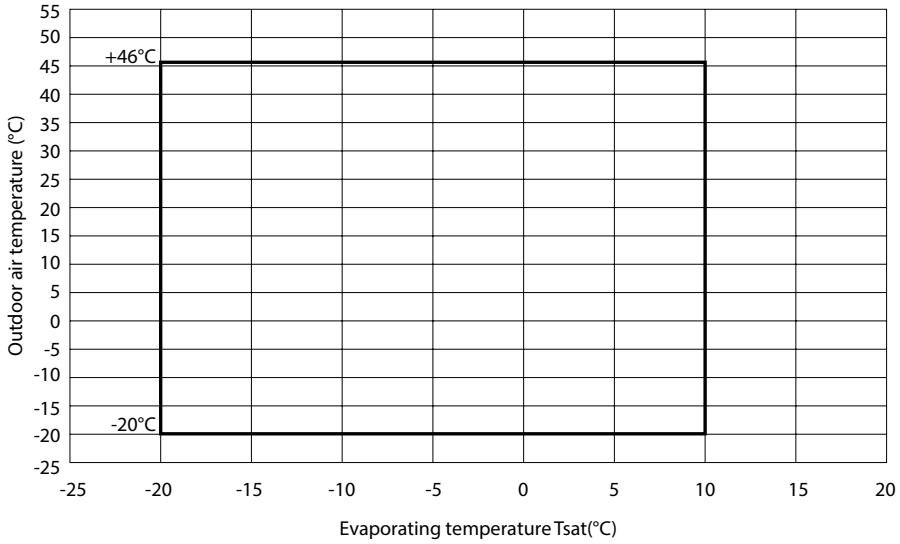
ENGINEERING
TOMORROW

Application guidelines

Optyma™
iCO₂ condensing units

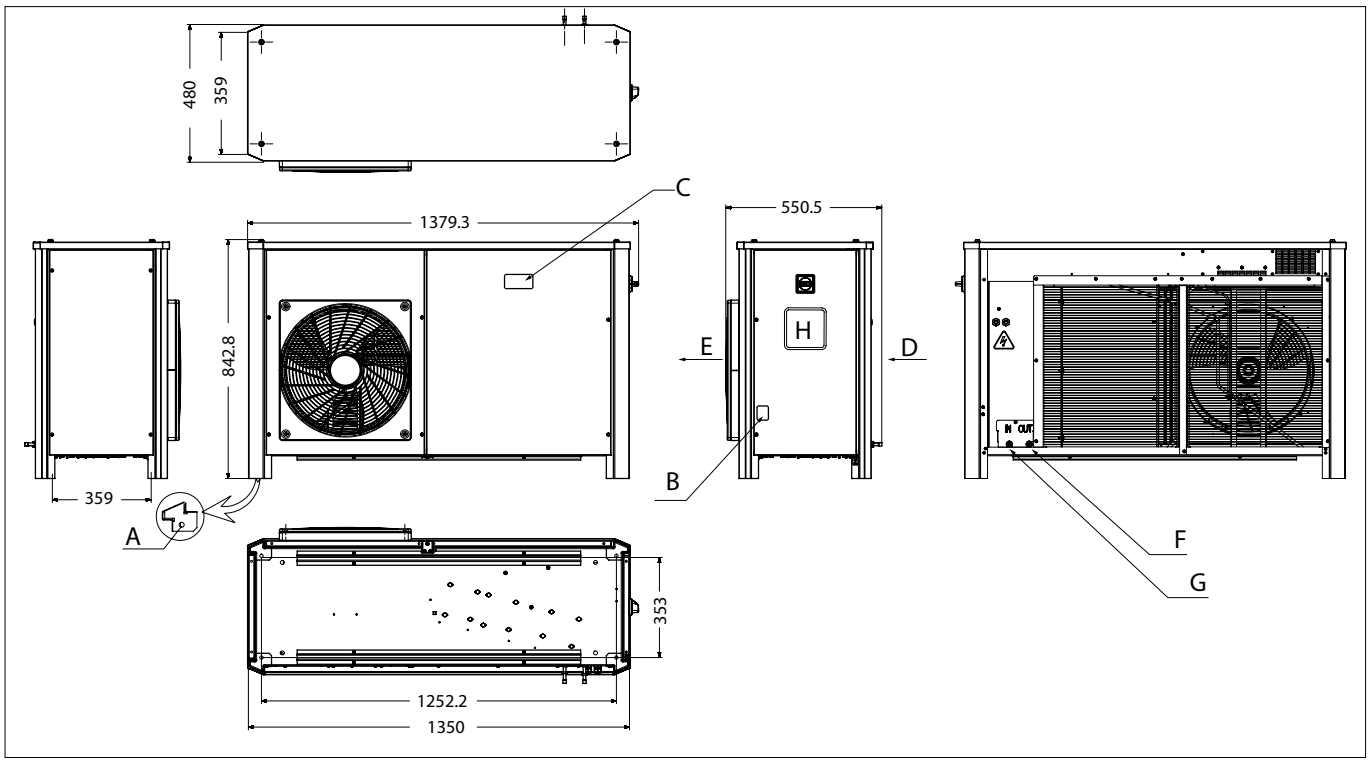
R744 | 50 Hz

www.danfoss.com

Storage temperature range	-25 °C ~ 50 °C
Envelope map	 *Warranty will be null in case of abnormal operations (Out of temperature ranges, bad installation, etc).* **Note** *For ambient temperature below the evaporating temperature, condensing unit performances are more sensitive to adverse conditions like strong wind.*
Operation humidity range	MAX 95%RH
Power	Rated voltage: Single phase 230V±10% Rated frequency: 50Hz Neutral connection : Yes **Note** *Compressor of Optyma™ ICO2 is equipped with a IPM (Interior Permanent Magnet) motor and built in Frequency converter in the condensing unit. The compressor cannot operate without Danfoss dedicated frequency converter. It will be destroyed immediately if connected directly to public network. The applied frequency from the inverter will be 73,3 Hz for 36,66 rps (2200 rpm) up to 228 Hz for 114 rps (6840 rpm).* *Compressor speed Min Max* *rps 36.66 to 114* *rpm 2200 to 6840* *230V 1N ~50Hz through inverter*
Current	MCC is 15A. For over-current protection we recommend fuse rated 16 A to 20 A
IP protection level	54
RCD type	Type A or B
Levelness	Side to side : Less than or equal 2 degrees Ensure a foundation with horizontal surface (less than 2 degrees slope), strong and stable enough to carry the entire unit weight and to eliminate vibration and interference.

© Danfoss | Climate Solutions | 2023.08

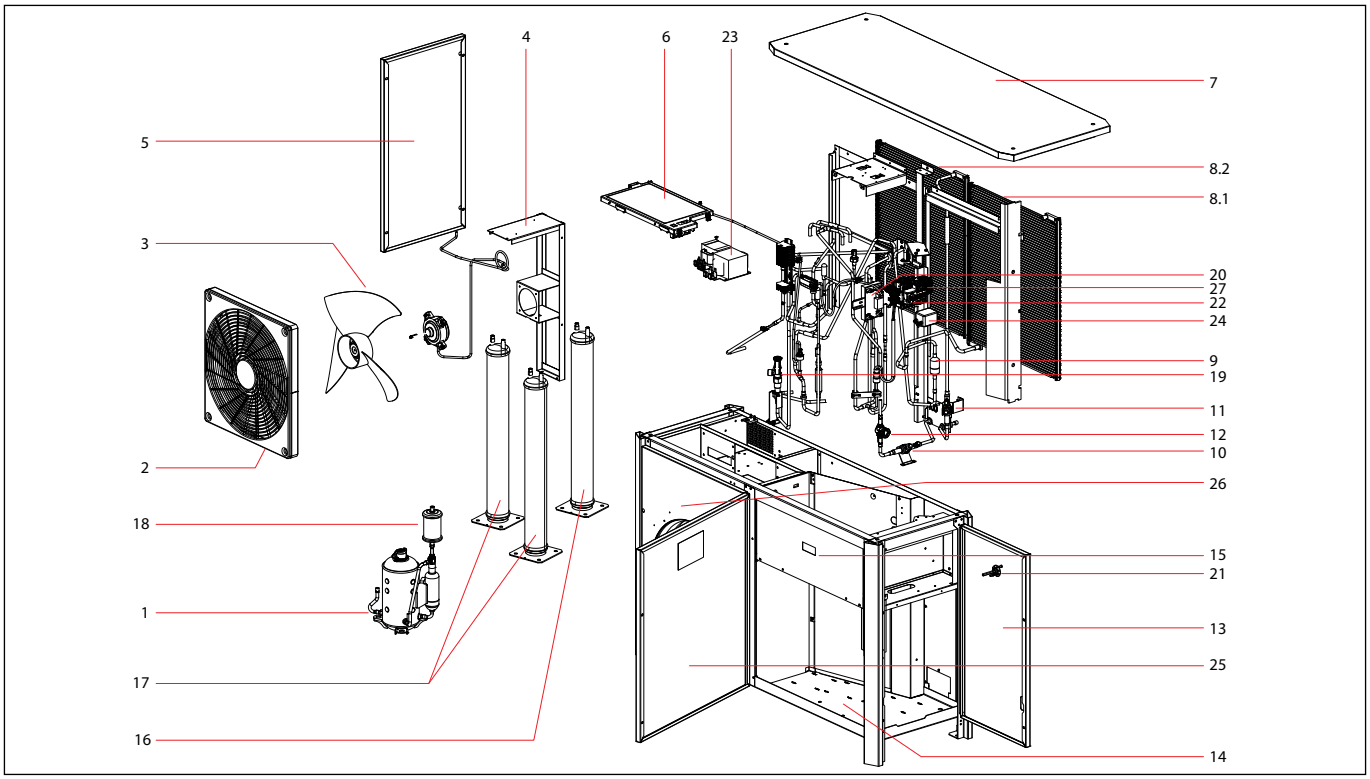
2.1 Delivery product appearance



A Ø12 Hole for Mounting
B Sight Glass
C Controller Display
D Air in
E Air out
F Liquid Port
G Suction Port
H Nameplate

⚠ Electrical Cables

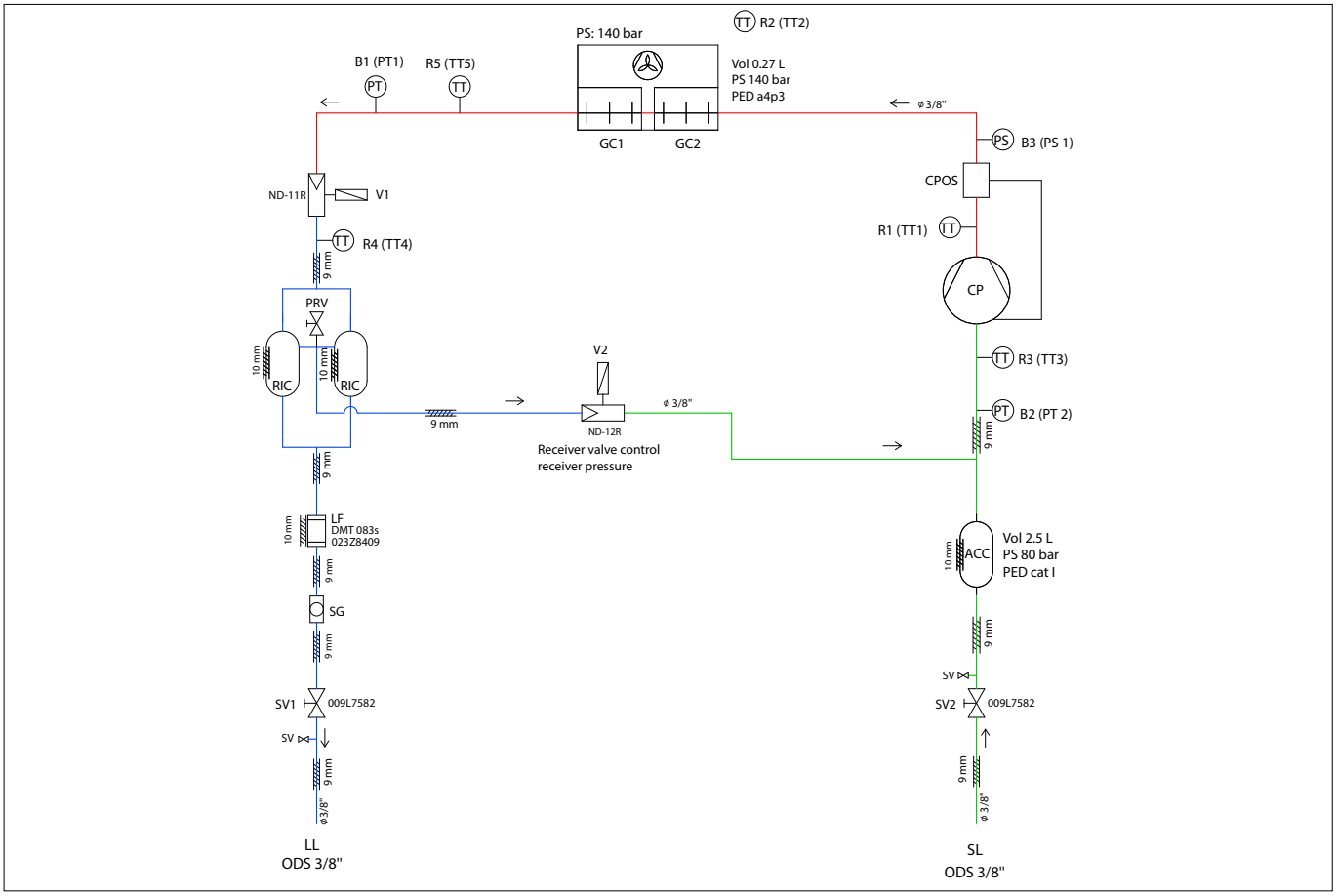
Note: all dimension are in mm

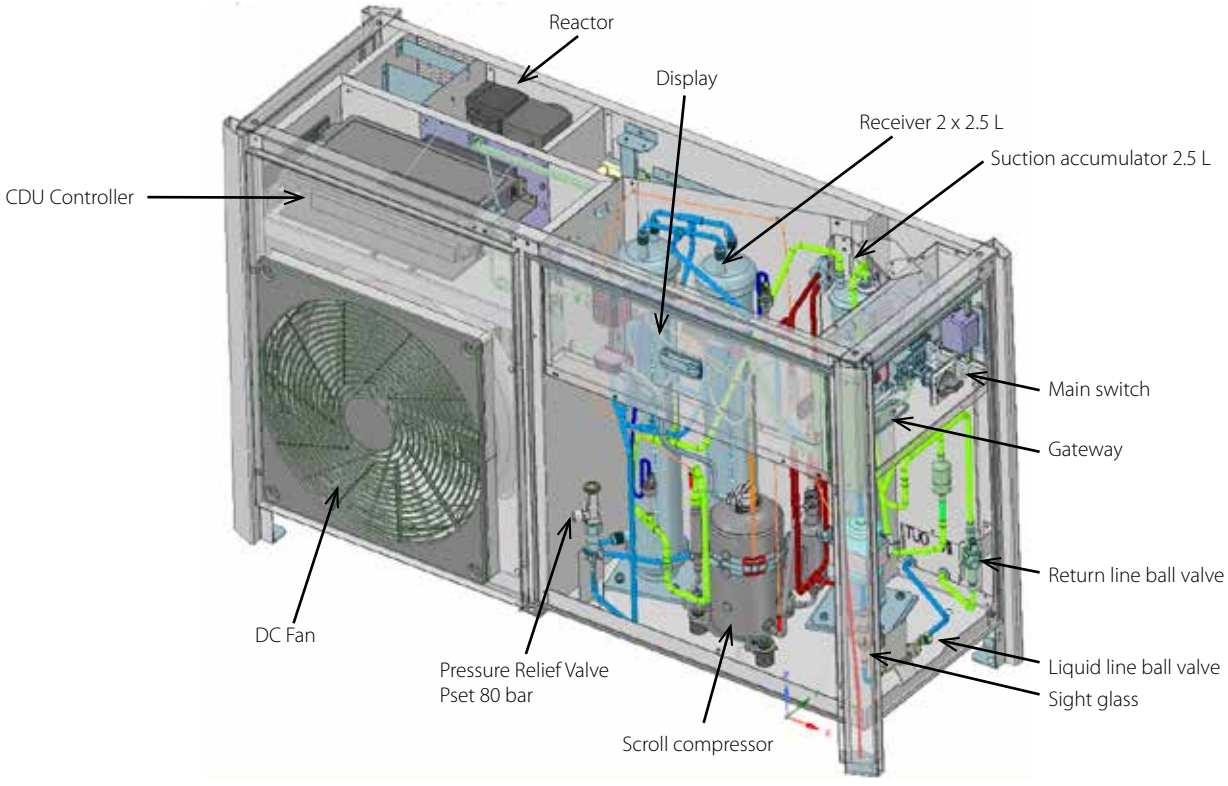


Nr	Component type legend	Component code	SAP Description
1	Compressor	118U4105	SPARE PART, COMPRESSOR 045CC
2	Fan cowl/grill	118U4100	SPARE PART, FAN GRILL D1
3	Fan assembly	118U4129	SPARE PART, FAN ASSEMBLY (D 415)
4	Braket	No spare part	Fan braket
5	Sheet metal left	118U4099	SPARE PART, LEFT SIDE D1
6	Electronic controller	118U4126	SPARE PART, CONTROLLER D1
7	Sheet metal top	118U4101	SPART PART, TOP PANEL D1
8.1	Gascooler 1	118U4112	SPARE PART, FIRST GAS COOLER D1
8.2	Gascooler 2	118U4116	SPARE PART, SECOND GAS COOLER D1
9	Strainer	No spare part	suction strainer
10 , 11	Shut-off ball valve, GBCH 10s	009L7582	GBCH 10s CO2 90bar Ball Valve M/25 w AP
12	Sight glass	118U4111	SPARE PART, SIGHT GLASS
13	Sheet metal service panel	118U4097	SPARE PART, RIGHT DOOR D1
14	frame	No spare part	Unit frame
15	Display	080G0233	MMILDS Elect.Control Panel I/25
16	Accumulator	118U4104	SPARE PART, ACCUMULATOR
17	Receiver	118U4103	SPARE PART, RECEIVERS 2X2,5L
18	Filter drier	023Z8409	Filter drier DMT 083S I/12
19	Pressure relief valve	118U4106	SPARE PART, RELIEF VALVE 80B (15.6 MM2)
20	Gateway	118U4119	SPARE PART, GATEWAY D1
21	Main Switch Handle	118U3858	HANDLE, ABB-OHB2AJM,MSMN,OXS5X131
22	Main Switch Ms132 16-20 A	118U3854	MPCB, ABB-MS132-20+HK1-12
23	Reactor	118U4124	SPARE PART,REACTOR(BIG) (VFD,DRIVE)
23	Reactor 2	118U4125	SPARE PART,REACTOR (SMALL) (VFD,DRIVE)
24	EMC filter (Controller)	118U4120	SPARE PART, NOSIE FILTER (TYPE:EMI FILTE
25	Sheet metal front	118U5273	SPARE PART, FRONT DOOR D1
26	Sheet metal fan	118U4098	SPARE PART, FAN PANEL D1
27	Contactor 16A	118U3847	CONT, ABB-A16-30-01-80+CA5-11
	Valve body	118U4107	SPARE PART, EXP VALVE (3/8")
	Suction pressure sensor	118U4108	SPARE PART, PRESSURE SENSOR (0-10 MPA RA
	High-pressure switch	118U4109	SPARE PART, HIGH PR SWITCH (14MPA)
	Discharge pressure sensor	118U4110	SPARE PART, HIGH PR SENSOR (0-19.6MPA)
	High pressure valve coil 1	118U4117	SPARE PART, EXP VALVE COIL (3/8")
	Receiver valve coil 2	118U4118	SPARE PART, EXP VALVE COIL (3/8")
	Temperature switch	118U4121	SPARE PART, THERMAL SWITCH KIT
	Temperature switch 2	118U4122	SPARE PART, REACTOR THERMAL KIT
	Temperature sensor	118U4123	SPARE PART, THERMISTOR KIT

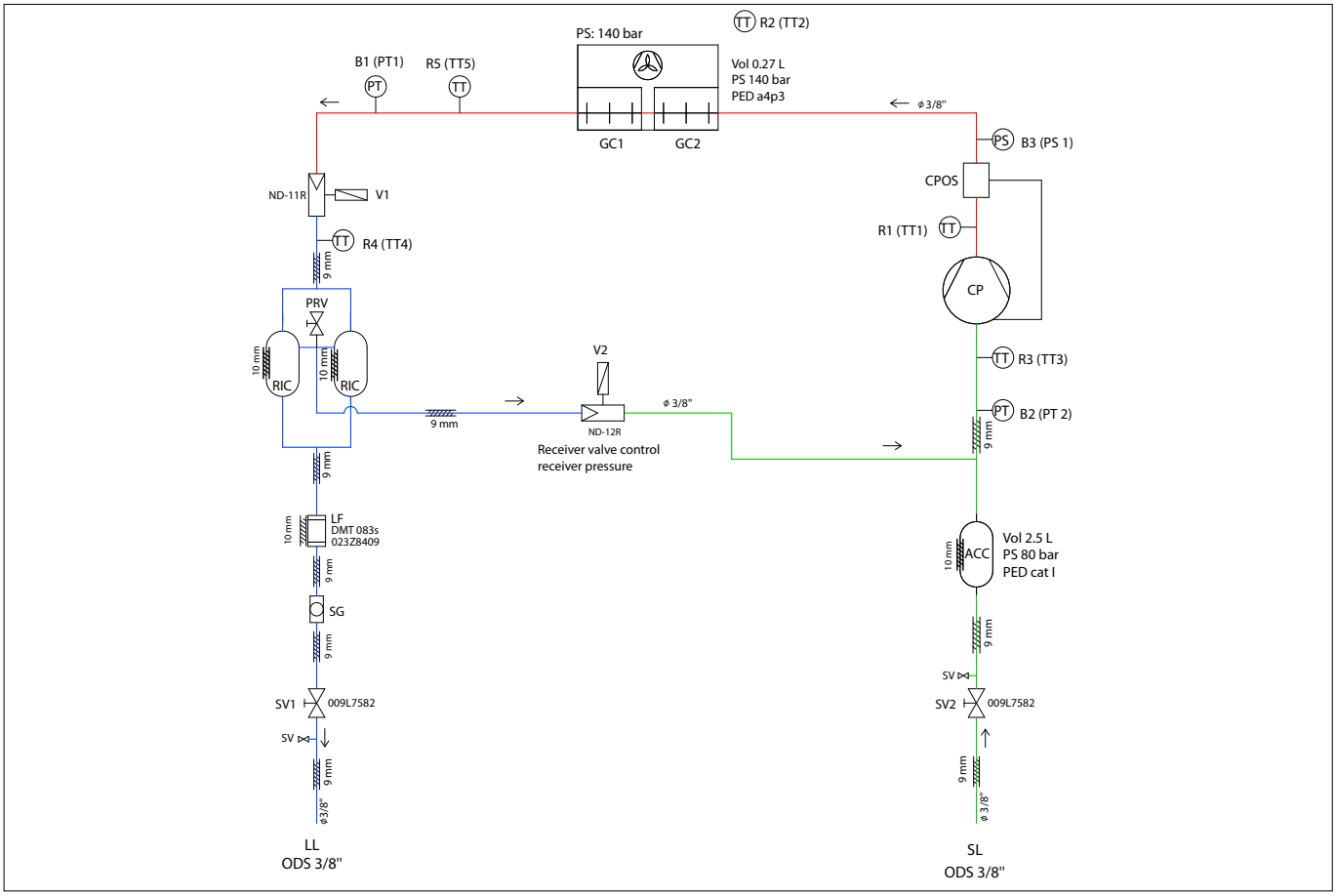
© Danfoss | Climate Solutions | 2023.08

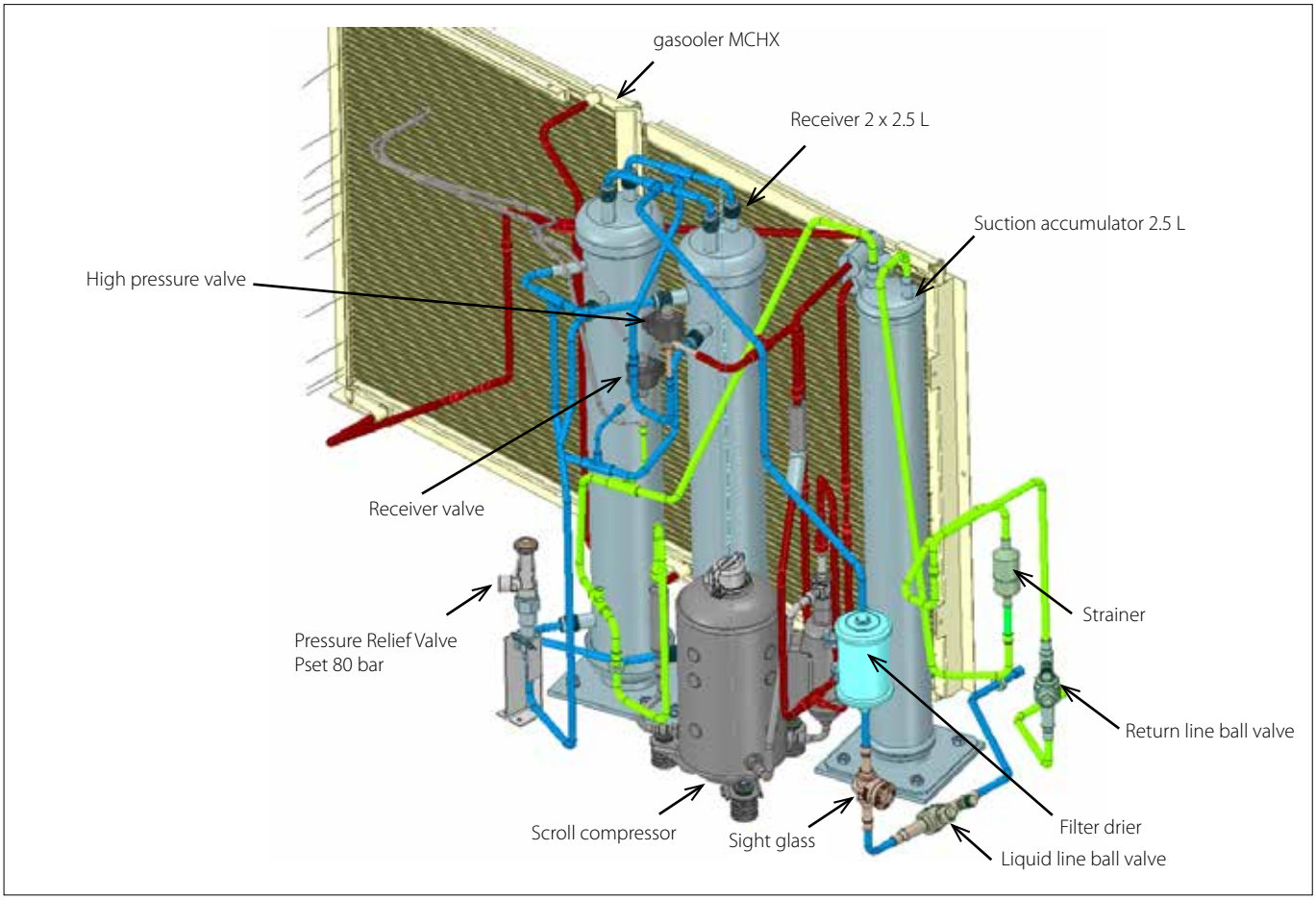
Components


PS: 140 bar
R2 (TT2)
B1 (PT1)
R5 (TT5)
Vol 0.27 L
PS 140 bar
PED a4p3
GC1
GC2
ø 3/8"
B3 (PS 1)
CPOS
ND-11R
V1
R1 (TT1)
R4 (TT4)
9 mm
CP
PRV
V2
R3 (TT3)
10 mm
RIC
RIC
9 mm
ND-12R
ø 3/8"
B2 (PT 2)
Receiver valve control
receiver pressure
LF
DMT 083s
023Z8409
ACC
Vol 2.5 L
PS 80 bar
PED cat I
SG
SV1
009L7582
SV2
009L7582
SV
ø3/8"
LL
ODS 3/8"
SL
ODS 3/8"


Reactor
Display
Receiver 2 x 2.5 L
Suction accumulator 2.5 L
CDU Controller
Main switch
Gateway
Return line ball valve
DC Fan
Pressure Relief Valve
Pset 80 bar
Liquid line ball valve
Sight glass
Scroll compressor

