Lodam
BY BITZER GROUP

Lodam Condensing Unit Controller

User manual

Version 3.0

LMC340i

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1. Read this first

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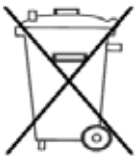


Disposing of the parts of the controller:

INFORMATION FOR USERS ON THE CORRECT HANDLING OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

In reference to European Union directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

1. WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
2. The public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to the distributor at the end of its working life when buying new equipment;
3. The equipment may contain hazardous substances: the improper use or incorrect disposal of such may have negative effects on human health and on the environment;
4. The symbol (crossed-out wheeled bin) shown on the product or on the packaging and on the instruction sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
5. In the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

1.1. Installation

Before installation the user should be thoroughly familiarized with this user manual, especially with purposes, installation, settings and operation.

Special care should be taken when installing and connecting external equipment (sensor, high voltage etc) and handling the PCB's correctly according to protection against ESD.

Installation of the LMC340i must be performed by authorized personnel only. All warranties are excluded in case installation is performed by unauthorized personnel or in case theLMC340i has not been correctly installed.

Electrical plant failures are to be immediately solved, even though no immediate danger exists; the LMC340i must not be operating.

1.2. Safety

The LMC340i is not a safety component and cannot be used in "medical" or "life support" equipment.

The LMC340i is not a safety component according to the Machinery Directive.

Before plant commissioning the service technician shall ensure that personal safety requirements are met in conformity with the Machinery Directive on the basis of safety estimations.

2. General

Lodam's Condensing Unit Controller, LMC340i enable you to gain total control of your condensing unit to deliver cooling to one or more evaporators – thereby optimizing your system to save energy, time and money.

The Lodam Condensing Unit Controller is designed for most condensing units, with a frequency inverter driven compressor or with an On/Off driven compressor.

Some benefits from the LMC340i Condensing unit controller:

- Single compressor controlled by frequency inverter, equipped with unloader, or in On/Off operation
- Dual compressor equipped with unloaders in On/Off operation
- Energy and cost saving through intelligent capacity control
- Eco or low sound fan mode
- Compressor protection
- 1 year data log
- Full graphical colour display
- Remote monitoring through a web interface
- Weekly program with real time clock
- Easy installation
- Higher max. capacity of compressors
- Refrigerant configurable
- Heat recovery
- Liquid compressor operation detection
- Web server
- Modbus interface to external master controller
- Supports many languages

This user manual applies to software version 2.1.6.x or later of LMC340i.

3. Definitions

BMS	Building Management System
ESD	Electro Static Discharge
FI	Frequency inverter
HW	Hardware/electronics
I/O	Input/output (electrical signals)
Limiter	Short form for a limiting function which monitors the operating conditions
LMT	Lodam Multi Tool (PC communication tool for Lodam controllers)
NC	Normally closed (relay)
NO	Normally open (relay)
Pdis	Discharge pressure
Psuc	Suction pressure
PWM	Pulse Width Modulated. Achieve an average value over time
RS485	Serial communication interface
SW	Software
Tamb	Ambient temperature
Tc	Saturated condensing temperature calculated from the discharge pressure
T0	Saturated suction temperature calculated from the suction pressure
Tdis	Discharge pipe temperature
Tsuc	Suction pipe temperature

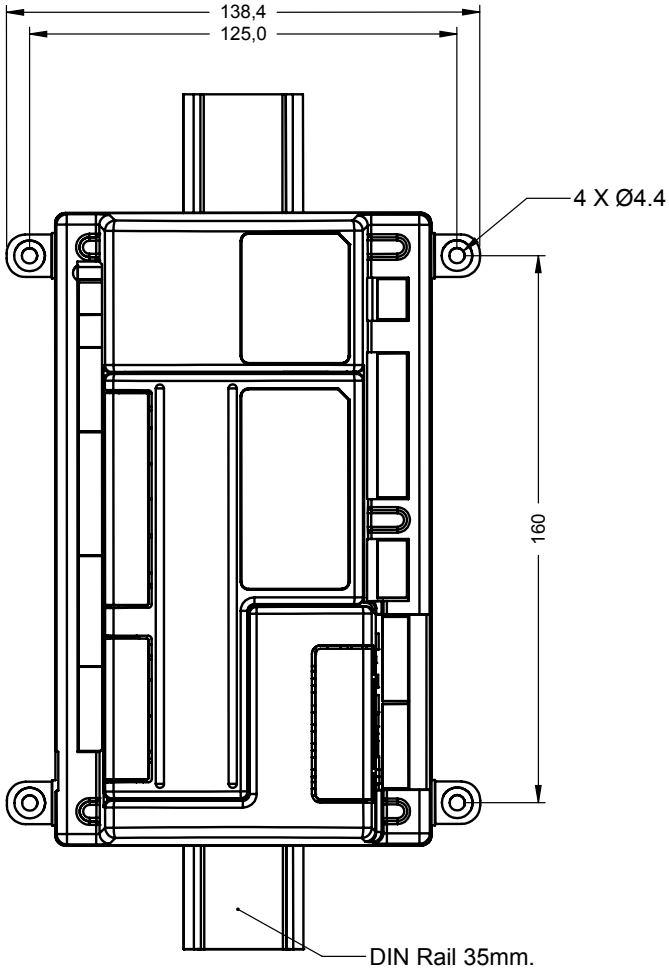
A Condensing unit kit from Lodam includes:

