Danfoss Optyma iCO2 Condensing Units Installation Guide

Service Guide
Optyma™ iCO2

Contents

Transport (Page 7)

Move the condensing unit to its final destination and if possible, unpack the unit once in position to avoid transport damage.

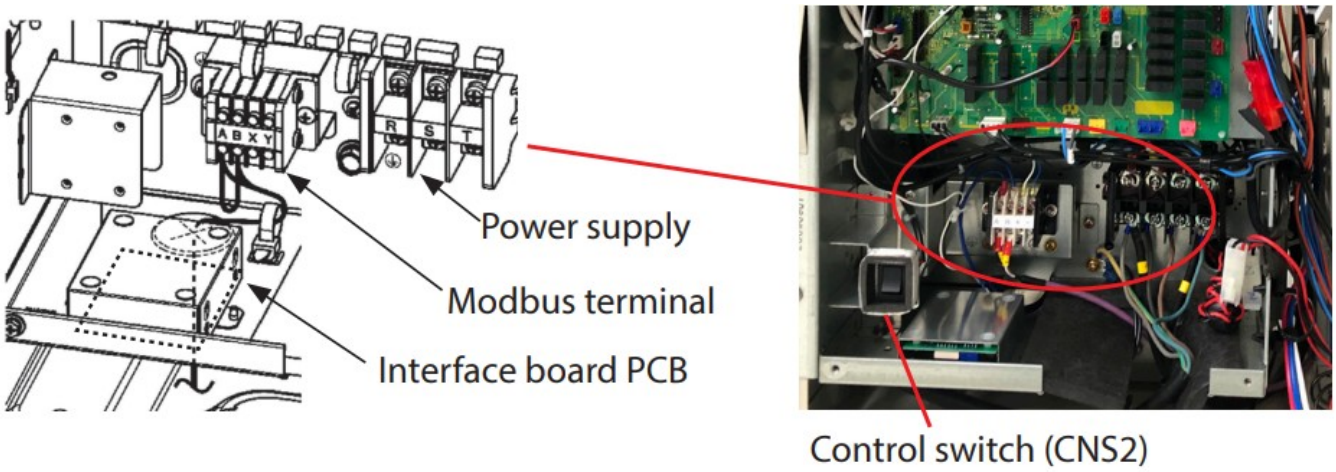
Mechanical installation (Page 7-11)

Provide sufficient space around the condensing unit and fix the unit in position. Connect the suction/liquid pipe and insulate both.

Install the supplied liquid line filter dryer. Connect to max. 8 evaporators with AK-CC55 controls, software version ≥1.7. Max. total 100m pipe length.
Max. height difference evaporator(s) above condensing unit 5m.
Max. height difference evaporator(s) below condensing unit 22m.
Note. When using more than one evaporator – DO NOT install them above and below the condensing unit.