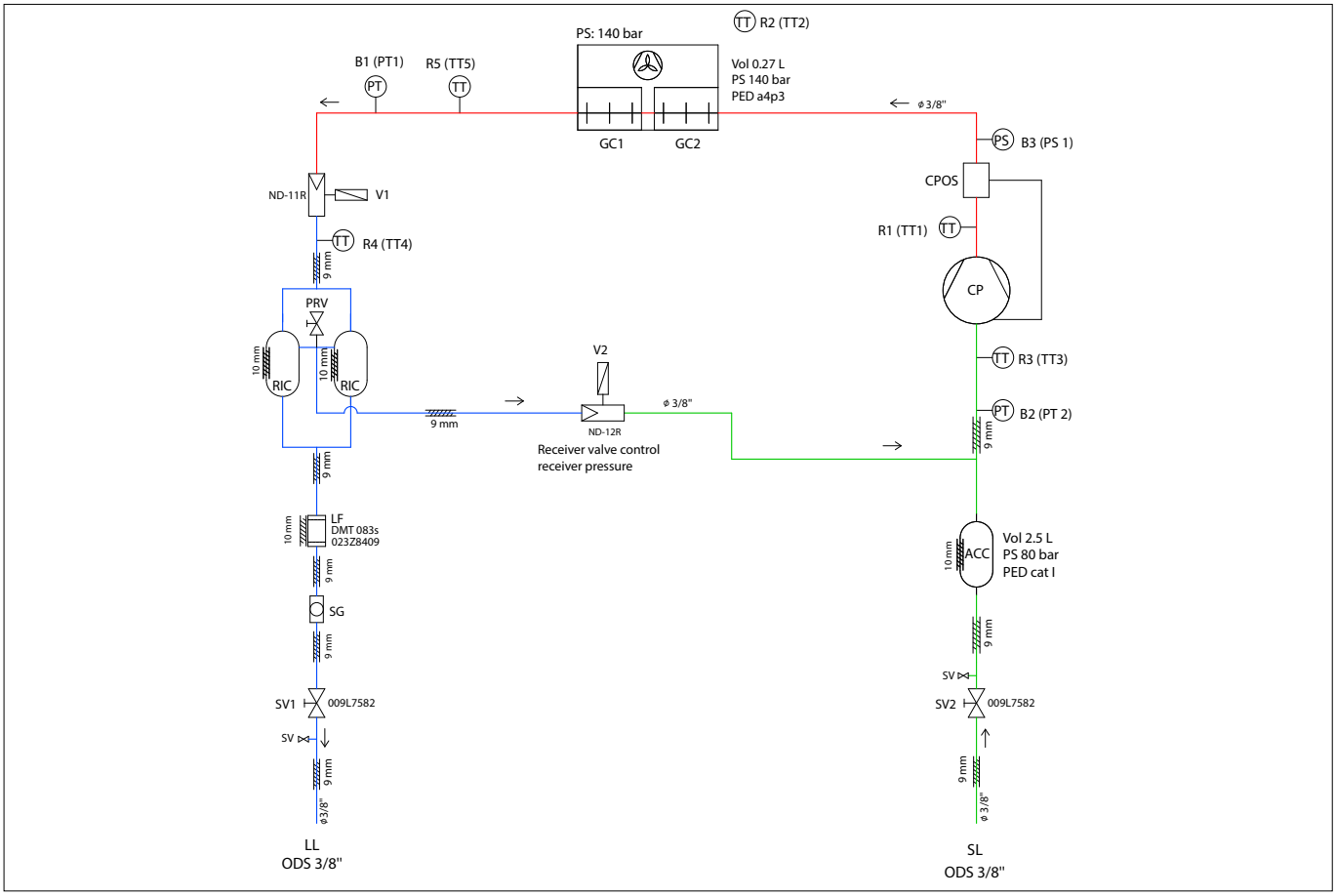
Components

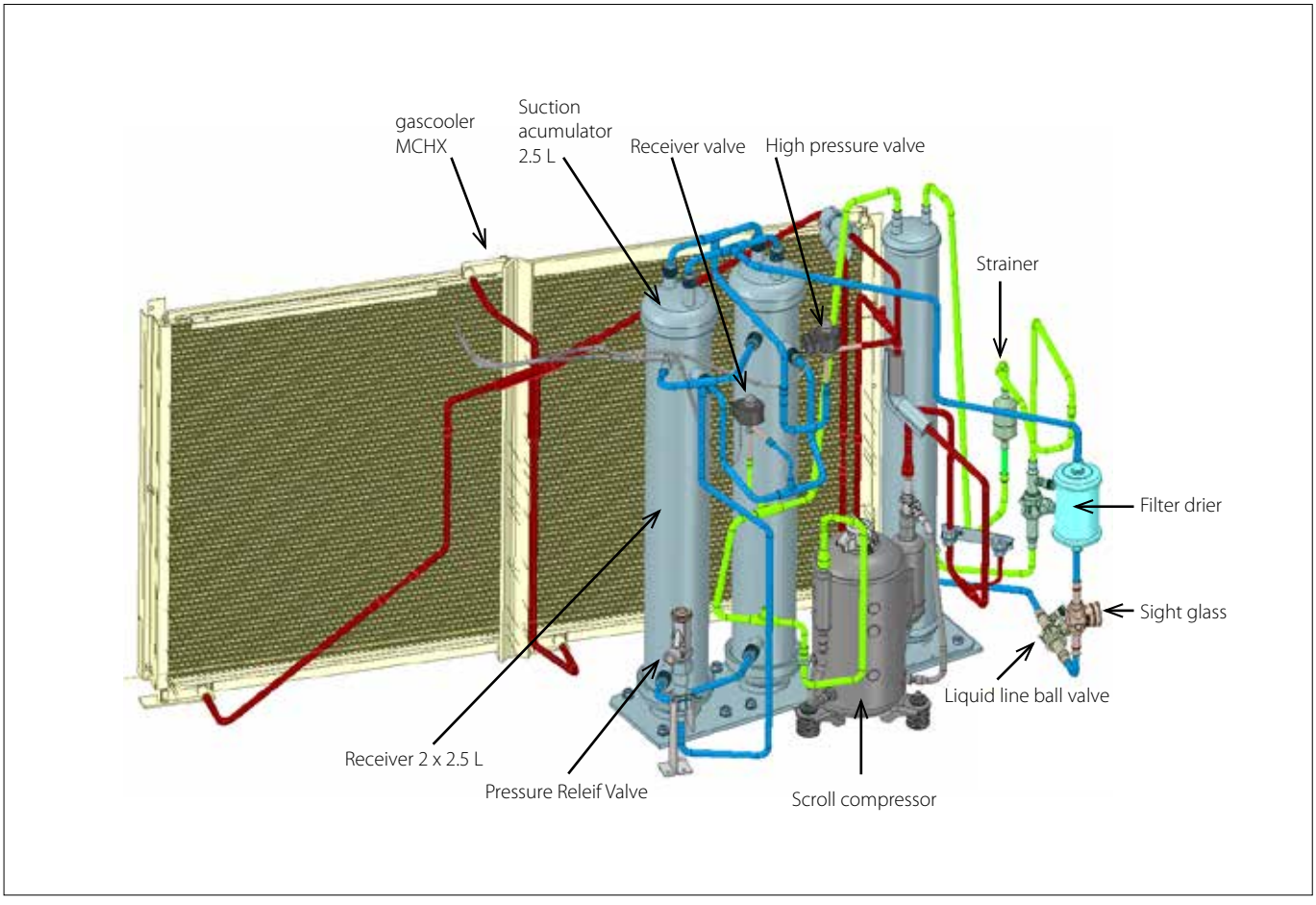




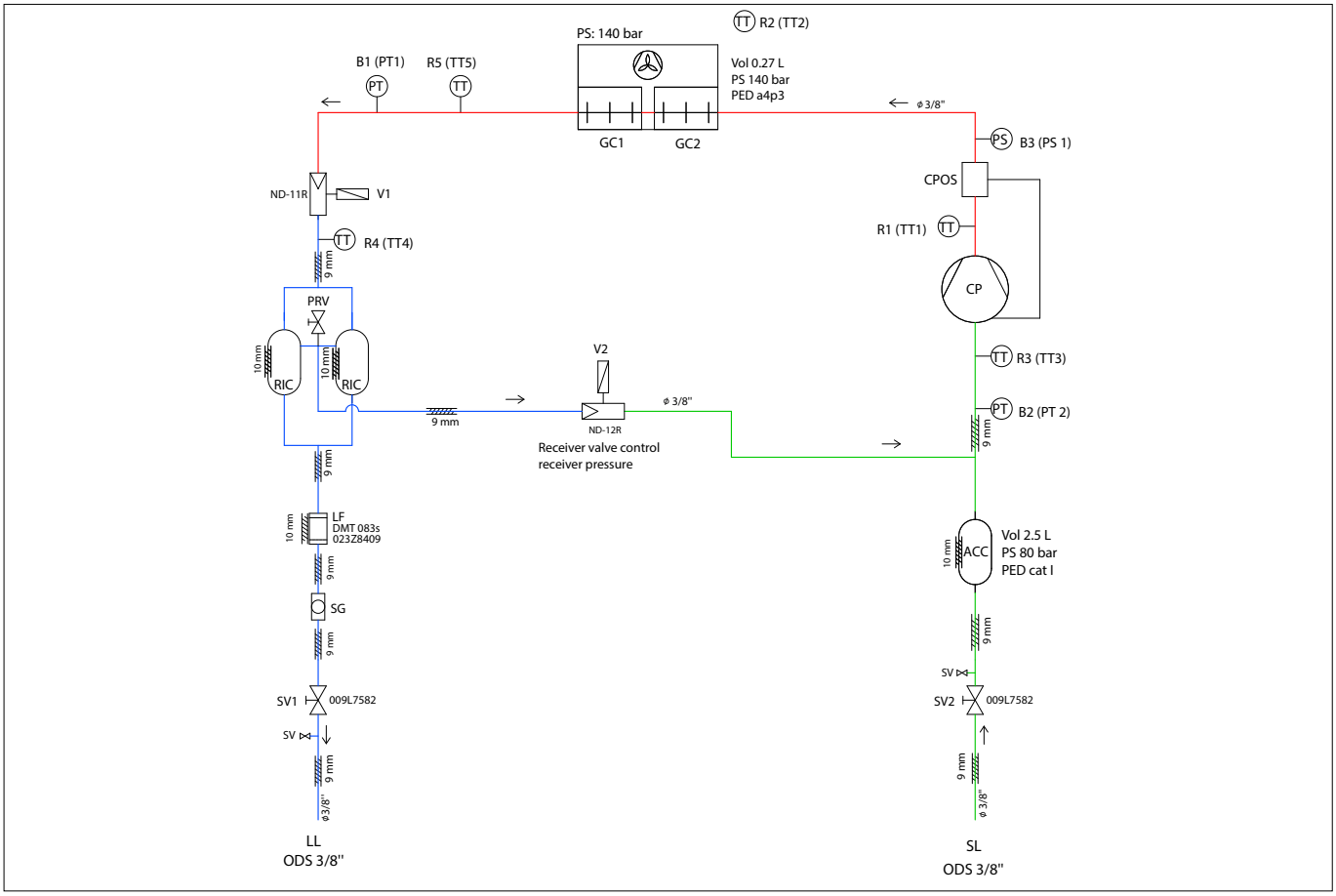
© Danfoss | Climate Solutions | 2023.08

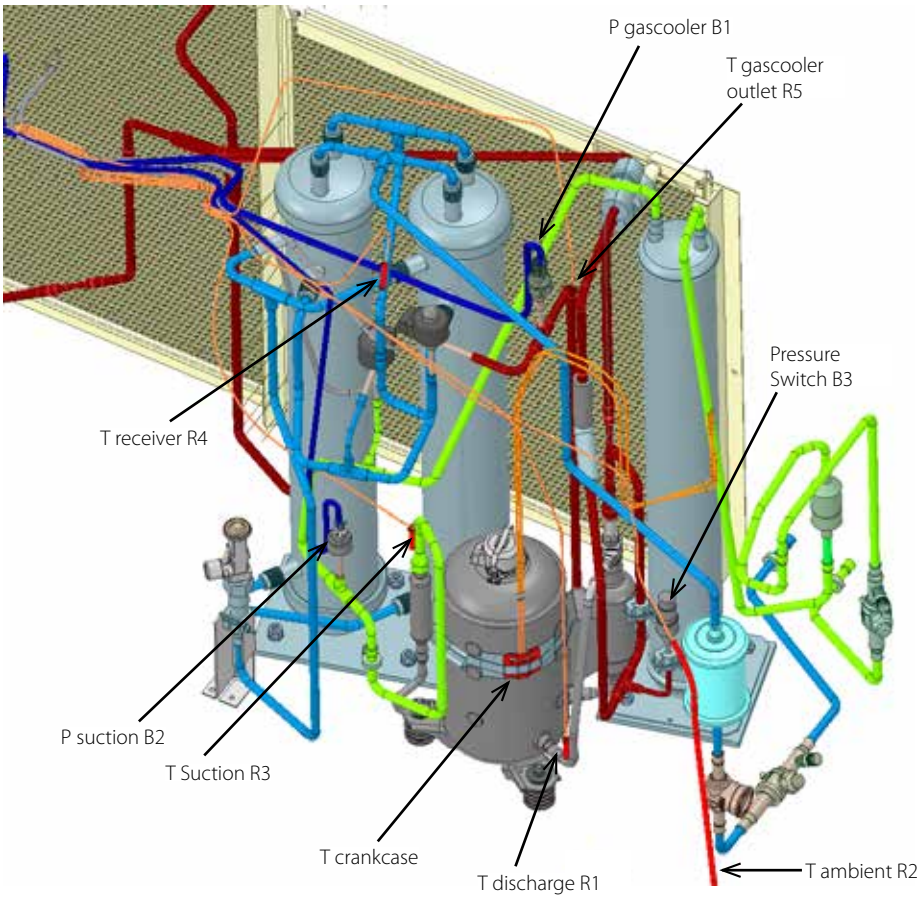
Components


PS: 140 bar
R2 (TT2)
B1 (PT1)
R5 (TT5)
Vol 0.27 L
PS 140 bar
PED a4p3
GC1
GC2
ø 3/8"
B3 (PS 1)
CPOS
ND-11R
V1
R1 (TT1)
R4 (TT4)
9 mm
CP
PRV
V2
R3 (TT3)
10 mm
RIC
RIC
ND-12R
B2 (PT 2)
Receiver valve control
receiver pressure
LF
DMT 083s
023Z8409
ACC
Vol 2.5 L
PS 80 bar
PED cat I
SG
SV
SV1
009L7582
SV2
009L7582
LL
ODS 3/8"
SL
ODS 3/8"


gascooler
MCHX
Suction
acumulator
2.5 L
Receiver valve
High pressure valve
Strainer
Filter drier
Sight glass
Liquid line ball valve
Receiver 2 x 2.5 L
Pressure Releif Valve
Scroll compressor

Sensors

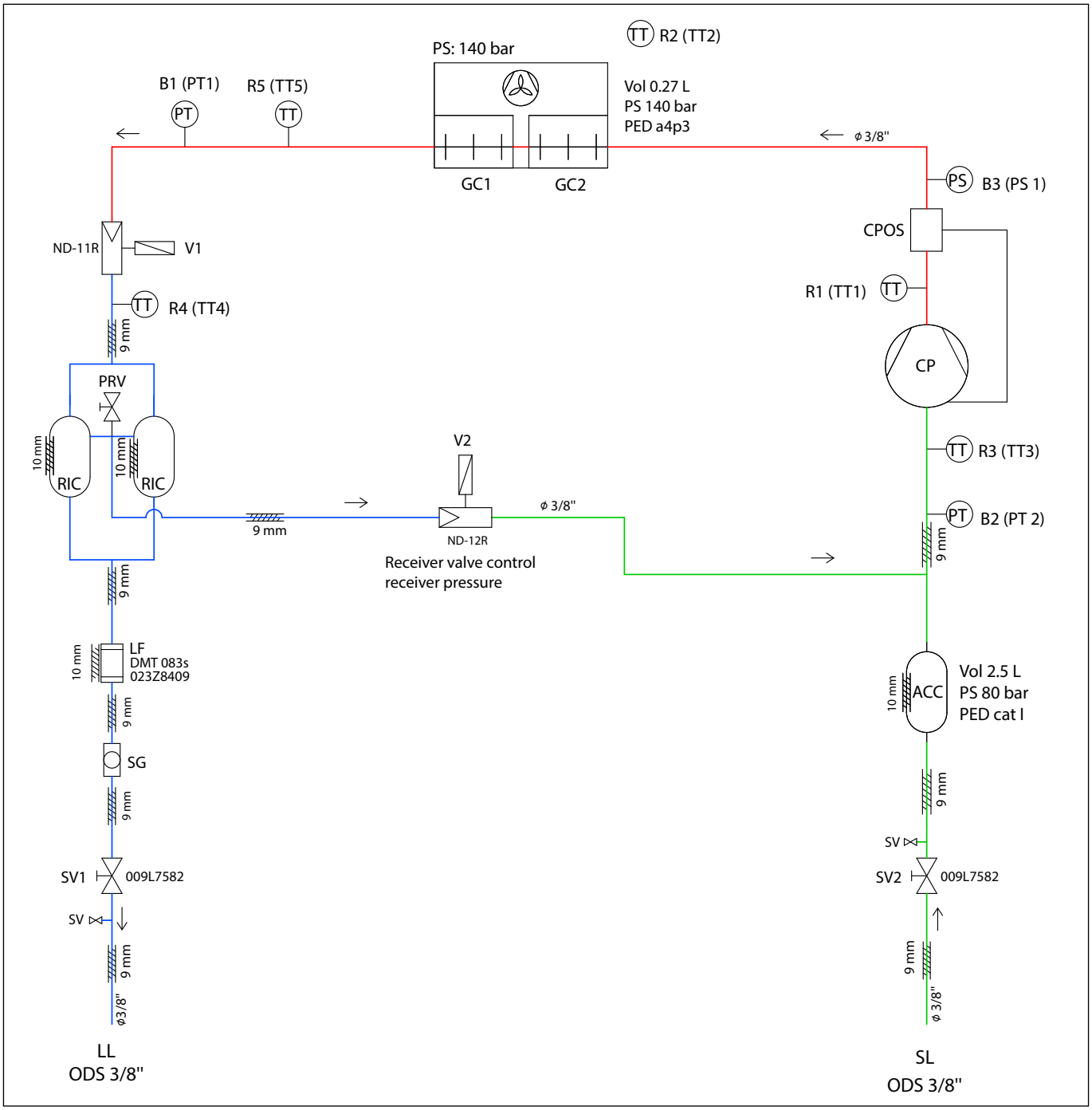




© Danfoss | Climate Solutions | 2023.08

Refrigerant name / amount	CO_2 Pure grade 99.995% / According to charge calculation excel sheet
Compressor oil	Danfoss oil tank 118U4144 (1 can=250 ml) / 268g±25g PAG ND8 (Factory default)
Connecting piping specification	in/out diam 3/8'', max working pressure 80 bar
Dimension	H 1028 / W 800 / L 1500 mm
Weight	114 kg (with total charge of oil inside CDU 268 g = 158 g compressor charge + 110 g suction accumulator charge)
Reference standard and regulation	All reference needed for issuing of CE declaration of incorporation for the Optyma™ iCO_2
Condition1 (rated condition)	Evaporating Temperature : -10 °C
	Ambient Temperature : 32 °C
	Super Heat : 10 K
Cooling capacity	4.58 kW under condition1
Cooling COP / SEPR	1.55 / 3.2 (according to Ecodesign Detective 2009/125/EC, Regulation (EU) 2015/1095) under condition1
Power and sound pressure (standard ISO 3745)	67dB(A) (Sound power level). 35 dB(A) sound pressure at 10 m (free field) under condition 1
Environmental response	Compatible with REACH and RoHS: equipment containing electrical components must not be disposed of together with domestic waste. It must be separately collected with electrical and electronic waste according to local and currently valid legislation. **RoHS Directive 2011/65/EU including amendment 2015/863** Though Condensing units are not in the scope of RoHS 2011/65/EU, declaration Danfoss declares that the listed products and spare parts/accessories are compliant with the requirements of the Directive 2011/65/EU of the European Parliament and of the Council of June 8th, 2011. Assessment done according to standard EN IEC 63000:2018. Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances. **REACH** Danfoss supports the objective of REACH (Registration, Evaluation, Authorization and restriction of Chemicals, 1907/2006/EC) to further improve the European Union's chemicals regulatory system, including the aim to advance public health and safety as well as the protection of the environment.

2.2 PID (Piping & Instrumentation Diagram)



ACC - Suction accumulator vol 2.5L PS 80 bar PED cat 1
B1 - High pressure sensor
B2 - Low pressure sensor
B3 - High pressure switch
CP - Inverter driven Scroll compressor with oil separator, Compressor suction vol 1.2L PS 80 PED cat 1
CPOS - Oil separator build on compressor
R1 - Discharge temperature sensor
R2 - Ambient temperature sensor
R3 - Suction temperature sensor
R4 - Receiver inlet temperature sensor
R5 - Gas cooler outlet temperature sensor
V1 - Expansion valve (main)
High pressure valve control gascooler pressure
V2 - Expansion valve (gas by-pass)
Receiver valve control receiver pressure
PRV - Pressure Relief valve
GC1 - MCHE Gas cooler 1
GC2 - MCHE Gas cooler 2
LF - Liquid filter dryer
LL - Liquid line
PRV - Pressure relief valve on receiver Pset = 80 bar
RIC - Receiver Vol 2.5 L PS 80 bar PED cat I
SG - Sight glass with moisture indicator
SL - Suction line
SV - Schrader valve
SV1 - GBCH Service ball valve 1 (liquid line)
SV2 - GBCH Service ball valve 2 (suction line)

Red line - high pressure line
Blue line - Liquid line
Green line - Suction line
Black line - Oil line

© Danfoss | Climate Solutions | 2023.08

2.4 Pressure resistance

Max. working pressure	High pressure side 140 bar Medium pressure 80 bar Low pressure side 80 bar PRV (Pressure Release Valve) setting : 80 bar
Test pressure	According to EN378-2

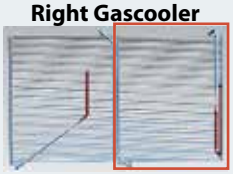
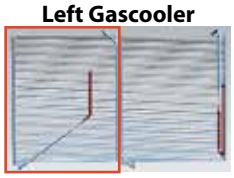
2.5 Strength

Corrosion resistance	Salt spray test 1000 h (According to EN60068-2-52)

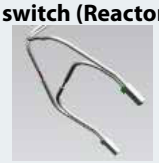
2.6 Electric safety tests (according EN60335-1:2010)

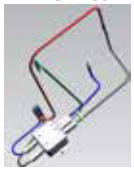
TEST	MAIN FEATURES
Protective Bond Test	25A, 0.1Ω Max time 3 sec.
High Voltage Test	1000V, 1sec. Max current 20mA
Insulation Resistance Test	500V DC Low limit 1MΩ
Leakage Current Test	Max 3.5mA at 1.06 rated voltage

3.1 Parts name and specification

Parts Name	Specification
Kit Compressor (included insulation) 	Spare part code : 118U4105 Rated voltage : DC165V Power voltage : Through Danfoss Optyma™ iCO2 inverter controller (118U4126)
Right Gascooler 	Spare part code : 118U4112 (Right GC) Type : Aluminum Brazed (external view). Microchannel technology (internal view) Dimension : H480 mm X W572mm X D11.5mm
Left Gascooler 	Spare part code : 118U4116 (Left GC) Type : Aluminum Brazed (external view). Microchannel technology (internal view) Dimension : H480 mm X W572mm X D11.5mm
Kit Receiver (included insulation) 	Spare part code : 118U4103 Vessel dimension : Diameter 76mm Height 687mm Volume : 2.5 L each Pipe diameter : 3/8" X 5 pipes
Kit Accumulator (included insulation) 	Spare part code : 118U4104 Vessel dimension : Diameter 76mm Height 687mm Volume : 2.5 L Pipe diameter : 3/8" X 2 pipes
Dryer 	Spare part code : 023Z8409 Manufact. designation : DMT 083s Dimension : Diameter 68.0mm Length 144mm Connection : 3/8" X 2 pipes
Moisture indicator 	Spare part code : 118U4111 Dimension : Length 117 mm Indication : From Yellow (wet) to green (dry) Connection : 3/8" X 2 pipes
Charge Valve 	Spare part code : 009L7582 Manufact. designation : GBCH 10s Manufacturer P/N : 009L7582 Connection : 3/8" X 2 pipes
High pressure valve coil 	Spare part code : 118U4117 Type : ND-11R Rated coil voltage : DC 14 V Rated coil current : 0.3 A (per phase) Rated coil resistance: 46 Ω (at 20°C)
receiver valve valve coil 	Spare part code : 118U4118 Type : ND-12R Rated coil voltage : DC 14 V Rated coil current : 0.3 A (per phase) Coil resistance : 46 Ω (at 20°C)

© Danfoss | Climate Solutions | 2023.08

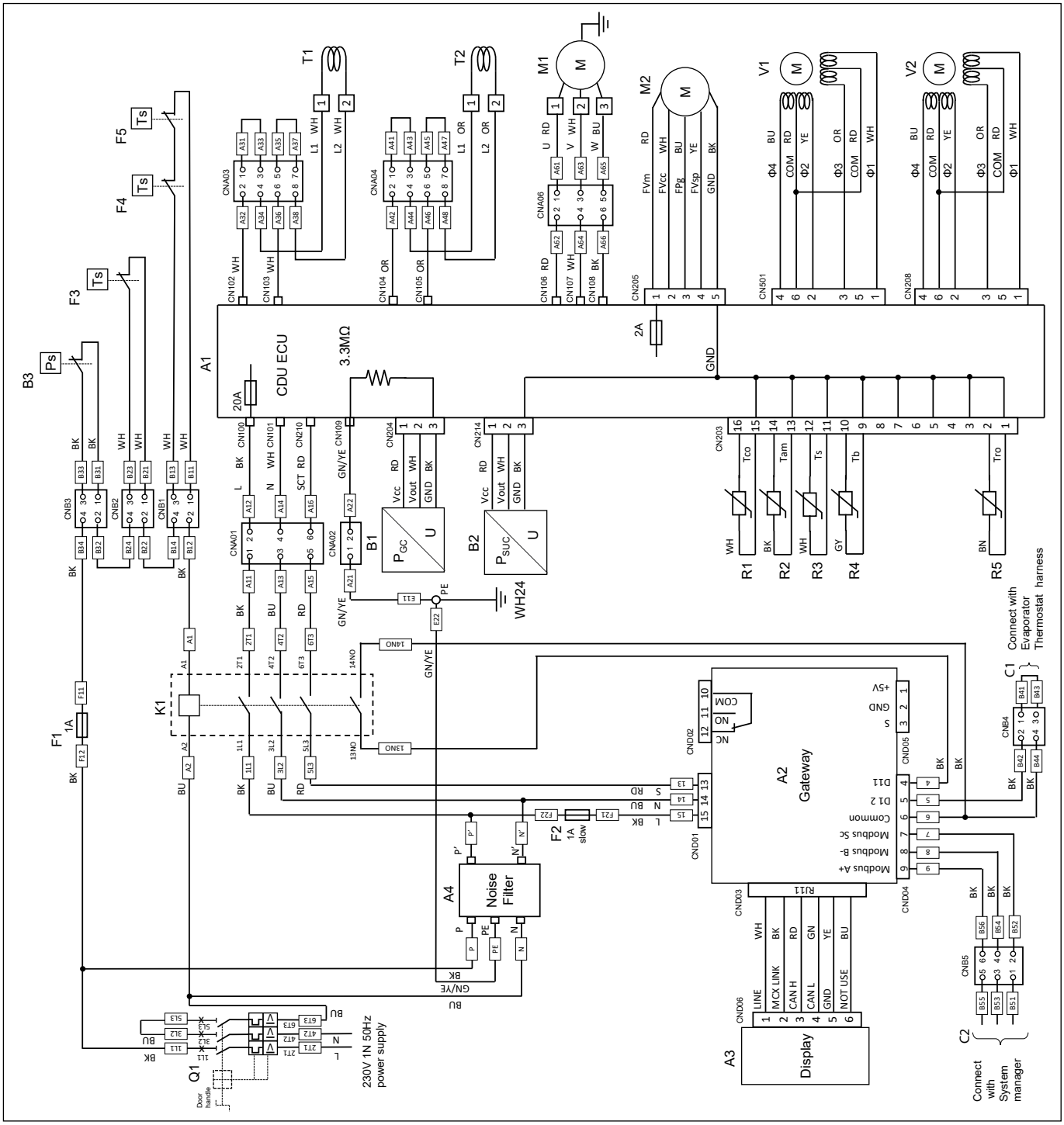
Parts Name	Specification
Spare part valve body for both high pressure valve and receiver valve (3/8") 	Spare part code : 118U4107 Inlet pipe diameter : Φ 6 mm Outlet pipe diameter : Φ 9.5 mm
Temperature sensor assembly 	Spare part code : 118U4123 Resistance : R_{100} = 184.3 kΩ ± 3% (Gas cooler refrigerant outlet thermistor, Receiver inlet temperature thermistor, Ambient air thermistor, Suction temperature thermistor) Resistance : R_{100} = 3.3 kΩ ± 5% (Discharge temperature thermistor) *Press the small terminal clip and remove the upper from the lower part, and connect the new sensor kit the other way around. Ensure that the upper and lower part of the terminal interlocks with a "click".)*
Relief valve 	Spare part code : 118U4106 Set pressure : 80 bar Over pressure : +10% Blowdown :-15% Connection : INLET 3/8" OUTLET ¾"
High pressure sensor 	Spare part code : 118U4110 Type : Ratiometric Rated voltage : DC 5 V Measuring range : 0 bar~196 bar Pipe diameter : 6 mm
Low pressure sensor 	Spare part code : 118U4108 Type : Ratiometric Rated voltage : DC 5 V Measuring range : 0 bar~100 bar Pipe diameter : 6 mm
High Pressure switch 	Spare part code : 118U4109 Type : PS80-2X series Actuation pressure :140 + 0 bar -7 bar Current range :~1A
Thermal switch (Compressor surface) 	Spare part code : 118U4121 Type : JP72 series Actuation temperature :125 ± 5 °C Release temperature : 85 ± 15 °C Current range : 5 mA ~ 1.5 A
Thermal switch (Reactor surface) 	Spare part code : 118U4122 Type : JP72 series Actuation temperature :110 ± 5 °C Release temperature : 70 ± 15 °C Current range : 5 mA ~ 1.5 A
CDU Controller (6) 	Spare part code :118U4126 Rated voltage : 230 V Rated frequency : 50 Hz Input current : Less than or equal 15 Arms *The package includes inverter*

Parts Name	Specification
Reactor 1 	Spare part code : 118U4124 Type : VFD (Variable Frequency Drive) Rated current : 16 A (There are two Reactor per condensing unit)
Reactor 2 	Spare part code : 118U4125 Type : VFD (Variable Frequency Drive) Rated current : 16 A (There are two Reactor per condensing unit)
Fan motor & blade 	Spare part code : 118U4129 Type : DC brushless motor with built-in sine wave circuit Specifications : Rated voltage DC 240 V Rated current 0.08 A Control power supply volt : DC 15 V Rated rotation speed : 870 rpm
Main switch 	Spare part code : 118U3854 Official designation : KIT MPCB, ABB-MS132-20+HK1-11 Rated voltage : 690 V Rated current : 20 A
Main switch handle 	Spare part code : 118U3858 Type : MSHDLTB Rated current : 20 A
Contactor 	Spare part code : 118U3847 Official designation: KIT MPCB, ABB-A16-30-01-80+CA5-10 Rated voltage : 690 V Rated current : 16 A Design life : ON/OFF 10.000.000 cycle
Gateway 	Spare part code : 118U4119 Official Designation : Gateway Rated voltage : 100 - 277 VAC Rated frequency : 50/60 Hz
EMC filter 	Spare part code : 118U4120 Official designation : EMC filter Type : FN2030B-6-06
Display 	Spare part code : 080G0233 Official designation : Display Type : MMILDS

Please refer to drawing page 6 for Sheet metal parts.

