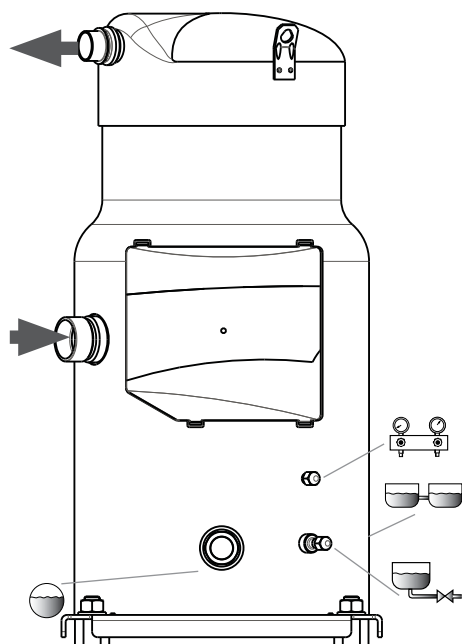


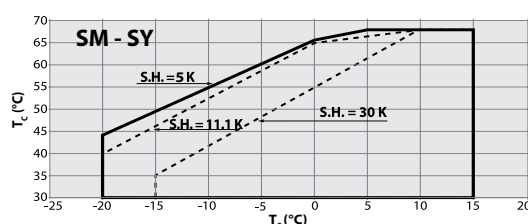
# INSTRUCTIONS SM / SY / SZ / SH / WSH COMPRESSORS



- A:** Model number  
**B:** Serial number  
**C:** Refrigerant  
**D:** Supply voltage, Starting current & Maximum operating current  
**E:** Housing service pressure  
**F:** Factory charged lubricant

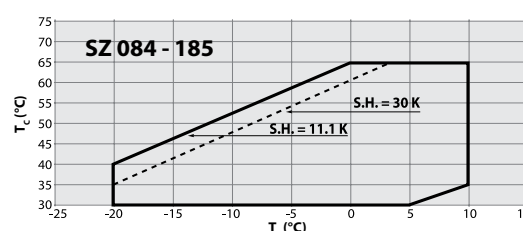
**⚠ Installation and servicing of the compressor by qualified personnel only. Follow these instructions and sound refrigeration engineering practice relating to installation, commissioning, maintenance and service.**

**R22 & R417A**

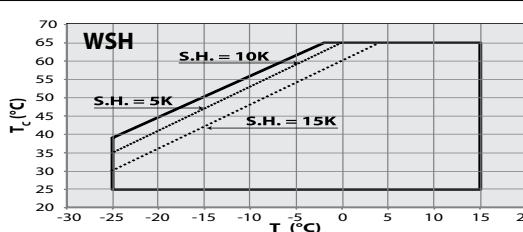
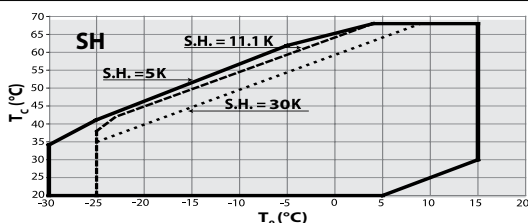


When SM compressors are used with R417A, the factory charged mineral oil 160P must be replaced by polyolester oil 160SZ.

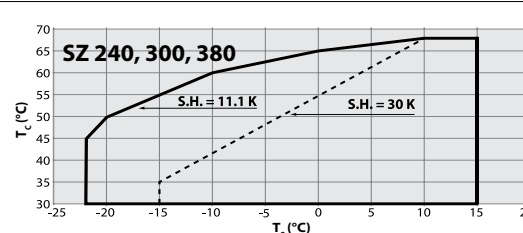
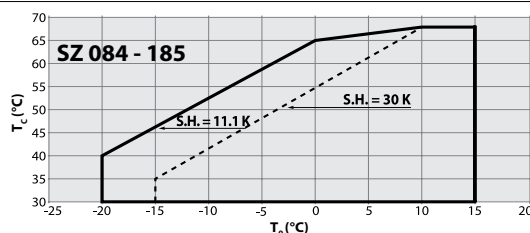
**R404A & R507A**



