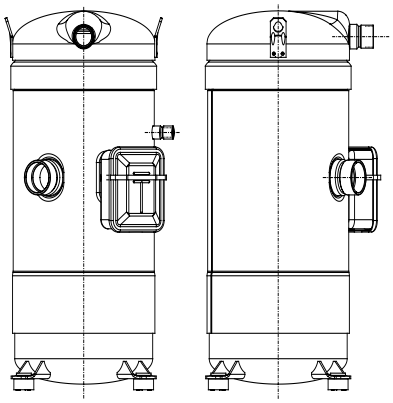
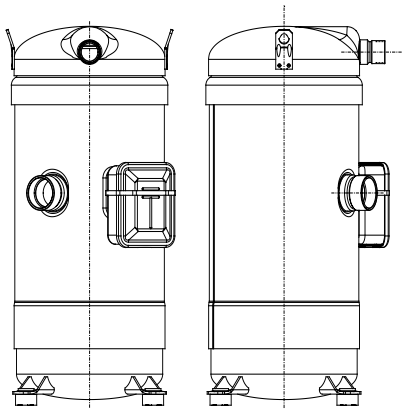
ENGINEERING
TOMORROW

Instructions

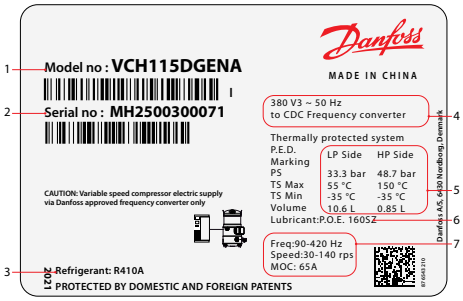
VCH115 Compressor



VCH115D (for heat pump)

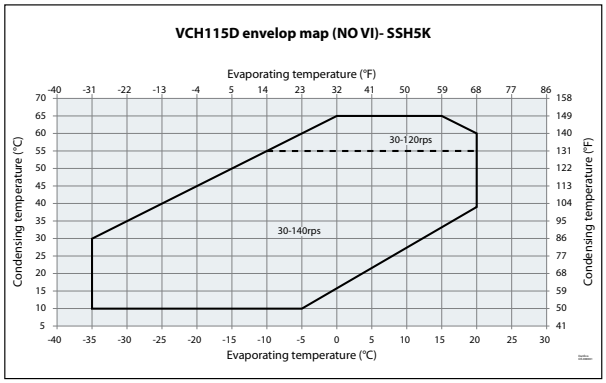


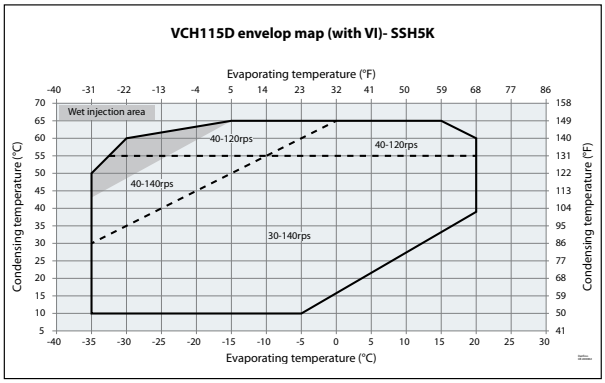
VCH115E (for CRAC)

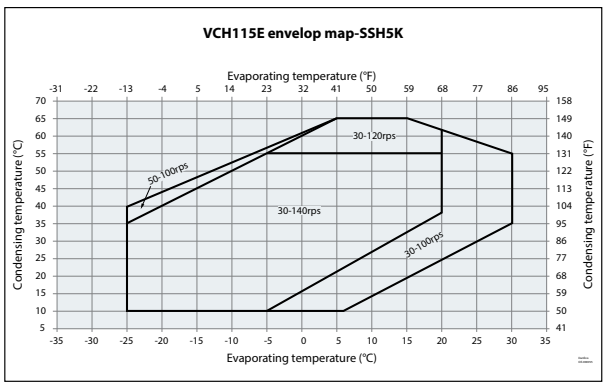


1: Model number
2: Serial number
3: Refrigerant
4: Supply voltage to frequency converter
5: Housing service pressure
6: Factory charged lubricant
7: Compressor frequency & Max Operating current

Operating maps







The solid line envelope is valid for a suction superheat within 5K at nominal voltage. Higher suction superheat may lead to discharge temperature above 135° and map shrinkage for No VI and VI area.