© Danfoss | Climate Solutions | 2023.08

3.2 Electric diagram

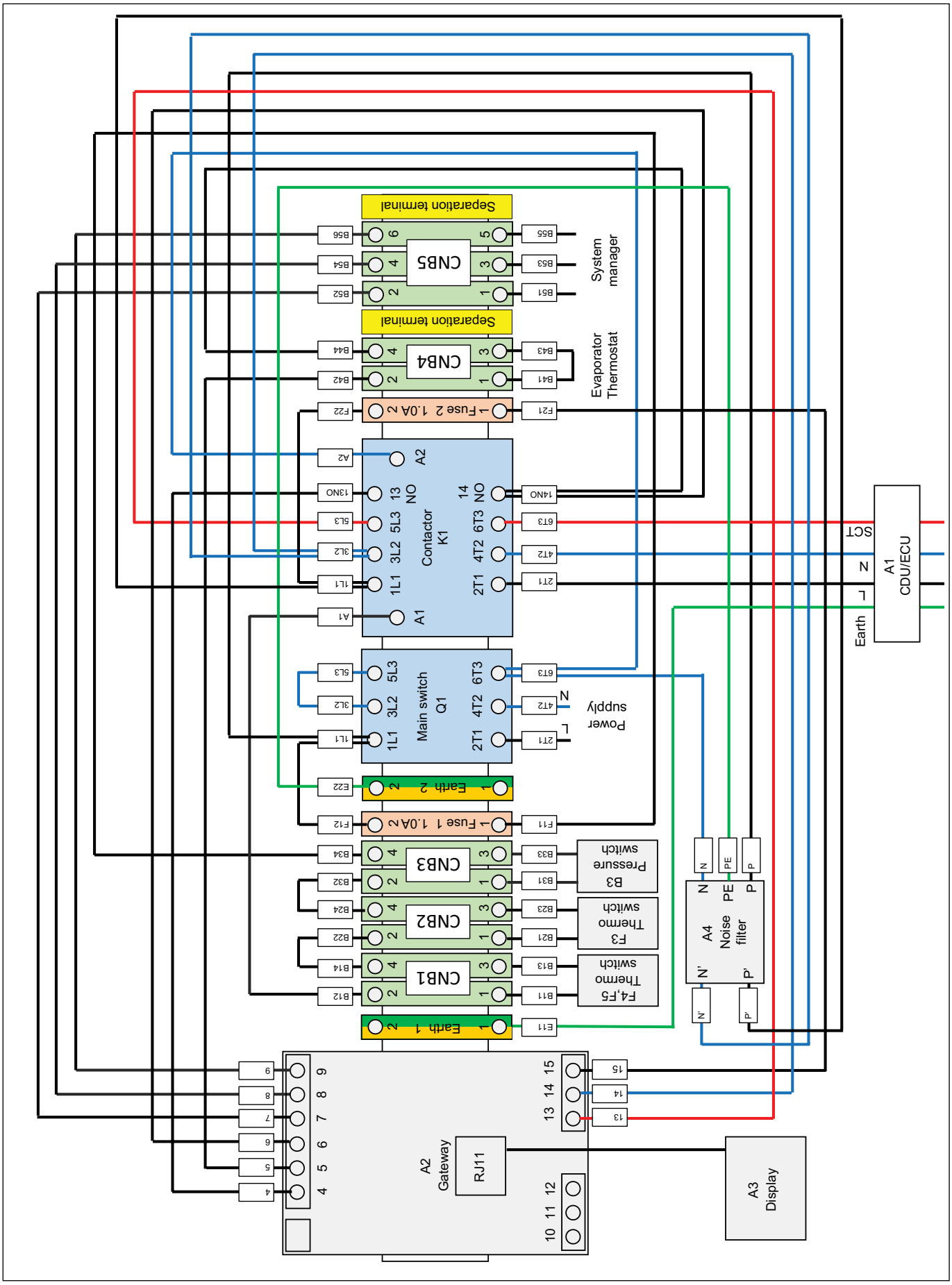


A1 : CDU ECU
A2 : CDU Gateway
A3 : CDU Display
A4 : Noise filter
B1 : High pressure sensor
B2 : Low pressure sensor
B3 : High pressure switch
C1 : Connect with Evaporator Thermostat harness
C2 : Connect with System manager
F1 : Fuse (Pressure SW Thermal SW circuit)
F2 : Fuse (GW circuit)
F3 : Thermal switch (compressor)
F4 : Thermal switch (reactor1)
F5 : Thermal switch (reactor2)

K1 : Contactor
M1 : Compressor
M2 : Fan motor
Q1 : Main switch
R1 : Discharge temp. thermistor
R2 : Ambient air temp. thermistor
R3 : Suction temp. thermistor
R4 : Receiver inlet temp. thermistor
R5 : Refrigerant outlet temp. thermistor
T1 : Reactor1
T2 : Reactor2
V1 : Expansion valve (main)
V2 : Expansion valve (bypass)

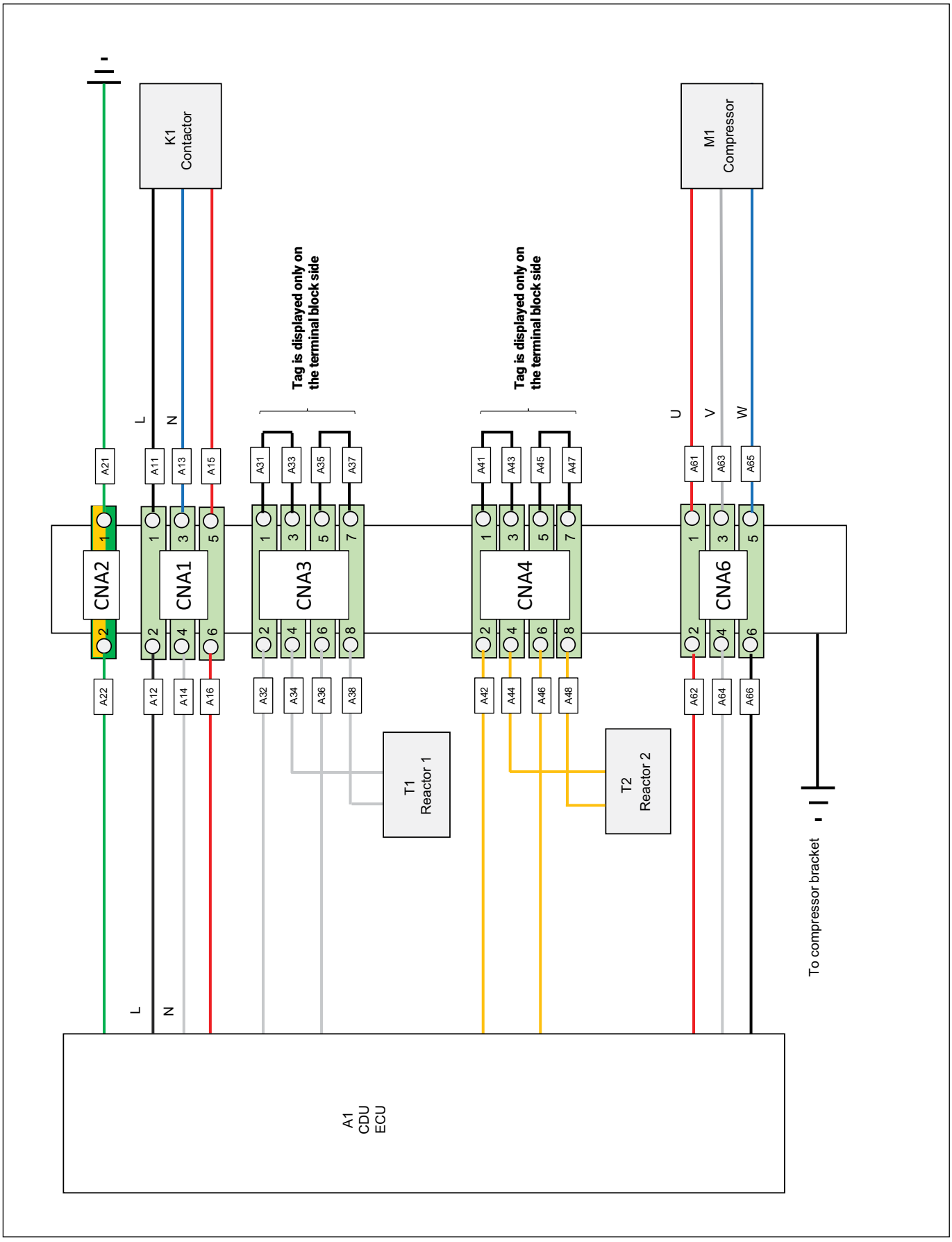
Wire colors
BK : black
BU : blue
BN : brown
GN : green
GY : grey
OR : orange
RD : red
YE : yellow
WH : White

Terminal block layout and wiring plan with tags (1/2)

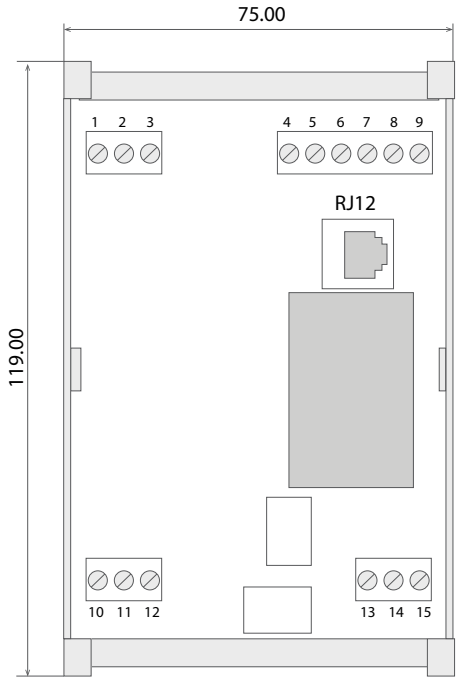


© Danfoss | Climate Solutions | 2023.08

Terminal block layout and wiring plan with tags (2/2)



4.1 Layout and characteristics



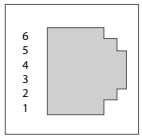
Terminals

1. Pressure Transmitter - +5VDC
2. Pressure Transmitter - GND
3. Pressure Transmitter - Signal
4. Digital Inputs - DI1
5. Digital Inputs - DI2
6. Digital Inputs - Common
7. Modbus RTU - Screen
8. Modbus RTU - B-
9. Modbus RTU - A+
10. Alarm Relay - Common
11. Alarm Relay - Normally Open
12. Alarm Relay - Normally Closed
13. 230V UART - Signal
14. Power Supply - Neutral
15. Power Supply - Live

RJ12. Connector for MMILDS Display

} Connection with system manager or external controller

} Signal with the Unit controller



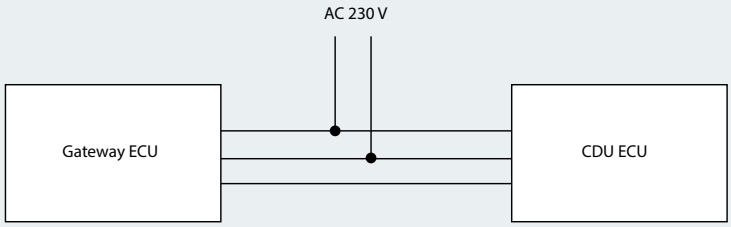
6. Not used
5. GND
4. CAN L
3. CAN H
2. Not used
1. VCC

4.2 Optyma™ iCO₂ Gateway – interface description

The iCO₂ condensing unit is equipped with a gateway for communication to external controls:

Physical Specification	
Mounting	DIN-rail
Dimensions	75x119x59 mm
Weight	~150 g
Environment	-30°C to +60°C during operation -40°C to +70°C during transport 20 – 90% Rh, not condensed
Power supply	
Input	100-277VAC, 50/60Hz Max. 8VA
Protection	1A slow-blow fuse
Alarm relay SPDT to connect alarm horns or lights, ext. controllers or control circuits.	
Contact function	SPDT (Single-Pole Double-Throw)
Max. voltage	277 VAC, 30 VDC
Max. current	3 A (resistive load)
Connection	3 screw terminals
Digital Inputs to be used for auxiliary signals, such as an external thermostat.	
Nominal voltage	12 V URGENT: Do NOT apply external voltage, which will damage the controller. Connect ONLY voltage free (dry) relay contacts!
Connection	3 screw terminals

© Danfoss | Climate Solutions | 2023.08

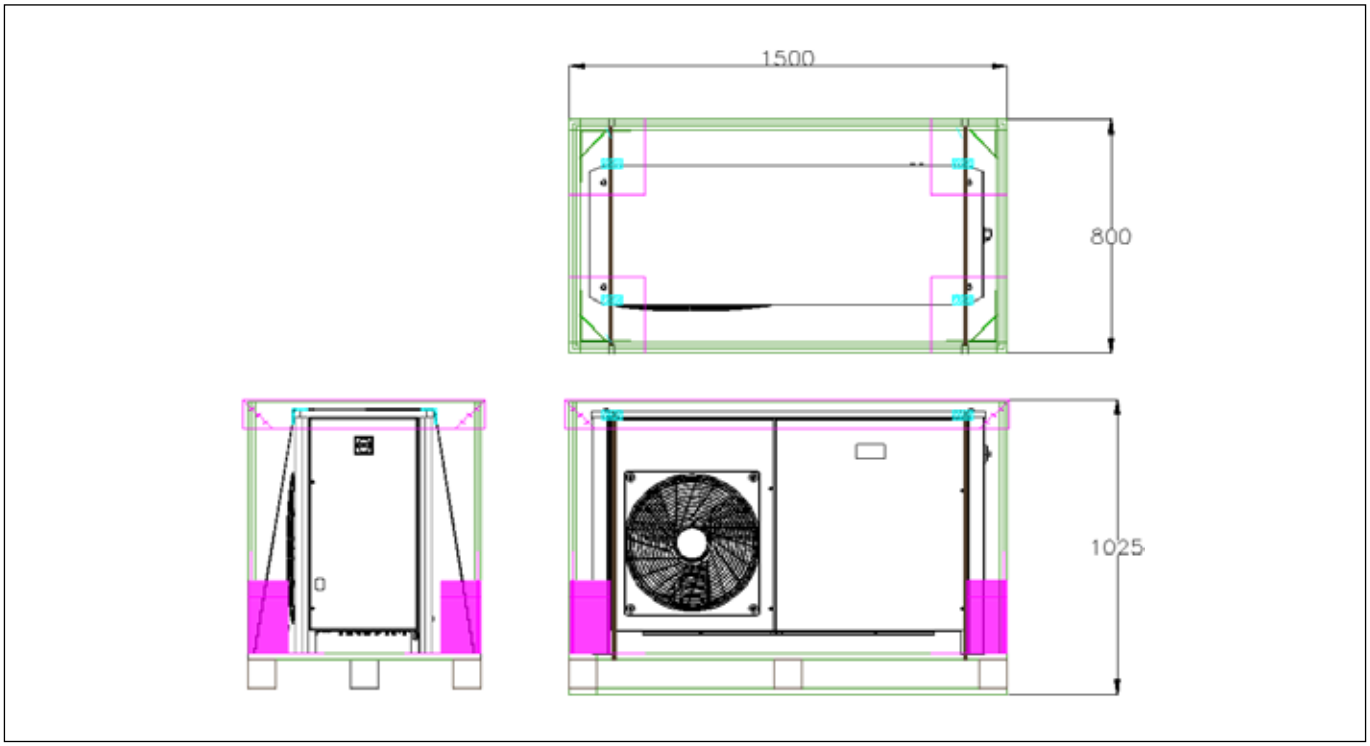
Analog Input to be used with a ratiometric pressure transmitter.	
Nominal voltage	5 VDC
Max. current	30 mA
Connection	3 screw terminals
230V Universal Asynchronous Receiver Transmitter (UART) to communicate with the condensing unit controller	
	
Cable type:	2,5mm² / AWG10
Cable length:	Max. 30 m
Transmission system	Super imposed AC power supply system
Transmission waveform	Rectangular wave
Logic	Negative Logic (NRZ signal)
Transmission rate	500 bps ± 1.0%
Synchronization method	Start-stop synchronous half-duplex system
Start bit	Logical 0
Data delivery	LSB First
Parity	Even parity
Stop bit	Logical 1
Character Spacing	In principle, no space is left between the stop bit and the next character, but up to 100 ms is permitted by design.
RS485 Modbus to connect to Danfoss ADAP-KOOL® network or programmable controllers. For more details refer to Danfoss design guide no. RC8AC902 "Data communication between ADAP-KOOL® refrigeration controls".	
Baudrate	19 200 / 38 400 Kbps (automatic selection)
Data bits	8
Stop bits	1
Parity	Even
Termination	A 120 ohm resistor should be mounted if the Gateway ECU is the last node on the bus
Biasing	Biasing resistors (pull-up, pull-down) should typically be built-in in master on the bus
Protocol	Modbus RTU
CAN bus to connect the local display MMILDS. See more details in chapter 9.1ff within this document.	
Baudrate	50 Kbps
Termination	Built-in 120 ohm resistor
Protocol	CANopen
Real-time clock (RTC)	
Backup power	The Gateway ECU is equipped with a real-time clock (RTC) with a capacitor for backup power.
Power reserve	4 hours
Usage	The RTC is designed to be used for day/ night switchover, ect.

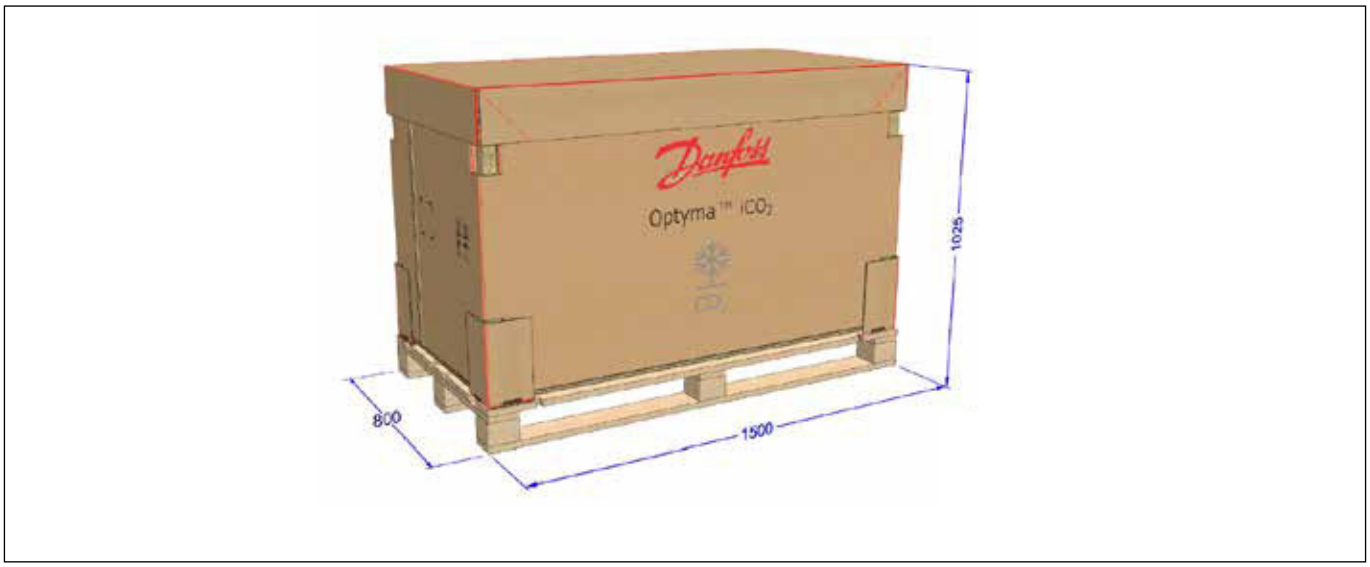
4.3 Controller version

Gateway Version (GW)	1.10 (U80 parameter)
Controler software version	002 (o08 parameter)

5.1 Unpacking

When unit reaches your warehouse, inspect the packing for any visible damage and make sure it is in good condition. In the event you detect any damage, please contact your forwarder immediately: send a registered letter to the shipping company claiming the suffered damage, a copy of which should be sent responsible contact in Danfoss.





5.2 Disposal Instruction

Equipment containing electrical components must not be disposed of together with domestic waste. It must be separately collected with electrical and electronic waste according to local and currently valid legislation.

© Danfoss | Climate Solutions | 2023.08

6.1 Service and safety advice

If the refrigerant system has been opened the system has to be flushed with dry air or nitrogen to remove moisture and a new filter dryer has to be installed. Beware of hot and cold components in the refrigeration system. The components in the refrigeration system are pressurized; as a consequence special attention has to be paid during operation on these components.

Do not operate condensing unit without refrigerant charge or without being connected to the system.

Safety goggles, gloves, protective clothing, safety boots, hard hats or another safety equipment should be worn when necessary.
Never install a system in the field and leave it unattended when it has no charge, a holding charge, or with the service valves closed without electrically locking out the system.
Do not touch the compressor until it has cooled down. Ensure that other materials in the area of the compressor do not get in touch with it.

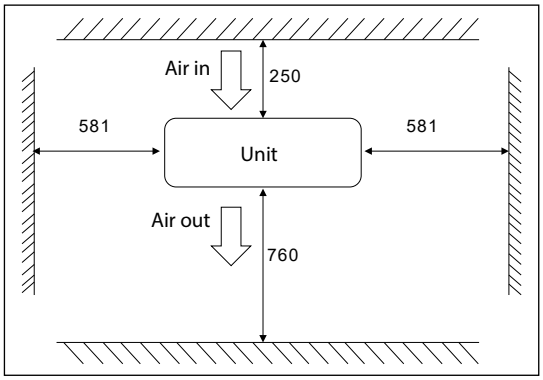
Before starting a repair work
- Disconnect from mains
- Wait as stated before for discharge of the DC-link. (Refer section 4.5.1 Warning when touching unit when OFF)

Item	Contents
Transportation and delivery	1. Cargo unloading work should be carried out using appropriate handling equipment (Forklifts, cranes, etc.). Do not let the unit fall.
Leak inspection	1. Do not pressurize with oxygen or air for leak inspection. 2. If you find a leak, do leakage inspection again after repair.
Evacuation and Refrigerant charge	Please see specific paragraph 6.9.2.
Trial run	1. Check that the refrigerant is filled. (Do not turn on the compressor in vacuum.) 2. Do not insert or remove electrical connectors during operation.

Failure to comply with the instructions will avoid the warranty.

6.2 Location & fixings

Install the equipment in a plane surface where air circulates around the equipment and the equipment operates correctly.



Do not install in the following locations:
- A dusty place
- Place with flammable gas atmosphere
- Place where water or oil (contain machine oil) is scattered or where there is a lot of steam
- Place exposed to direct sunlight.
- Place where snow can accumulate : The ambient temperature sensor is located inside one of the condensing unit leg. Snow accumulation will generate wrong ambient temperature measurement.
- Area with high corrosive atmosphere
- Places expose to strong wind.
- Areas with large voltage fluctuations
- Place where there is a machine that generates electromagnetic waves
- Place where not blocking or expose an obstacle for walking areas, doors, windows etc.

The base shall be installed so that the angle of inclination of the unit is within 2 degrees.
The maximum number of stack of the units shall be two and the top unit shall be fixed.
The base must be strong enough to withstand the weight of the unit.

6.3 Power supply connection

Electrical connections shall be performed by qualified personnel in accordance with applicable national legal standards and EN-60204 -1.
Before connecting the equipment electrically, confirm that the voltage and frequency rating of the AC power line corresponds to the indication on the identification plate and that the power supply voltage is within the allowable range of +/- 10% of the rated value.
Be sure to connect the ground wire (PE). Below table lists recommended wiring sizes for the condensing unit power supply cables. These wiring sizes are valid for a cable length up to 30 m.

Model	Cable size, mm^2 (from network to unit main switch)
Optyma iCO_2	2.5mm^2 up to 4.0mm^2 depending on ambient temperature and grouping

Note:
The wire size here is the guideline. In each specific case required cable size should be specified by the installer depending on the system design, ambient temperature, the wire material, current, etc.

The unit is equipped with a main switch with overload protection. Overload protection is preset from factory. Value for overload protection can be found in the wiring diagram. Wiring diagram can be found in front door of unit. Unit is equipped with high pressure switch, which directly cuts the power supply of the compressor contactor in case of activation.
The condensing unit is equiped with an electronic controller. The controller is pre-programmed with parameters ready for use.

6.4 Power supply protection

You should use only original circuit breaker, min. short circuit breaking capacity needs to be 100 kA. Please refer to spare part set section for selection of components for service replacement.
RCD type: Type A or B.

6.5 Signal connection

The condensing unit start and stop can be controlled by the cold room thermostat. To activate this control mode, remove the jumper (bridge connection) on digital input DI2 (CNB41 and CNB43) and connect the thermostat relay on the same slots.

With the jumper, the condensing unit is in pressure control mode: unit start and stop depending on suction pressure and low pressure switch limits (user defined limits).

Jumper on slots CNB41 and 43 bridge the digital input DI2.
Condensing unit is in pressure control mode.

Jumper

6.6 Protection and features

- Thermal compressor protection: 125±5 °C
- Thermal switches for reactor protection against overload.
- HP pressure cartridge setting: cut out 140 bar, cut in 100 bar.
- Receiver pressure releive valve setting : 80 barg
- The root cause of an individual alarm can be shown with the display.

6.7 Electrical protection standard

Complete unit Ingress Protection Code: IP54
The unit is fully wired and factory tested. Electrical connection compromises only power supply.

6.8 EMC compliance

All necessary actions are taken to secure EMC compliance of complete condensing unit (See declaration of incorporation).

© Danfoss | Climate Solutions | 2023.08

6.9 Warning when touching unit when OFF

Capacitors in condensing unit controller can remain charged even when the condensing unit controller is not powered. To avoid electrical hazards, disconnect AC remains and wait 15 min for the capacitors to fully discharge before performing any service or repair work (see par. 9.4 Alarm indications and Status messages). Failure to wait the specified time after power has been removed before doing service or repair could result in death or serious injury.

6.10 System design recommendation

Pipe work practice

- Be careful not to let foreign matter or water enter in the unit.
- At the time of piping brazing, carry out the process while blowing with nitrogen to suppress the generation of copper oxide.
- During installation of the unit or replacement of CO2 carrying components it's mandatory to use chlorine free flux material in order to preserve the hydraulic circuit from internal corrosion. Silver flux is admitted but must be chlorine free.

Installation

- Piping must be of refrigeration quality compliant with PED 2014/68/EC and EN 12735 -1.
- Maximum safety length of pipes between CU and last evaporator is 20 m.
- The height difference between the outdoor unit and the evaporator shall be +/- 5 m or less.
- All piping (liquid and return lines) should be covered with insulation to ensure performance.
- The piping connected to the condensing unit must be flexible in 3 dimensions to accommodate vibrations.
- The pipes should be sized to ensure optimum performance and good oil return.
- Do not assume that the liquid and suction connection sizes on the unit are in fact the correct sizes to run your interconnecting refrigeration pipes. The sizing must also take into account the full capacity range through which this particular unit will need to operate.
- Pipe runs should be kept as short as possible, using the minimum number of directional changes

Liquid line

- Liquid line and receiver are protected by a pressure relieve valve connected to the receiver. Pressure limit set at 80 bar.
- All parts of the liquid line must be rated for PS 80 bar.
- Refrigerant velocity in liquid line should not exceed 1 m/s

Suction line

- The design pressure of the evaporator(s) and suction line is preferable to be 80 bar, no less than 60 bar.
- Suction line must be protected by a pressure relief valve (Contractor responsibility) set at the MWP of the evaporators and suction pipe.
- All section of system that can be close by isolation valve must be protected by a PRV or a check valve to allow flow in the direction of a PRV.
- Pressure relieve valve must be place where no risk for people or goods.
- Design suction pipe to ensure good oil return.
  - Diameter of separate suction lines from evaporators to condensing unit manifold should be with appropriate size according evaporator capacity (securing recommended speed for proper oil return).
  - Common manifold tube should be as close as possible to condensing unit.
  - The suction gas velocity must be sufficient to ensure a good oil return : 4 m/s in horizontal pipes, 8 to 12 m/s in vertical risers.
  - Use oil trap trap for every vertical risers line of more than 2.5 meter length.
  - Secure gentle slope towards the unit (recommended slope minimum 0.5/100)
  - All pipes should be adequately supported to prevent sagging which can create oil traps. Piping must be supported and clamped every 1 meter for D3/8".
  - Use large radius bends and avoid trapping of oil and refrigerant. This is especially important for the suction line.

Evaporator

- Smallest evaporator internal volume should not be less than 2 Liters.
- Maximum total evaporator internal volume is 10 Liters for evaporating temperature -5°C and 6 Liters for evaporating temperature +10°C

Ensure if liquid line stub supplied on display case is 80 bar

Evaporator expansion valve selection

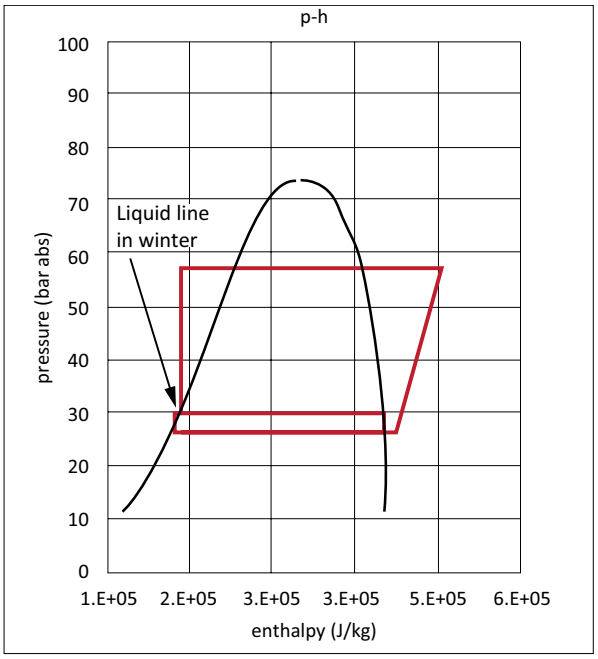
The condensing unit can work with

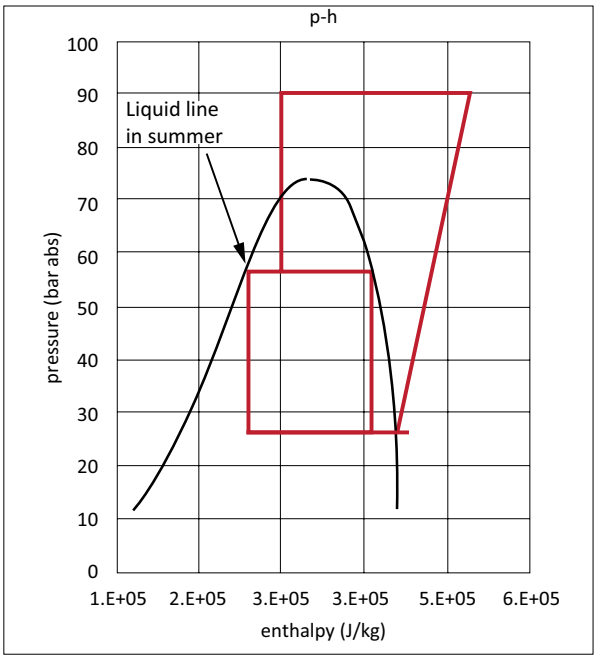
- Stepper valve,
- Pulsating valve,
- Thermostatic expansion valves

When selecting an evaporator expansion valve consider the following :

- There is not subcooling on liquid line : SC = 0 K.
- Max liquid line pressure is Preceiver max = Psuction + 30 bar and no more than 65 bars abs. (Summer conditions).
- Min liquid line pressure is Preceiver min = Psuction + 3 bar (winter condition).

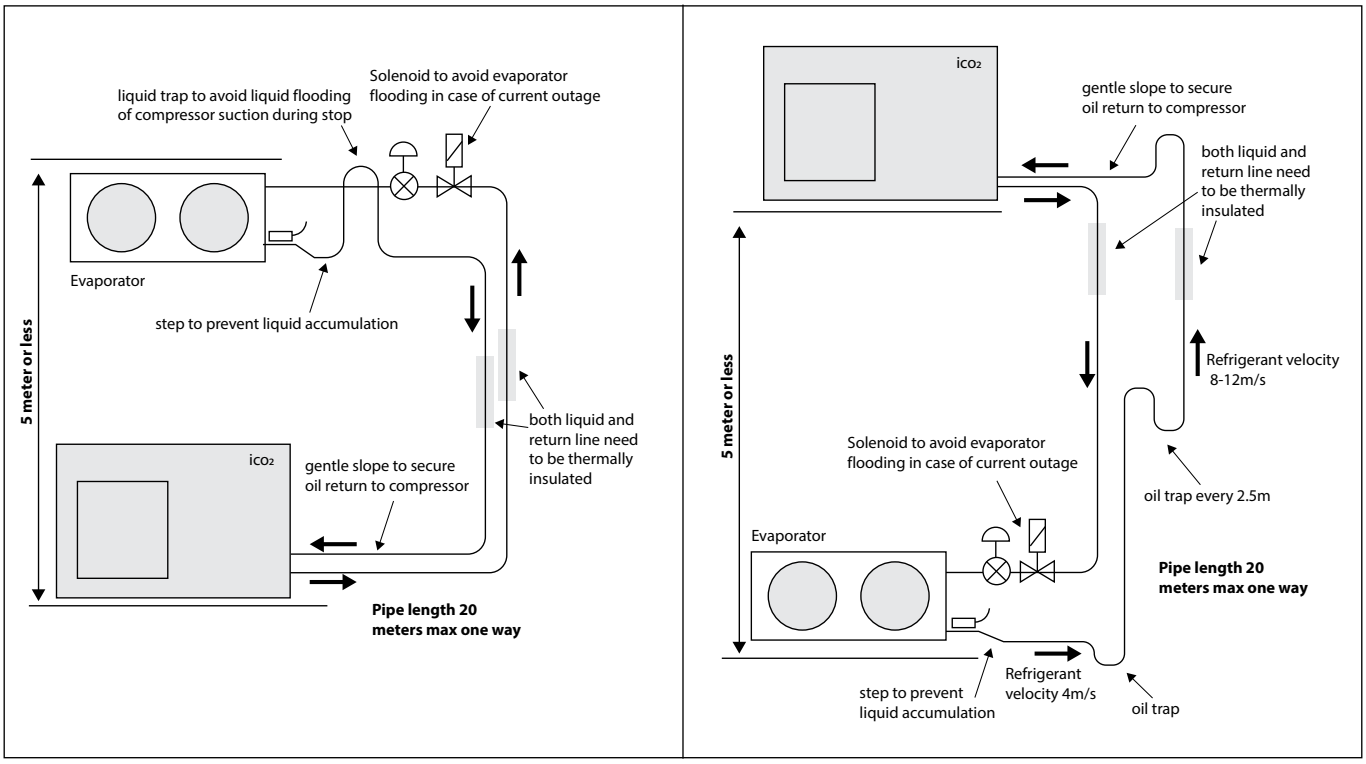
Let say saturated evaporating temperature is -10°C. Evaporating pressure is 26.5 bar abs. Liquid line pressure range from 56.5 bar abs (summer) to 29.5 bar abs (winter). Liquid line saturated temperature range from 19.4°C (summer) to -6.2 °C (winter).





