SHORT FORM SERVICE MANUAL - CIM 6/6.1/6.2 CONTROLLER

810921C - JUNE 2019

STAR COOL

MAERSK CONTAINER INDUSTRY

Operating temperature

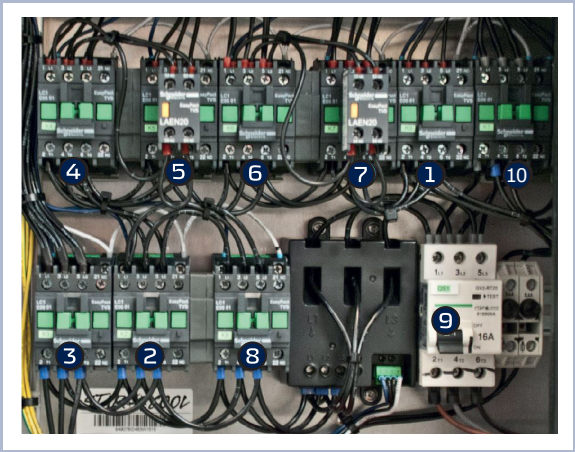
1 -30°C to +30°C
-22°F to +86°F

Ambient temperature

2 -30°C to +50°C
-22°F to +122°F

Model:
SCU-40/SCI-40 with CIM 6/6.1/6.2
Refrigerant: R134a/R513A
Charged with 4.5 kg (9.9 lb)
Compressor oil charge 1.5 L

Controller box view 1/2



1. FC/Compressor
2. Phase direction
3. Heat element
4. Condenser fan low
5. Condenser fan high
6. Evaporator fan low
7. Evaporator fan high
8. Phase direction
9. Main circuit breaker
10. Vacuum pump for CA (only CA units)

Heater for vacuum pump (only CA units, can’t be seen)

Controller box view 2/2

11 Controller module

12 Power measurement module

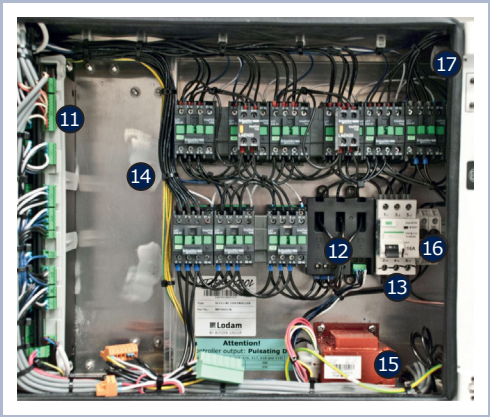
13 Unit power supply

14 Modem (if installed)

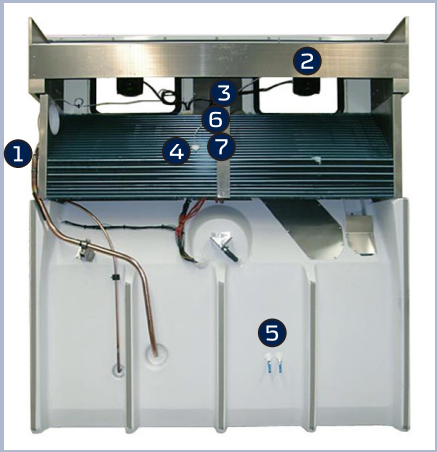
15 Transformer

16 Fuse (max. 0.4A)

17 Retreiver socket, USB only on newer models



Unit rear side view



1. Suction sensor (Tsuc)
2. Return air sensor (Tret)
3. Humidity sensor (RH)
4. Evaporator sensor (Tevap)
5. Supply air sensors (Tsup 1 & 2)
6. O_2 sensor (only CA units)
7. CO_2 sensor (only CA and AV+ units)

Sensors can be reached from outside by removing right hand side service hatch.

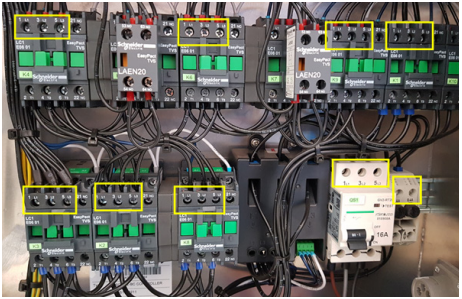
Supply sensors to be reached from unit front side.