Remove lower front- and backside panels

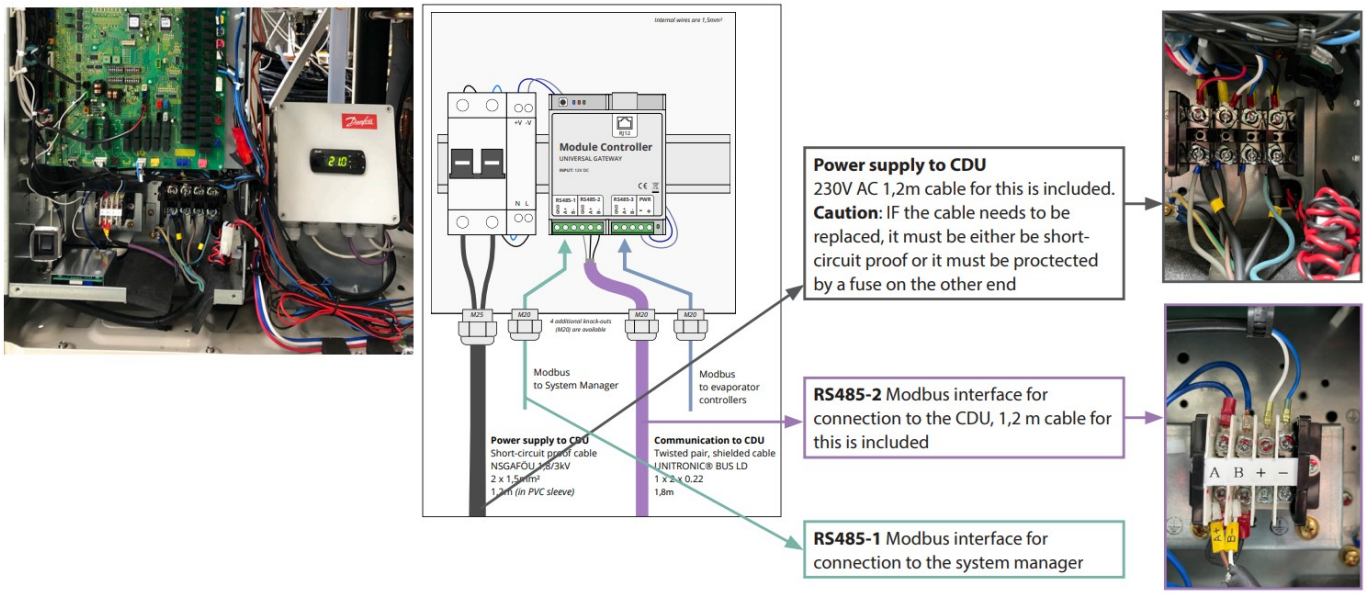
Electrical installation (Page 21-23): Provide proper power supply from grid via earth leakage breaker (≥30A type B 30mA), circuit breaker (25A class C, contact gap cat.3), main switch and supply cable 5G10mm² and connect it to provided terminals (L1, L2, L3, N) and grounding screw (PE). Switch ON the power supply and leave the control switch (CNS2) OFF, to active the crankcase heater for at least 6hours.



Module Controller installation (Page 22-23)

Install the Module controller (MC) metal bracket beside the unit controller electrical box with self-tapping crews and install the Module Controller electrical box on this bracket.
Make the following connections for the Module controller:

- Provided MC power supply cable with unit controller power supply terminals L1 and N.
- Provided MC Modbus cable RS485-2 with the unit controller Modbus PCB terminals A+ to A+ and B- to B-.
- MC Modbus terminals RS485-3 (terminated) in series with Modbus AK-CC55 evaporator controllers and terminate the last one.
- Option if AK-SM800(A) installed: MC Modbus terminals RS485-1 (terminated) with System manager AK-SM800(A).