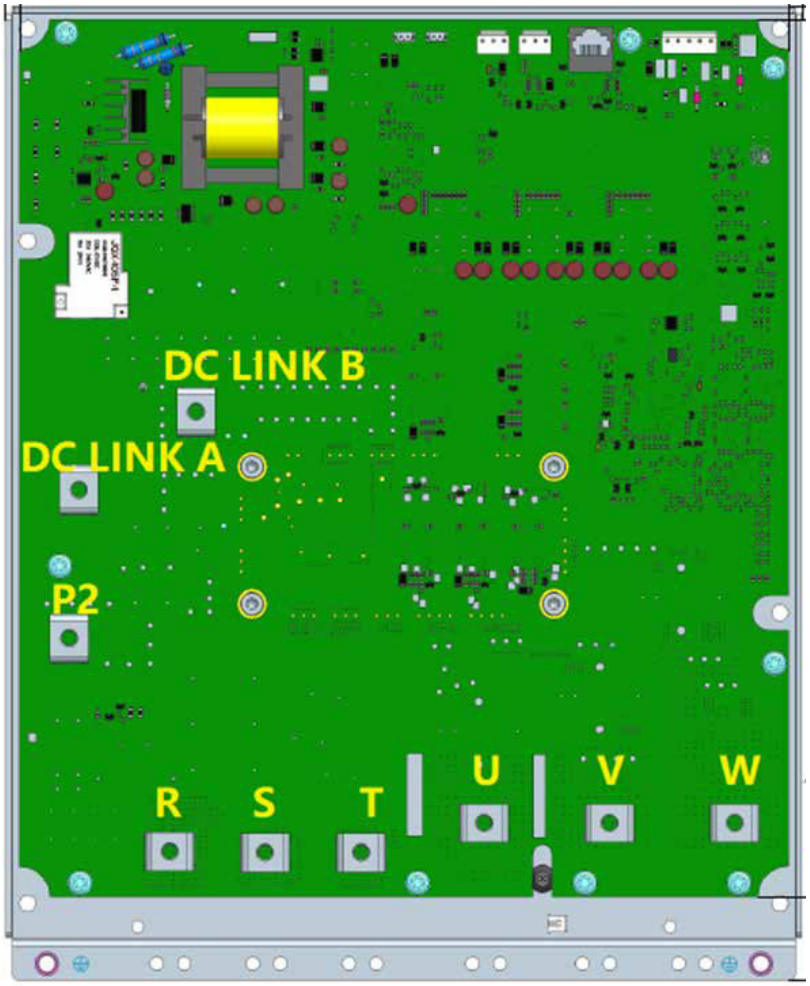
⚠ The compressor must only be used for its designed purpose(s) and within its scope of application (refer to «operating limits»). Consult Application guidelines and datasheet available from http://cc.danfoss.com	⚠ Under all circumstances, the EN378 (or other applicable local safety regulation) requirements 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°)

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Instructions

Basic connections

-Depending on the frequency converter version, the physical position of individual connectors may differ from below diagram.
-Always make sure that the compressor terminals T1, T2, T3 are connected to the frequency converter terminals U,V,W respectively.
-The compressor motor cable must be shielded and the armoured part must be connected to ground on both cable ends; at the side of the compressor and at the side of the frequency converter.
-A low pressure safety switch is mandatory to avoid compressor vacuum operation.
-At start-up, verify that the compressor rotates in the right direction and pumps.



Description of main circuit terminals:

Symbol	Function
R, S, T	Power input, Single phase connected to R, T
U, V, W	Power output, connect to the motor
DC LINK A	Link to capacitor board DC LINK A
DC LINK B	Link to capacitor board DC LINK B
P2	Link to the other end of the DC CHOKE
⏚	Ground terminal

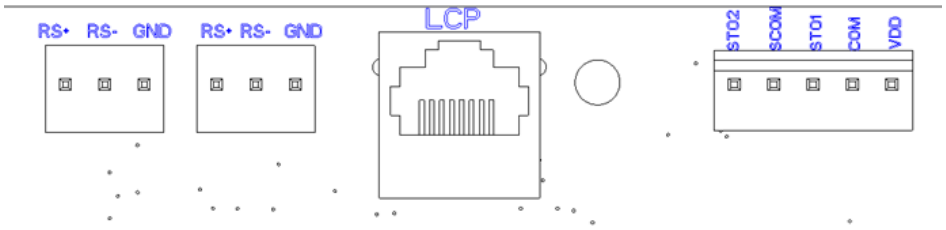
Main Circuit Terminal Screws and Wiring Recommended Specifications