Insulation testing 1/2

1. Using a multimeter, measure the continuity in the Ground (GND) in the main power cable from the plug to the controller cabinet.

   The measured value shall be below 1 Ω.

   If the value is more than 1 Ω, then the cause is in the main power cable or plug. Trouble shoot and repair before connecting unit to main power supply.



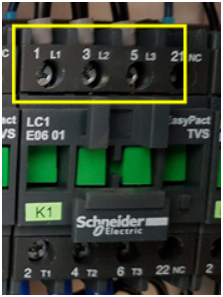
Insulation testing 2/2

2 Using a 500V or 1000V insulation tester, measure between ground (earth) and terminals 1, 3, & 5 of all of the contactors and the main circuit breaker.

The measured value should be more than 1 MΩ.

3 Note: Measuring the K1 contactor for the frequency converter (FC) the value will fluctuate in the beginning due to discharging of the capacitors. The value needs to be higher than 1 MΩ.

3

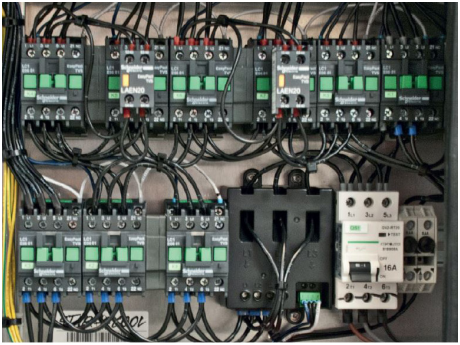


Function of contactors 1/2

When a contactor is pulled and activated a DC-pulse is supplied from the controller.

The length of these waves depends on:

- Supplied voltage
- The ambient temperature
- Supplied frequency



Attention!

Controller output: **Pulsating DC**

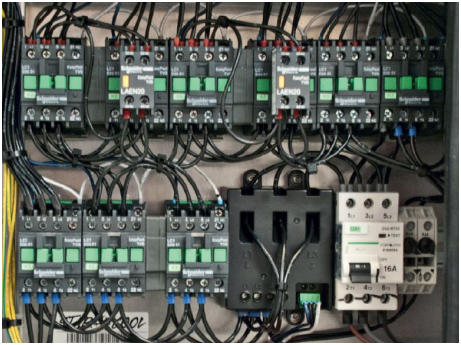
Normal range (X12, X13, X16, X17, X18 and X19)	
7.0 - 17	Vac
2.5 - 6.5	Vdc

Function of contactors 2/2

To ensure constant functionality of a contactor it is, every 6-10 seconds, supplied with a revival DC-pulse.

When measuring output with a voltmeter expect to measure 2.5 - 6.5 VDC if output is ok (A1 - A2).

Schneider coil resistance is 8-10 Ω
ABB coil resistance is 11-13 Ω
Danfoss coil resistance is 5-6 Ω



Attention!

Controller output: **Pulsating DC**

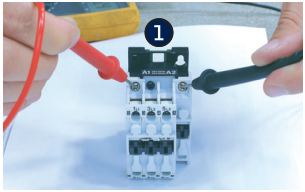
Normal range (X12, X13, X16, X17, X18 and X19)	
7.0 - 17	Vac
2.5 - 6.5	Vdc

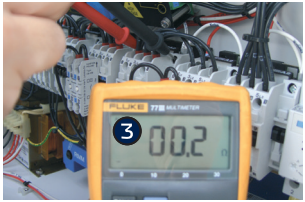
Contactor check

1. Measure Ω between terminal A1 and A2. Correct value see below.
2. Contactor is ok.
3. Contactor is not ok.

Deviation in resistance can be due to change in temperature.

Schneider coil resistance is 8-10 Ω
ABB coil resistance is 11-13 Ω
Danfoss coil resistance is 5-6 Ω



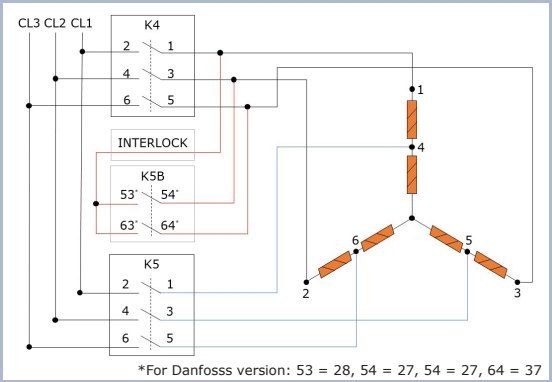


Evaporator and condenser motor

Low speed is terminal 1-2, 2-3, 1-3 (example resistance 300 Ω).