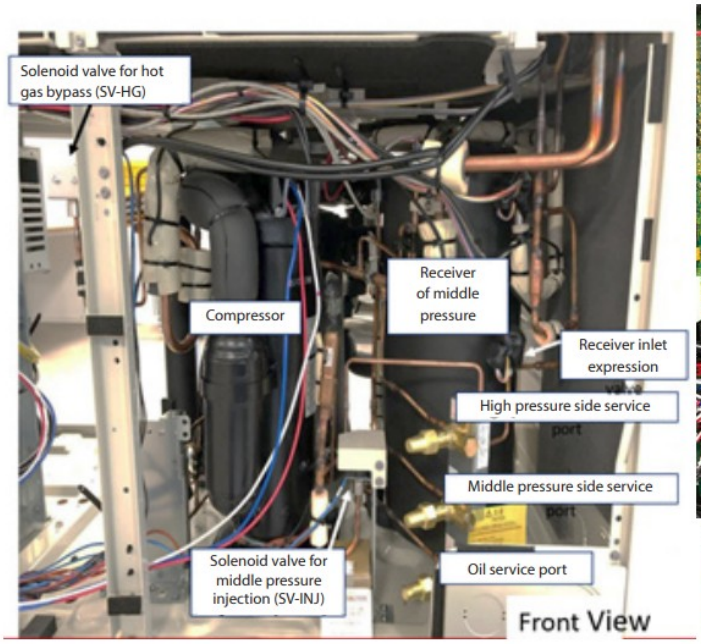


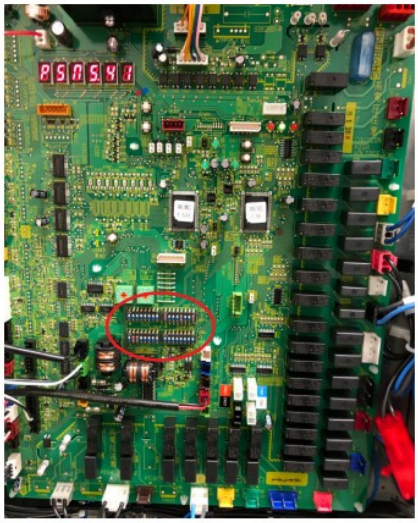
Leak detection (Page 12-13)

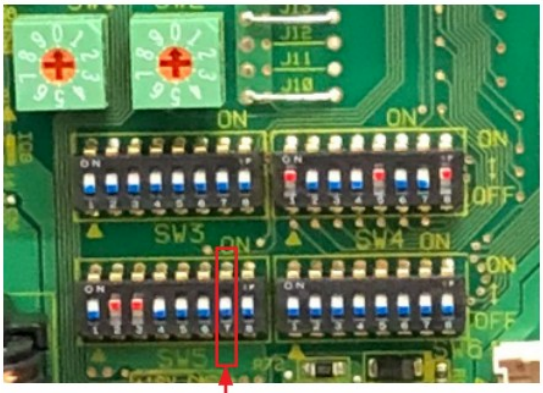
Open valves for pressure equalization, if no power supply with a special magnet on solenoid valve SV-INJ, or with power supply open stepper and solenoid valves via following procedure

- Unit power supply switched OFF
- Move DIP-switch 5-7 from OFF to ON position
- Turn power ON to open the stepper valves
- Test the system with 80bar Nitrogen – only charge nitrogen from the medium/high pressure service ports.
- You can check all the pressure points in the system on the module controller by reading the U parameters – all should read the same if system is equalised in pressure.
- Close the stop valve (connected to the safety valve) during air tightness test. THE PRV set point is 80 bar. After these test/charge process, ensure to open the stop valve and seal it with appropriate material to secure the unit.

Note:
The condensing unit is pressure tested from the factory.
Be sure to test the field piping / evaporates at the correct pressure depending on evaporator M.W.P 60 or 80 bar.
Always increase pressure slowly