The installer is responsible for the installation of the unit and complete refrigeration system design according to particular conditions of each application as this is not scope of current Guideline.

Tube size	Distance between 2 clamp supports
3/8"	1.0 m



© Danfoss | Climate Solutions | 2023.08

6.11 Leak and pressure test

Pressure tests :

- Test liquid line at 1.1 x PS = 88 bars.
- Test suction line at 1.1 x PS according to suction line design pressure (60 or 80 bars).
- When testing at 88 bar, close unit shutoff valve to prevent the receiver PRV to blow-out. Condensing unit does need to be tested at 88 bar. It has already been pressure tested in factory.
- Don't forget to remove suction line PRV and place it back again after pressure test and before leak test.

leak test

- Perform a leak detection test on the complete system at pressure P = 0,25 x PS = 20 bar.
- When a leak is discovered, repair the leak, and repeat the leak detection.

After completion of test, vent nitrogen to atmosphere and open condensing unit service valve.

6.12 Oil charge calculation

The condensing unit is supplied with PAG oil, the oil separator and accumulator is pre-charged with 268 g (Total charge 268 g = 158 g compressor charge + 110g suction accumulator charge).

Use the provided excel file in order to identify the amount of oil that must be added. The calculation already include 20 m + 20 m of pipes between CDU and evaporator so it's only requested to fill in:

- Number of evaporators
- Max Ambient temperature

Calculation assume evaporator volume to be 2 Liters. Add 50 g of oil for each Liters above 2 liters.
Highest the setting of the oil return strategy, lowest the oil amount that must be added. See example below

<input>	
Evaporator unit (≤ 2.0L/unit)	1 unint
Suction set point temperature	-15°C
Highest operating ambient temperature	35°C

<Output>	
Oil retun control set value	Amount of additional Oil
Unnecessary	430g, but the oil return is not good
3000rpm (Default)	190g
4500rpm	No add oil
5600rpm	No add oil

Oil boost speed is default 3000 rpm, you can see in the below chart oil addition for two different ambient temperatures and different evaporator volumes.

(The default oil boost speed us 3000 rpm, this can be increased however it could lead to increased compressor noise and sharp reduction in evaporating temperature as well as increased discharge temperature)

TA	°C	38
Oil boost	rpm	3000

Oil Addition (gr)

Evap Vol	Te [°C]			
Liters	-15	-10	0	5
2	430	430	430	190
4	530	530	530	290
6	630	630	630	390

TA	°C	32
Oil boost	rpm	3000

Oil Addition (gr)

Evap Vol	Te [°C]			
Liters	-15	-10	0	5
2	190	190	190	0
4	290	290	290	100
6	390	390	390	200

If additional oil is require, you can fellow bellow procedure.

6.13 Oil addition

- Open condensing unit ball valves
- Connect a flexible house to the condensing unit suction port and vent the nitrogen charge
- Pump require volume of oil into suction line with a stirrup pump. Ensure pump is full of oil before connecting the pump to suction service port.

Instead of a stirrup pump, it is also possible to use the vacuum pump to charge oil :

- Set condensing unit to vacuum mode (see next section)
- Connect vacuum pump to liquid line shrader port
- Connect a flexible hose to suction port to suck oil from the can.

Note:

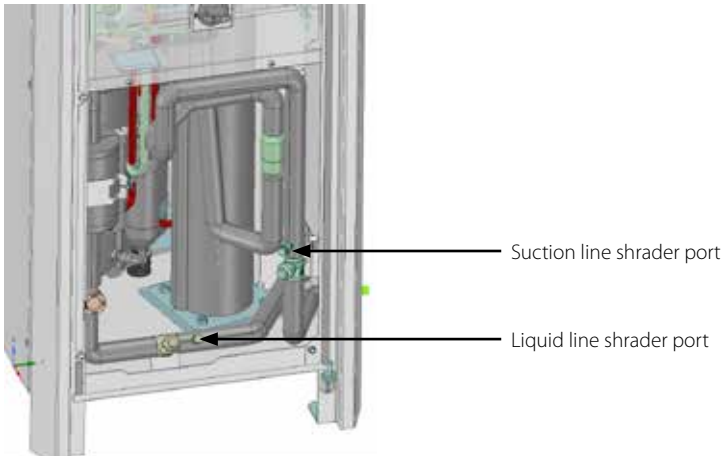
Oil can 250 ml inside the Optyma™ iCO_2 packaging already supplied by Danfoss.
Do not charge oil through the liquid service valve; do not charge oil when the compressor runs.

6.14 Evacuation

Vacuum shall be applied after completion of leakage inspection and oil addition.
Do not test electrical strength of the compressor motor insulation while it is under vacuum, to prevent motor damages.

- Select Vacuum mode by changing parameter "r12" to "2". The stepper valves will fully open within the 10 seconds.
- Connect the vacuum pump to liquid service valves (and open the service valve).
- Turn on the vacuum pump, keep this condition for at least 4 hours min.
- Check if gauge is showing 0.67mbar (absolute) after 4 hours since the start of vacuuming.
- In case if pressure was not able to reach to 0.67mbar (absolute) within 4 hours, break the vacuum with Nitrogene gas with 1 bar, restart vacuum procedure, repeat 3 times to eliminate all moisture and impurities.
- In case of use at higher altitude place pressure read does not reach to 0.67mbar (absolute) in the short duration, prolong the vacuum time for 30minutes more.
- Shut stop-valve of vacuum pump hose.
- Turn OFF the vacuum pump.
- Leave them for 30 min. Then check that vacuum gauge read does not show any changes (i.e. keeping 0.67mbar (absolute) for 30 min.
- If pressure increases rapidly, the system is not airtight. Locate and repair leaks. Restart the vacuum procedure, followed by steps 1, 2 etc.
- If pressure increases slowly, the system contains moisture inside. Break a vacuum with nitrogen gas and restart the vacuum procedure
- After confirming the stable 0.67mbar (absolute), go to charge refrigerant.

Suggested actions if vacuum level cannot be reached or pressure gauge readings change:
- Check hose connections for any leakage.
- Check flare connections if tightened.
- Check copper brazing for any leakage.
- Remaining CO_2 gas can still diffuse out of the oil. Retry vacuuming for 10min.



© Danfoss | Climate Solutions | 2023.08

6.15 Refrigerant charge calculation

Use refrigeration CO2 purity 99.995% (grade 4.5), humidity H2O < 5 ppm.

Refrigerant charge amount must be calculated and system charge must be done using a scale. DO NOT use the sight glass as an indicator of correct / incorrect charge amount in the system.

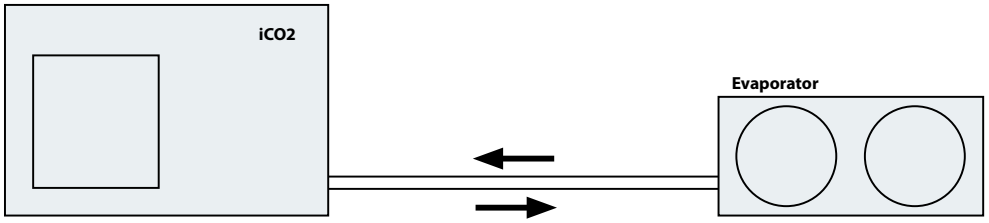
Refrigerant charge amount can be calculated by provided excel file.

Refrigerant charge amount can also be estimated using below equations :

- System charge M = CDU charge + liquid line charge + evaporator charge
- Condensing unit need 2.15 kg of CO2 to run properly
- Liquid line mobilize approximately 0.80 kg/L of CO2. This correspond to 0.04 kg/m for liquid line D3/8.
- Evaporator mobilize approximately 0.25 kg/L at evaporating temperature TE = +10°C and 0.15 kg/L at TE = -5°C

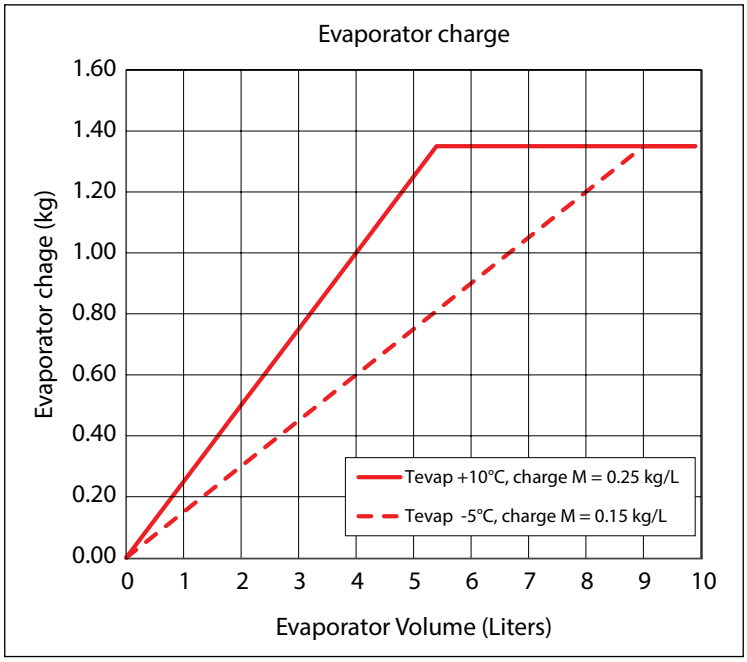
Condensing charge should never exceed 3.50 kg. Max system charge is then 3.50 kg + liquid line charge. And **max evaporator charge is 1.35 kg**.

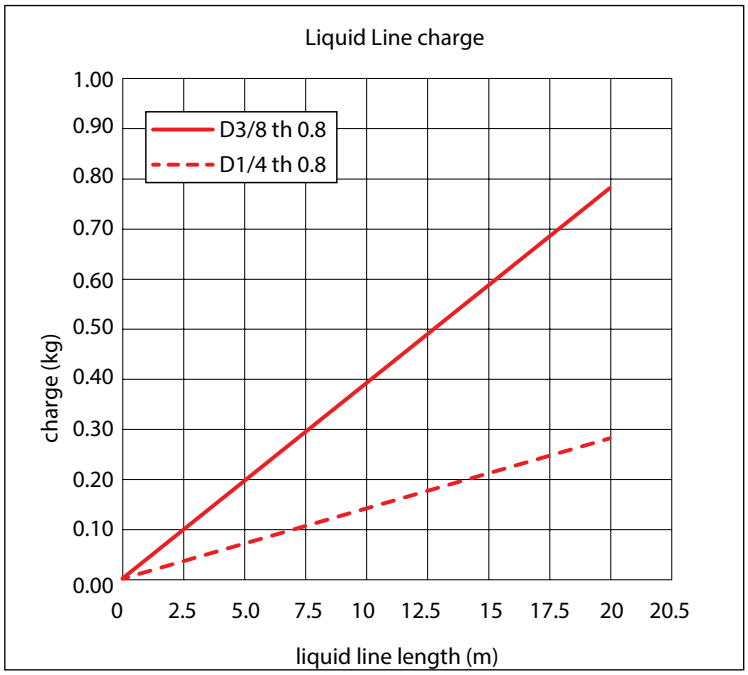
Charge equation



System Charge M =	Condensing unit charge	+ Liquid Line charge	+ Evaporator charge
System Charge M =	2.15 kg	+ 0.80 kg/L x Liquid Line Volume Corresponding to 0.04 kg/m for liquide line D3/8.	+ 0.25 kg/L * evap volume for TE = +10°C +0.15 kg/L * evap volume for TE = -5°C But no more than 1.35 kg.

Evaporator and liquid line charge are given below versus volume and pipe diameter.





Bellow example of calculation results for liquid line D3/8, thickness 0.8 mm and different liquid line length and evaporator volume.
Evaporating temperature assume to be +10°C.

Liquid Line D3/8 th 0.8 mm		Evaporator Volume (Liters)					
length	volume						
m	Liters	1	2	3	4	5	6 and above
0.00	0.00	2.40	2.65	2.90	3.15	3.40	3.50
5.00	0.25	2.60	2.85	3.10	3.35	3.60	3.70
10.00	0.50	2.80	3.05	3.30	3.55	3.80	3.90
15.00	0.75	3.00	3.25	3.50	3.75	4.00	4.10
20.00	1.00	3.20	3.45	3.70	3.95	4.20	4.30

6.16 Refrigerant charge method

Several charging method are possible. You can for instance charge in liquid phase on liquid line after having break the vacuum with 5 - 10 bar of vapor.

Bellow we describe in detail the easiest charging method. It will work for both suction line PS 80 and 60 bar :

- Check condensing unit is in vacuum mode. Parameter r12 should be set to value 2. This will force HP and BP valve fully open.
- Put CO_2 cylinder on the scale. Connect to the condensing unit. Make the zero.
- Charge the condensing unit on suction line in vapor phase till you reach a pressure bellow suction line PS - 20%.
- Set the condensing unit to automatic mode, r12 = 1. Condensing unit should start.
- Charge the rest of the calculated CO_2 refrigerant progressively.

Note :

- Never charge liquid in suction line. It risks to damage the compressor.
- Do not overcharge the system. Overfilling the system may risk in pressure increase and release of refrigerant through the receiver relief valve during standstill. Overfilling the system may risk of liquid return to compressor inlet when running.
- You should always charge with a scale. Condensing unit sight glass is not a reliable indication of charge correctness.

Check the charge

- Overcharged system will show very low compressor suction superheat
- Low charge will give low suction pressure, large superheat at evaporator outlet, large evaporator valve opening degree.
- If you suspect wrong charge, double check your calculation, pipe length, evaporator volume, empty the system and re-do the charge.
- Check system restart correctly after a pump down.
- Once you reach steady condition, check system run correctly in high ambient condition by covering gascooler.

Record type and amount of refrigerant charge as well as operating conditions as a reference for future inspections
Never leave the filling cylinder connected to the circuit. Disconnect and remove refrigerant bottle from the unit, close Schrader valves with their protection caps.

© Danfoss | Climate Solutions | 2023.08

6.17 Check before start

1. Compliance between unit and power supply
2. Check the service valves inlet/outlet both are opened
3. Check that fan can rotate freely
4. Check for possible faults in the installation
5. Check main switch overload protection setting

6.18 inspection before maintenance

Even if main switch of condensing unit is in position OFF power still available at income terminals of main switch.
In case of any service related to electrical components inside condensing unit it is recommended to disconnect condensing unit from the power by switch located before condensing unit.
It is recommend to check the unit for leakages minimum once a year.

Furthermore following should be checked:
1. Electrical and refrigerant connections for damages, corrosion etc.
2. The mounting devices (bolts, nuts, etc.) of the unit.
3. Vibrations: if it is on the same level as after installation or any signs of abnormal vibration.
4. Operation conditions.
5. Airflow across the gas cooler.
6. Tightness of electrical connections.

6.19 Gas cooler maintenance

Gas cooler should at least once a year be checked for clogging and be cleaned if deemed necessary. Access to internal side of condenser through fan door. Remember to switch off the unit at main switch before opening the fan door.
In comparison to fin and tube heat exchangers, microchannel coils tend to accumulate more of the dirt on the outside surface which can make them easier to clean.

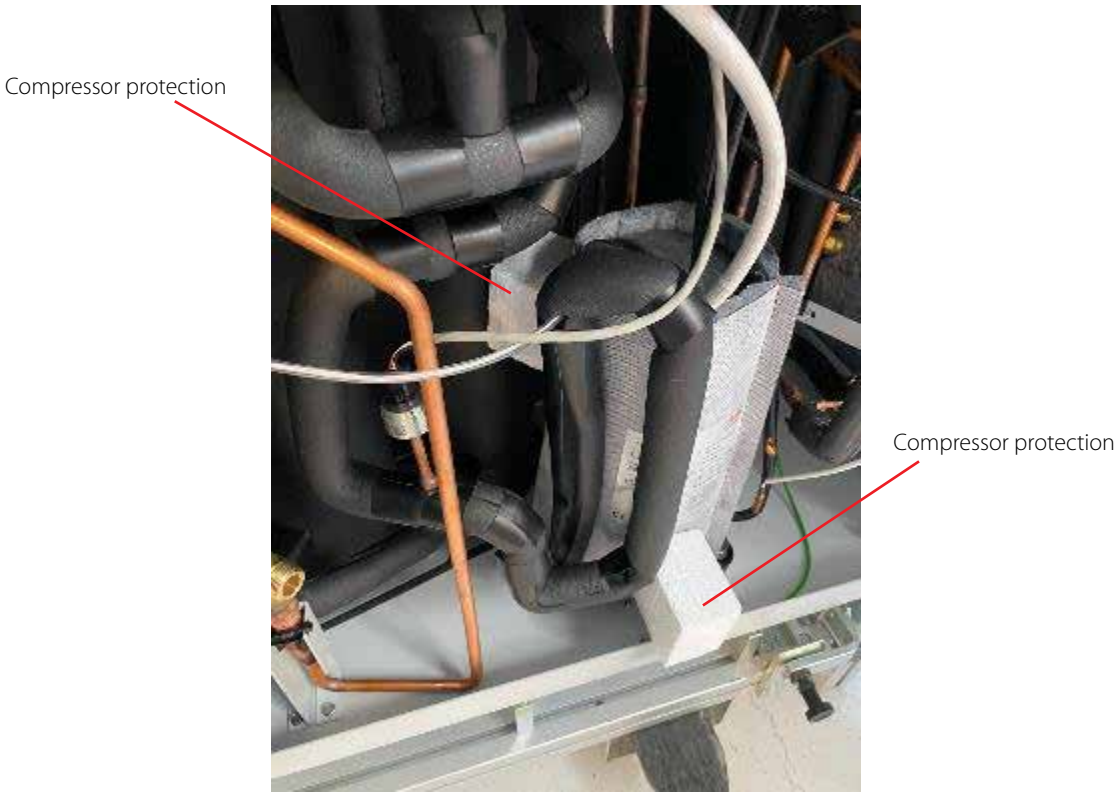
Step 1: Remove surface debris
Remove surface dirt, leaves, fibers, etc. with a vacuum cleaner (preferably with a brush or other soft attachment rather than a metal tube), compressed air blown from the inside out, and/ or a soft bristle (not wire!) brush. Do not impact or scrape the coil with the vacuum tube, air nozzle, etc.

Step 2: Rinse
Do not use any chemicals (including those advertised as coil cleaners) to wash microchannel heat exchangers. They can cause corrosion. Rinse only with water.
Hose the MCHE off gently, preferably from the inside out and top to bottom, running the water through every fin passage until it comes out clean. Microchannels fins are stronger than traditional tube & fin coil fins but still need to be handled with care. Do not bang the hose into the coil.

Step 3: Optional blow dry
Microchannel heat exchangers, because of their fin geometry, tend to retain water more than traditional fin & tube coils. It may be beneficial to blow or vacuum out the rinse water from your unit to speed drying and prevent pooling

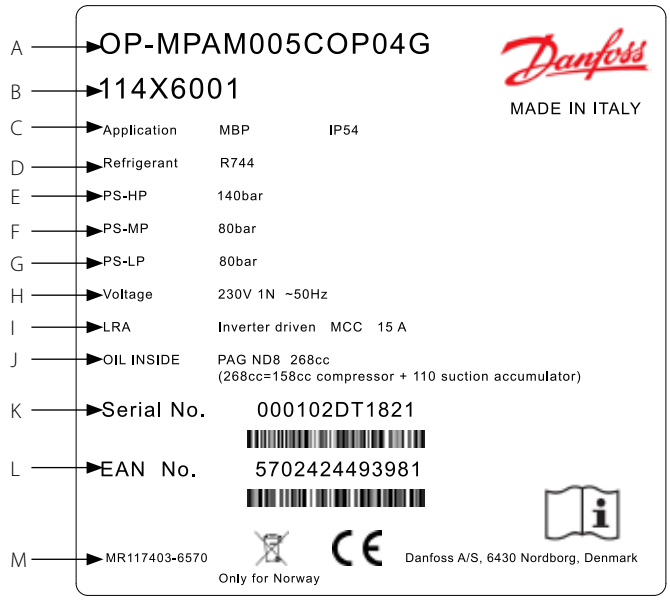
7.1 WARNING

WARNING: remember to remove compressor protection during installation procedures.



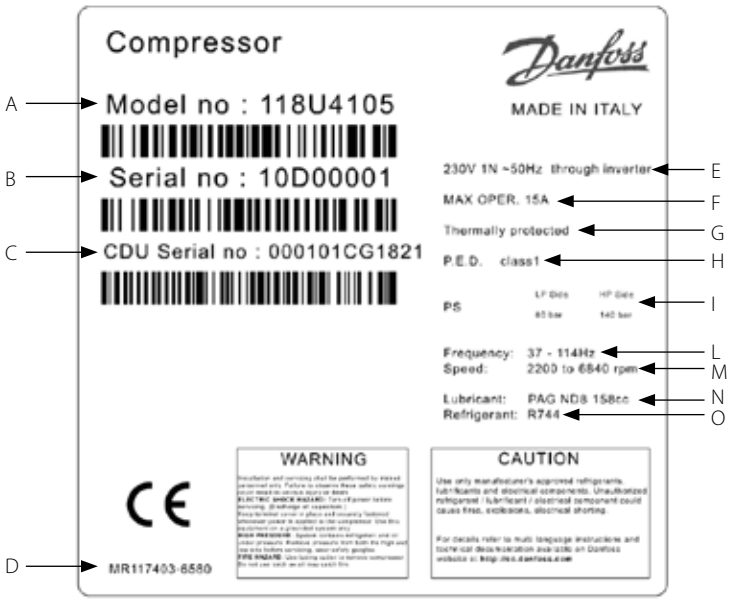
© Danfoss | Climate Solutions | 2023.08

8.1 CDU CO_2 – Optyma™ iCO_2 label



A: Model
B: Code number
C: Application, IP protection level
D: Refrigerant (R744=CO_2)
E: Hight side working pressure
F: Liquide line circuit working pressure
G: Suction line working pressure
H: Supply voltage
I: Locked Rotor Ampere, Maximum Current Consumption
J: Oil type
K: CDU serial number
L: European Article Number
M: Condensing unit Label PN (Factory)

8.2 Compressor label



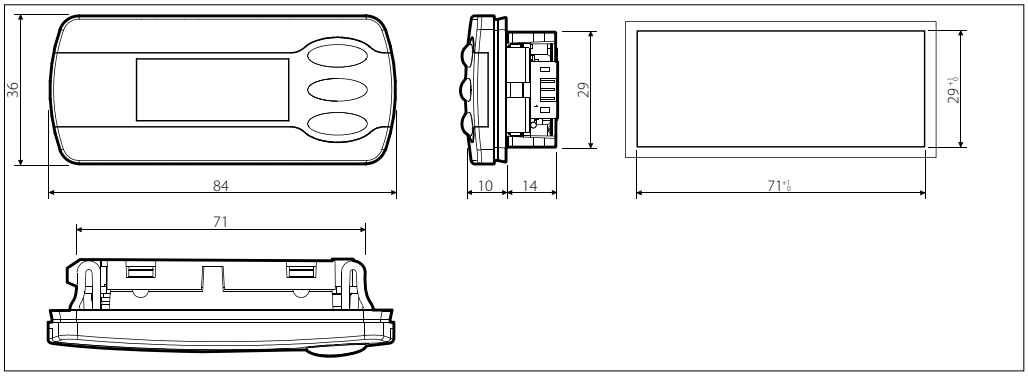
A: Spare part PN
B: Compressor serial number
C: Condensing unit serial number
D: Compressor Label PN (Factory)
E: Supply voltage
F: Maximum Current Consumption
G: Compressor protection type
H: Pressure Equipment Directive and classification
I: Min and Max working pressure
L: Min and Max compressor operation frequency
Electrical frequency is twice 74 ... 228Hz (4-pole motor)
M: Min and Max compressor operation rotation speed
N: Oil type
O: Refrigerant (R744=CO_2)

CAUTION: Variable speed compressor electric supply via Danfoss approved frequency converter only.

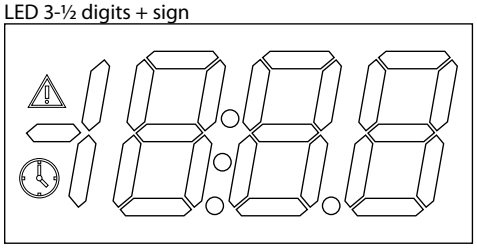
9.1 MMIDLS product description

- Preset controller
- LED display 3-½ digit
- Easy connection through CANbus to Danfoss Optyma iCO₂ gateway
- Pre-programmed
- Give a master connection to the drive
- Indicate and record errors and alarms

Dimensions



User interface

TYPE	FEATURES	DESCRIPTION
LED display	Display	LED 3-½ digits + sign 
	Digits	Green colour
	Allarm/warning icons	Red colour
	Dimensions	45 x 17 mm
Keyboard	Number of keys	3
	Keys function	Set by the application software

Common MMILDS display operation

- Press the upper button for more than 3 seconds to get access to parameter menu. The first parameter "r05" is shown on the display.
- Press short upper or lower button to go to the next or previous parameter.
- Press the middle button briefly to show the value of the selected parameter.
- Press the upper or lower button to change the value of the selected parameter.
- The parameter value will be stored with a short press on the middle button.
- The parameter menu closes, and display returns to the main screen after 10 seconds without any activity on the buttons. It shows again the saturated suction temperature in °C.

© Danfoss | Climate Solutions | 2023.08

9.2 Survey of functions

Function	Parameter	Parameter by operation via data communication
Normal display		
The display shows the saturated temperature value of the suction pressure Ts.	---	Ts

Regulation		
Unit Set here if the display should show SI-units or US-units 0: SI (°C and bar) 1: US (°F and Psig).	r05	r05 Temp.unit °C=0 / °F=1 (Only °C on AKM, whatever the setting)
Start / stop of refrigeration With this setting the condensing unit can be started, stopped, vacuumized or a manual override of the outputs be allowed. For manual control the value is set to -1, then outputs like fan motor speed F07 can be force controlled by the respective parameter F20. Start / stop of refrigeration can also be accomplished with the external switch function connected to a digital input. The digital input must be shorted, if the external switch function is deselected. Stopped refrigeration will give a "Standby alarm".	r12	r12 Main switch -1: Manualmode 0: Stop 1: Start 2: Vaccuum
Day / Night status Status of Day / Night (on or OFF), 1 = on = Night operation.	u13	u13 NightCond
Reference Ts Setpoint Saturated suction pressure Ts setpoint (°C/°F).	r23	r23 Ts Ref
Reference Ts Reading Readout of Saturated suction pressure Ts (°C/°F).	r24	- - - Reference
Reference Ts Offset Value added to the Reference r23 in the night.	r43	r43 Night Offset

Compressor		
Compressor min. speed Here set the minimum allowable speed for compressor.	c46	c46 Min Speed
Compressor max. speed Upper limit for compressor speed during day operation.	c 48	c48 Max Spd Day
Compressor max. Speed night Upper limit for compressor speed during night operation.	c 69	c69 Max Spd Night
Minimum suction pressure Enter the lowest permitted suction pressure here, where the compressor should stop, if the pressure drops below this minimum value.	c 75	c75 Ps OFF
Restart suction pressure Enter the permitted suction pressure here, where the compressor should restart, if the pressure rises after a stop and exceed this limit.	c 76	c76 Ps ON
Low pressure ON/OFF type: 0=dynamic; 1=absolute With absolute settings, LP ON and OFF are directly defined by saturated temperature (c75, c76). With dynamic settings, LP ON and OFF are defined relative to reference suction saturated temperature Ts and ambient temperature Ta (c78, c79,c80).	c77	c 77 LPSwitchType
LPON / To offset on Dynamic Pump-Down Offset of LPON compared to saturated suction temperature.	c78	c78 LPDynOffsetTo
LPON / Ta offset on Dynamic Pump-Down Offset of LPON compared to ambient temperature.	c79	c79 LPDynOffsetTa
LPON/OFF hysteresis on Dynamic Pump-Down Offset of LPOFF compared to LPON	c80	c80 LPDynOffsetON
Oil return management Judgement speed If the compressor exceeds this limit, a time counter will be increased. It will be decreased if the compressor speed falls down below this limit.	P77	P77 Spd Thrshld
Oil return management Judgement time Limit value above described time counter. If the counter exceeds this limit, the compressor speed will be raised to the boost speed.	P78	P78 Jdgmnt Oil R
Oil return management Boost speed This compressor speed ensures that the oil returns to the compressor.	P79	P79 Spd Oil Ret
Oil return management Boost time The compressor operates for this period of time with above boost speed.	P80	P80 Time Oil Ret

Function	Parameter	Parameter by operation via data communication
Fan		
Fan speed The actual fan speed is read out here as a % of the nominal speed.	F07	F07 Fan Speed%
Maximum fan speed day The fan's top speed during day time can be limited here. The value can be entered by setting the nominal speed from 100% to the desired percentage.	F19	F19 Max Spd Day
Manual fan speed control An override of the fan speed control can be done here. This function is only relevant when the main switch is in service mode (r12=-1). 0=Stop; 1=Low; 2=Medium; 3=High.	F20	F20 Manual Fan%
Max Fan speed night The fan's top speed during night time can be limited here. The value can be entered by setting the nominal speed from 100% to the desired percentage.	F22	F22 Max Spd Nght
Real time clock (RTC)		
Switch to day operation Enter the start time where the control reference, fan and compressor speed shall switch back to normal control.	t17	t17 Day start h
Switch to night operation Enter the start time where the control reference shall be raised and where the fan and compressor speed limited.	t18	t18 Night start h
Realtime Clock hour setting.	t07	t07 Clk Hours
Realtime Clock minutes setting.	t08	t08 Clk Minutes
Miscellanous		
Controller address If the controller is built into a data communication network, it must have an unique address and the master of the system must know this address.	o03	o03 Unit Addr
Software version of the Condensing Unit controller	o08	o08 SW version
Evap. Expansion valve type (0 = Stepper or TXV, 1 = AKV) With Stepper valve, receiver pressure limit at standstill is 76 bar. With AKV valve, receiver pressure limit at standstill is 30 bar above suction pressure.	o09	o09 EXV Type
Factory reset This parameter should reset the gateway and the Condensing Unit Controller when set.to 1. It should also stop the Condensing Unit.	o67	o67 Make Factory
Injection ON Condensing Unit status for Evaporator control to allow the evaporator controller to inject. Injection ON is a Modbus master function.	u99	- - - Injection ON
Statistic		
Operating time for condensing unit The condensing unit's operating time can be read here. The read-out value must be multipilied with 1000 to get the correct hour value. It can be adjusted if required.	P48	P 48 Unit Runtime
Operating time for compressor The compressor's operating time can be read here. The read-out value must be multipilied with 1000 to get the correct hour value. It can be adjusted if required.	P49	P 49 Comp Runtime
Number of HP alarms The number of high pressure alarms can be read here. It can be adjsted if required.	P51	P 51 HP Alarm Cnt
Number of LP alarms The number of low pressure alarms can be read here. It can be adjsted if required.	P52	P 52 LP Alarm Cnt
Number of high discharge alarms The number of high discharge temp. alarms can be read here, can be adjsted if required.	P53	P 53 DisAlarm Cnt
Service		
Measured High pressure	u01	u01 Pc bar
Status of gateway Digital Input 1 (DI1 = evaporator controller alarm; 0=no alarm)	u10	u10 DI1 Status
Calculated Superheat	u21	u21 Superheat K
Status of gateway Digital Input 2 (DI2 = request from cold room thermostat; 0=no reqest)	u37	u37 DI2 Status
Readout of Compressor speed in %	u52	u 52 CompCap%
Status of gateway Alarm Relay	U62	U62 Alarm Relay
Measured Gascooler outlet temperature	U05	U05 Sgc Temp
Measured Receiver inlet temperature	U07	U07 Srec2 temp