High speed is terminal 4-5, 5-6, 4-6. This must always read half the value (150 Ω) of the low speed.

Low speed terminal:	1, 2, 3
High speed terminal:	4, 5, 6
Over heat terminal:	7, 8



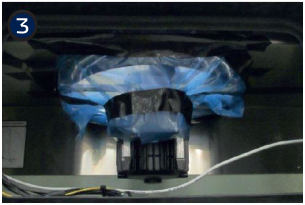
Faulty evaporator fan motor bypass 1/2

1. Turn off the unit via the on/off switch and unplug the unit from the main power.

2. Unplug (or disconnect at terminal box) the faulty evaporator fan motor.

3. Using a plastic bag of a suitable size, cover the fan propeller and secure the bag around the shaft of the faulty motor. This is to prevent air short cycling by the remaining working evaporator fan motor.

4. Protect the defective evaporator fan motor loose plug from humidity and water ingresses by securing it with a smaller plastic bag.



Faulty evaporator fan motor bypass 2/2

5. Bypass the faulty motor IP connection on the microprocessor. Both evaporator fan motor IP's are connected at plug X26 terminals 1 and 2 (Mevap1) and 3 and 4 (Mevap2) on the microprocessor.

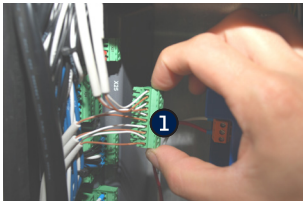
   Determine which motor was removed in step 2. As you face the reefer unit, motor 1 is on the right hand side of the reefer. Replace the IP connection with a jumper cable at X26.

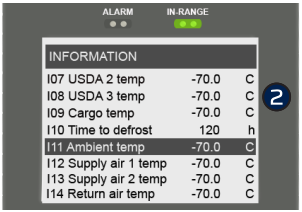
6. Replace the evaporator access panel, re-plug the reefer unit, close the breaker and turn the unit on.

Temperature sensor check 1/3

1. Disconnect the X24 and X25 plugs on the controller module.

2. All temperature readings must drop to -70°C (-94°F) within a short time.





Temperature sensor check 2/3

3. Dismount the current defective sensor(s) according to the wiring diagram inside the controller door.

   Measure the voltage between the two terminals on the controller.

   Range: 3.2 VDC - 3.4 VDC

4. Temperature resistance check: Value must be according to the resistance table in the operation and service manual.

Temperature sensor check 3/3

5 Place the bulb in icewater and stir the sensor in the icewater.

The displayed temperature in the controller should be: 0°C +/- 0.3°C (32°F +/- 0.5°F) otherwise replace the sensor.

If ice water is not available, hold two or more sensors in your hand. They must show the same values on the controller display.

Replacement of Tsuc sensor

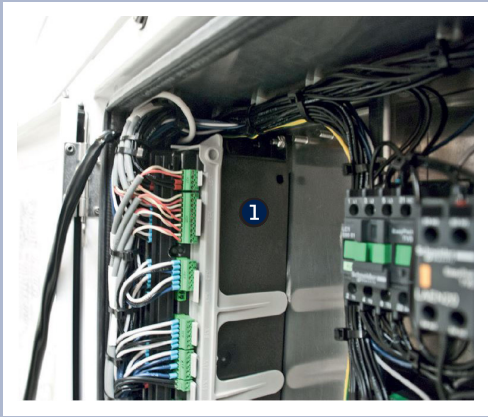
1. Remove PVC cover to access Tsuc sensor.
2. Cut the cable tie. Sensor can then be removed.
3. When installing the new sensor, make sure to insert properly into the tube and add a new cable tie to make sure the sensor/tube is properly insulated.
4. Thermo paste must be applied to ensure optimum heat transfer.

Pressure transmitter check 1/2

1. Disconnect the X22 plug on the controller module.

   Pressure reading for Psuc must show -1 bar (-14.5 psi).

   Pressure reading for Pdis must show 0 bar (0 psi).