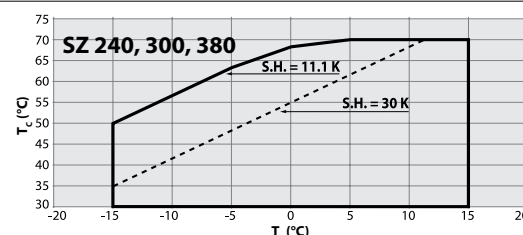
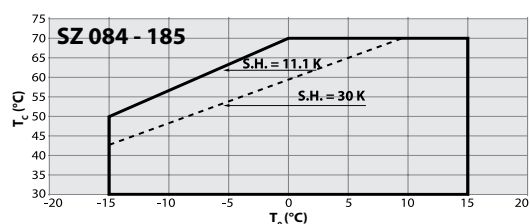
**R410A**



**R407C**  
Dew point Conditions



**R134a**



**⚠** 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](http://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.

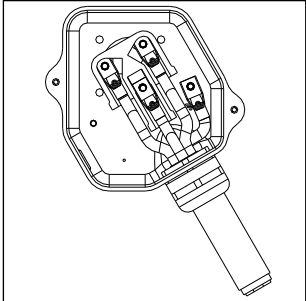
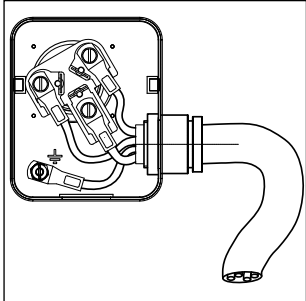
The compressor must be handled with caution in the vertical position (maximum offset from the vertical: 15°)

SH / WSH 090 - 105 - 120 - 140 \*- 161\* -184\*  
SM 084 - 090 - 100 - 110 - 112 - 120 - 124 - 147 - 148 - 161  
SZ 084 - 090 - 100 - 110 - 120 - 147 - 148 - 161

These Danfoss scroll compressors compressors are protected against overheating and overloading by an internal safety motor protector. However, an external manual reset overload protector is recommended for protecting the circuit against over-current.

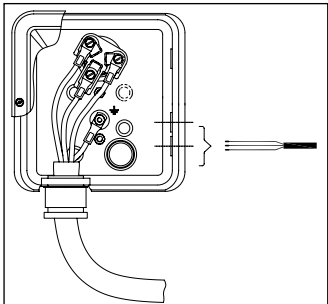
All models except SH/  
WSH140-3 & 161-3 & 184

SH140-3 & 161-3 & 184  
WSH140-3 & 161-3 & 184



SM 115 - 125 - 160 - 175 - 185  
SZ 115 - 125 - 160 - 175 - 185 versions with thermostat

