in abnormal temperature. The lead wires of thermostat are enveloped with tube, as same as that of the terminals, to avoid direct contact with the compressor and pipe.
- When using the R290 models, the manufacturing process of refrigerating system must comply with the regulations related to flammable refrigerants, since R290 is flammable refrigerant.
- When using the R290 models, explosion-proof unit should be used in the system.

10 - Start-up

- Never start the compressor when no refrigerant is charged.
- Do not provide any power to the compressor unless suction and discharge service valves are open, if installed.
- Energize the compressor. It must start promptly. If the compressor does not start, check wiring conformity and voltage on terminals.

11 - Check with running compressor

- In all allowable rotational speed range, the difference of pressure should be more than 0. 39MPa{4kgf/cm^2}. But if there is no problem of noise when assembled in air conditioner, it can also below this value.
- Discharge pipe temperature is measured at a distance 300mm from the surface of compressor and should be less than 110°C for vertical type and 100°C for horizontal type. The tip of the thermocouple is fixed by soldering when measuring discharge pipe temperature, furthermore, soldering point is covered with urethane foam to prevent the effect of wind.
- The oil should be returned continuously to the compressor and the structure of the refrigerating system should not make oil stay in the system. When the oil cannot return to the compressor properly, oil separator should be installed.
- The start-stop frequency should be less than 6 times per hour. Operating time from start to stop should be more than 3 minutes.Stopping time should be more than 3minutes. Suction and discharge pressure should balance completely before restarting.
- The rate of compressor rotational speed (acceleration) should be less than 133min-1/s, but if the variable range is below 120min-1, rate can also be less than 600min-1 when rotational speed is reduced to avoid temporary over- current.
- The compressor should be operated for more than 20 seconds within 15 minutes after charging refrigerant into the system so proper lubrication results.
- There should not exist noise of the liquid refrigerant compression, current and vibrancy increase. System can append the assistant stank or reduce the amount of refrigerant to prevent from liquid refrigerant compression. Refrigerant system forbids liquid refrigerant from flowing back compressor in any case. In normal condition the overheat gas refrigerant should flow back compressor.
- The motor winding temperature should be less than 149 °C and hermetic terminal body temperature should be less than 177 °C in process of manufacturing.
- The max vibration level of the pipes, which connect from the compressor to other parts of the refrigerate- or systems, should be less than 0.8mm (1/32″) when the compressor is operating at allowable rotational speed range and voltage range of rated ±10%. Displacement more than 0.8mm (1/32″) will require changing tube length and/or routing.
- Temperatures within systems during stable compressor operation should not be less than -35 °C to prevent wax precipitation from the oil.
- For variable speed compressor, adjust the start-up current of the compressor to get enough tor-

sion by inverter. Confirm and measure the start-up current if change the parts and design.
- Current peak among motor terminals (include instantaneous current peak) should be below demagnetizing current to prevent magnet in motor from demagnetization.
- The refrigerant migration to compressor shell should be avoided during the system shut down periods, it's suggested that the electric heating belt should be used around the shell bottom when necessary.
- Oil sump super heat (Oil sump temperature minus Condensing temperature) It is necessary to have an oil superheat higher than 6K for R404A application and an oil superheat higher than 10K for R290 application.
- Discharge super heat (Discharge temperature minus Condensing temperature). Discharge superheat is to be at least 6K, to avoid oil dilution and reduced lifetime.

12 - Maintenance

- Internal pressure and surface temperature are dangerous and may cause permanent injury. Maintenance operators and installers require appropriate skills and tools. Tubing temperature may exceed 100°C / 212°F and can cause severe burns.Ensure that periodic service inspections to ensure system reliability and as required by local regulations are performed. To prevent system related compressor problems, following periodic maintenance is recommended:
- Verify that safety devices are operational and properly set.
- Ensure that the system is leak tight.
- Check the compressor current draw.
- Confirm that the system is operating in a way consistent with previous maintenance records and ambient conditions.
- Check that all electrical connections are still adequately fastened.
- Keep the compressor clean and verify the absence of rust and oxidation on the compressor shell, tubes, and electrical connections.
- Acid / moisture content in system and oil should be checked regularly.

13 - Warranty

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

14 – Disposal

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

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