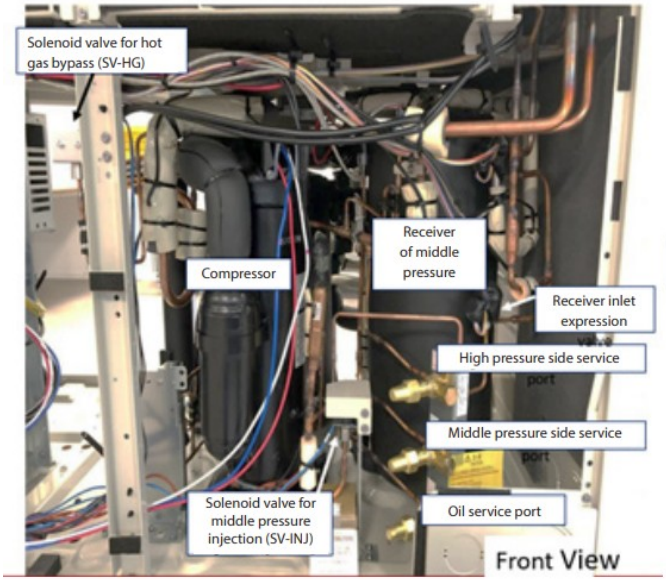


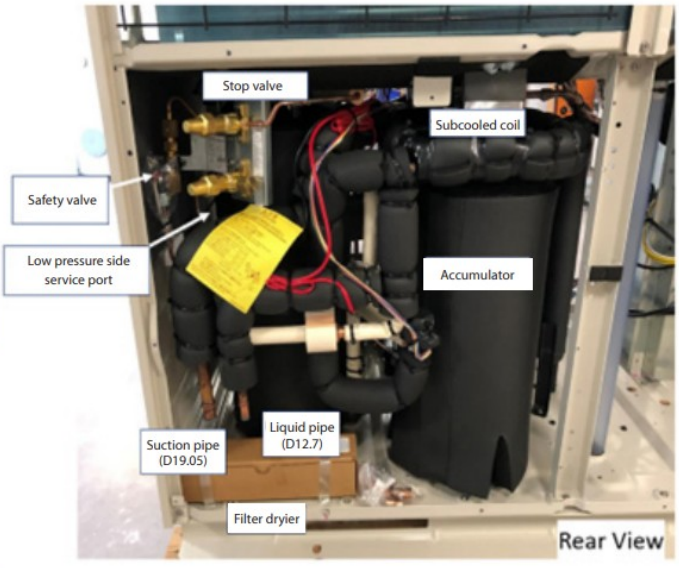




Vacuum dehydration (Page 13-17)

Valves are still open from leak detection step before.
Evacuate the system from suction port with a vacuum pump down to 0,67mbar (abs).
Note: 7 segment display only shows positive pressure so during vacuum will display 0
Before oil charging, if no power supply, open additionally the hot gas bypass and oil return solenoid valves with a special magnet





Calculate additional oil charge with provided Excel table or formula provided in instructions and charge it from oil service port.
Confirm correct oil level if unit controller par. C32 shows 110 (oil level sufficient). See page 7, how to operate unit controller display.
Charge additional oil slowly if par. C32 shows continuous 010 (oil level low), or alarm code oPE88-1 or error code

E88-1 appears from continuous low oil level during operation. Consider max. oil charge!

Refrigerant charge (Page 17-20; 23)

Calculate refrigerant charge with provided Excel table or formula in instructions. Consider calculated max. refrigerant charge! Never overcharge!