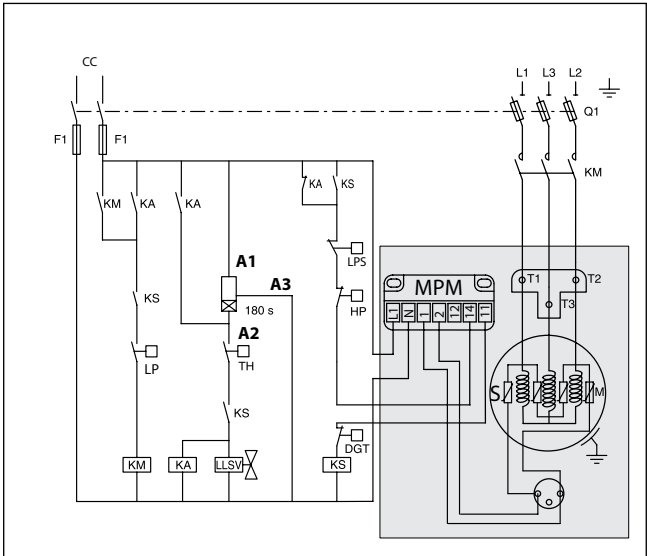
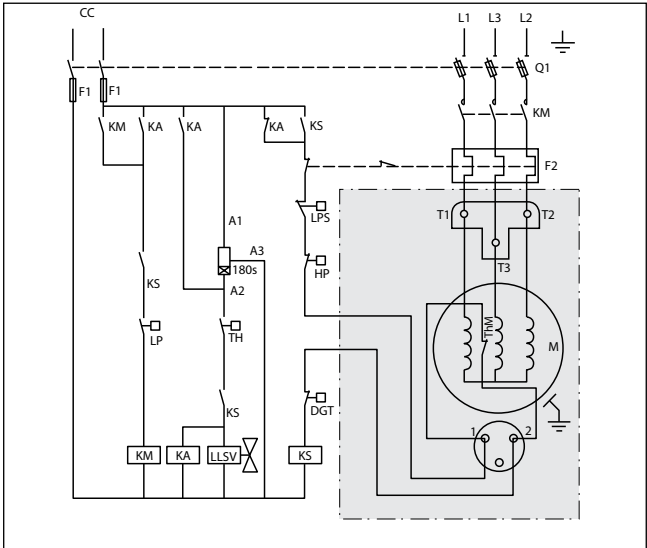
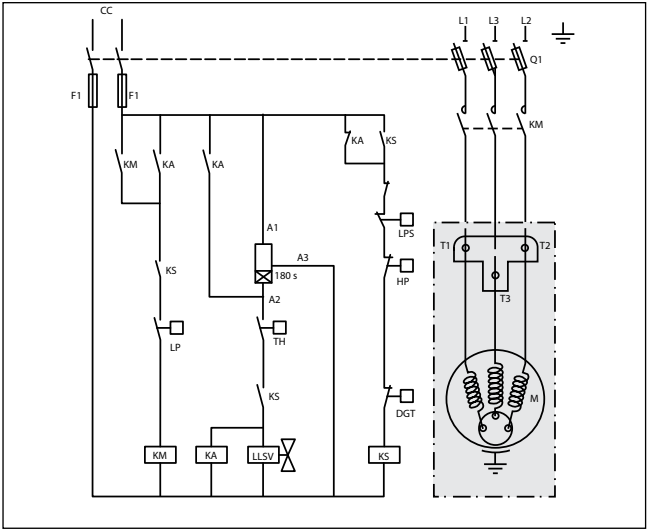
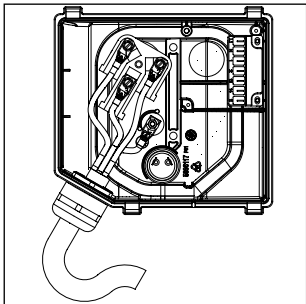
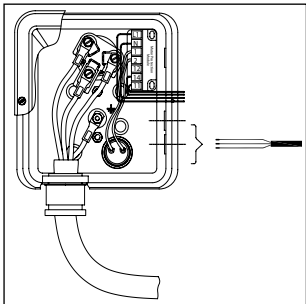
These Danfoss scroll compressors compressors are provided with a bimetallic single pole single throw thermostat which is located in the motor windings. Because the thermostat is an automatic reset device, it must be wired in a lockout safety circuit with a manual reset to restart the unit. For over-current protection, an external manual reset overload protector must be used.



SH 180  
SM 115 - 125 - 160 - 175 - 185  
SZ 115 - 125 - 160 - 175 - 185 versions with electronic module

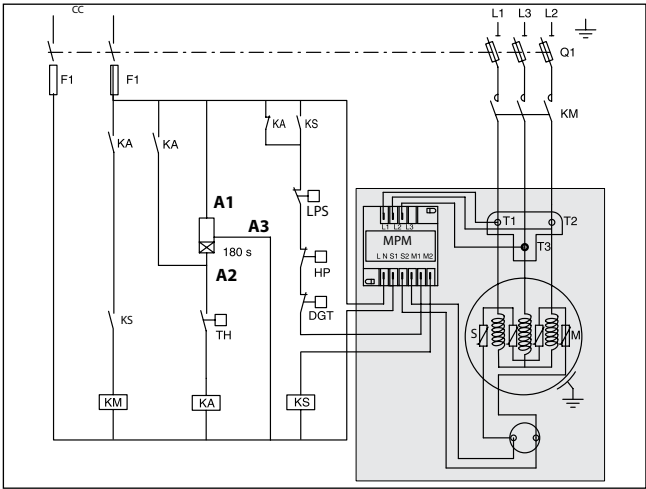
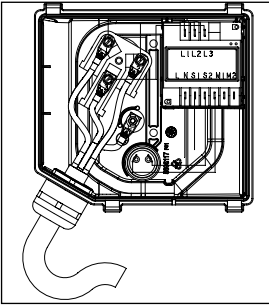
This Danfoss scroll compressors compressor motor is protected by an external module protecting against overheating and high current draw.