© Danfoss | Climate Solutions | 2023.08

Function	Parameter	Parameter by operation via data communication
Measured Receiver pressure (gateway option) - CURRENTLY NOT AVAILABLE	U08	U08 Prec pressure
Converted Receiver pressure (gateway option) - CURRENTLY NOT AVAILABLE	U09	U09 Trec temp
Converted High pressure	U22	U22 Tc
Measured Suction pressure	U23	U23 Po
Converted Suction pressure	U24	U24 To
Ambient temperature	U25	U25 T Ambient
Discharge temperature	U26	U26 T Discharge
Suction temperature	U27	U27 T Suction
Low pressure OFF effective low pressure limit at which compressor stop	U78	U78 DynLP OFF
Low pressure ON Effective low pressure limit that force compressor to restart.	U79	U79 DynLP ON
Gateway software version	U80	U80 GW version
High pressure valve opening degree OD	U91	U91 Vhp %
Receiver pressure valve opening degree OD	U92	U92 Vrec %

9.3 Alarm indications and Status messages

Alarm indications	
Function	**Code**
Gascooler outlet Temperature sensor error	E20
Ambient Temperature sensor error	E31
Discharge Temperature sensor error	E32
Suction Temperature sensor error	E33
Suction Pressure sensor error	E39
Receiver inlet Temperature sensor error	E40
Receiver Pressure sensor error (option)	E41
Gascooler pressure sensor Error	E42
MMILDS display communication Error	E90
Low Pressure Alarm - pressure limit 14 bar (-28.5°C)	A2
High Pressure Alarm - pressure limit 148 bar	A17
Gascooler low fan speed Alarm - fan speed <= 100 rpm for 60 seconds	A34
Main Switch Off Alarm (r12=0 or DI2=0)	A45
Receiver Temperature Alarm	A85
Discharge Temperature Alarm - Temperature above 138 deg.C for more than 5 seconds	A96
High pressure switch - safety Alarm - pressure limit 140bar	A97
Unit Controller / Inverter error code (internal)	H23
Electrical circuit failure on the inverter	H24
Motor current sensor failure on inverter	H25
Input current sensor failure on inverter	H26
Motor current error (phase open)	H27
Other error for compressor or inverter	H28
Abnormality, compressor speed not increasing	H29

Status messages	
Function	**Code**
Wait for communication to CU conroller	- - - -
No communication to CU controller	F0....F99
Normal Control	S0
Stopped by Main switch: Internal (r12) or external (DI2)	S10
Thermostat cutout on DI2	S11
Manual Mode (r12=-1)	S25
Safe Stop (Pressure and Temperature safety switches on DI1)	S34
Restart state 101 (High pressure)	Sr1
Restart state 102 (Fan motor)	Sr2
Restart state 103 (Discharge temp)	Sr3
Restart state 104 (Receiver pressure)	Sr4

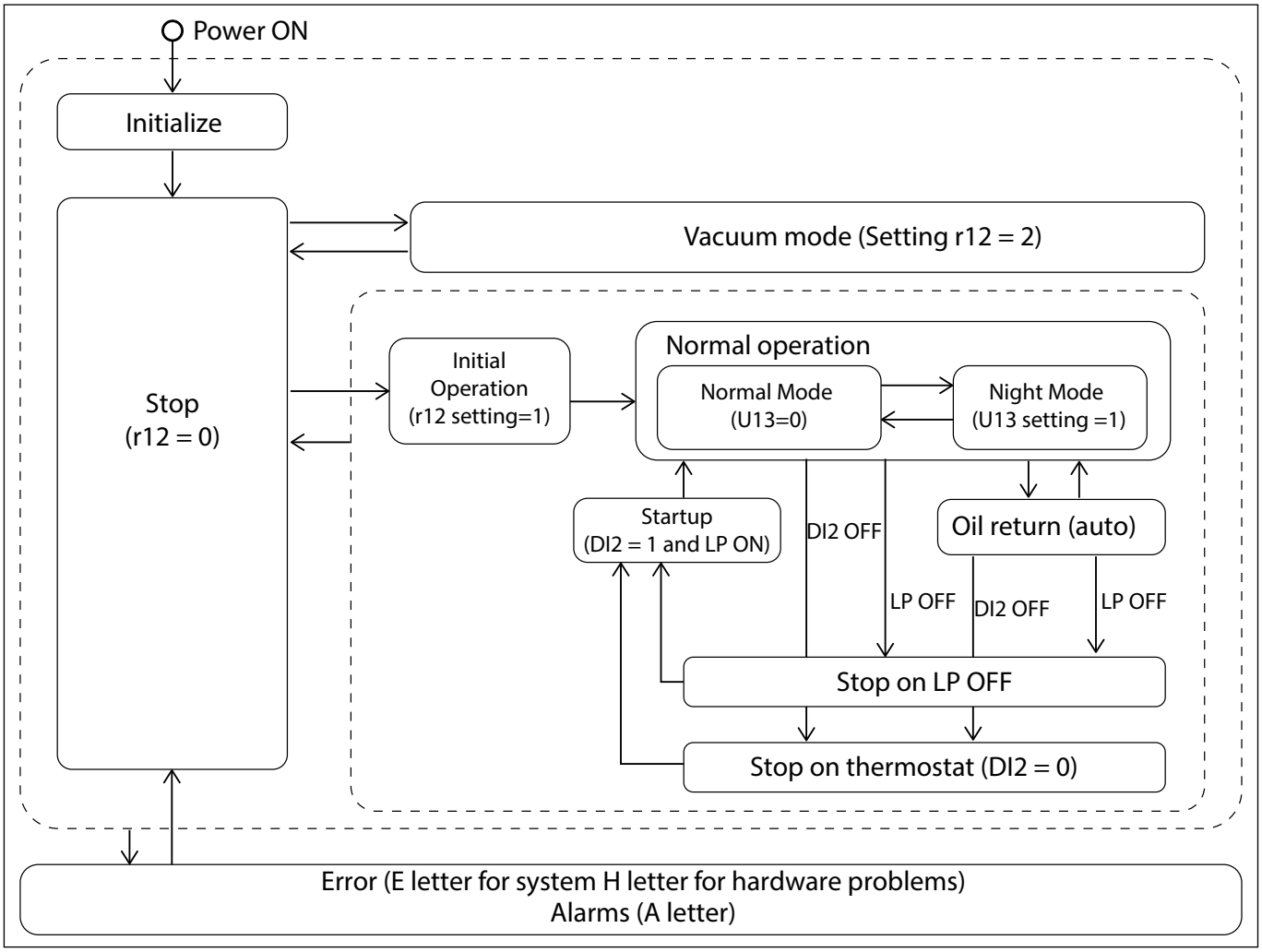
© Danfoss | Climate Solutions | 2023.08

9.5 Parameters of MMIDLS

Parameter			Minimum	Maximum	Factory	Actual
Function		Code	value	value	setting	
Regulation						
Selection of SI and US units: 0=SI (°C-barg) and 1=US (°F-psig)		r05	0	1	0	
Control Main switch: -1=Manual; 0=Stop; 1=Automatic; 2=Vaccuum mode		r12	-1	2	0	
Day / Night mode: 0=Day (normal); 1=Night	*	u13	0	1	-	
Reference Setpoint: Saturated suction pressure Ts setpoint (°C/°F)		r23	-20.0 °C	10.0 °C	-10.0 °C	
Readout of Saturated suction pressure Ts (°C/°F)	*	r24	-40.0 °C	50.0 °C	-	
Reference Offset: Value added to the Reference r23 in the night		r43	0 K	10 K	2 K	
Compressor						
Min comp. capacity		c46	32%	58%	32%	
Max comp. capacity during day operation		c 48	59%	100%	100%	
Max comp. capacity during night operation		c 69	59%	100%	80%	
Low Pressure OFF absolute		c 75	-25.0 °C	30.0 °C	-15 °C	
Low Pressure ON absolute		c 76	-20.0 °C	30.0 °C	-5.0 °C	
Low pressure ON/OFF type: 0=dynamic; 1=absolute		c77	0	1	0	
LPON / To offset on Dynamic Pump-Down		c78	-30.0°C	10.0 °C	-5.0 °C	
LPON / Ta offset on Dynamic Pump-Down		c79	-30.0°C	10.0 °C	-5.0 °C	
LPON/OFF hysteresis on Dynamic Pump-Down		c80	-30.0°C	0.0 °C	-5.0 °C	
Compressor speed threshold for oil return control		P77	33%	58%	35%	
Judgment time for oil return control		P78	5 min	720 min	20 min	
Compressor speed during oil return control		P79	35%	100%	44%	
Operation time for oil return control		P80	10 s	600 s	60 s	
Fan						
Readout of Fan speed in %	*	F07	0%	100%	-	
Max. Fan speed during day		F19	38%	100%	100%	
Fan speed setting in manual mode (r12=-1): 0=Stop; 1=Low; 2=Medium; 3=High		F20	0	3	0	
Max Fan speed during night		F22	38%	100%	80%	
Real time clock (RTC)						
Day time start for Day / Night function		t17	0 h	23 h	0 h	
Night time start for Day / Night function		t18	0 h	23 h	0 h	
RTC setting (hours)		t07	0 h	24 h	0 h	
RTC setting (minutes)		t08	0 min	59 min	0 min	
Miscellanous						
Controller address on Modbus Network		o03	0	240	0	
Software version of the Condensing Unit controller	*	o08	0	9999	-	
Evap. Expansion valve type (0 = Stepper, 1 = AKV)		o09	0	1	0	
Factory reset of Gateway and Condensing Unit controller		o67	0	1	0	
Condensing Unit status for Evaporator control (Injection ON = Master function).	*	u99	1	1	-	
Statistic						
Condensing Unit runtime in 1000 hours		P48	0	999	0	
Compressor runtime in 1000 hours		P49	0	999	0	
Number of HP alarms registered		P51	0	1999	0	
Number of LP alarms registered		P52	0	1999	0	
Number of High discharge alarm registered		P53	0	1999	0	
Service						
Measured High pressure	*	u01	-1,0 bar	250 bar	-	
Status of gateway Digital Input 1 (DI1 = evaporator alarm)	*	u10	0 (OFF)	1 (ON)	-	
Calculated Superheat	*	u21	-10,0 K	50,0 K	-	
Status of gateway Digital Input 2 (DI2 = request from cold room thermostat)	*	u37	0 (OFF)	1 (ON)	-	
Readout of Compressor speed in %	*	u52	0	100	-	
Status of gateway Alarm Relay	*	U62	0 (OFF)	1 (ON)	-	
Measured Gascooler outlet temperature	*	U05	-30.0 °C	150.0 °C	-	
Measured Receiver inlet temperature	*	U07	-100.0 °C	200.0 °C	-	
Measured Receiver pressure (gateway option) - Currently not available	*	U08	-1,0bar	99,0 bar	-	
Converted Receiver pressure (gateway option) - Currently not available	*	U09	-50.0 °C	50.0 °C	-	
Converted High pressure	*	U22	-50.0 °C	100.0 °C	-	
Measured Suction pressure	*	U23	-1,0bar	99,0 bar	-	
Converted Suction pressure	*	U24	-50.0 °C	100.0 °C	-	
Ambient temperature	*	U25	-10.0 °C	100.0 °C	-	
Discharge temperature	*	U26	-10.0 °C	250.0 °C	-	
Suction temperature	*	U27	-10.0 °C	100.0 °C	-	
Low pressure OFF	*	U78	-25.0°C	30.0°C	-	
Low pressure ON	*	U79	-20.0°C	30.0°C	-	
Firmware version for GW ECU	*	U80	0.0	9.99	-	
High pressure valve opening degree OD	*	U91	0%	100%	-	
Receiver pressure valve opening degree OD	*	U92	0%	100%	-	

** Read only*

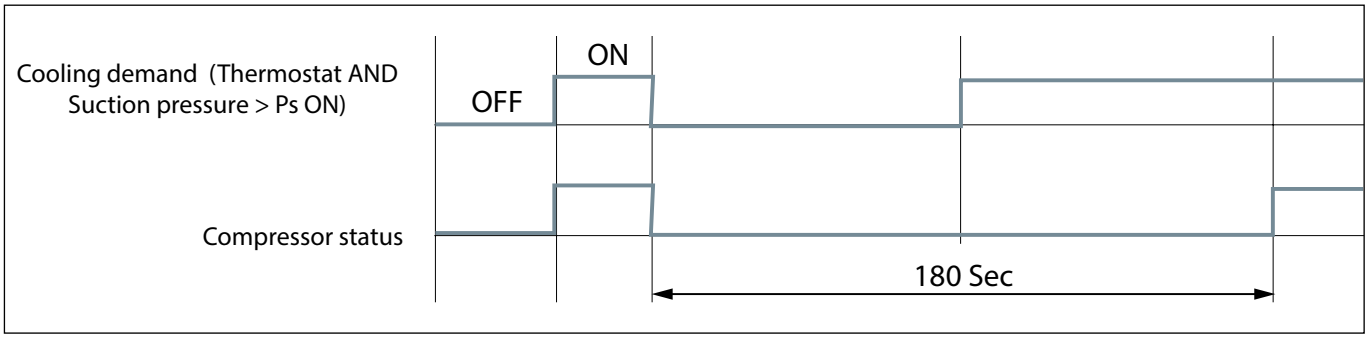
10.1 State transition diagram



If the communication between controller condensing unit and Gateway controller of the unit is lost, the condensing unit will continue to operate with the set value before the losing communication.
If communication is lost in STOP status, the Condensing unit cannot be operated unless communication is restored.

10.2 Constraint of cycle operation

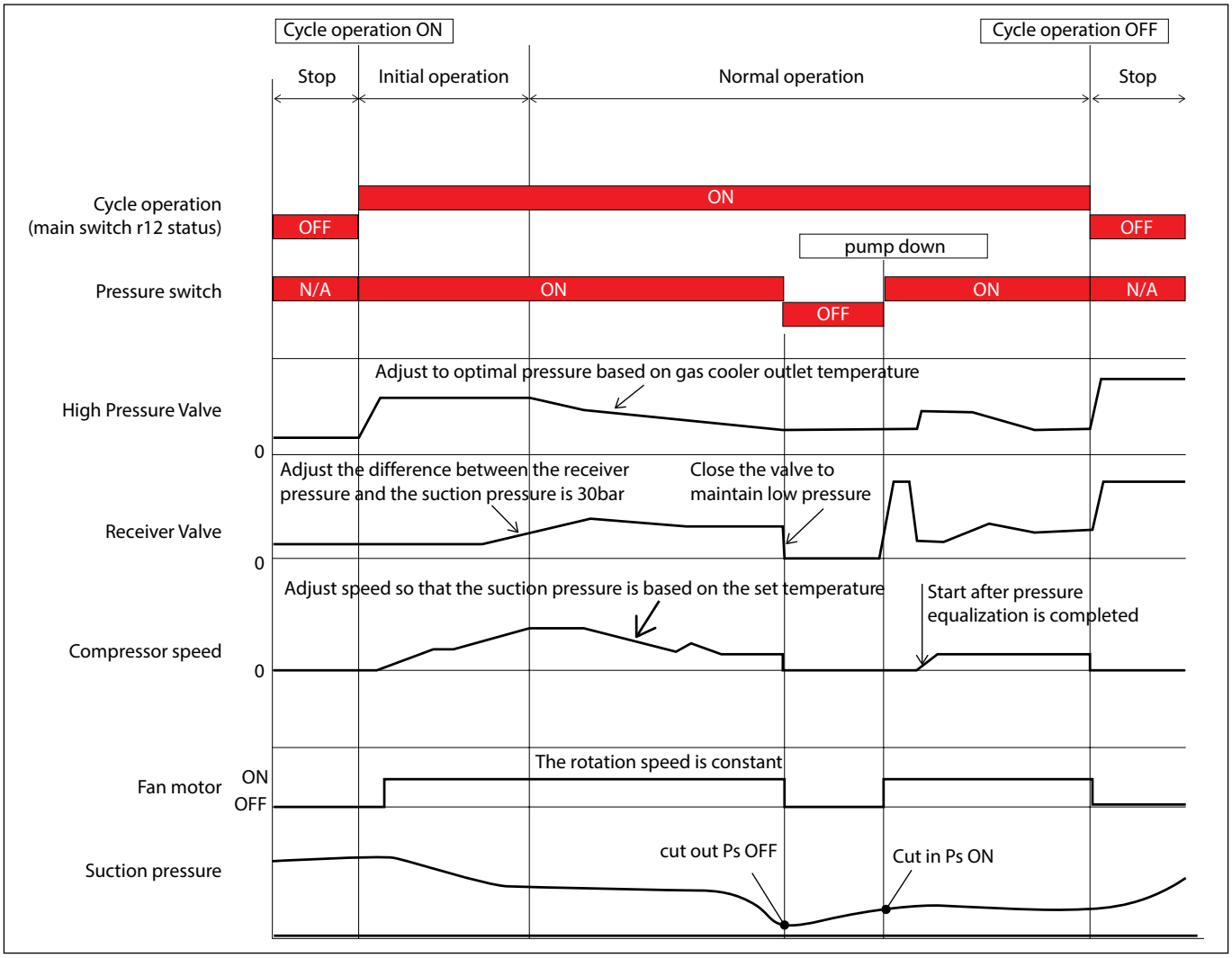
For 180 seconds after having stopped cycle operation, the state of operation is held as OFF.



© Danfoss | Climate Solutions | 2023.08

10.3 Control of the cycle operation

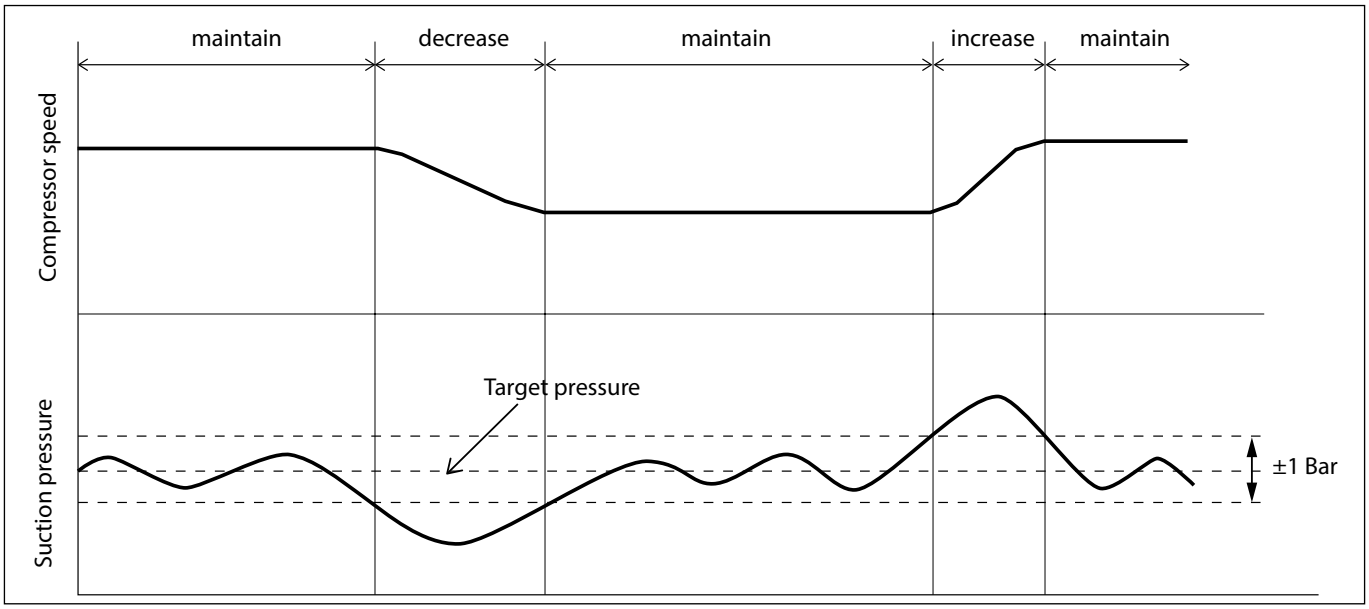
When the cycle operation is started, the condensing unit runs such as below.



10.4 Normal operation

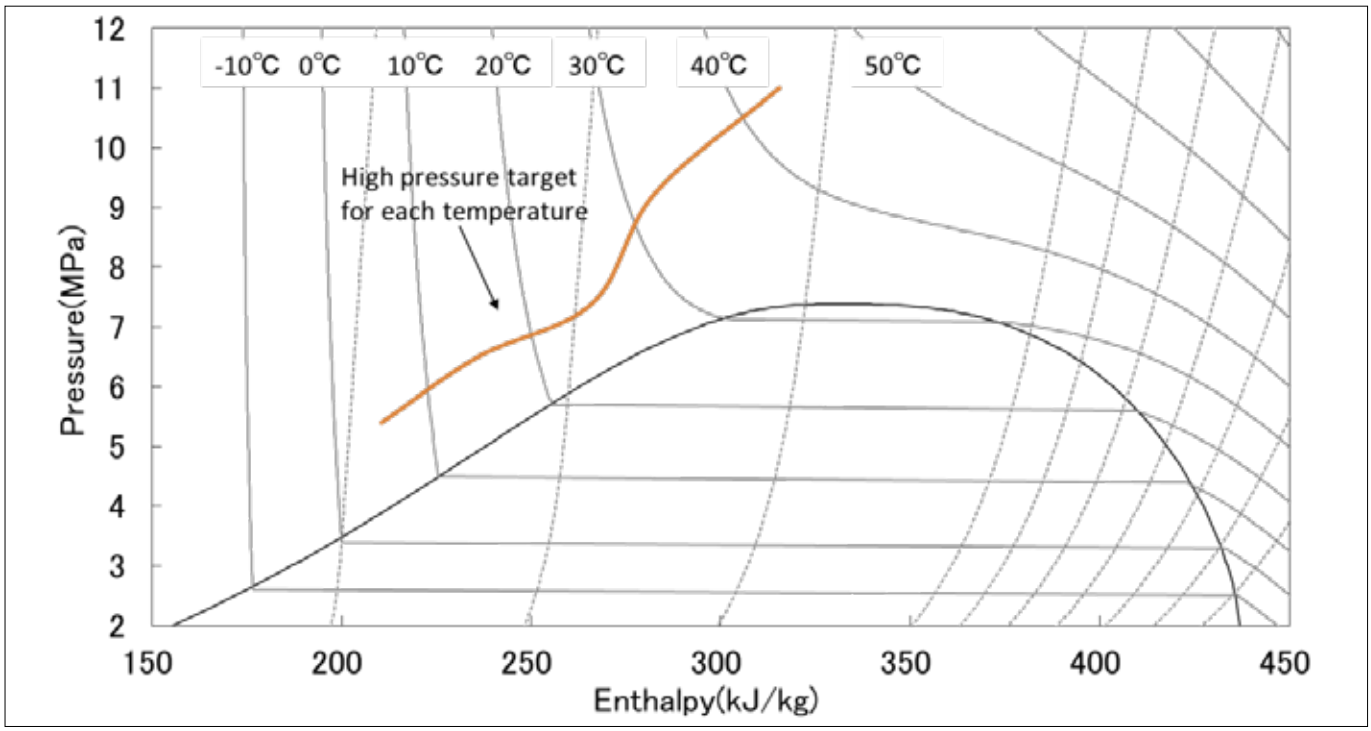
Compressor operation

Compressor changes speed (refrigeration capacity) based on suction pressure.
If the actual suction pressure is lower than the target set pressure, decrease the compressor speed, and if the actual suction pressure is higher than the target, increase the compressor speed.
If the actual suction pressure is within ± 1 bar of the target low pressure, the compressor speed is maintained.



High pressure valve operation

High pressure valve controls high pressure based on the gas cooler outlet temperature.
High pressure target for each temperature is below.



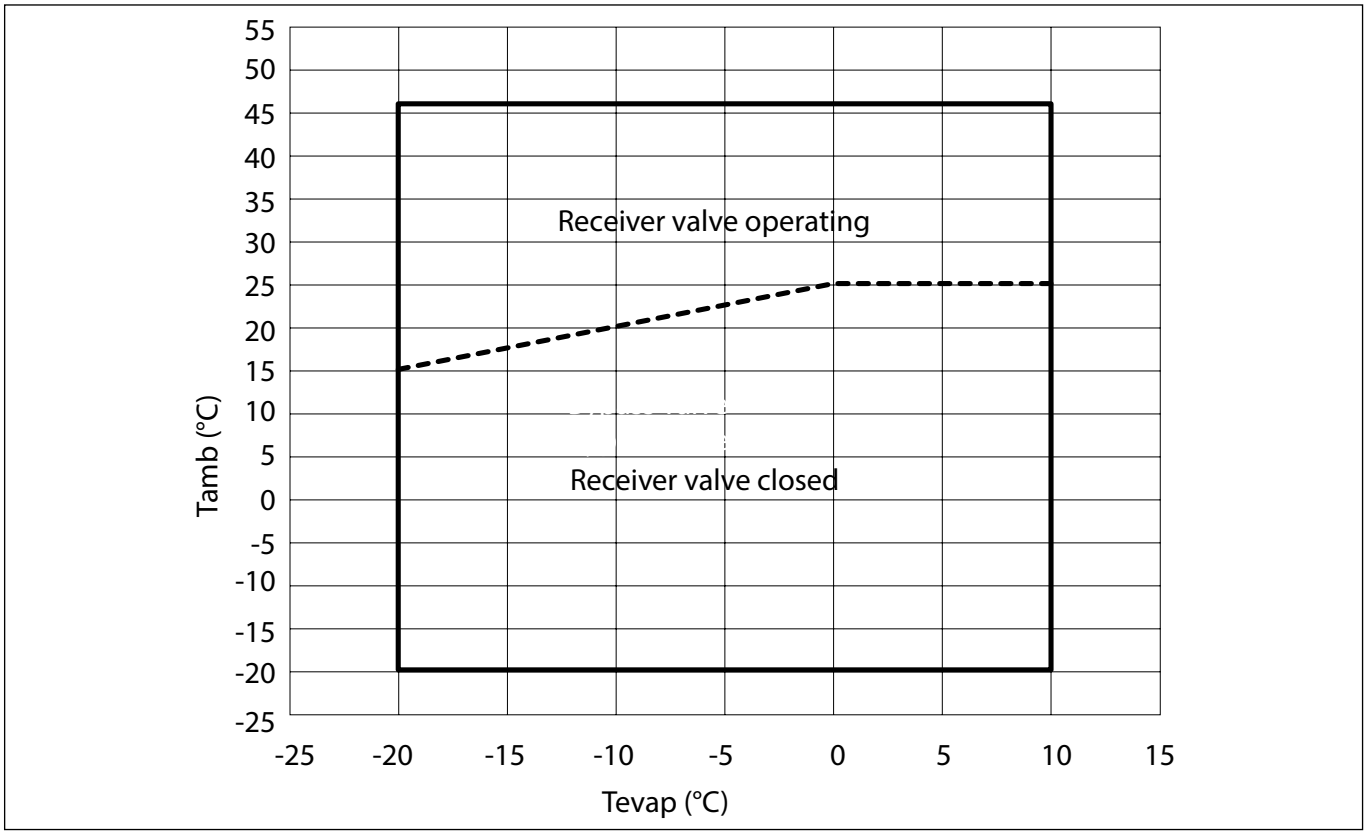
Notes

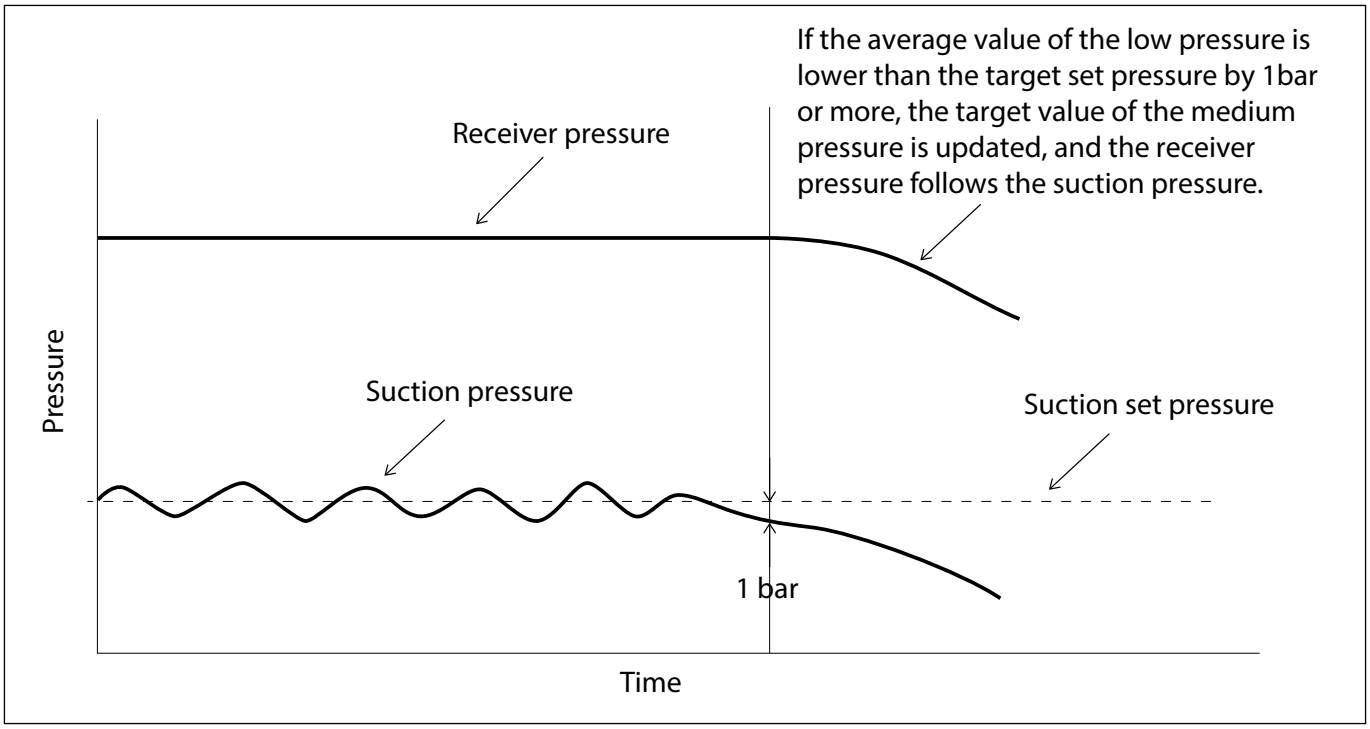
The gas cooler pressure is optimized to maintain the best COP - For each gas cooler outlet temperature we have an optimal pressure to maximize the COP
To stay within the compressor operating envelope the gas cooler pressure is maintained above 30 bar above suction pressure.

© Danfoss | Climate Solutions | 2023.08

Bypass valve operation

The controller operating the the receiver pressure valve valve tries to maintain a pressure difference between receiver pressure and suction pressure of 30 bar

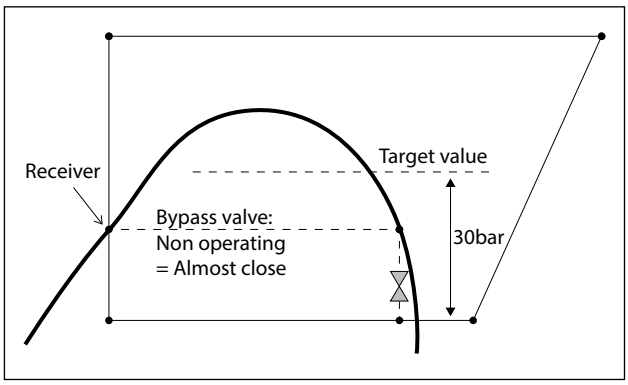




The condensing unit controller continues to operate even if the receiver pressure is lower than the target value.
The following are possible cases where the receiver pressure is lower than the target value.