Model	Input Cable	Output Cable	Input and Output Terminals' Screws	Input and Output Terminals'Torque	Ground Terminal Screw	Ground Terminal Torque
	(mm^2)	(mm^2)		(N·m)		(N·m)
CDC100	22	22	M6 × 12	5	M6 × 12	5

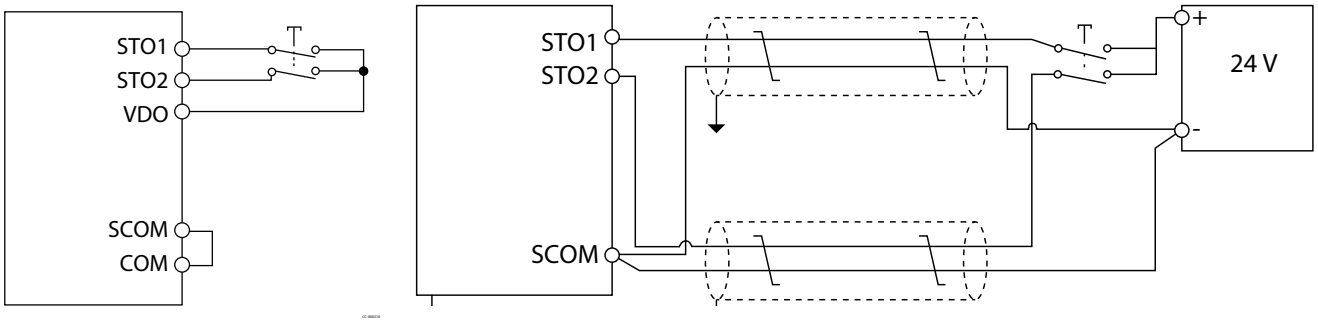
Note: *This specification is under using single-core line VV and 25°C if use other cables or under higher temperature environment, please refer to electrical manual. The conductor is based on American Standard , based on copper wire.*

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Description of Control Circuit



Symbol	explain	Function
RS+, RS-	RS485 communication	Maximum baud rate 38400bit/s
LCP	Display board interface	It is connected with the display board through RJ45
STO2, SCOM, STO1, COM, VDD	Sto function	If sto function is configured, internal power supply can be used, as shown in figure A, or external 24 V power supply can be used, as shown in Figure B



1 - Introduction

These instructions pertain to the VCH Variable Speed scroll compressors used for A/C and HP 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(-31 °F) and 70 °C(158 °F) when charged with nitrogen.
- 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 Ts max value for LP side indicated on compressor nameplate during off-cycle.
- Mount the compressor on a horizontal flat surface with less than 3° slope.
- The compressor can only be supplied by a frequency converter. Make sure that the frequency converter is the dedicated one for the compressor (power size and voltage: input & output). Parameter 1.13 of the frequency converter lists the possible combinations of compressors, frequency converters and refrigerants.
- When installing a VCH, use equipment specifically reserved for HFC refrigerants which was never used for CFC 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.
- Make sure the installation is equipped with high-pressure safety components (e.g. pressure switch, pressure relief valve) to prevent against the bursting of pressure-containing components.

4 - Assembly

- Slowly release the nitrogen holding charge through the schrader port.
- 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.

5 – Leak detection

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

- Do not use dye for leak detection.
- Perform a leak detection test on the complete system.
- The test pressure must not exceed 1.1 x PS value for LP side and PS value for HP side indicated on compressor nameplate.
- 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.
- Evacuate the system to a pressure 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 previous page for wiring details.
- The compressor is protected against excess current by the frequency converter. Follow local regulations regarding power line protection. The compressor must be connected to ground.
- All electrical components must be selected as per local standards and compressor requirements.
- Please refer to drawings for typical wiring connections and examine the specific wiring diagram located in the frequency converter package. For further details, refer to the application guidelines.
- Follow very closely the installation instruction for the frequency converter:
  - Mounting: The base frame of the frequency converter must be very well fixed to the support to ensure a very good continuity between the ground potential of all electrical panels and electrical boxes of the system.
  - Wiring: All control wires have to be of a screeened design. The cable for electrical motor supply has to be of a shielded design as well. Correct earthing of the shield cover has to be done using the method shown on drawings, every time this one has to be earthed on each end of the cables. Distinct cable trays must be used for control and motor supply.
- The frequency converter ensures direct motor protection and the factory set parameters are such to protect the motor over all current malfunctions. An external overload is not necessary.
- Set the frequency converter parameters in accordance with Danfoss recommendations for the CDC100 frequency converter and VCH variable speed compressor.