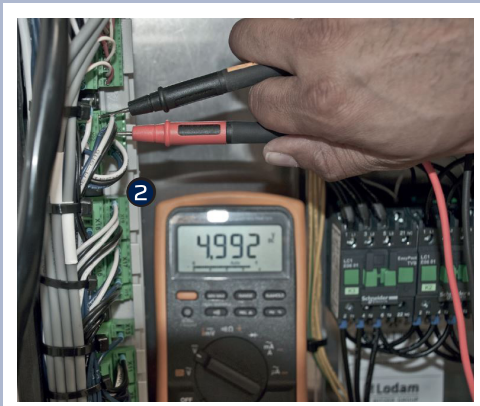
Pressure transmitter check 2/2

2 Dismount the current defect transmitter according to the wiring diagram inside the controller door.

Measure voltage between ground and 5 VDC for the transmitter (according to the electrical wiring diagram).

Correct range: 4.80 - 5.05 VDC

Reconnect GND and 5 VDC. Check signal output from transmitter. Compare it to gauge reading/value found in relevant table in the Operating and Service Manual.

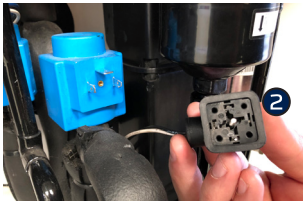


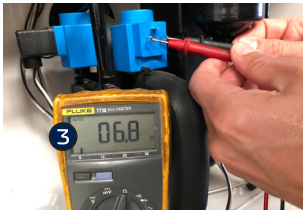
Solenoid coil check

1. Measure resistance on X19 terminal 1 and 2 (Veco), 3 and 4 (Vexp), 5 and 6 (Vhg). Solenoid coil is ok (above 4.5 Ω).

2. Solenoid coil is not ok (below 4.5 Ω). Dismount the connector plug and check for moisture. If moist, replace the connector plug (818761A).

3. Check the resistance directly on the coil. Small deviation in resistance can be due to change in temperature.





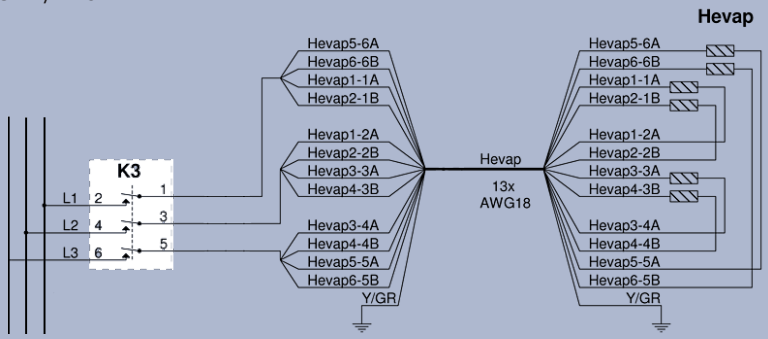
Check of heat elements

Measure the voltage applied to each heater.

Measure the resistance value of each disconnected heater: 210 Ω

Range: +/- 10 Ω

Meggering:
New heaters above 10 MΩ
Old heaters above 1 MΩ
Value below = Replacement is required

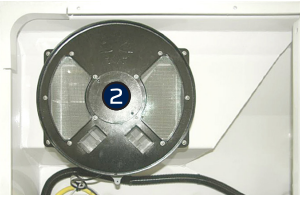


Replacement of air exchange sensor

1. Remove the two screws on the damper and dismount the cover plate.

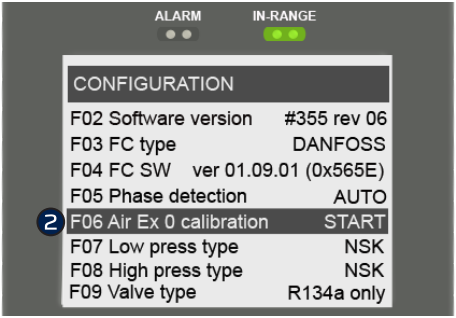
2. Remove the fourteen screws to loosen the black cover where the air exchange sensor is mounted.

3. Replace the sensor and install all the dismounted parts again.



Air exchange sensor calibration

1. Close the air exchange damper.
2. In the Service menu S05, Configuration menu F06, press Enter and hold until the hourglass appears.
3. Calibration is completed.