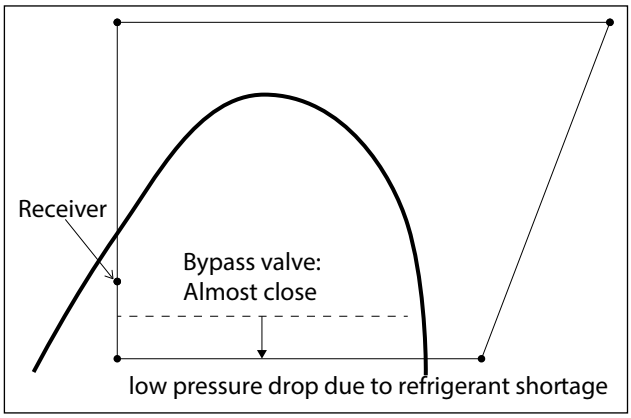
Case 1: Low ambient temperature condition

With a fully closed receiver valve, receiver pressure is on the saturated liquid line. Depending on air outside air temperature and gascooler outlet temperature, it will not always be possible to reach the receiver target pressure.



Case 2: Refrigerant shortage

If condensing unit is missing some refrigerant charge, it will not be possible to build up receiver pressure. System will continue to run but cooling capacity will be lower and suction pressure will drop down.



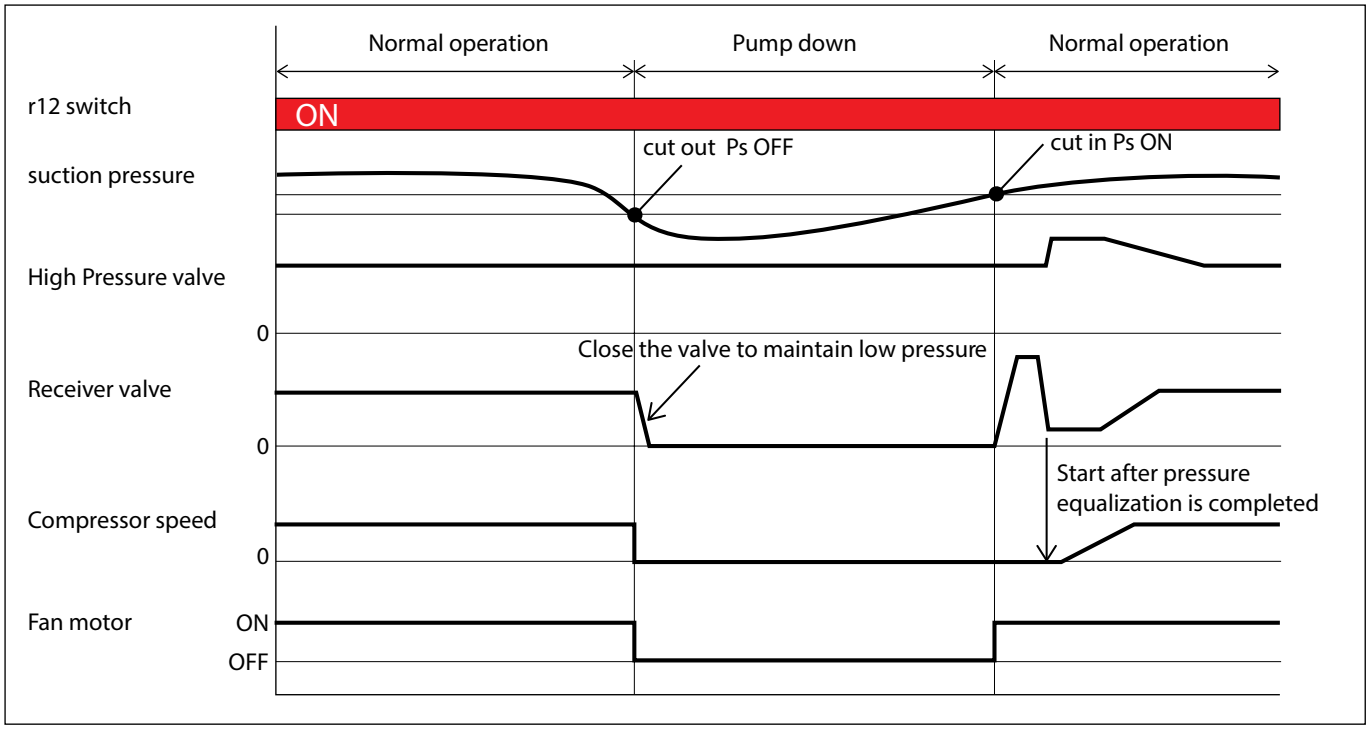
© Danfoss | Climate Solutions | 2023.08

10.5 Compressor OFF/ON

Compressor starts and stops are controlled by both suction pressure (LP ON/OFF) and digital input DI2.

Pressure control mode (Standalone mode)
If digital input DI2 is shunted, there is no communication between the condensing unit and the cold room controller. The condensing unit work in a standalone mode. Only suction pressure commands compressor starts and stops. This mode is also called pressure control mode or pump down mode.

Condensing unit behavior is depict in below drawing. Compressor will stop when suction pressure reaches the LPOFF value. Receiver valve is closed during standstill. The evaporator is pumped down. When suction pressure reach the LPON value, receiver valve open to make a pressure equalization and compressor restart.

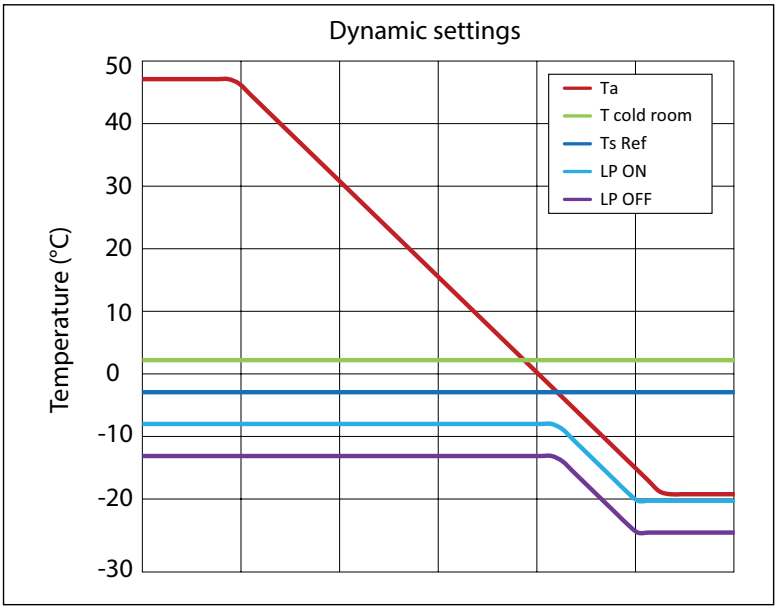


There is 2 ways to specify the LPON/OFF pressure limits :

1. **Static settings**: LP ON/OFF are defined as static (or absolute) values. Pressures are defined with their corresponding saturated temperature values (parameter c75 and c76).

2. **Dynamics settings:** LP ON/OFF are specified relative to suction reference Ts and ambient temperature Ta.
   - LPON = Smallest value of (Ts + offsetTs) and (Ta + offsetTa) and no less than -20°C
   - LPOFF = LPON + offsetON and no less than -25°C

Typical setting could be to fix all offset = -5 K. Compressor will start at a pressure 5 K below To and Ta which ever is the smallest. Pump down will be done 5 K below LPON i.e. 10 K below To and Ta.



Benefit of Dynamic settings : LP limits will adjust to ambient temperature. Pump down will be lighter in summer when there is no need to pump down to very low pressure. In winter the LPON will always be below Ta, to ensure condensing unit can always restart.

Note

Electronic controller check and modify setting temperature so that LPOFF < Ts and LPOFF < LPON

- If LP OFF > TsRef, then LP OFF is corrected to LP OFF = TsRef - 5 K
- If LP ON < LP OFF, then LP ON is set to LP ON = TsRef + 5K

Thermostat control mode

Condensing unit digital input DI2 (CNB41-43) need to be connected to cold room thermostat. When relay is closed, condensing unit run in normal operation. When relay is open, condensing unit stops. Receiver valve is fully open during standstill. Pressure is equalized in all the circuit during OFF period.

Summer vacation

In case condensing unit is in pressure control mode, during summer, when cold room is turn OFF a long period of time, condensing unit could still need to start from time to time to cool down the receiver.

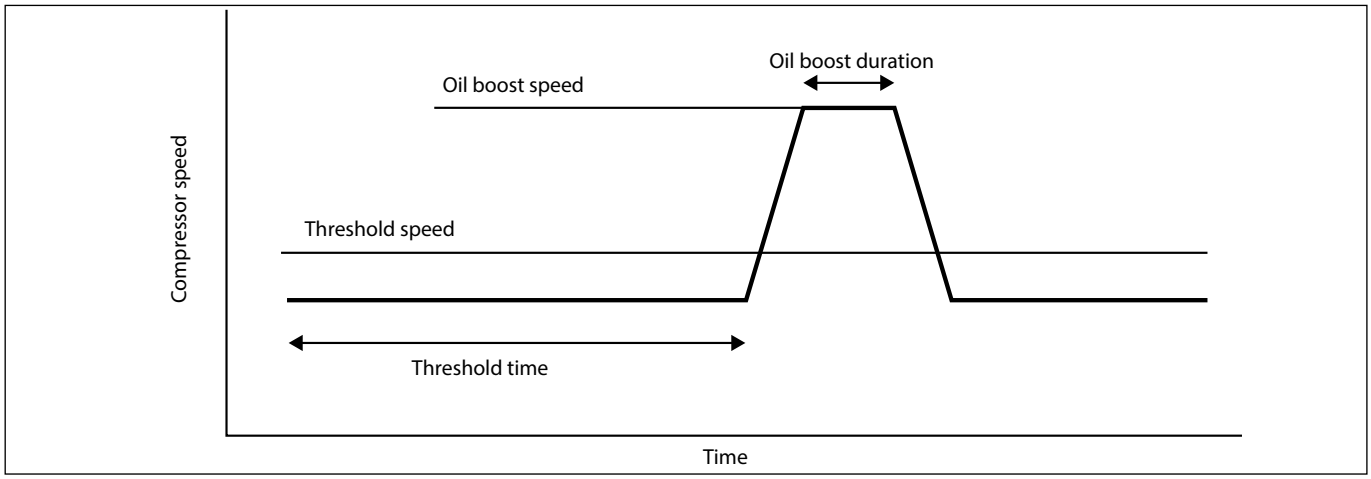
To avoid those cycling, we strongly recommand to set condensing main switch r12 = 0. This will force bypass valve full open and equalize pressure in all the circuit. Refrigerant charge equation and charge limits guarantee that system pressure will be less than 80 bar as long as cold room temperature does not exceed 38°C.

In case evaporator and suction line are PS 60 bar, best option is to keep system running during summer vacation. Set point can be modified to save energy. It only need to be less than 22°C with some margin (saturated pressure at 22°C is 60 bar).

© Danfoss | Climate Solutions | 2023.08

10.6 Oil return

If the operation under the specified rotation speed (35%) is continued for more than a certain time (20 minutes), the compressor rotation speed will be increased (44%) for 60 seconds. (factory setting)
Threshold speed and time, oil boost speed and duration can be specified by the user.

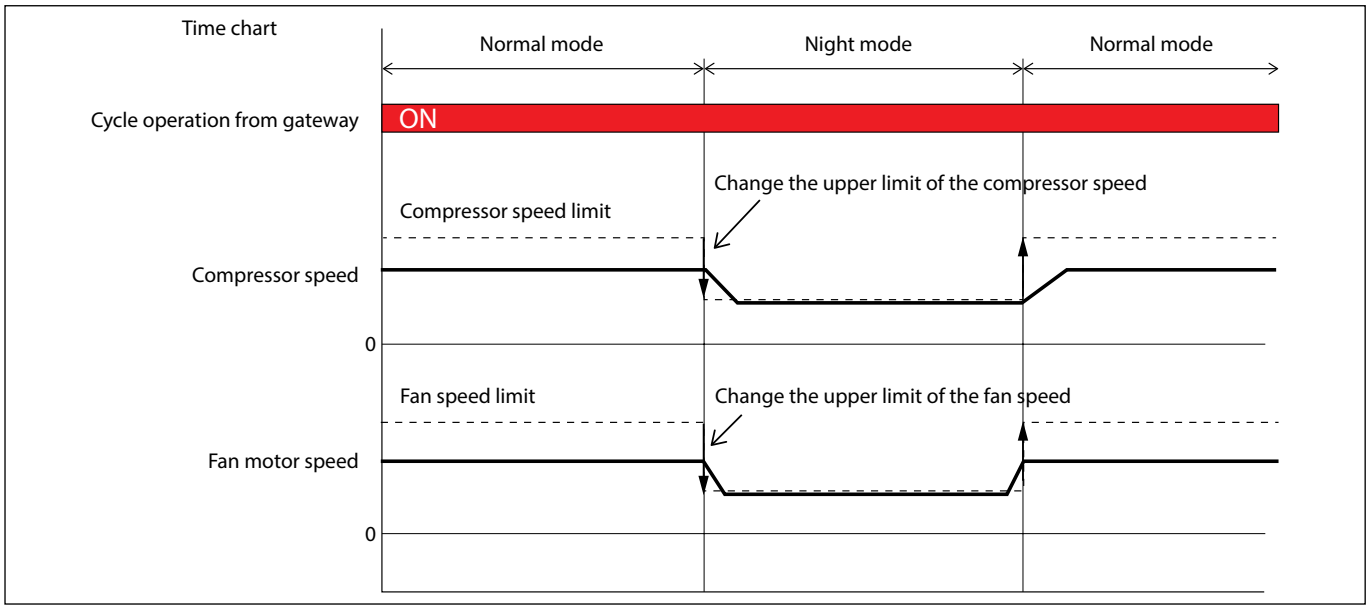


Note

1. If the compressor is stopped (OFF) during oil return operation, the oil return operation will be continued at the next start-up.
2. Compressor speed doesn't increase during emergency pressure or discharge temperature control. Oil return strategy as a lower priority than pressure and discharge temperature control.

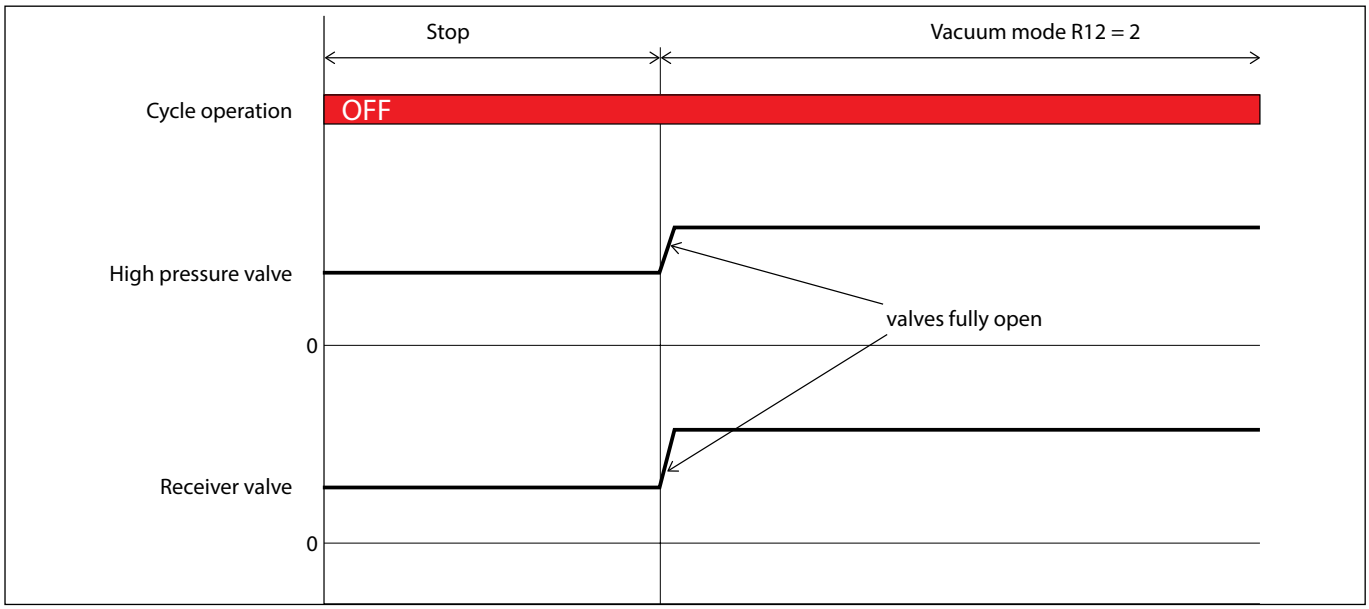
10.7 Normal mode / Night mode

The condensing unit switch between Normal (Day) and Night mode depending on time.
Different maximum compressor speed and fan speed will apply during nigh and day.
All parameters, time and speed limits can be defined by the user.



10.8 Vacuum mode

Vacuum mode is set by r12 = 2.
During vacuum mode, the valves become fully open.



10.9 Fan speed management:

For high ambient running conditions, if the temperature difference between gas cooler outlet and ambient temperature is greater than 10K then fan speed is increased by a step of 50 rpm until the temperature difference is at or below 10K
When the ambient temperature is below the evaporator setting, fan speed is adjusted to keep the gas cooler outlet pressure 30 bar above suction pressure.

10.10 Pressure management in case of abnormal pressure rising

Control to avoid receiver over pressure during standstill
During standstill receiver pressure is read by the gas cooler pressure transmitter. If receiver pressure rises up to a limit, receiver valve will open and force compressor to restart.

- If valve type is Stepper (o09 = 0): Receiver pressure limit during standstill is Plimit = 76 bar.
- If valve type is AKV (o09 = 1) : Receiver pressure limit is Plimit = suction pressure + 30 bars and less than 76 bar.

Note:
There is a minimum of 180 second time delay between stop and a restart (See 10.2). During that time receiver valve is open and receiver pressure is equalized with the compressor suction.

Control to avoid receiver over pressure during operation
When receiver inlet temperature reach

- 27°C, receiver valve is fully open
- 30°C, compressor slow down
- 33°C, compressor stops.

Control to avoid gas cooler over pressure during operation
Compressor slow down when the gas cooler outlet pressure is higher than 118 Bar.
Compressor is stopped by pressure switch when the compressor outlet pressure is higher than 140 Bar.

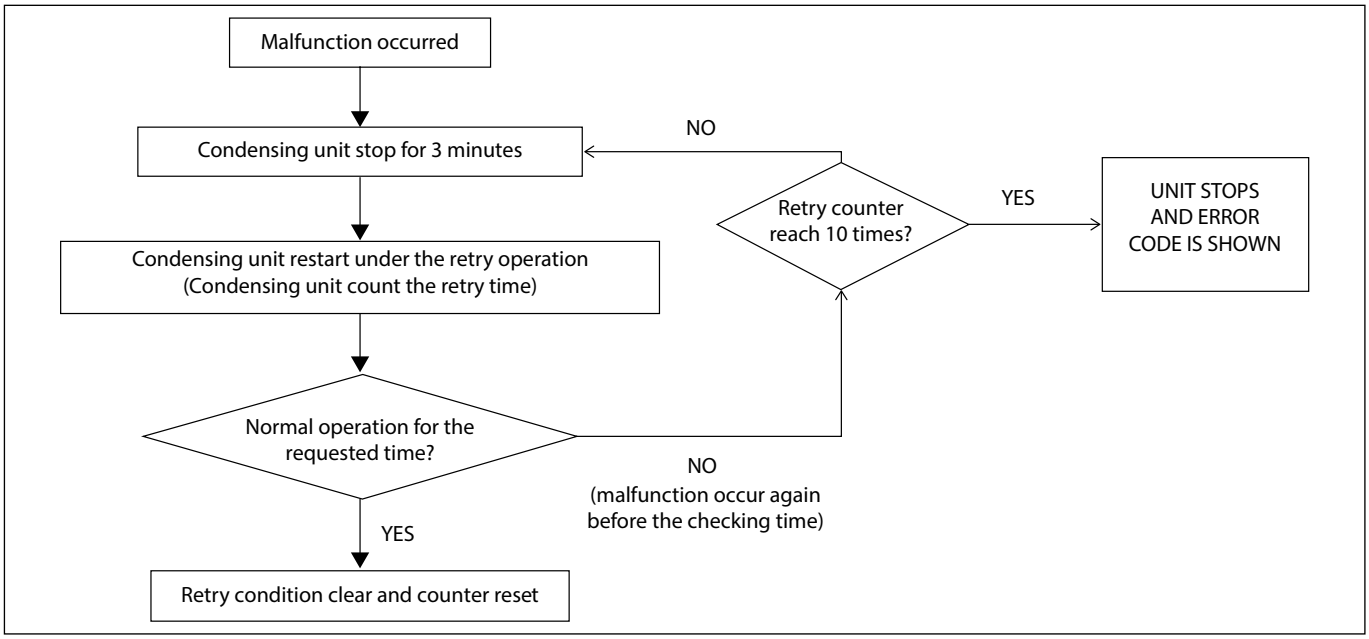
© Danfoss | Climate Solutions | 2023.08

10.11 Error code

The table below show the number of retry times before, showing the error code and stopping the unit. The table show also the time of normal operation that reset the counter of retry numbers. (Temporary stop Interval between retry is 3 minutes)

Error code	Number of retry times	Checking Time
A17	10 times	30 min
A34	10 times	72 s
A96	10 times	30 min
H23	10 times	5 min
H24	10 times	5 min
H25	10 times	5 min
H26	10 times	5 min
H28	10 times	5 min
H29	10 times	5 min
A85	10 times	30 min

Retry operation



Error code	Content	Detection contents	Detection timing	Self-return	Cycle operating status	Remarks
A2	Low pressure alarm (B2)	Low pressure sensor (B2) are less than 14 Bar.	Stand by	Need reset manually	Stop	Reset error codes after charging
A17	Abnormal high-pressure alarm (B1)	High pressure sensor (B1) detects more than 140 Bar, Srl is continued ten times	Compressor running	Need reset manually	Stop*2	10 –times of retrials starting procedure
E20	Gas cooler outlet thermistor error (R5)	Disconnection (less than or equal -30°C) Short (more over or equal 150 °C)	Power supply ON	Need reset manually	Continue*1	Operation continues using alternative setting values. Or Optyma™ iCO_2 to suspend its operation.
E33	Suction temperature sensor (R3) error	Disconnection(less than or equal -40°C) Short(more over or equal 100 °C)	Power supply ON	Need reset manually	Continue*1	Optyma™ iCO_2 to suspend its operation.
E40	Receiver thermistor (R4) error	Disconnection (less than or equal -40°C) Short (more over or equal 100 °C)	Power supply ON	Need reset manually	Stop	Optyma™ iCO_2 to suspend its operation
E31	Ambient air thermistor (R2) error	Disconnection(less than or equal -40 °C) Short(more over or equal 100°C)	Power supply ON	Need reset manually	Stop	Optyma™ iCO_2 to suspend its operation
E32	Discharge thermistor (R1) error	Disconnection(less than or equal -40 °C) Short(more over or equal 250°C)	Power supply ON	Need reset manually	Stop	Optyma™ iCO_2 to suspend its operation
A34	Gas cooler fan motor (M2) error	Rotor pulse signals is detected continuously less than or equal 100rpm for 60 seconds	Compressor running	Need reset manually	Stop*2	10 –times of retrials
E39	Low pressure sensor (B2) error (suction)	Disconnection (less than or equal 0.0 Bar) Short(more over or equal 112 Bar)	Power supply ON (without vacuum mode)	Need reset manually	Stop	Optyma™ iCO_2 to suspend its operation
A96	Discharge temperature (R1) alarm	Discharge temp. thermistor detects more than or equal 138°C for 5 seconds.	Compressor running	Need reset manually	Stop*2	10 –times of retrials
H23	Optyma™ iCO_2 Electronic controller error	Unit Controller / Inverter error code (internal)	Compressor running	Need reset manually	Stop*2	10 –times of retrials
H24		Electrical circuit failure on the inverter				
H25		Motor current sensor failure on inverter				
H26		Input current sensor failure on inverter				
H27		Motor current error (phase open)				
H28		Other error for compressor or inverter				
H29		Anbornamlity, compressor speed not increasing				
E42	Pressure sensors (B1) error or refrigerant shortage	Disconnection (more over or equal 219.5 Bar) Short (less than or equal 0.0 Bar)	Power supply ON (without vacuum mode)	Need reset manually	Stop	Optyma™ iCO_2 to suspend its operation
A85	abnormality medium pressure	Receiver thermistor (R4) detects more than 78 Bar in pressure conversion value	Compressor running	Need reset manually	Stop*2	10 –times of retrials
A97	High pressure sensor safety switch (B3) alarm	Mechanical high pressure safety switch (B3) disconnect contactor & compressor	Compressor running	Need reset manually	Stop	
A45	Main Switch OFF	Main switch par. r12 OFF	Stand by	Need reset manually	Stop	

**1 When the following sensors fail, the Optyma™ iCO_2 continues to operate using another sensor.*

- *GC outlet thermistor ⟶ Ambient air thermistor : Except operating out of the envelope map*
- *Suction thermistor ⟶ Low pressure sensor (Convert to temperature)*

Optyma™ iCO_2 stops when two or more errors are occurred at the same time.

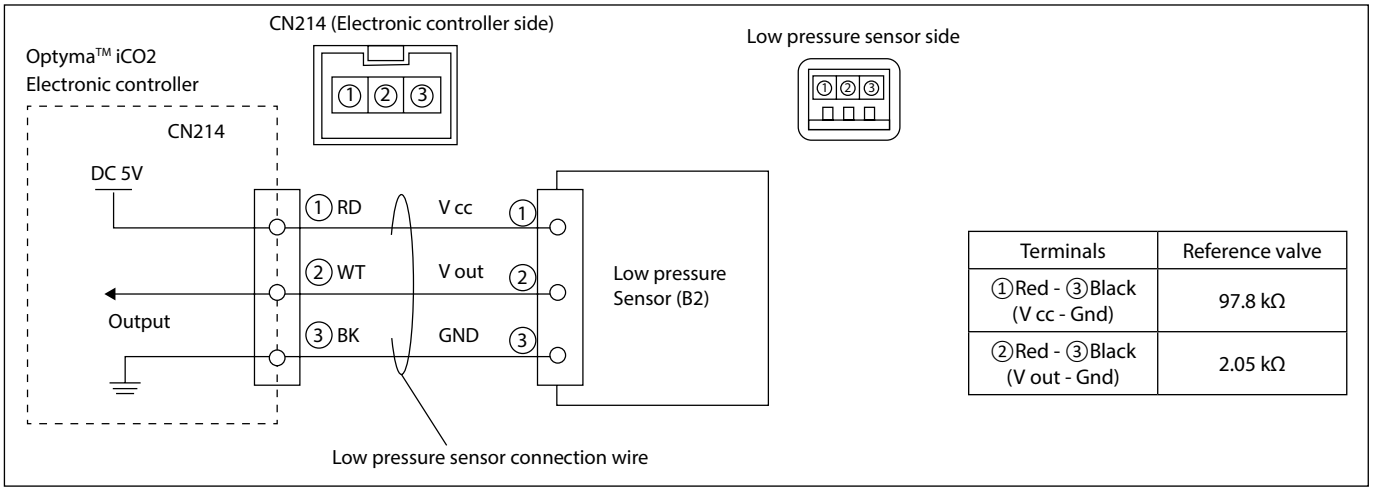
**2 Optyma™ iCO_2 to suspend its operation when error continues after 10 – times of retrials; after this, sending error code.*

***ATTENTION**: Do not reach your hands into the Optyma™ iCO_2 unit because there is a possibility of electric shock.*

***Note (1):** Electronic controller is Electronic controller + driver*
***Note (2):** For the abbreviations R1, R2, R3, etc., please see appendix material*

© Danfoss | Climate Solutions | 2023.08

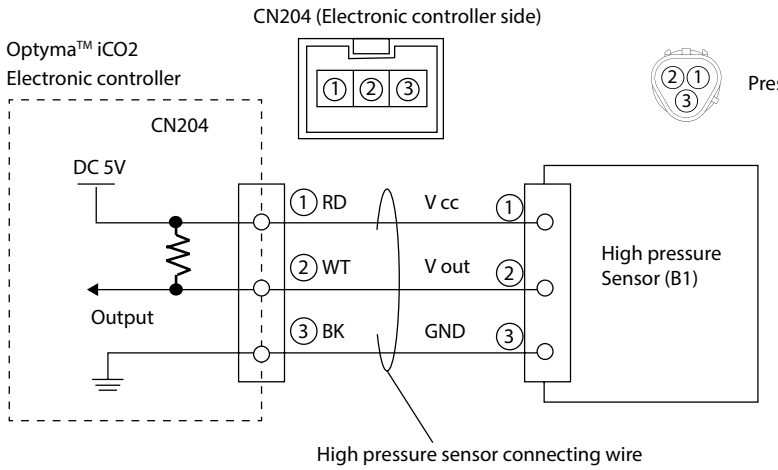
Error code A2 - Low pressure alarm (sensor B2)



Terminals	Reference valve
①Red - ③Black (V cc - Gnd)	97.8 kΩ
②Red - ③Black (V out - Gnd)	2.05 kΩ

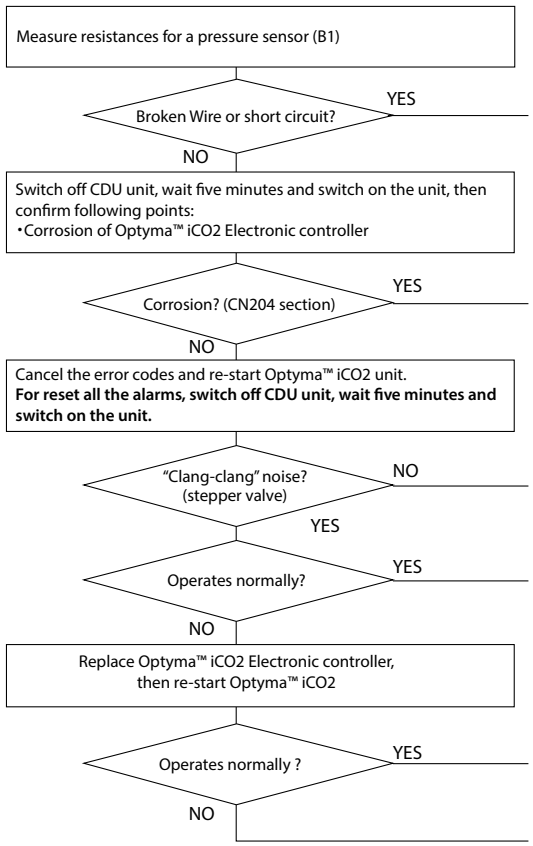
1. Detection condition	Diagnosis flow	Cause (action taken)
Low pressure are less than 14 Bar for 10 s.	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector/service valves closed by visual check 2. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing	Correct quantity of gas? YES →	Check if there is any leak and correct the refrigerant charge. (Reset error codes after charging)
When a cycle operation signal from GW change OFF to ON	NO Leak test system ? YES →	Repair leak
	NO Cancel the error codes and re-start Optyma™ iCO2 unit. For reset all the alarms, switch off CDU unit, wait five minutes and switch on the unit.	
3. Estimated causes	Same Error code shows up again? YES	
1. Refrigerant not charged or leak 2. Low pressure sensor	NO Turn off mains power (230V AC) to the system (before open maintenance door), then check followings after 5 min. •Corrosion of Optyma™ iCO2 Electronic controller	
	Corrosion found? YES →	Replace failure parts
	NO Disconnect connectors from Optyma™ iCO2 Electronic controller and a low pressure sensor, and check if there is a wire snapping or/and a short circuit.	
	Wire snapping or short circuit found? YES →	Low pressure sensor connecting wire (replace connecting wire)
	NO Measure inter-terminal (①-③, ②-③) resistances for the pressure sensor	
	Wire snapping or short circuit to a part of terminals? YES →	Pressure sensor failure (Replace pressure sensor)
	NO Replace Optyma™ iCO2 Electronic controller, then reset error codes. Restart Optyma™ iCO2 unit by turning on and of the unit)	
	Operates normally ? YES →	Optyma™ iCO_2 Electronic controller failure (Repair complete)
	NO	Refrigerant leak, blockage(Identify leak portion, and replace parts)
	If the problem cannot be solved by checking only Optyma™ iCO_2, there is a possibility of leakage or blockage in the Evaporator or the piping between a Evaporator and Optyma™ iCO_2, so please check that as well.	Watch the consequence