- 1 Lodam condensing unit controller (LMC340i) with Option board for extra I/O (LOM301) and Lodam Ethernet Module (LOM320)
- 1 Lodam full graphical colour display with keyboard (LUP200i)
- 1 Connector kit for LMC340i
- 3 NTC temperatures sensors
- 1 High temperature NTC temperatures sensorr
- 2 Pressure sensors with cables
- 1 Access license to Lodam Multi Tool

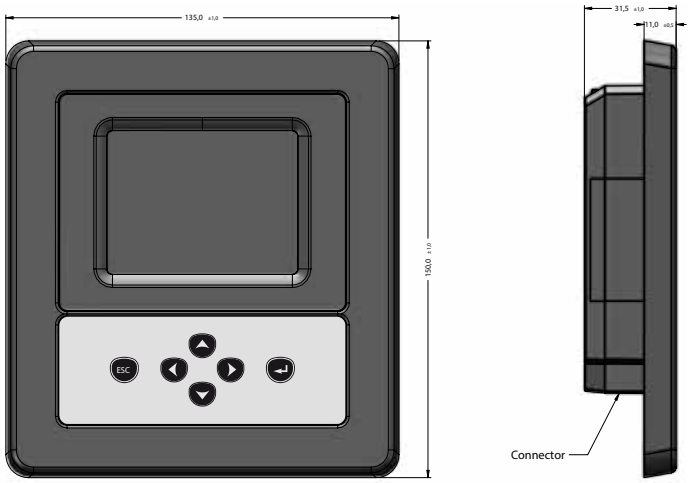
4. Mounting of LMC300 controller and LUP200

4.1. LMC300

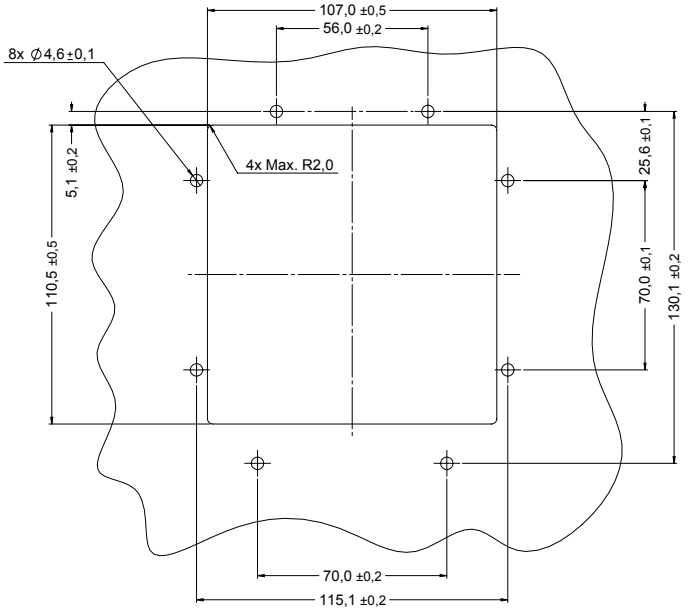
Mounting dimensions. All dimensions are in mm.



4.2. LUP200



4.3. Panel cut out for the LUP200



5. Technical data

Technical specifications, LMC340i Condensing Unit controller	
Size	185mm (l) * 110mm (w) * 61mm (h)
Power supply	15 - 30VDC/12 - 24VAC 50-60 HZ; typical 4 VA, max. 15 VA
CPU	LMC340i ARM7 processor; Ethernet connection ARM9
Operating temperature	-20°C ~ +60°C
Storage temperature	-30°C ~ +60°C
Enclosure protection	IP20, pollution degree 2
Relative humidity	5% - 95%RH, non-condensing
Temperature inputs	3 for Lodam NTC sensors -40°C to +130°C, +/- 1°C accuracy; 1 is used for 0-10V input. Remaining temperature inputs are not used.
Analogue inputs	2, AI1 and AI2; 0-5V with 5 Volt supply for radiometric pressure transmitters; Rin: 25KΩ Use Sensata 2CP-49 for Psuc and Sensata 2CP-49 for Pdis or equivalent
Digital inputs	2; not galvanic isolated; 0 - 5V with pull-up resistor
High voltage digital input	6; 180-265VAC digital input. Double isolation to low power side
Analogue outputs	4, AnOut0 to AnOut3; 0-10V, +/- 3%, Rin > 10kOhm; max frequency 1Hz; not galvanically isolated
Relay outputs	9; RE1 to RE5: 10A 24VDC / 10A 250VAC; max 250VAC isolation between relays. RE5 is a toggle relay; max isolation 400VAC between relays. RE6 to RE9: 10A 24VDC / 10A 250VAC resistive, max 3A inductive load; double isolation to low power side; max. 250VAC isolation between relays
RS485 ports	2 with common 12V 100mA output; 1 used for display and 1 used for FI 1 with optional 120 Ω termination resistor; used for Modbus
USB ports	1 device mode mini B for software update and communication with a PC 2 USB host A connector for software update and future use
Datalog	Up to 1 year capacity
Real time clock	With 1 year battery back up
12VDC output	Up to 500 mA
Ethernet connection	1; 10/100 Mbit

Note: The maximum cable length for a NTC temperature sensor is 30m. The cable used for extension should be screened and twisted-pair. Signal cable should be routed so the influence from the power cables is minimized.