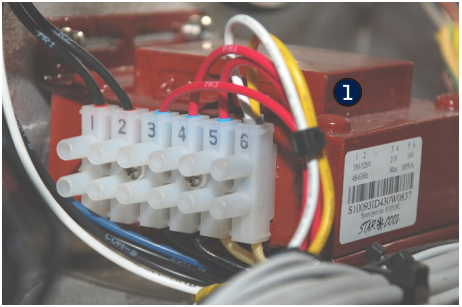


Transformer T1

1. Transformer T1

2. Measure supply voltage on terminal 1 and 2:

   Range -50 Hz: 335 – 460 VAC
   Range -60 Hz: 390 – 525 VAC



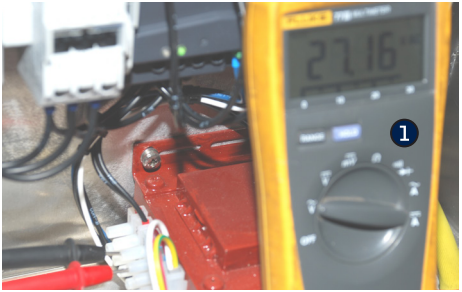
Transformer output

1. Measure output and voltage on terminal 3 and 4 (27 VAC):

   Range: 20 - 30 VAC

2. Measure output voltage on terminal 5 and 6 (24 VAC):

   Range: 19 – 28 VAC



1. **FC 1.0**
   Front cover must be removed to install FC

2. **FC 1.1**
   Never remove front cover to install FC

3. **FC 2.0**
   Only remove the black cover to install FC

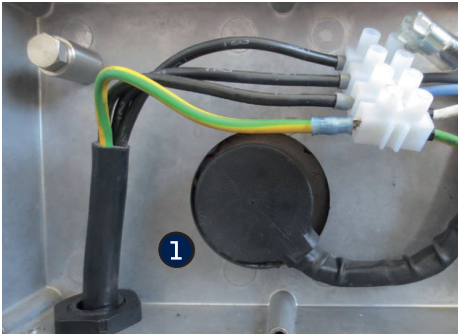
FC 1.0 FC 1.1 FC 2.0

IMPORTANT:
ALWAYS MOUNT FC CABLE ON COMPRESSOR FIRST

Emergency operation 1/2

1. Dismount the frequency converter and connect the FC power cable directly to the compressor supply terminals (U, V, W).

   The 3 remaining terminals (X, Y, Z) have to be fitted with a wire-jumper.



Coil resistance:
U-X 1.15 Ω
V-Y 1.15 Ω
W-Z 1.15 Ω
Also ensure to check to ground.

Meggering:
Value above 5 MΩ = OK
Value below 5 MΩ = Remove terminal block and measure again on windings directly:
· If still below, replace compressor.
· If above, replace terminal block only.

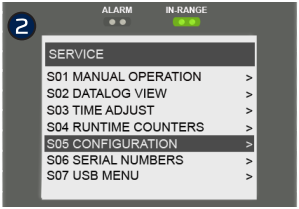
Emergency operation 2/2

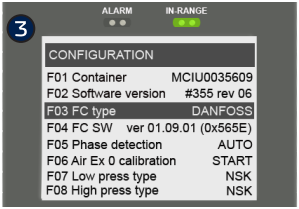
2. Go to Service menu and select S05 Configuration.

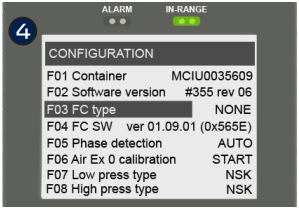
3. In the Configuration menu scroll down to F03 FC type.

4. Then press Enter and select NONE.

Note: Remember to switch F03 FC type back to Danfoss when a new FC is mounted.



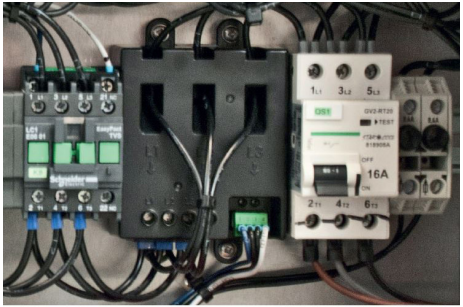




Change of parts

Always regard your personal safety as high priority.

Always switch off the main circuit breaker and disconnect the power cable when working on the unit.



Notes

Notes

SHORT FORM SERVICE MANUAL

Contacts

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