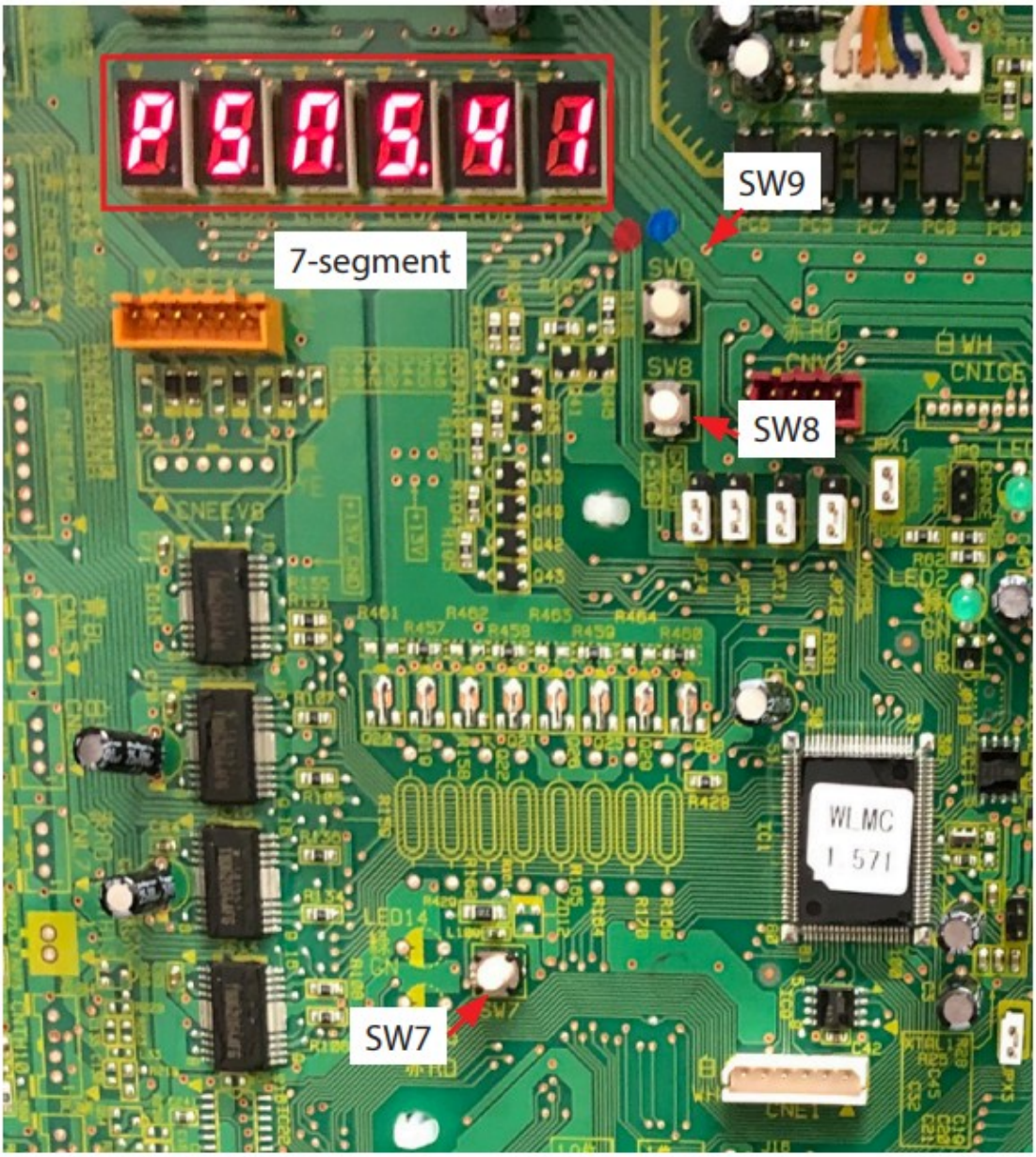
- Unit power supply switched OFF
- Move DIP-switch 5-7 from ON to OFF position
- Change dip switch 5-6 to on (This will completely open the electromagnetic solenoid valves and electronic expansion valves except for EEV-LB and SV-INJ not to charge liquid refrigerant to the compressor)
- Turn power ON to open the stepper valves
- You can double check with 7 segment PCB display to check situation of control valves open/close as required
- Break the vacuum with refrigerant in gas phase
- Charge in the middle pressure connection port
- Charge vapour until 7 bar to be sure to be above triple point (dry ice)
- Then charge 90% of calculated mass in liquid phase
- Charge additional refrigerant later in gas phase from suction port, while unit is running.
- Indication of sufficient charge while running ≥ 5min.:
- Sub-cooling degree par. C46-C15 shall be ≤ 0 Kelvin (recommend 1…3 Kelvin).
- Subcooling expansion valve EEVSC par. C23 shall be fully open at 470 steps
- No bubbles visible on sight-glass, mounted directly before last evap. expansion valve.
- During charging the evaporator controllers need to be operating
- Once charging is complete, power down the condensing unit and Change dip switch 5-6 from ON to OFF position.

Controller setting (Page 23-29)

a) Condensing unit controller operation: The standard unit controller display shows rotating the low-, medium- and high-pressure data in MPa. Other parameters can be displayed and confirmed by the “unit control PCB” 7-segment display, LED’s and operating
buttons. The display operation is performed by push buttons “SW7” to “SW9”.

- SW9: Code display – tens digit setting button: Jump from parameter “C0x” to “C1x” … “C9x”, “P0x” … “P9x” by pressing SW9 repeatedly.
- SW8: Code display – ones digit setting button: Jump from parameter “Cx0″, ”Cx1” … “Cx9″or “Px0″ … “Px9” by pressing SW8 repeatedly.
- SW7: Data erase/write button:
  – Select the parameter to change via SW8/9.
  – Press SW7 for 3 seconds to activate erase / write mode. The display starts flashing 2Hz.
  – Press SW9 and/or SW8 to change the data.
  – Press SW7 for 3 seconds or more to store the changed data to EEPROM, and jump from data erase/write mode back to display mode.
  – The CDU is controlled from now on with the new parameter content. The recorded content is retained even after the power is turned back on.

- Remark: The data erase/write mode will be terminated, if no switch input for 10 sec.