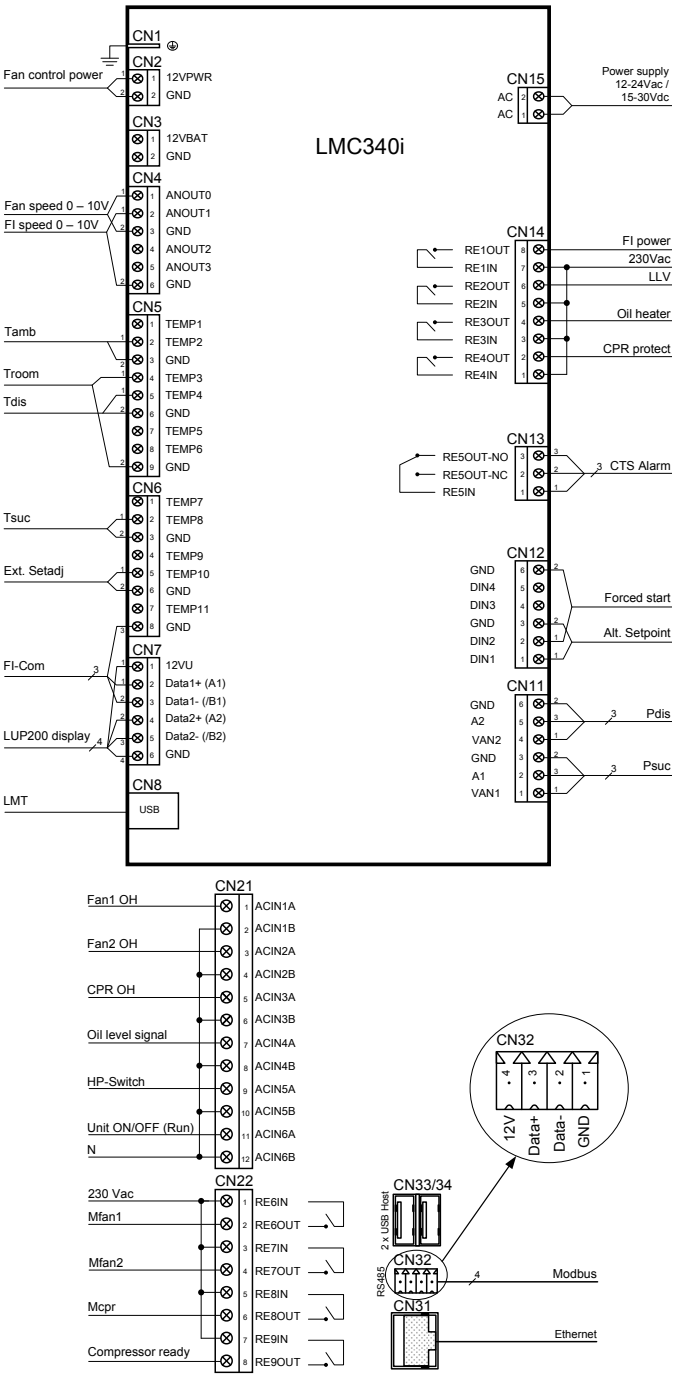
Technical specification, LUP200i	
Display	262k colours, graphical display 320x240 pixels
Cabinet dimensions	135 mm (h) * 150mm (w) * 25mm (d)
Power supply	12 VDC
CPU	ARM7 processor
Operating temperature	-20°C ~ + 60°C
Storage temperature	-30°C ~ + 60°C
Enclosure protection	Front: IP 66 when mounted accordingly in cabinet1 Other: IP 00
Relative humidity	5% - 95%RH, non condensing
RS485 ports	1 port
USB port	1 mini B connector (device mode only); for future use
Display backlight lifetime	30,000 hours at 20°C and “normal” brightness
Display heater	24 VAC, max. 150 mA; thermo controlled
Number of buttons	6 buttons
Languages	English, German, French, Finnish, Spanish, Russian and Turkish
Cabinet mounting	8 pcs. 4 mm screws Max screw-in depth 6 mm Max tightening torque 3 Nm

Note1: Front is IP65 if the LUP200 is mounted with the supplied gasket in a metal sheet cabinet of at least 1,5mm thickness and level accuracy better than 0.1 mm over the entire mounting area.