Error code A17 - Abnormal high-pressure alarm (sensor B1)



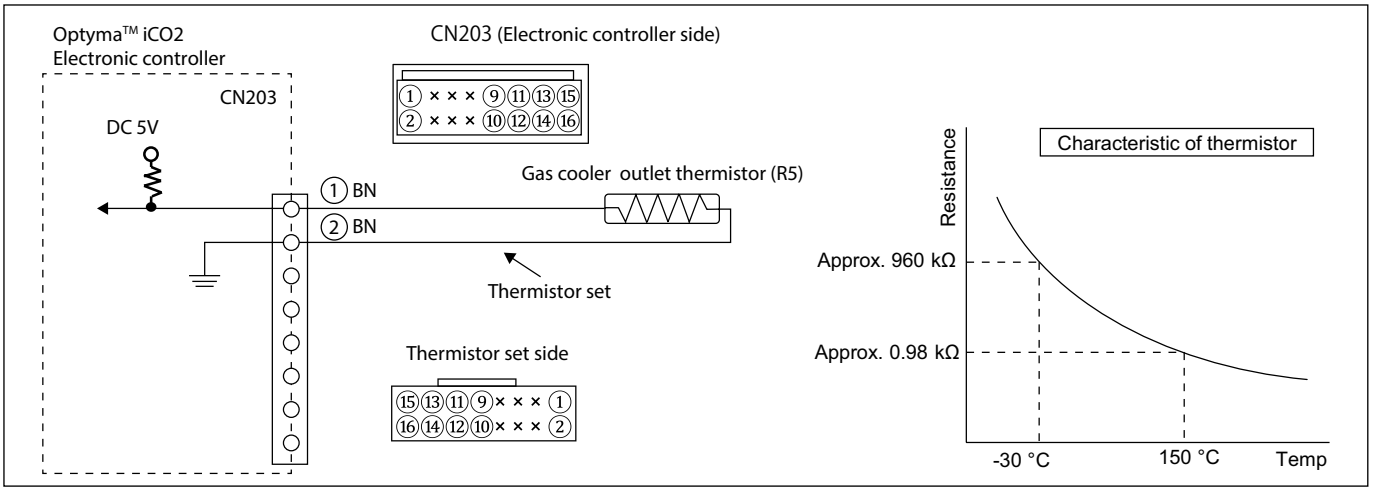
Terminals	Reference valve
①Red - ③Black (V cc - Gnd)	5.6 kΩ
②Red - ③Black (V out - Gnd)	7.3 kΩ

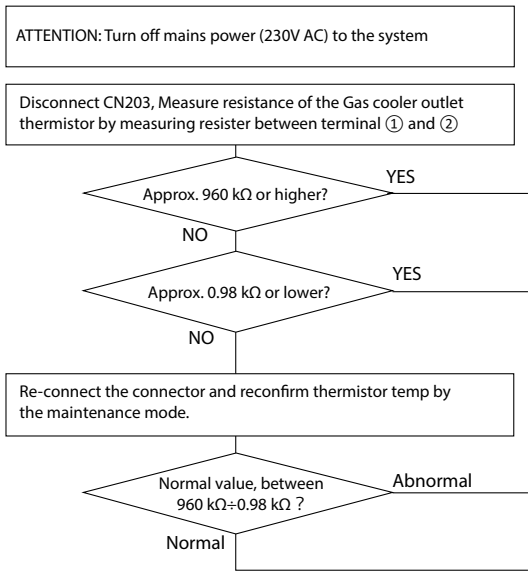
1. Detection condition	Diagnosis flow	Cause (action taken)
High pressure sensor (B1) transmitter more than 140 Bar (0.5 s)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector/service valves closed / gas cooler blockage (air side) by visual check 2. To check whether if there is pipes distortion, blockage/ filter blockage 3.Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing		
Compressor running		
3. Estimated causes		
1. High pressure sensor 2. Fan motor 3. Optyma™ iCO_2 Electronic controller 4. Expansion valve 5. CO_2 cycle 6. Gas cooler		
4. Action when error occurred		
Optyma™ iCO_2 to suspend its operation if abnormal continues after 10 times of retrial **Note** Retrial control logic: Re-start operation after 3 min. of operation stop.	If the problem cannot be solved by checking only Optyma™ iCO_2, there is a possibility of leakage or blockage in the Evaporator or the piping between a Evaporator and Optyma™ iCO_2, so please check that as well.	



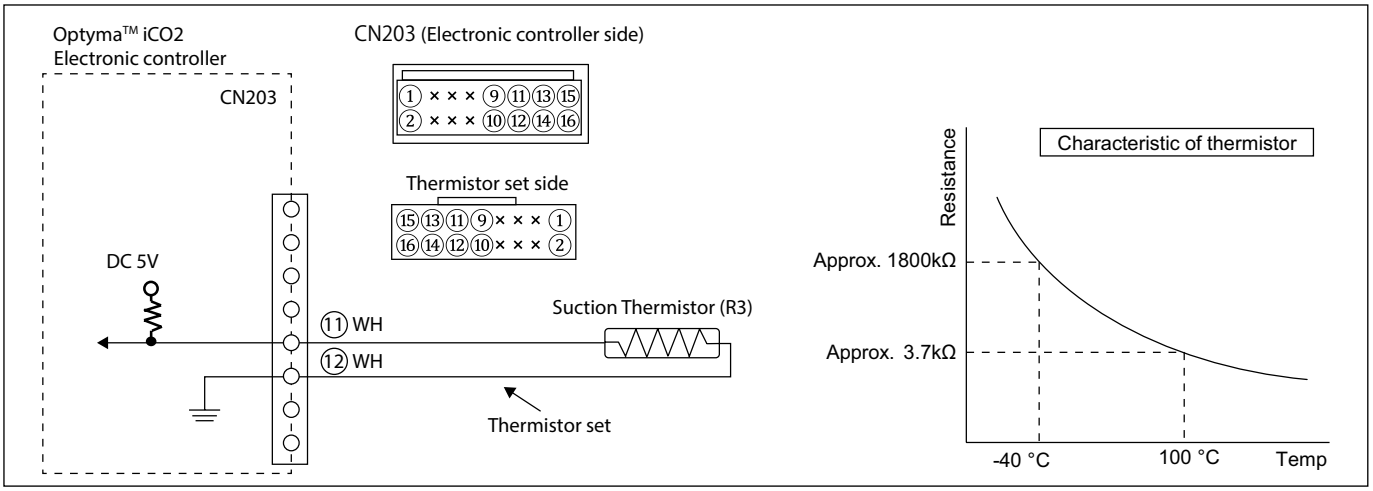
© Danfoss | Climate Solutions | 2023.08

Error code E20 - Gascooler outlet thermistor error (R5)



1. Detection condition	Diagnosis flow	Cause (action taken)
1. Wire snapping (- 30 °C or lower to last for 10 s) 2. Short circuit (150 °C or higher to last for 10 s)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector by visual check 2. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check. 	Gas cooler Outlet thermistor broken (Replace the thermistor) Gas cooler Outlet thermistor Short circuit (Replace thermistor) Optyma™ iCO_2 Electronic controller failure (Replace Optyma™ iCO_2 Electronic controller) Repair complete (Watch the consequence)
2. Detection timing Power supply ON		
3. Estimated causes 1. Thermistor 2. Connector connection failure. wire snapping, etc. 3. Optyma™ iCO_2 Electronic controller		
4. Action when error occurred Operation continues using alternative setting values. Or Optyma™ iCO_2 to suspend its operation.	**Note** Resistance value checking process: (Hold a thermistor by hand) 1. Read resistance value 2. Compare temp between values on the resistance-temp table and measured value. (Criteria: If there is a gap for 10 % or more, it is judged NG. Replace the thermistor)	

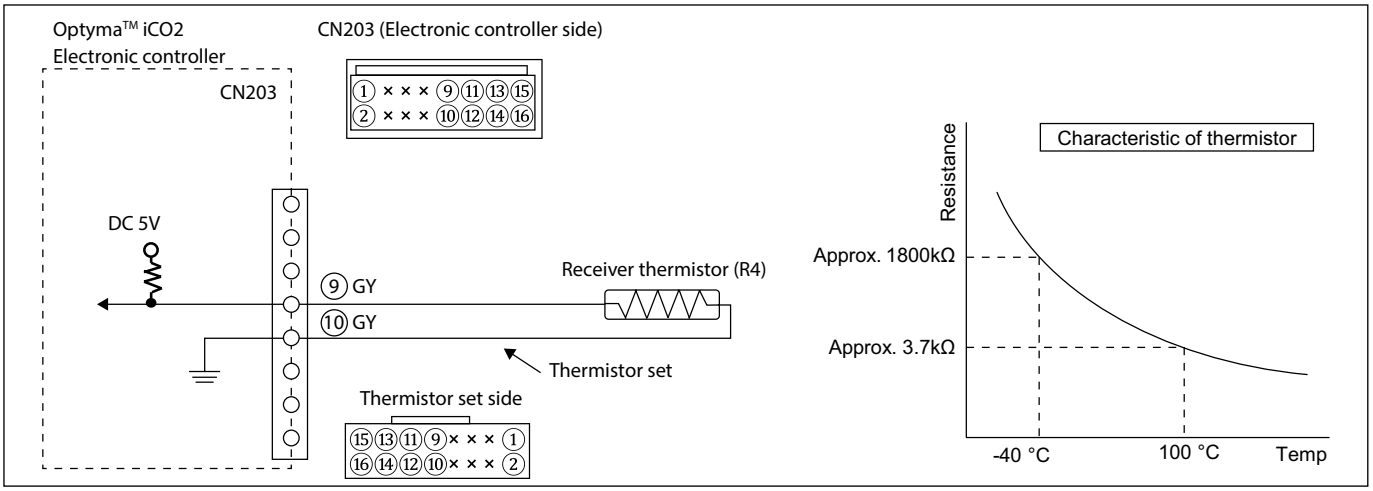
Error code E33 - Suction temperature sensor (R3) error



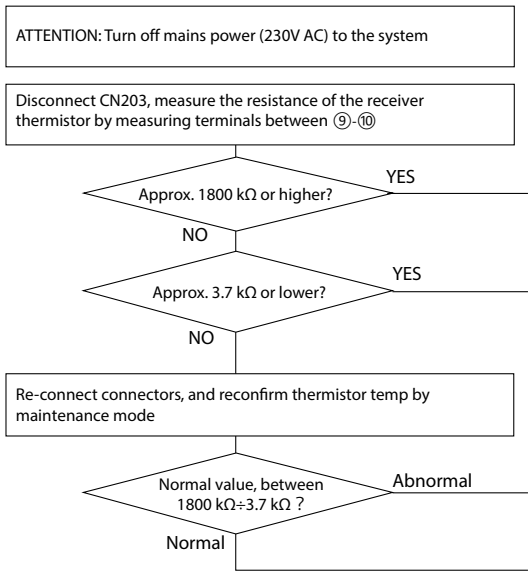
1. Detection condition	Diagnosis flow	Cause (action taken)
1. Wire snapping (- 30 °C or lower to last for 10 s) 2. Short circuit (150 °C or higher to last for 10 s)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector by visual check 2. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing	ATTENTION: Turn off mains power (230V AC) to the system	
Power supply ON	Disconnect CN203. measure the resistance of the suction thermistor by measuring terminals between ⑪-⑫	
3. Estimated causes	Approx. 1800 kΩ or higher? YES → Suction Thermistor broken (Replace the thermistor) NO	
1. Thermistor 2. Connector connection failure. wire snapping, etc. 3. Optyma™ iCO_2 Electronic controller	Approx. 3.7 kΩ or lower? YES → Suction Thermistor Short circuit (Replace thermistor) NO	
4. Action when error occurred	Re-connect connectors, and reconfirm thermistor temp by maintenance mode	
Operation continues using alternative setting values. Or Optyma™ iCO_2 to suspend its operation.	Normal value, between 1800 kΩ÷3.7 kΩ ? Abnormal → Optyma™ iCO_2 Electronic failure (Replace Optyma™ iCO_2 Electronic controller) Normal → Repair complete (Watch the consequence)	
	Note Resistance value checking process: (Hold a thermistor by hand) 1. Read resistance value 2. Compare temp between values on the resistance-temp table and measured value. (Criteria: If there is a gap for 10 % or more, it is judged NG. Replace the thermistor)	

© Danfoss | Climate Solutions | 2023.08

Error code E40 - Receiver thermistor error (R4)



1. Detection condition	Diagnosis flow	Cause (action taken)
1. Wire snapping (- 40 °C or lower to last for 10 s) 2. Short circuit (100 °C or higher to last for 10 s)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector by visual check 2. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing		
Power supply ON		
3. Estimated causes		
1. Thermistor 2. Connector connecting error, Snapping of the wire 3. Optyma™ iCO_2 Electronic controller		
4. Action when error occurred		
Optyma™ iCO_2 to suspend its operation.		



Receiver thermistor broken
(Replace the thermistor)

Receiver thermistor Short circuit
(Replace thermistor)

Optyma™ iCO_2 Electronic failure
(Replace Optyma™ iCO_2 Electronic controller)

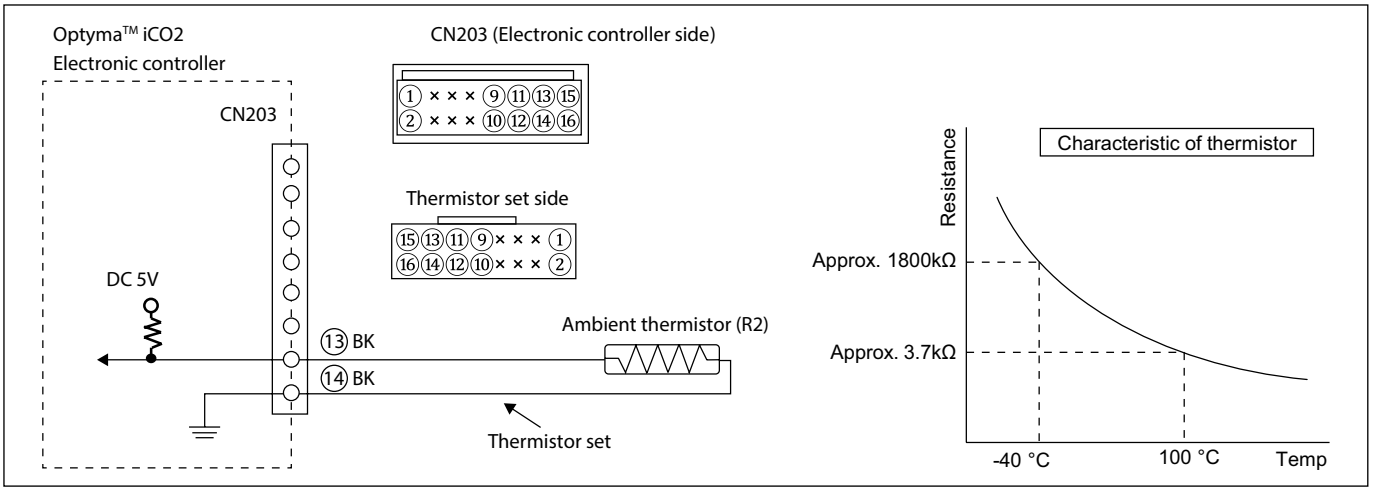
Repair complete
(Watch the consequence)

Note
Resistance value checking process:

(Hold a thermistor by hand)
1. Read resistance value
2. Compare temp between values on the resistance-temp table and measured value.

(Criteria:
If there is a gap for 10 % or more, it is judged NG. Replace the thermistor)

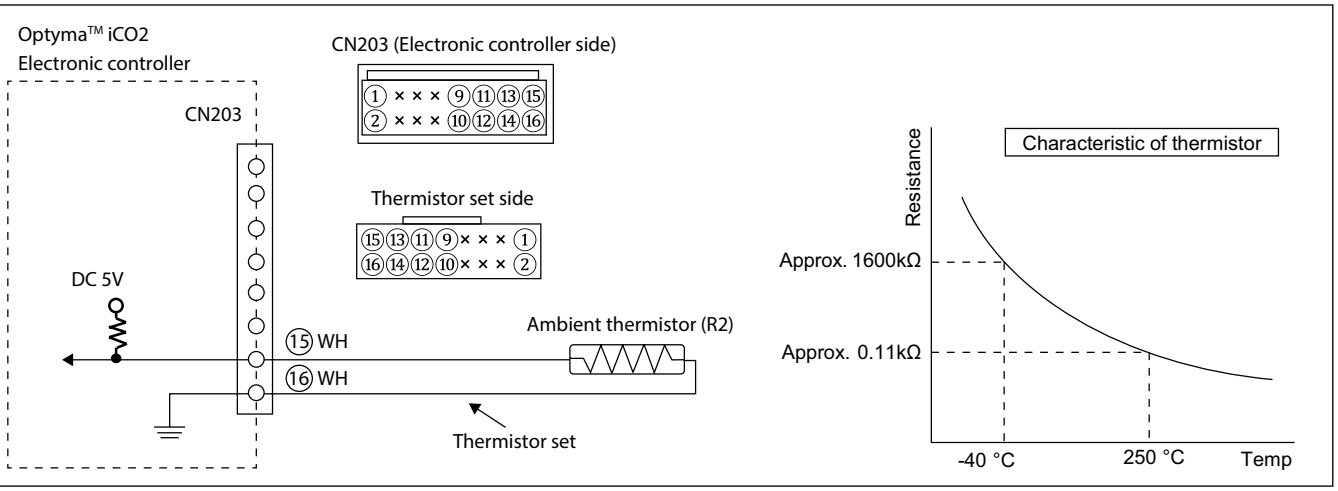
Error code E31 - Ambient air thermistor error (R2)



1. Detection condition	Diagnosis flow	Cause (action taken)
1. Wire snapping (- 40 °C or lower to last for 10 s) 2. Short circuit (100 °C or higher to last for 10 s)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector by visual check 2. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing	ATTENTION: Turn off mains power (230V AC) to the system	
Power supply ON	Disconnect CN203, measure the resistance of ambient air thermistor by measuring terminals between ⑬-⑭	
3. Estimated causes	Approx. 1800 kΩ or higher? YES	Ambient air thermistor broken (Replace the thermistor)
1. Thermistor 2. Connector connecting error, Snapping of the wire 3. Optyma™ iCO₂ Electronic controller	NO Approx. 3.7 kΩ or lower? YES	Ambient air thermistor Short circuit (Replace thermistor)
4. Action when error occurred	NO Re-connect connectors, and reconfirm thermistor temp by maintenance mode	
Optyma™ iCO₂ to suspend its operation.	Normal value, between 1800 kΩ÷3.7 kΩ ? Abnormal	Optyma™ iCO₂ Electronic failure (Replace Optyma™ iCO₂ Electronic controller)
	Normal	Repair complete (Watch the consequence)
	Note Resistance value checking process: (Hold a thermistor by hand) 1. Read resistance value 2. Compare temp between values on the resistance-temp table and measured value. (Criteria: If there is a gap for 10 % or more, it is judged NG. Replace the thermistor)	

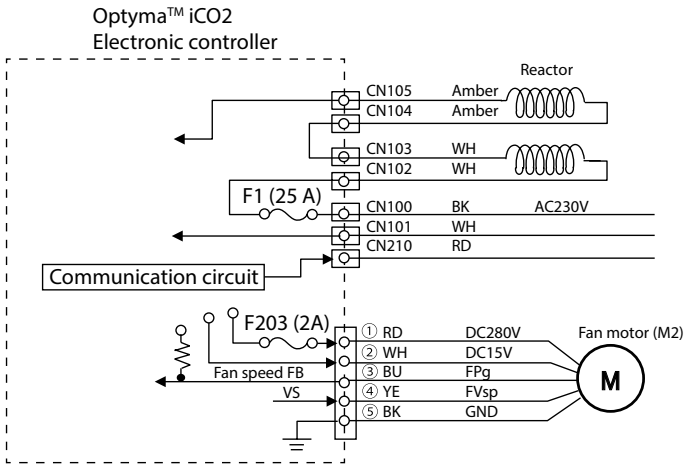
© Danfoss | Climate Solutions | 2023.08

Error code E32 - Discharge thermistor (R1) error



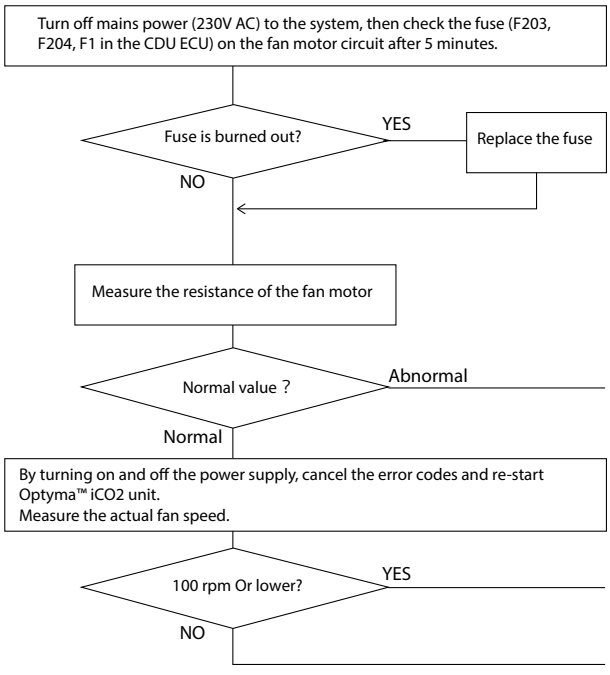
1. Detection condition	Diagnosis flow	Cause (action taken)
1. Wire snapping (- 40 °C or lower to last for 10 s) 2. Short circuit (200 °C or higher to last for 10 s)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector by visual check 2. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing	ATTENTION: Turn off mains power (230V AC) to the system	
Power supply ON	CN203 measure the resistance of the discharge thermistor by measuring terminals between ⑮-⑯	
3. Estimated causes	Approx. 1600 kΩ or higher? YES	Discharge thermistor broken (Replace the thermistor)
1. Thermistor 2. Connector connecting error, Snapping of the wire 3. Optyma™ iCO₂ Electronic controller	NO Approx. 0.11 kΩ or lower? YES	Discharge temp thermistor Short circuit (Replace thermistor)
4. Action when error occurred	NO Re-connect connectors, and reconfirm thermistor temp by maintenance mode	
Optyma™ iCO₂ to suspend its operation.	Normal value, between 1600 kΩ÷0.11 kΩ ? Abnormal	Optyma™ iCO₂ Electronic failure (Replace Optyma™ iCO₂ Electronic controller)
	Normal	Repair complete (Watch the consequence)
	Note Resistance value checking process: (Hold a thermistor by hand) 1. Read resistance value 2. Compare temp between values on the resistance-temp table and measured value. (Criteria: If there is a gap for 10 % or more, it is judged NG. Replace the thermistor)	

Error code A34 - Fan motor error (M2)



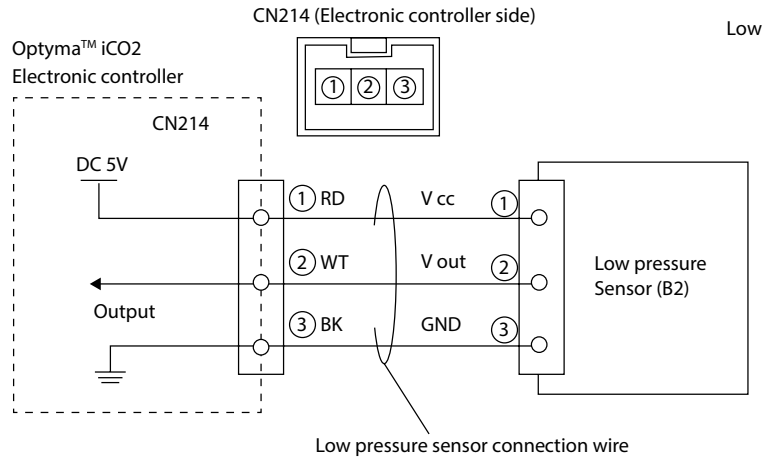
Terminals	Reference valve
Red – White	∞
Red – Black	∞
White – Black	1.25 kΩ
Blue – Black	∞
Yellow - Black	210 kΩ

1. Detection condition	Diagnosis flow	Cause (action taken)
Rotor pulse signals is detected continuously less than or equal 100 rpm for 60 seconds	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector by visual check 2. To check if there is any foreign matter getting caught in the fan blade 3. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing Fan motor is ON		
3. Estimated causes Fans do not turn due to vegetation, freezing, snow, etc. 1. Fan motor 2. Optyma™ iCO_2 Electronic controller 3. Connector connection failure. wire snapping, etc.		Fan motor failure (Replace fan motor) * If after replace fan motor, this one does not work, It is suggested to replace also the Electronic controller.
4. Action when error occurred Optyma™ iCO_2 to suspend its operation when error continues after 10 –times of retrials. <Retrial control> Return back to normal operation after Optyma™ iCO_2 to be suspended for 3 min.		Fan motor failure (Replace fan motor) Repair complete (Watch the consequence)



© Danfoss | Climate Solutions | 2023.08

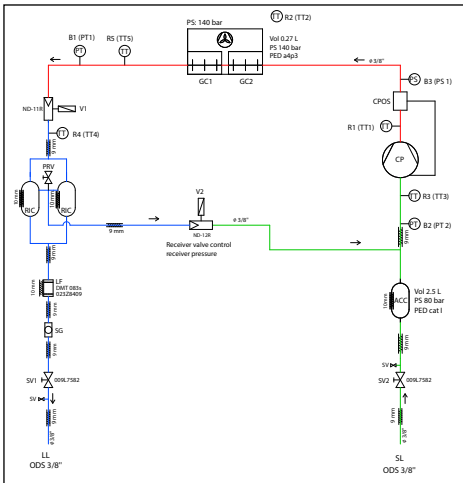
Error code E39 - Low pressure sensor (B2) error (suction)



Terminals	Reference valve
①Red - ③Black (V cc - Gnd)	97.8 kΩ
②Red - ③Black (V out - Gnd)	2.05 kΩ

1. Detection condition	Diagnosis flow	Cause (action taken)
1. Wire snapping (approx. 4.5 V to last for 10 s) 2. Short circuit (approx. 0.5 V to last for 10 s)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector by visual check 2. To check whether if there is pipes distortion, blockage/ filter blockage 3. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing Power supply ON	By turning on and off the power supply, cancel error codes and re-start Optyma™ iCO2 unit. Same Error code shows up again? YES / NO Turn off mains power (230V AC) to the system (before open maintenance door), then check followings after 5 min. •Corrosion of Optyma™ iCO2 Electronic controller Corrosion found? YES / NO	Replace failure parts
3. Estimated causes Product related factors : 1. wiring, connector connecting 2. Optyma™ iCO_2 Electronic controller 3. Low pressure sensor 4. Press. Sensor wiring 5. CO_2 cycle 6. Ref. gas leakage 7. Service valve	Disconnect connectors from Optyma™ iCO2 Electronic controller and pressure sensor, and check if there is a wire snapping or/and a short circuit. Wire snapping or short circuit found? YES / NO Measure inter-terminal (①-③, ②-③) resistances for the pressure sensor Wire snapping or short circuit to a part of terminals? YES / NO Replace Optyma™ iCO2 Electronic controller,then reset error codes. Restart Optyma™ iCO2 unit. Operates normally ? YES / NO	Pressure sensor connecting wire (replace connecting wire) Pressure sensor failure (Replace pressure sensor) Optyma™ iCO_2 Electronic controller failure (Repair complete) Refrigerant leak, blockage (Identify leak portion, and replace parts)
4. Action when error occurred Optyma™ iCO_2 to suspend its operation.	If the problem cannot be solved by checking only Optyma™ iCO_2, there is a possibility of leakage or blockage in the Evaporator or the piping between a Evaporator and Optyma™ iCO_2, so please check that as well.	Watch the consequence

Error code A96 - Discharge temperature error (R1)



ACC - Suction accumulator vol 2.5L PS 80 bar PED cat 1
B1 - High pressure sensor
B2 - Low pressure sensor
B3 - High pressure switch
CP - Inverter driven Scroll compressor with oil separator, Compressor suction vol 1.2L PS 80 PED cat 1
CPOS - Oil separator build on compressor
R1 - Discharge temperature sensor
R2 - Ambient temperature sensor
R3 - Suction temperature sensor
R4 - Receiver inlet temperature sensor
R5 - Gas cooler outlet temperature sensor
V1 - Expansion valve (main)
High pressure valve control gascooler pressure
V2 - Expansion valve (gas by-pass)
Receiver valve control receiver pressure

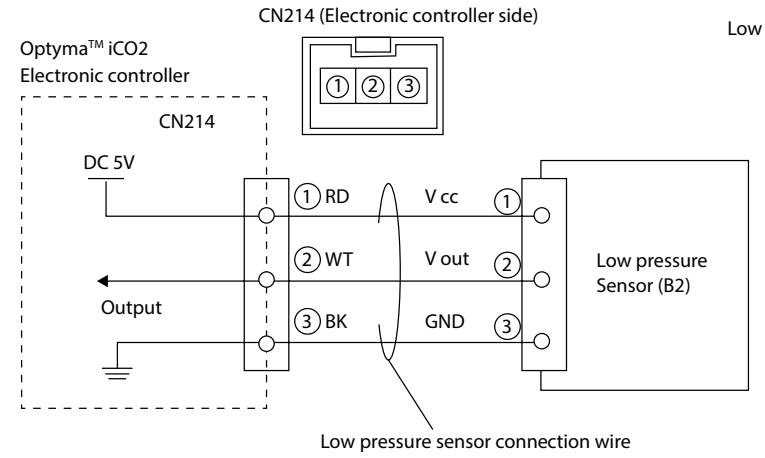
PRV - Pressure Relief valve
GC1 - MCHE Gas cooler 1
GC2 - MCHE Gas cooler 2
LF - Liquid filter dryer
LL - Liquid line
PRV - Pressure relief valve on receiver Pset = 80 bar
RIC - Receiver Vol 2.5 L PS 80 bar PED cat I
SG - Sight glass with moisture indicator
SL - Suction line
SV - Schrader valve
SV1 - GBCH Service ball valve 1 (liquid line)
SV2 - GBCH Service ball valve 2 (suction line)

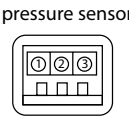
Red line - high pressure line
Blue line - Liquid line
Green line - Suction line
Black line - Oil line