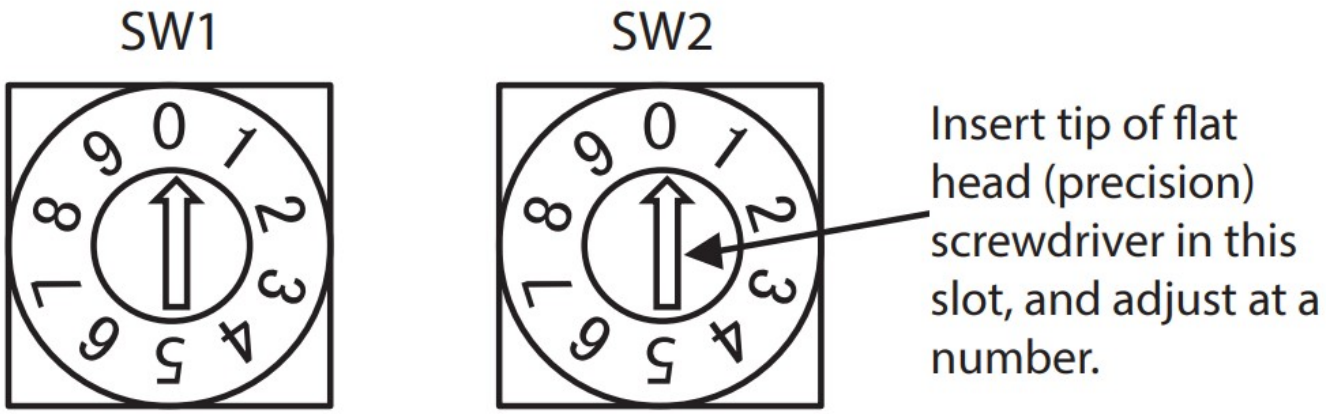


Following types of identification alphabets of the code display unit exist:
“C”: C00 … C99 Sensor-, Actuator-, Unit-, Control-, Error-counter information
“P”: P00 … P99 User- and Service-settings
“E”: E00 … E99 Error code information
„oPx“ or oPE-X“: Caution display
See full parameter lists with descriptions for inspection and servicing in instructions booklet and pasted on the e-box cover.
Alarm/Error code reset*:

- Press SW8 and SW9 will change display to “P20”
- Press SW7 for > 3seconds, 7-Segment display will start flashing
- Press SW8 to change alarm/error from 1 to 0
- *: Error reset can be done also via digital input (CNS3) activated with P08 = 3