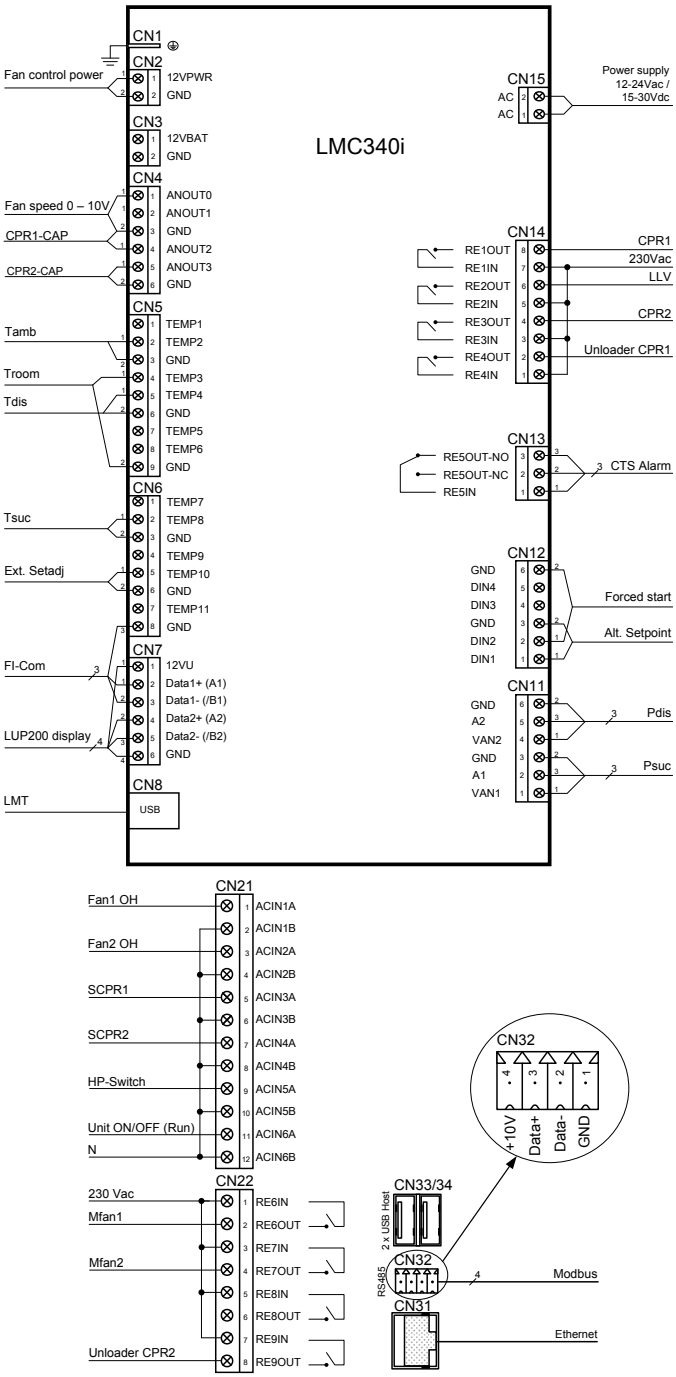
Note2: Maximum cable length between the LMC320 and the LUP200 is 100m.