1. Detection condition	Diagnosis flow	Cause (action taken)
Ref. Compressor outlet temp. : Tco to be 138 °C or higher for 5 s or more.	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector/service valves closed / gas cooler blockage (air side) by visual check 2. To check whether if there is pipes distortion, blockage/ filter blockage 3. To check Whether the oil was properly filled at the time of installation 4. If other error code to be shown, follow the diagnosis procedure for that error code. 5. If no any other errors aren't shown, follow process flow shown below:	
2. Detection timing When comp is ON	Turn off mains power (230V AC) to the system, and turn ON after 5 min. Confirm the noise of "clang-clang" (Zero-reset noise for stepper valve EXV) to come out from Optyma™ iCO2 unit.	
3. Estimated causes 1. Thermistor is not properly connected. 2. Gas-cooler (air flow failure) 3. Optyma™ iCO2 Electronic controller 4. Expansion valve 5. Bypass valve 6. CO2 cycle	"Clang-clang" noise (ex. EXV)? — NO	To Check and fix Expansion valve or Bypass valve
	YES By turning on and off the power supply, cancel the error code, Power OFF the Optyma™ iCO2 power line, then power ON again after 1 min. Check the operation condition in maintenance mode.	
	Only A96 is shown — No(other error code is shown)	Conduct diagnosis based on that error codes (ex. A17, A34)
	YES Suspend Optyma™ iCO2 operation, measure resistance value of the discharge thermistor parts (see diagnosis flow for error code E32).	
4. Action when error occurred Optyma™ iCO2 to suspend its operation if abnormal continues after 10 times of retrial **Note** Retrial control logic: Re-start operation after 3 min. of operation stop.	1.0 kΩ or lower ? — YES	Discharge thermistor failure (replace thermistor set)
	NO Check connection if there is a failure for gas cooler outlet / Discharge thermistor	
	connection failure of thermistors? — YES	Thermistor connection failure (Connect it properly)
	NO Able to operate Normally? — YES	Watch the consequence Especially check if super-heat is above 30 °C and Optyma™ iCO2 is stopped by pressure switch
	NO If the problem cannot be solved by checking only Optyma™ iCO2, there is a possibility of leakage or blockage in the Evaporator or the piping between a Evaporator and Optyma™ iCO2, so please check that as well.	CO2 cycle or Gascooler failure (blockage)

© Danfoss | Climate Solutions | 2023.08

Error code E39 - Low pressure sensor (B2) error (suction)

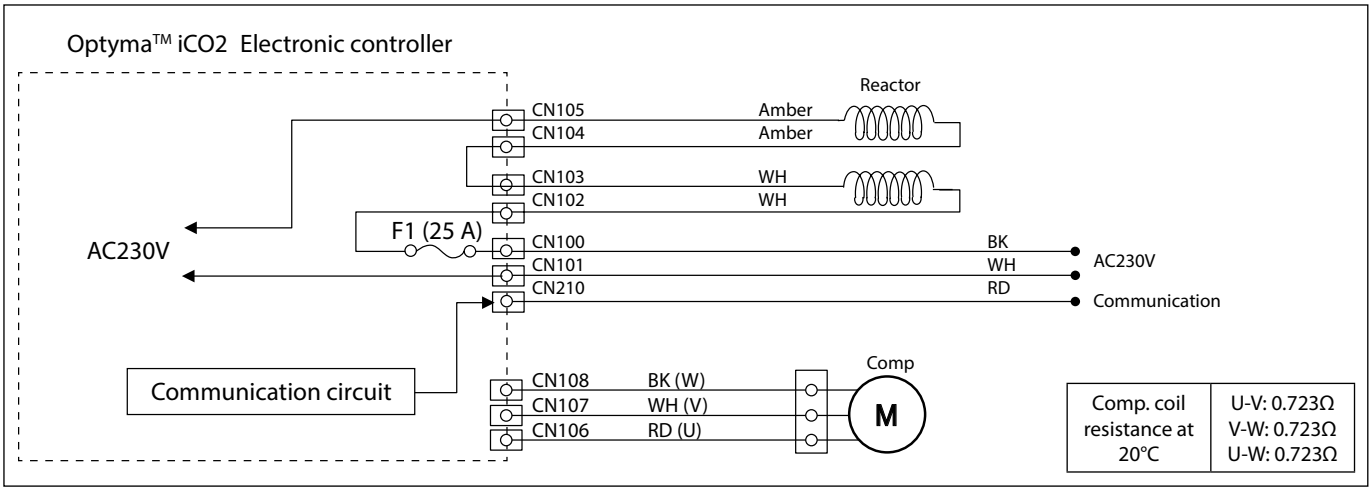




Terminals	Reference valve
①Red - ③Black (V cc - Gnd)	97.8 kΩ
②Red - ③Black (V out - Gnd)	2.05 kΩ

1. Detection condition	Diagnosis flow	Cause (action taken)
1. Wire snapping (approx. 4.5 V to last for 10 s) 2. Short circuit (approx. 0.5 V to last for 10 s)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector by visual check 2. To check whether if there is pipes distortion, blockage/ filter blockage 3. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing Power supply ON	By turning on and off the power supply, cancel error codes and re-start Optyma™ iCO2 unit. Same Error code shows up again? YES / NO Turn off mains power (230V AC) to the system (before open maintenance door), then check followings after 5 min. •Corrosion of Optyma™ iCO2 Electronic controller Corrosion found? YES / NO	Replace failure parts
3. Estimated causes Product related factors : 1. wiring, connector connecting 2. Optyma™ iCO2 Electronic controller 3. Low pressure sensor 4. Press. Sensor wiring 5. CO2 cycle 6. Ref. gas leakage 7. Service valve	Disconnect connectors from Optyma™ iCO2 Electronic controller and pressure sensor, and check if there is a wire snapping or/and a short circuit. Wire snapping or short circuit found? YES / NO	Pressure sensor connecting wire (replace connecting wire)
	Measure inter-terminal (①-③, ②-③) resistances for the pressure sensor Wire snapping or short circuit to a part of terminals? YES / NO	Pressure sensor failure (Replace pressure sensor)
4. Action when error occurred Optyma™ iCO2 to suspend its operation.	Replace Optyma™ iCO2 Electronic controller,then reset error codes. Restart Optyma™ iCO2 unit. Operates normally ? YES / NO	Optyma™ iCO_2 Electronic controller failure (Repair complete) Refrigerant leak, blockage (Identify leak portion, and replace parts) Watch the consequence
	If the problem cannot be solved by checking only Optyma™ iCO_2, there is a possibility of leakage or blockage in the Evaporator or the piping between a Evaporator and Optyma™ iCO_2, so please check that as well.	

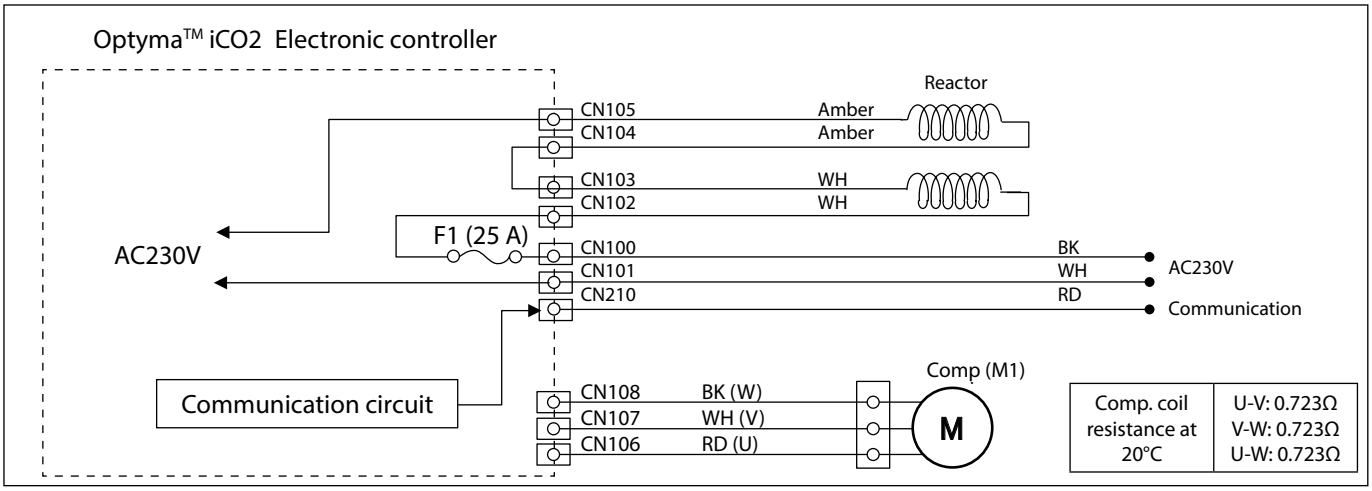
Error code H23 to H26 - Optyma™ iCO2 Electronic controller error



1. Detection condition	Diagnosis flow	Cause (action taken)
Optyma™ iCO2 Electronic controller to receive compressor control failure.	Conduct following checks before starting diagnosis: Whether there is/are Disconnection of connectors, pinch of connector wire at swaging part by visual check. **Note** This error code won't be shown due to refrigeration cycle abnormal. Turn off mains power (230V AC) to the system, and turn ON after 5 min. then check following: ・Corrosion of Optyma™ iCO2 Electronic controller Corrosion? YES → Replace failure parts NO Verify poor contact or/and wire snapping for the connectors for both Optyma™ iCO2 Electronic controller side and comp side. Abnormal? YES → Properly re-connect failure part, or replace parts NO → Optyma™ iCO2 Electronic controller failure (Replace Optyma™ iCO2 Electronic controller)	
2. Detection timing When comp is ON		
3. Estimated causes 1. Wiring, connector connection 2. Optyma™ iCO2 Electronic controller		
4. Action when error occurred Optyma™ iCO2 to suspend its operation when error continues after 10 –times of retrials. <Retrial control> Return back to normal operation after Optyma™ iCO2 to be suspended for 3 min.		

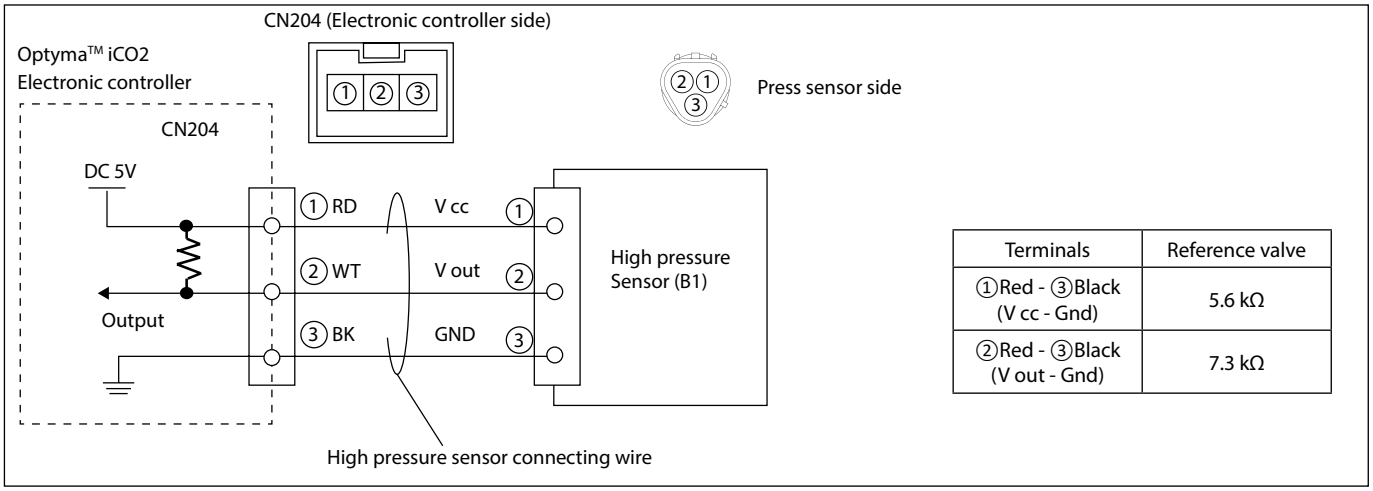
© Danfoss | Climate Solutions | 2023.08

Error code H28 and H29 - Optyma™ iCO2 Electronic controller error



1. Detection condition	Diagnosis flow	Cause (action taken)
Optyma™ iCO2 Electronic controller to receive compressor control abnormal (H28, H29)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector/service valves closed / gas cooler blockage (air side) by visual check 2. To check whether if there is pipes distortion, blockage/ filter blockage 3. To check Whether the oil was properly filled at the time of installation 4. If other error code to be shown, follow the diagnosis procedure for that error code. 5. If no any other errors aren't shown, follow process flow shown below:	
2. Detection timing	Turn off mains power (230V AC) to the system, and turn ON after 5 min. Confirm the noise of "clang-clang" (Zero-reset noise for stepper valve EXV) to come out from Optyma™ iCO2 unit.	
When Comp is ON (H28, H29)	"Clang-clang" noise (ex. EXV)? NO	To Check and fix Expansion valve or Bypass valve
	YES	
	Turn off mains power (230V AC) to the system, then confirm following points after 5 minutes ・Corrosion of Optyma™ iCO2 Electronic controller	
3. Estimated causes	Corrosion? YES	Replace abnormal parts
Product related factors : 1. Power fluctuates seriously (Fluctuates more than 5 V momentary)	NO	
	Verify poor contact or/and wire snapping for the connectors for both Optyma™ iCO2 Electronic controller side and comp side.	
Product related factors : 1. wiring, connector connection 2. Optyma™ iCO2 Electronic controller 3. Comp	Abnormal? YES	(Re-connect failure portion, or replace failure parts)
	NO	
	Confirm connection of gas cooler outlet thermistor, Compressor outlet Thermistor	
4. Action when error occurred	connection failure of thermistors? YES	Thermistor connection failure (Properly re-connect the parts)
Optyma™ iCO2 to suspend its operation when error continues after 10 –times of retrials. <Retrial control> Return back to normal operation after Optyma™ iCO2 to be suspended for 3 min.	NO	
	Replace Optyma™ iCO2 Electronic controller, then re-start Optyma™ iCO2	
	Able to operate Normally? YES	Optyma™ iCO2 Electronic controller failure (Repair complete)
	NO	Comp or CO2 cycle failure (Replace Optyma™ iCO2 unit)
	If the problem cannot be solved by checking only Optyma™ iCO2, there is a possibility of leakage or blockage in the Evaporator or the piping between a Evaporator and Optyma™ iCO2, so please check that as well.	

Error code E42 - Discharge pressure sensor (B1) error

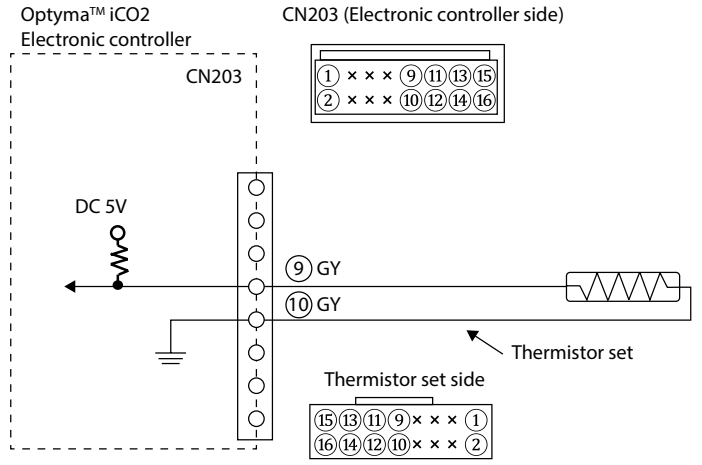


Terminals	Reference valve
①Red - ③Black (V cc - Gnd)	5.6 kΩ
②Red - ③Black (V out - Gnd)	7.3 kΩ

1. Detection condition	Diagnosis flow	Cause (action taken)
1. Wire snapping (approx. 5 V to last for 10 s) 2. Short circuit (approx. 0.5 V to last for 10 s)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector/service valves closed / gas cooler blockage (air side) by visual check 2. To check whether if there is pipes distortion, blockage/ filter blockage 3. To check Whether the oil was properly filled at the time of installation 4. If other error code to be shown, follow the diagnosis procedure for that error code. 5. If no any other errors aren't shown, follow process flow shown below:	
2. Detection timing Power supply ON	Referring to a log data, Pressure sensor failure to be established if E41and A17 are to be shown at the same time. Cancel error codes and re-start Optyma™ iCO2 unit. For reset **all the alarms, switch off CDU unit, wait five minutes and switch on the unit.** Same Error code shows up again? YES / NO Turn off mains power (230V AC) to the system (before open maintenance door), then check followings after 5 min. ・Corrosion of Optyma™ iCO2 Electronic controller	
3. Estimated causes Product related factors: 1. wiring, connector connecting 2. Optyma™ iCO2 Electronic controller 3. High pressure sensor 4. Press. Sensor wiring 5. Refrigeration cycle 6. Ref. gas leakage 7. Gas cooler	Corrosion found? YES / NO	Replace failure parts
	Disconnect connectors from Optyma™ iCO2 Electronic controller and pressure sensor, and check if there is a wire snapping or/and a short circuit. Wire snapping or short circuit found? YES / NO	Pressure sensor connecting wire (replace connecting wire)
	Measure inter-terminal (①-③, ②-③) resistances for the pressure sensor Wire snapping or short circuit to a part of terminals? YES / NO	Pressure sensor failure (Replace pressure sensor)
4. Action when error occurred Optyma™ iCO2 to suspend its operation	Replace Optyma™ iCO2 Electronic controller,then reset error codes. Restart Optyma™ iCO2 unit. Operates normally ? YES / NO	Optyma™ iCO2 Electronic controller failure (Repair complete) Refrigerant leak, blockage (Identify leak portion, and replace parts)
		Watch the consequence
	If the problem cannot be solved by checking only Optyma™ iCO2, there is a possibility of leakage or blockage in the Evaporator or the piping between a Evaporator and Optyma™ iCO2, so please check that as well.	

© Danfoss | Climate Solutions | 2023.08

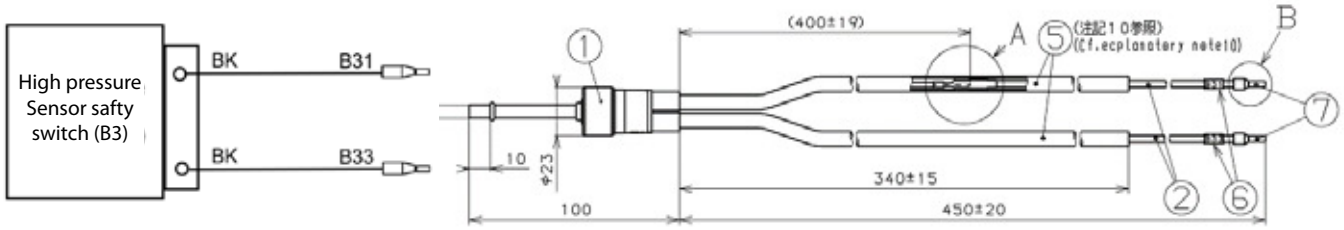
Error code A85 - Medium temperature/pressure alarm



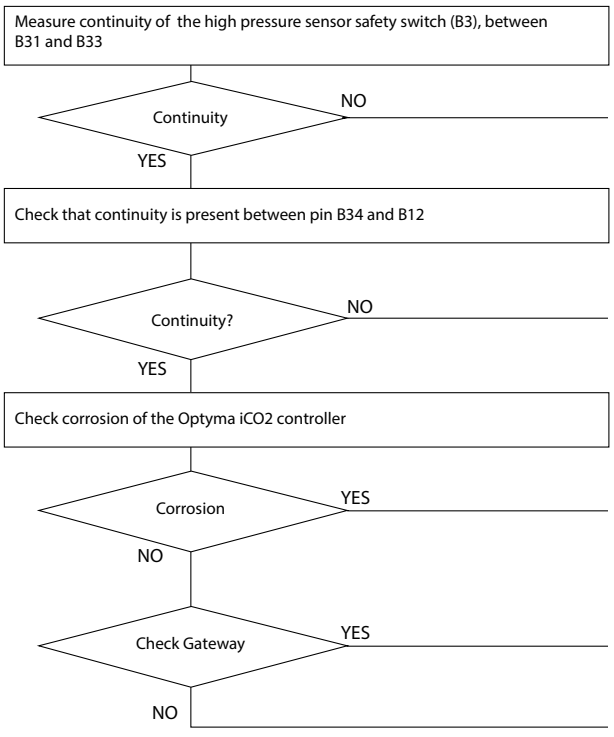
Ambient temperature	Reference value
-20 °C	535 kΩ
-10 °C	310 kΩ
0 °C	185 kΩ
10 °C	113 kΩ
20 °C	71 kΩ
30 °C	46 kΩ
40 °C	30 kΩ
50 °C	20 kΩ

1. Detection condition	Diagnosis flow	Cause (action taken)
Receiver thermistor value is 33 °C or higher for 5 s or more.	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector/service valves closed / gas cooler blockage (air side) by visual check 2. To check whether if there is pipes distortion, blockage/ filter blockage 3. To check whether if there is anything around the Optyma™ iCO2 that raises the intake air temperature of the Optyma™ iCO2 (heating element, wall surrounding the Optyma™ iCO2, etc.) 4. If other error code to be shown, follow the diagnosis procedure for that error code. 5. If no any other errors aren't shown, follow process flow shown below:	
2. Detection timing When Comp is ON	Turn off mains power (230V AC) to the system, and turn ON after 5 min. Confirm the noise of "clang-clang"(Zero-reset noise for stepper valve) to come out from Optyma™ iCO2 unit.	
	"Clang-clang" noise (ex. EXV)? NO	To Check and fix Expansion valve or Bypass valve
	YES	
	Cancel the error code, Power OFF the Optyma™ iCO2 power line, then power ON again after 1 min. Check the operation condition in maintenance mode.	
3. Estimated causes Product related factors: 1. wiring, connector connecting 2. Optyma™ iCO2 Electronic controller 3. Refrigeration cycle 4. Expansion valve 5. Bypass valve 6. Fan	Only Sr3 is shown? No (other error code is shown)	Conduct diagnosis based on that error codes (ex. A17, E31, A96 or Sr3, A34 or Sr2)
	YES	
	Suspend Optyma™ iCO2 operation, measure resistance value of the receiver thermistor parts(see diagnosis flow for E32).	
	Abnormal? YES	Receiver Thermistor failure (Replace thermistor set)
	NO	
	Check connection if there is a failure for: Receiver thermistor	
4. Action when error occurred Optyma™ iCO2 to suspend its operation when error continues after 10 –times of retrials. <Retrial control> Return back to normal operation after Optyma™ iCO2 to be suspended for 3 min.	connection failure of thermistors? YES	Thermistor connection failure (Connect it properly)
	NO	
	Replace Optyma™ iCO2 Electronic controller, then re-start Optyma™ iCO2	
	Able to operate Normally? YES	Watch the consequence
	NO	
	If the problem cannot be solved by checking only Optyma™ iCO2, there is a possibility of leakage or blockage in the Evaporator or the piping between a Evaporator and Optyma™ iCO2, so please check that as well.	CO2 cycle or Gas cooler failure (Replace parts)

Error code A97 - High pressure sensor safety switch (B3) alarm

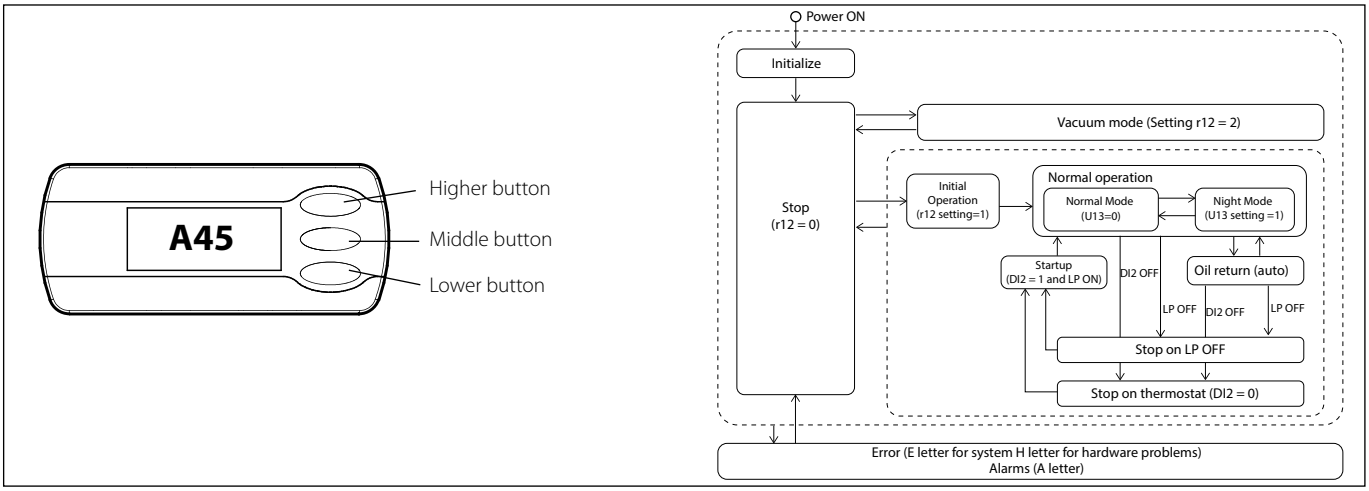


1. Detection condition	Diagnosis flow	Cause (action taken)
High pressure sensor safety switch (B3) alarm. CDU cannot run (fan and compressor switched off)	1. To check whether if there is disconnection/abnormal swaging / moisture ingression/wire jamming of the connector/service valves closed / gas cooler blockage (air side) by visual check 2. To check whether if there is pipes distortion, blockage/ filter blockage 3. Conduct diagnosis per following flow chart only when there is no abnormal found by visual check.	
2. Detection timing		
Start signal from GW and cooling cap demand are present but CDU is not running		
3. Estimated causes		
1. Pressure in the circuit higher than 140 bar 2. Pressure switch broken 3. Protection circuit broken 4. Optyma™ iCO2 Electronic controller		
4. Action when error occurred		
Optyma™ iCO2 to suspend its operation if abnormal continues after 10 times of retrial **Note** Retrial control logic: Re-start operation after 3 min. of operation stop.	If the problem cannot be solved by checking only Optyma™ iCO2, there is a possibility of leakage or blockage in the Evaporator or the piping between a Evaporator and Optyma™ iCO2, so please check that as well.	



© Danfoss | Climate Solutions | 2023.08

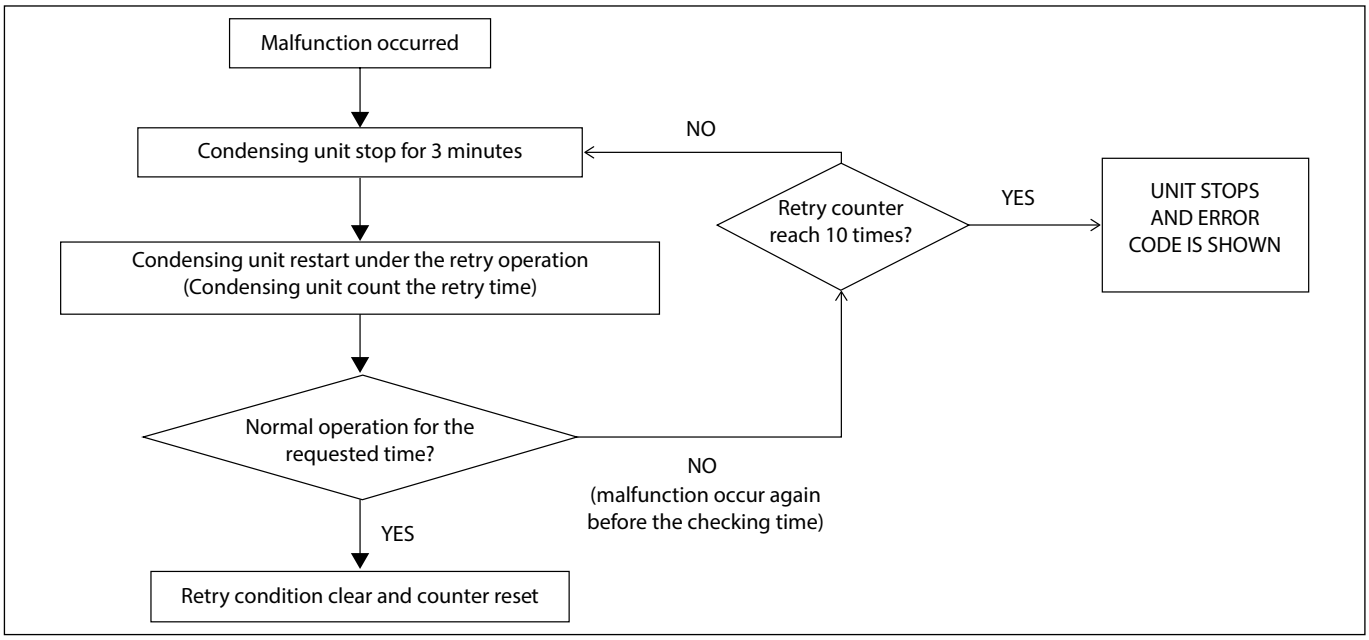
Error code A45 - Main Switch OFF



1. Detection condition	Diagnosis flow	Cause (action taken)
Display show alarm A45	1. Controller main switch off mean that the internal controller is on Stop Mode meaning R12 parameter =0 Go to Menu on the MMILDS Display (pushing higher buttom for 5 second) Navigate to R12 paremeter Push midle button to Select R12 parameter Change the setting to 1 for operation or to start cooling Compressor start NO YES	
2. Detection timing		
Start from powering the unit or after maintenance or Charging procedure		Check Error or Alarm code on the MMILDS display
3. Estimated causes		
1. Initialization 2. Vacuum mode 3. From wrong parameter/mode setting		
4. Action when error occurred		
Wrong setting of the parameter		

Error code: 10 – times of retrials

Retry operation



© Danfoss | Climate Solutions | 2023.08

Updates

Release date (Year/Month)	Guideline codification number	List of changes	Reason for change
2022/06	AB399636244436en-000101	First release	-
2023/01	AB399636244436en-000203	Pump down standard operation mode, +46 operation	Gateway (1.10) and Software (V2) update

ENGINEERING
TOMORROW

Danfoss Cooling

is a worldwide manufacturer of compressors and condensing units for refrigeration and HVAC applications. With a wide range of high quality and innovative products we help your company to find the best possible energy efficient solution that respects the environment and reduces total life cycle costs.

We have 40 years of experience within the development of hermetic compressors which has brought us amongst the global leaders in our business, and positioned us as distinct variable speed technology specialists. Today we operate from engineering and manufacturing facilities spanning across three continents.

Danfoss Turbocor Compressors

Danfoss Inverter Scrolls

Danfoss Scrolls

Danfoss Optyma™ Condensing Units

Danfoss Maneurop Reciprocating Compressors

Danfoss Light Commercial Refrigeration Compressors

Our products can be found in a variety of applications such as rooftops, chillers, residential air conditioners, heatpumps, coldrooms, supermarkets, milk tank cooling and industrial cooling processes.

member of:
ASERCOM
www.asercom.org

Danfoss A/S
Climate Solutions • danfoss.com • +45 7488 2222

Any information, including, but not limited to information on selection of product, its application or use, product design, weight, dimensions, capacity or any other technical data in product manuals, catalogues descriptions, advertisements, etc. and whether made available in writing, orally, electronically, online or via download, shall be considered informative, and is only binding if and to the extent, explicit reference is made in a quotation or order confirmation. Danfoss cannot accept any responsibility for possible errors in catalogues, brochures, videos and other material.
Danfoss reserves the right to alter its products without notice. This also applies to products ordered but not delivered provided that such alterations can be made without changes to form, fit or function of the product.
All trademarks in this material are property of Danfoss A/S or Danfoss group companies. Danfoss and the Danfoss logo are trademarks of Danfoss A/S. All rights reserved.

AB399636244436en-000203

© Danfoss | Climate Solutions | 2023.08