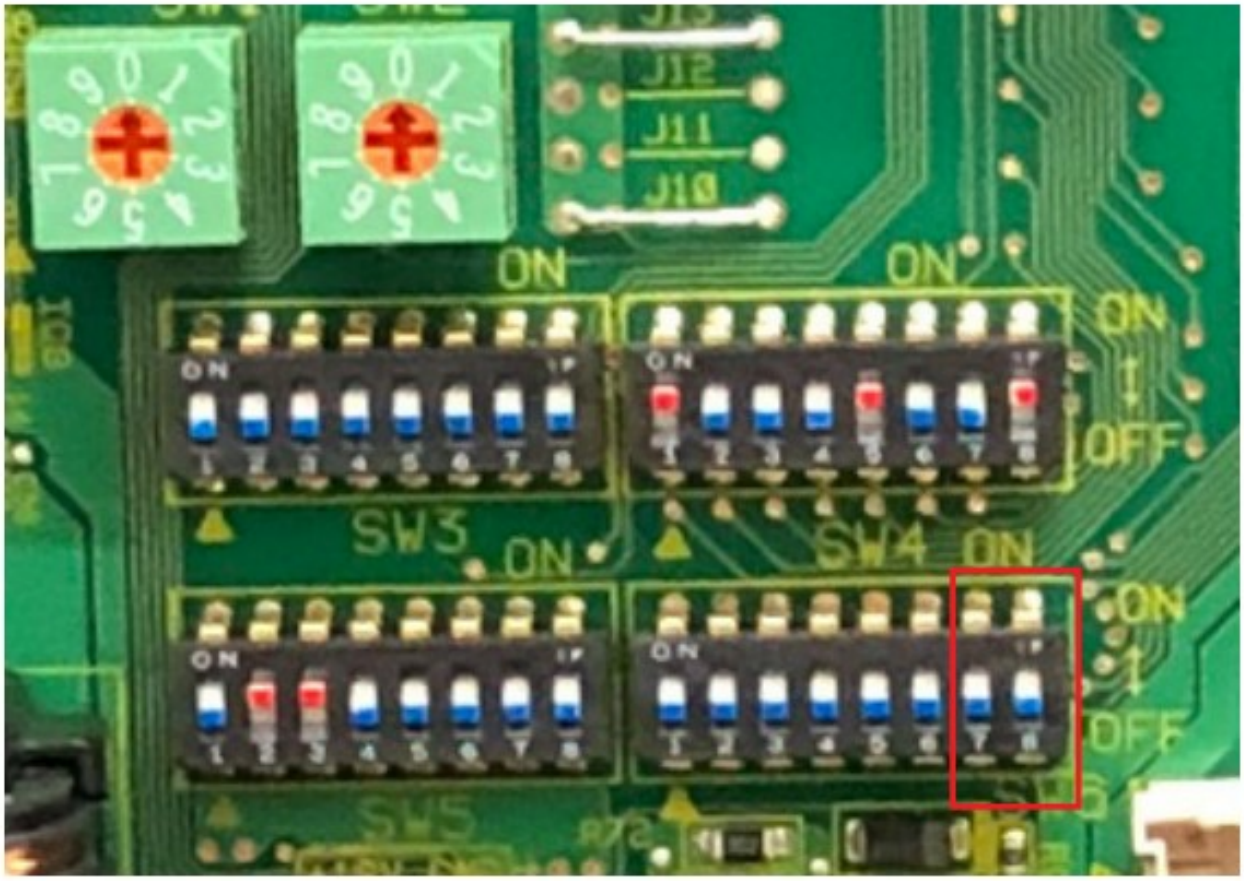
b) Low pressure cut-out setting (page 36-37):
Low pressure cut-out (pump-down) setting via DIP switches SW4-7 and SW4-8 located on unit controller, depend on Low Pressure Set Point (LPSP) according below table
c) Module Controller operation:

Evaporation temp. to set	SW1 (Tens place)	SW2 (Ones place)
5°C	7	5
-5°C	0	5
-10°C	1	0
-40°C	4	0



SW 4-7	SW 4-8	Low pressure setting OFF value “X”	
		29.45 bar > LPSP	LPSP 29.45 bar
OFF	OFF	13.3 bar	13.3 bar
ON	OFF	Pressure equivalent to”Evaporation temperature (setting value) -5 °C”	25.47 bar
OFF	ON	Pressure equivalent to “Evaporation temperature (setting val ue) -10 °C”	21.89 bar
ON	ON	Pressure equivalent to “Evaporation temperature (setting val ue) -15 °C”	18.68 bar

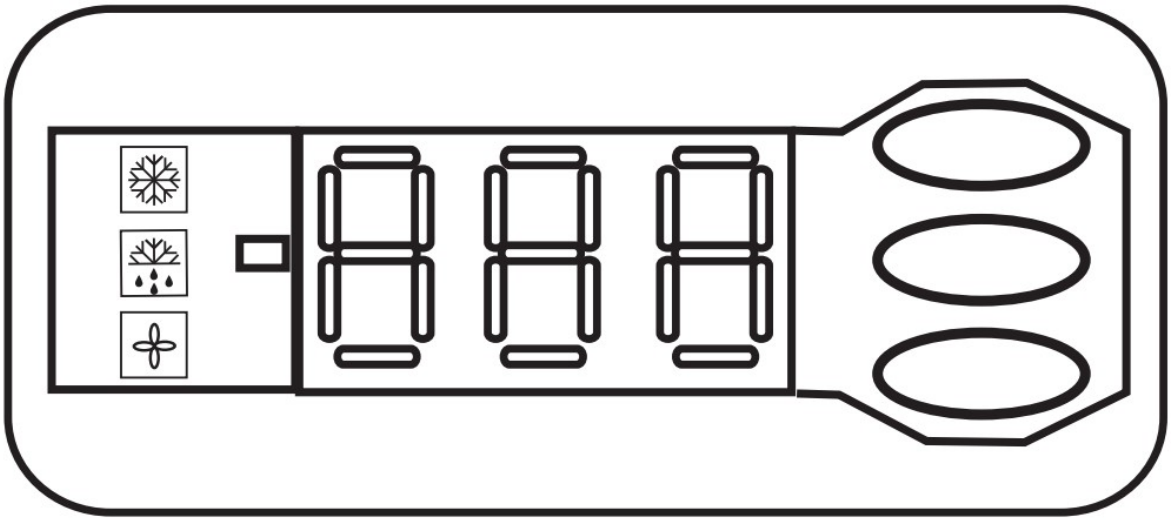
Low pressure control setting pressure (LPSP)	Low pressure setting OFF value
LPSP ≥ 18.7 bar	X bar
18.7 bar > LPSP ≥ 13.3 bar	9.0 bar
13.3 bar > LPSP	6.0 bar