6. Connections on the LMC340i kit

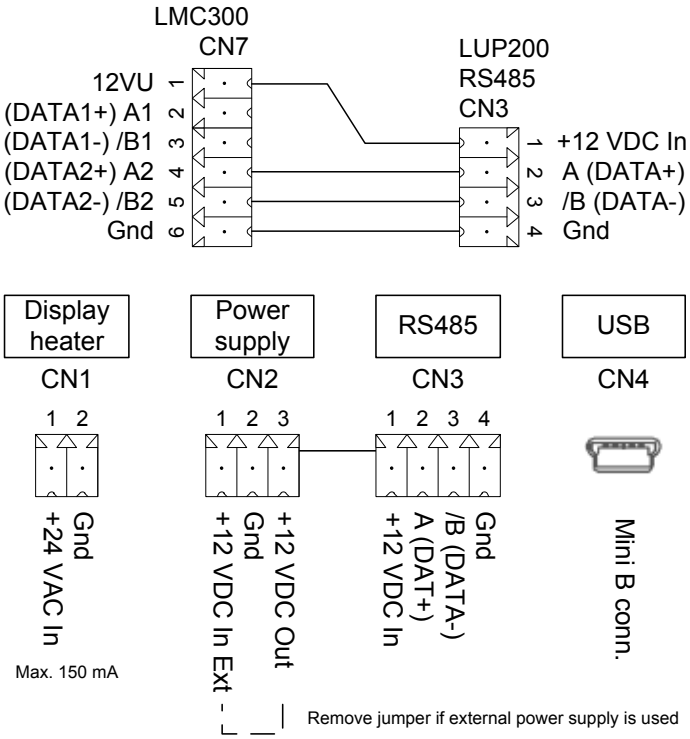
6.1. Single compressor configuration



6.2. Dual compressor configuration

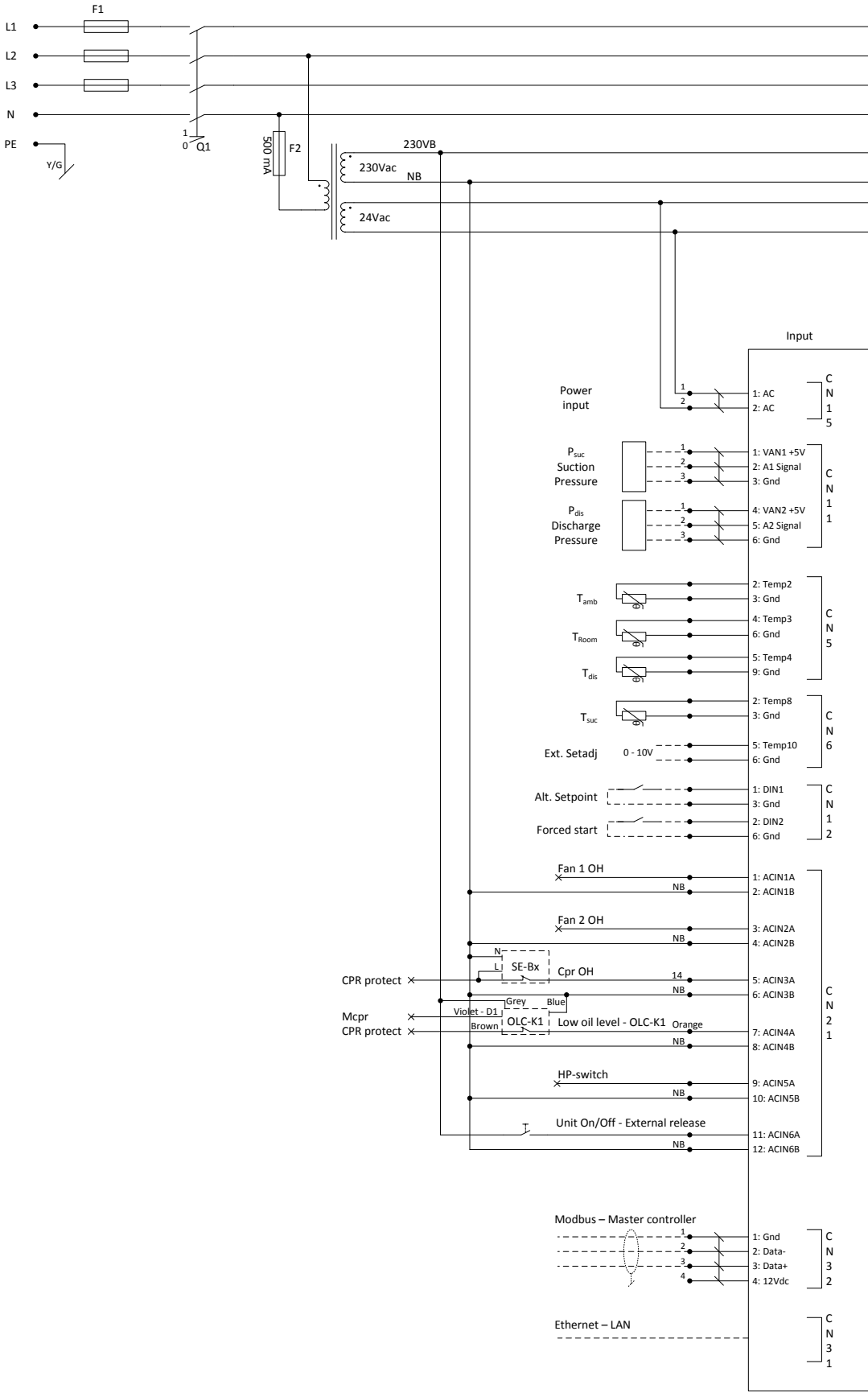