SM 115 - 125 - 160 - 175 - 185  
SZ 115 - 125 - 160 - 175 - 185 SH180



SH 240 - 295 - 300 - 380 -485  
SY 240 - 300 - 380  
SZ 240 - 300 - 380

These Danfoss scroll compressors compressors' motors are protected by an external module protecting against phase loss/reversal, over-heating and high current draw.



Legend:

Fuses .....F1  
Compressor contactor.....KM  
Control device.....KA  
Safety lock out relay.....KA  
Optional short cycle timer (3 min) ..... 180 s  
External overload protection.....F2  
Pump-down pressure switch .....LP

High pressure safety switch.....HP  
Control device.....TH  
Liquid Line Solenoid valve.....LLSV  
Discharge gas thermostat.....DGT  
Fused disconnect.....Q1  
Motor safety thermostat.....thM  
Compressor motor .....M

Motor Protection Module .....MPM  
Thermistor chain.....S  
Safety pressure switch .....LPS  
Control circuit .....CC

All Wiring diagrams are with pump-down cycle

1 – Introduction

These instructions pertain to the Danfoss scroll compressors SM, SY, SZ, SH & WSH scroll compressors used for air-conditioning systems. They provide necessary information regarding safety and proper usage of this product.

2 – Handling and storage

- Handle the compressor with care. Use the dedicated handles in the packaging. Use the compressor lifting lug and use appropriate and safe lifting equipment.
- Store and transport the compressor in an upright position.
- Store the compressor between -35°C and 50°C.
- Don't expose the compressor and the packaging to rain or corrosive atmosphere.

3 – Safety measures before assembly

⚠ Never use the compressor in a flammable atmosphere.

- The compressor ambient temperature may not exceed 50°C during off-cycle.
- Mount the compressor on a horizontal flat surface with less than 3° slope.
- Verify that the power supply corresponds to the compressor motor characteristics (see nameplate).
- When installing SZ or SH or WSH, use equipment specifically reserved for HFC refrigerants which was never used for CFC or HCFC refrigerants.
- 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

- In parallel assemblies of SH, WSH, SM112 - 124 - SM/SZ147 the compressor requires a rigid mounting on the rails. Use the rigid spacers from the tandem mounting kit or the rigid spacers delivered with dedicated tandem compressors.
- Slowly release the nitrogen holding charge through the schrader port.
- Remove the gaskets when brazing rotolock connectors.
- Always use new gaskets for assembly.
- Connect the compressor to the system as soon as possible to avoid oil contamination from ambient moisture.
- Avoid material entering into the system while cutting tubes. Never drill holes where burrs cannot be removed.
- Braze with great care using state-of-the-art technique and vent piping with nitrogen gas flow.
- Connect the required safety and control devices. When the schrader port is used for this, remove the internal valve.
- Do not exceed the maximum tightening torque for rotolock connections:

Rotolock connections	Tightening torque
1" rotolock	80 Nm
1 1/4" rotolock	90 Nm
1 3/4" rotolock	110 Nm
2 1/4" rotolock	130 Nm.

5 – Leak detection

⚠ Never pressurize the circuit with oxygen or dry air. This could cause fire or explosion.

- SM 084 to 185, SY 380, SZ 084 to 185, SZ 380, SH 090 to 184, WSH 090 to 184: Pressurize the system on HP side first and then on LP side. Never

let the pressure on LP side exceed the pressure on HP side with more than 5 bar. Such pressure difference could cause internal compressor damage.

- Do not use dye for leak detection.
- Perform a leak detection test on the complete system.
- The test pressure must not exceed:

Models	LP side	HP side
SY / SZ 240 - 380	20 bar	32 bar
SM / SZ 84 - 185	25 bar	32 bar
SH 180 - 485	30 bar	45 bar
SH / WSH 090 - 184	33 bar	45 bar

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

6 – Vacuum dehydration

- Never use the compressor to evacuate the system.
- Connect a vacuum pump to both the LP & HP sides.
- Pull down the system under a vacuum of 500 µm Hg (0.67 mbar) absolute.
- Do not use a megohmmeter nor apply power to the compressor while it is under vacuum as this may cause internal damage.

7 – Electrical connections

- Switch off and isolate the main power supply. See overleaf for wiring details.
- All electrical components must be selected as per local standards and compressor requirements.
- Refer to page 2 for electrical connections details.
- The Danfoss scroll compressors scroll compressor only works correctly in one rotation direction. Line phases L1, L2, L3 must absolutely be connected to compressor terminals T1, T2, T3 to avoid reverse rotation.