Note: Low pressure error cut-out at LP ≤ 5,8 bar
The Module Controller 3.5 digit 7-segment MMILDS display shows the saturated suction temperature Ts in °C. The display operation is performed by three push buttons, upper, middle, and lower.

- Press upper button ~ 5 seconds to move from standard display to the 1st parameter r01
- Press upper or lower button to select other parameters
- Press middle button to display parameter value
- Press upper or lower button to modify a parameter
- Press middle button to confirm the modified value.

After 10 seconds without any action on push buttons jumps it back to standard display.



d) Required Controller settings during commissioning:
The compressor frequency is suction pressure controlled, measured by the suction pressure transmitter. The suction pressure reference is set with two parameters, the upper and lower setpoint in bar(g). The arithmetic

middle of those two values is the reference setpoint.
Following Module Controller parameters need to be set during commissioning:

- Set Par. r28 to 1 to activate the Module Controller as the reference setpoint device.
- Modify Par. r01 for the correct lower setpoint in bar(g)
- Modify Par. r02 for the correct upper setpoint in bar(g)

The condensing unit requires communication to evaporator controllers for a proper oil return, which needs to be established from the Module Controller.

- Scan for connected evaporator controllers with Par. n01 set to 1
- Check Modbus address of all connected evaporator controllers with par. Io01, Io02, Io03 … all need to be visible!

Start the condensing unit:

- Set condensing unit ON/OFF-switch to ON and Module controller par. or12 to 1

Remark: You will find a complete Parameter and Error code list with short explanation on instructions page 26-29, and on a sticker pasted on the e-box cover.

See more informative info in instructions

- Detailed explanation of CDU control (page 30-34):
- Checks before turning ON power supply (page 35-36):
- Trouble shooting / error codes (page 42-43):
- External Input installation (page 46):
- External output installation (page 47):

Notes

- Settings as delivered from factory
  – Main switch on PCB board will be 0 (CNS2)
  – Module controller will be R12 = 0
  – The unit controller is factory configured on parameter r28 to 1 which means the evaporating temperature can be set by the display on the module controller with parameters r01 & r02
- A joint (Reducer) to install on the service valve is included in the accessories
- Pressures displayed in unit controller in Mpa (1MPa = 10 bar)
- Pressures displayed in module controller in bar
- If the unit will only start by setting in the module controller (r12 = -1) it will not start & no alarms visible on either unit controller or module controller
- When operating with CO2, set MOP on case controller, and set to lowest room / cabinet temperature – it is useful to reduce liquid flood back to the compressor when all valves are opening.
- Do not overcharge with CO2 – risk of liquid flood back – check suction superheat by measuring return gas temperature on the suction strainer on the side of the compressor.

- U parameters on module controller

Service		
Read discharge pressure	u01	Pc
Read gascooler outlet temp.	u05	Sgc
Read receiver pressure	u08	Prec
Read receiver pressure in temperature	u09	Trec
Read discharge pressure in temperature	u22	Tc
Read suction pressure	u23	Po
Read suction pressure in temperature	u24	To
Read discharge temperature	u26	Sd
Read suction temperature	u27	Ss
Read controller software version	u99	

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Documents / Resources

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