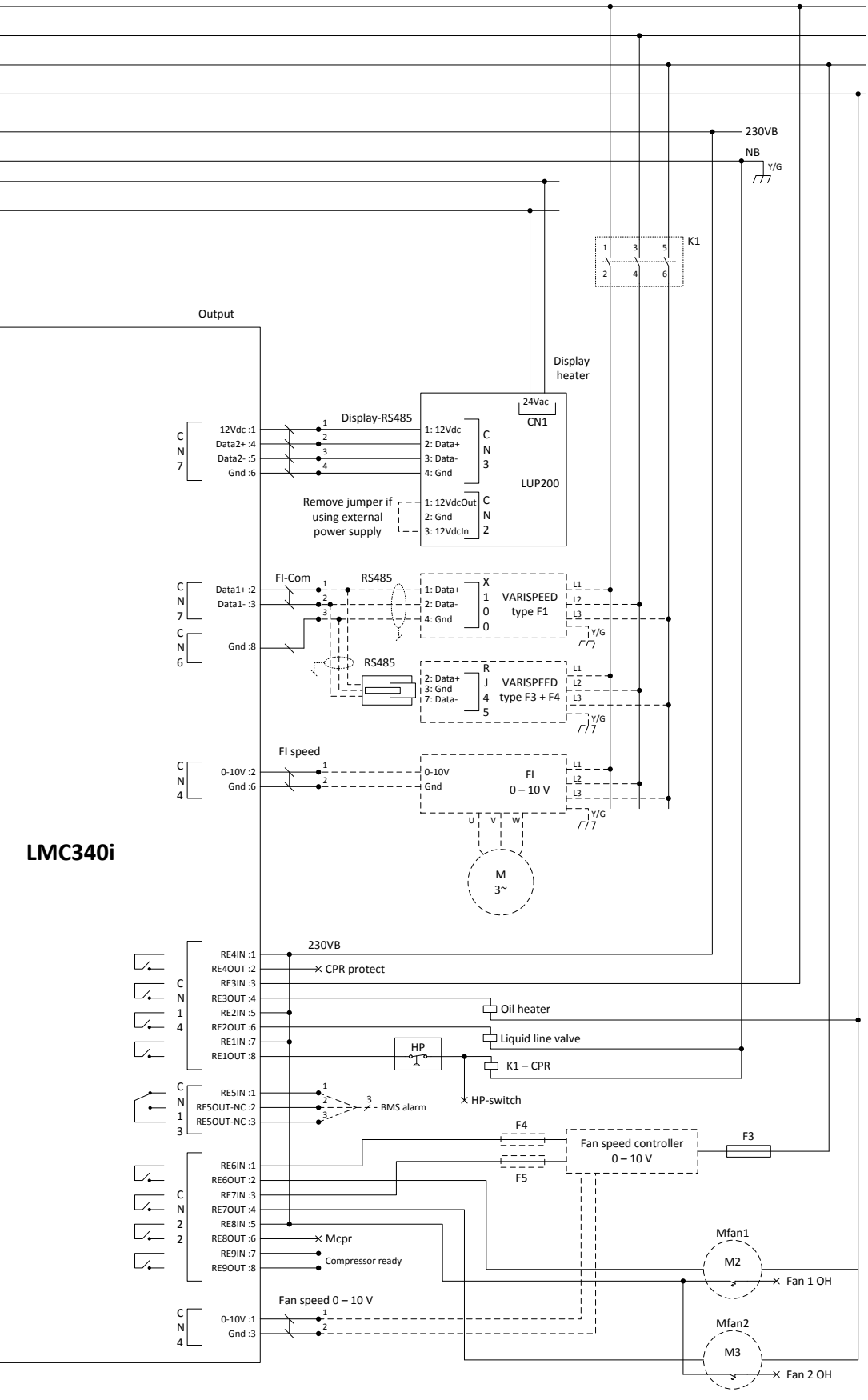
6.3. LUP200 connections



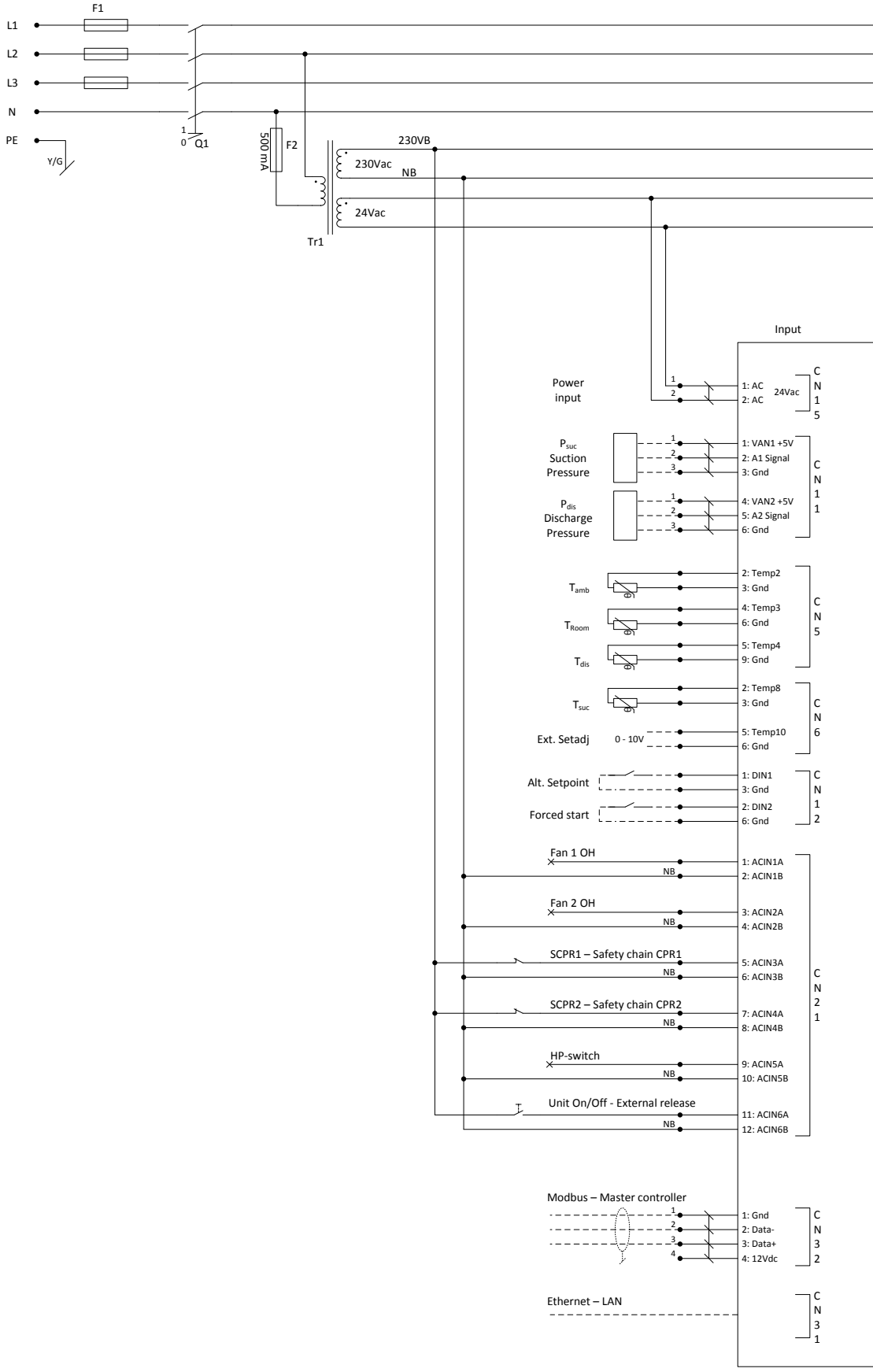
Note: The display heater must be connected to a 24VAC power supply capable of supplying up to 150 mA.