8 – Filling the system

- Keep the compressor switched off.
- Fill the refrigerant in liquid phase into the outlet side of 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.

Compressor	Refrigerant charge limit (kg)
VCH115	13

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 risk of flooded start (see Application Guidelines section "manage off cycle migration").

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 mandatory to avoid vacuum operation. Minimum setting 1 bar (g) for VCH115D and 2 bar (g) for VCH115E.
- Verify that all electrical connections are properly fastened and in compliance with local regulations.
- In default case, an external crankcase heater is required.
- After comissioning it is strongly recommended to keep the frequency converter always energized.

10 – Start-up

- All service valves must be in the open position.
- Balance the HP/LP pressure.
- Energize the compressor. It must start promptly.
- If the compressor doesn't start, verify that the compressor is hooked up to the frequency converter; check the power lead connections. If these verifications reveal no abnormality, check the motor windings with an ohmmeter.
- Check the frequency converter control panel: If any alarm is displayed check the wiring and in particular the polarity of the control cables. If an alarm is shown, refer to the frequency converter application manual. Verify in particular the combination of compressor, frequency converter and refrigerant.
- Check current draw and voltage levels on the mains. The values for the compressor electrical motor can be directly displayed on the frequency converter control panel.
- The optimum compressor suction superheat is around 5K. The maximum allowed superheat is 30K.

11 – Check with running compressor

- Check current draw and voltage.
- Check suction superheat to reduce risk of slugging.
- Observe the oil level at start and during operation to confirm that the oil level remains visible.Excess foaming in oil sight glass indicates refrigerant on the sump.
- Monitor the oil sight glass for 1 hour after system equilibrium to ensure proper oil return to the compressor. This oil check has to be done over the speed range to guarantee:
  - a good oil return at low speed with minimum gas velocity.
  - a good oil management at high speed with maximum oil carry over.
- 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 the 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 the 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.
- Compressor failure to build up pressure: Check all bypass valves in the system to ensure that none of these has been opened. Also check that all solenoid valves are in their proper position.
- Abnormal running noise: Ensure the absence of any liquid flood-back to the compressor by means of measuring the return gas superheat and compressor sump temperature. Oil sump superheat under steady state operating conditions should follow application guideline requirement.
- The high-pressure switch trips out: Check condenser operations (condenser cleanliness, fan operation, water flow and water pressure valve, water filter, etc.). If all these are OK, the problem may be due to either refrigerant overcharging or the presence of a non-condensable (e.g. air, moisture) in the circuit.
- The low-pressure switch trips out: Check evaporator operations (coil cleanliness, fan operations, water flow, water filter, etc.), liquid refrigerant flow and pressure drops (solenoid valve, filter dryer, expansion valve, etc.), refrigerant charge.
- Low refrigerant charge: The correct refrigerant charge is given by the liquid sight glass indication, the condenser delta T in relation to the refrigerant pressure tables (pressure-temperature), the superheat and the sub-cooling, etc. (if additional charge is deemed necessary, refer to section 8).
- Compressor short cycling: The number of cycles shall never exceed 12 starts per hour.

12 - Maintenance

⚠ Internal pressure and surface temperature are dangerous and may cause permanent injury.Maintenance operators and installers require appropriate skills and tools. Tubing and compresssor upper shell 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.
- Check the internal temperature of the frequency converter on its display and the cooling air flow.
- Faults are logged in the frequency converter memory and can be displayed. This can help to evaluate and improve parameters of the frequency converter or of the system itself.

13 - Warranty

Always transmit the model number and serial number with any claim filed regarding this product.

Use the fault memory of the frequency converter to recover the fault descriptions before initializing the system and even before shutting off the power.

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, frequency converters and compressor oil should be recycled by a suitable company.

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