## Instructions

- Use  $\varnothing$  4.8 mm (3/16") screws and 1/4" ring terminals for the power connection. Fasten with 3 Nm torque.
- The thermostat connection (if present) is a 1/4" AMP-AWE spade connector.
- The compressor must be connected to earth with the 5 mm earth terminal screw.

### 8 – Filling the system

- Keep the compressor switched off.
- Fill the refrigerant in liquid phase into the condenser or liquid receiver. The charge must be as close as possible to the nominal system charge to avoid low pressure operation and excessive superheat. Never let the pressure on LP side exceed the pressure on HP side with more than 5 bar. Such pressure difference could cause internal compressor damage.
- Keep the refrigerant charge below the indicated charge limits if possible. Above this limit; protect the compressor against liquid flood-back with a pump-down cycle or suction line accumulator.
- Never leave the filling cylinder connected to the circuit.

Compressor models	Refrigerant charge limit (kg)
SM/SZ 084, 090, 100	8.5
SM/SZ 110, 120	10
SM 112, 124, 147, SZ147	7.9
SM/SZ 115, 125	11
SM/SZ 148, 160, 161	12.5
SM/SZ 175, 185	13.5
SY/SZ 240	16
SY/SZ 380	20
SH / WSH 090	5.9
SH / WSH105, 120, 140, 161, 184	7.9
SH 180, 240, 295, 300	13.5
SH 380	14.5
SH 485	17

### 9 – Verification before commissioning

⚠ Use safety devices such as safety pressure switch and mechanical relief valve in compliance with both generally and locally applicable regulations and safety standards. Ensure that they are operational and properly set.

⚠ Check that the settings of high-pressure switches and relief valves don't exceed the maximum service pressure of any system component.

- A low-pressure switch is recommended to avoid vacuum operation. Minimum setting for SM/SY/SZ: 0.5 bar g. Minimum setting for SH / WSH: 1.5 bar g.
- Verify that all electrical connections are properly fastened and in compliance with local regulations.
- When a crankcase heater is required, it must be energized at least 12 hours before initial start-up and start-up after prolonged

shutdown for belt type crankcase heaters (6 hours for surface sump heaters).

### 10 – Start-up

- Never start the compressor when no refrigerant is charged.
- All service valves must be in the open position.
- Balance the HP/LP pressure.
- Energize the compressor. It must start promptly. If the compressor does not start, check wiring conformity and voltage on terminals.
- Eventual reverse rotation can be detected by following phenomena; the compressor doesn't build up pressure, it has abnormally high sound level and abnormally low power consumption. In such case, shut down the compressor immediately and connect the phases to their proper terminals. Most Danfoss scroll compressors scroll compressors are protected against reverse rotation either by an internal reverse rotation protection or by the external electronic protection module. They will shut off automatically. Only SH / WSH 090 to 184 and SM 112, 124, 147, SZ147 have no reverse rotation protection. Prolonged reverse rotation will damage these compressors.
- If the internal overload protector trips out (SM/ SZ 084, 090, 100, 110, 112, 120, 124, 147, 148, 161 and SH / WSH 090, 105, 120, 140, 161, 184), it must cool down to 60°C to reset. Depending on ambient temperature, this may take up to several hours.
- If the internal pressure relief valve is opened (SY/SZ 240, 300, 380 and SH 380, 485), the compressor sump will be warm and the compressor will trip out on the motor protector.

### 11 – Check with running compressor

- Check current draw and voltage.
- Check suction superheat to reduce risk of slugging.
- Observe the oil level in the sight glass for about 60 minutes to ensure proper oil return to the compressor.
- Respect the operating limits.
- Check all tubes for abnormal vibration. Movements in excess of 1.5 mm require corrective measures such as tube brackets.
- When needed, additional refrigerant in liquid phase may be added in the low-pressure side as far as possible from the compressor. The compressor must be operating during this process.
- Do not overcharge the system.
- Never release refrigerant to atmosphere.
- Before leaving the installation site, carry out a general installation inspection regarding cleanliness, noise and leak detection.
- Record type and amount of refrigerant charge as well as operating conditions as a reference for future inspections.

### 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 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.

### 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.