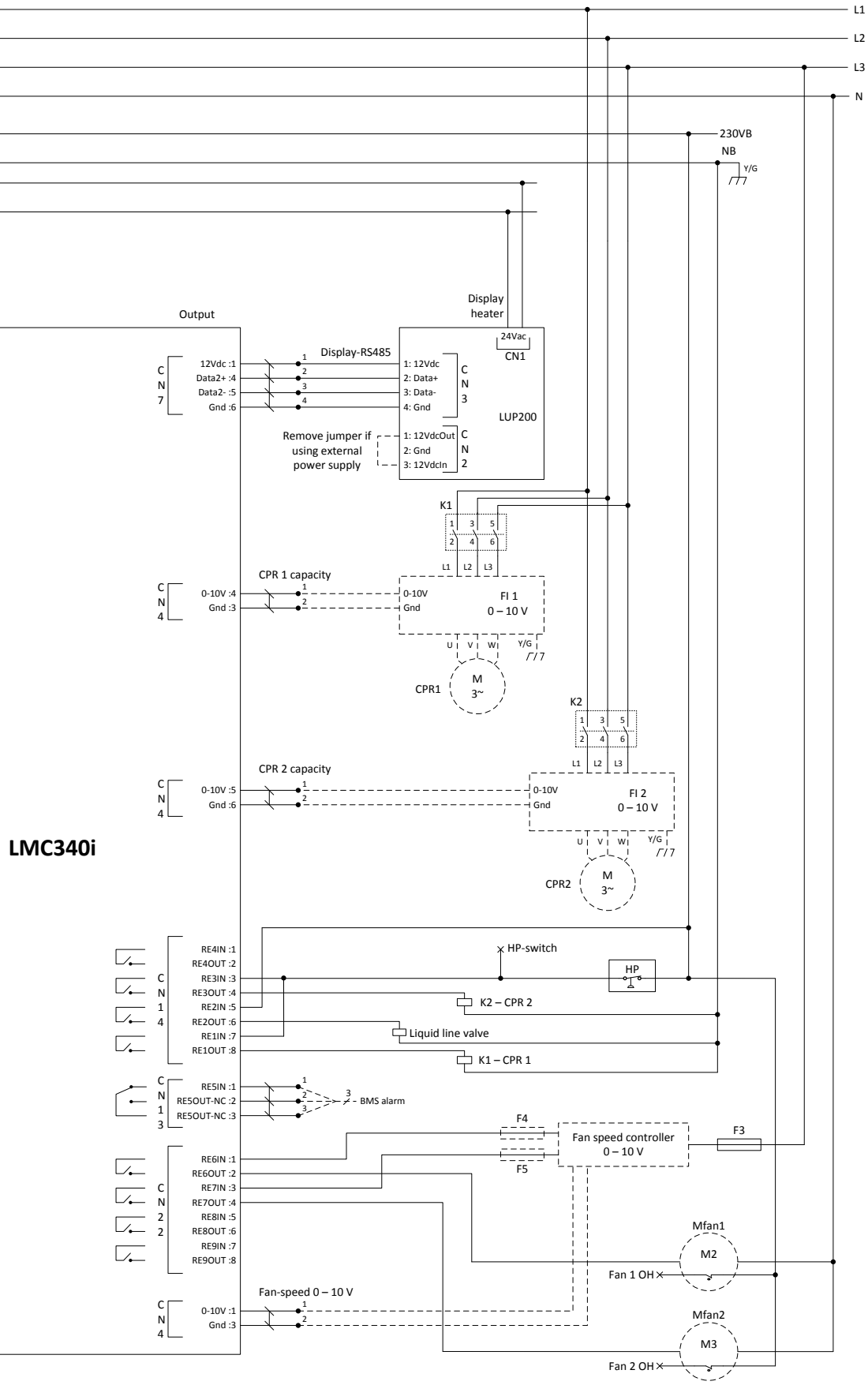
6.4. Wirediagram – single compressor use



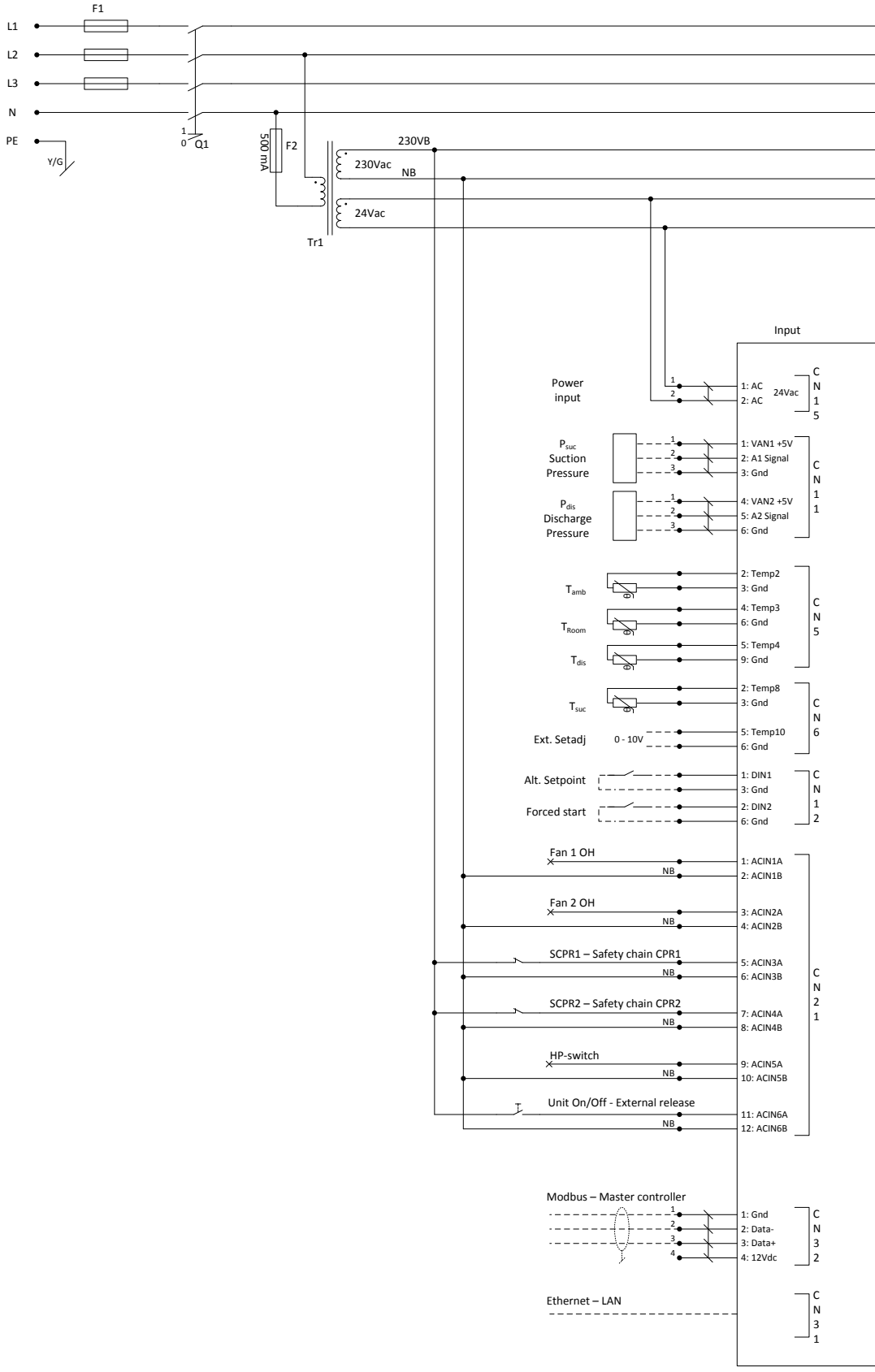

230VB
NB
Y/G
K1
Output
Display heater
24Vac
CN1
LUP200
Display-RS485
12Vdc :1
Data2+ :4
Data2- :5
Gnd :6
1: 12Vdc
2: Data+
3: Data-
4: Gnd
Remove jumper if using external power supply
1: 12VdcOut
2: Gnd
3: 12VdcIn
FI-Com
RS485
Data1+ :2
Data1- :3
Gnd :8
VARISPEED type F1
VARISPEED type F3 + F4
2: Data+
3: Gnd
7: Data-
FI speed
0-10V :2
Gnd :6
0-10V
Gnd
FI
0 – 10 V
L1
L2
L3
U
V
W
M
3~
LMC340i
230VB
RE4IN :1
RE4OUT :2
RE3IN :3
RE3OUT :4
RE2IN :5
RE2OUT :6
RE1IN :7
RE1OUT :8
CPR protect
Oil heater
Liquid line valve
HP
K1 – CPR
HP-switch
RE5IN :1
RE5OUT-NC :2
RE5OUT-NC :3
BMS alarm
F4
F5
Fan speed controller 0 – 10 V
F3
RE6IN :1
RE6OUT :2
RE7IN :3
RE7OUT :4
RE8IN :5
RE8OUT :6
RE9IN :7
RE9OUT :8
Mcpr
Compressor ready
Mfan1
M2
Fan 1 OH
Fan speed 0 – 10 V
0-10V :1
Gnd :3
Mfan2
M3
Fan 2 OH

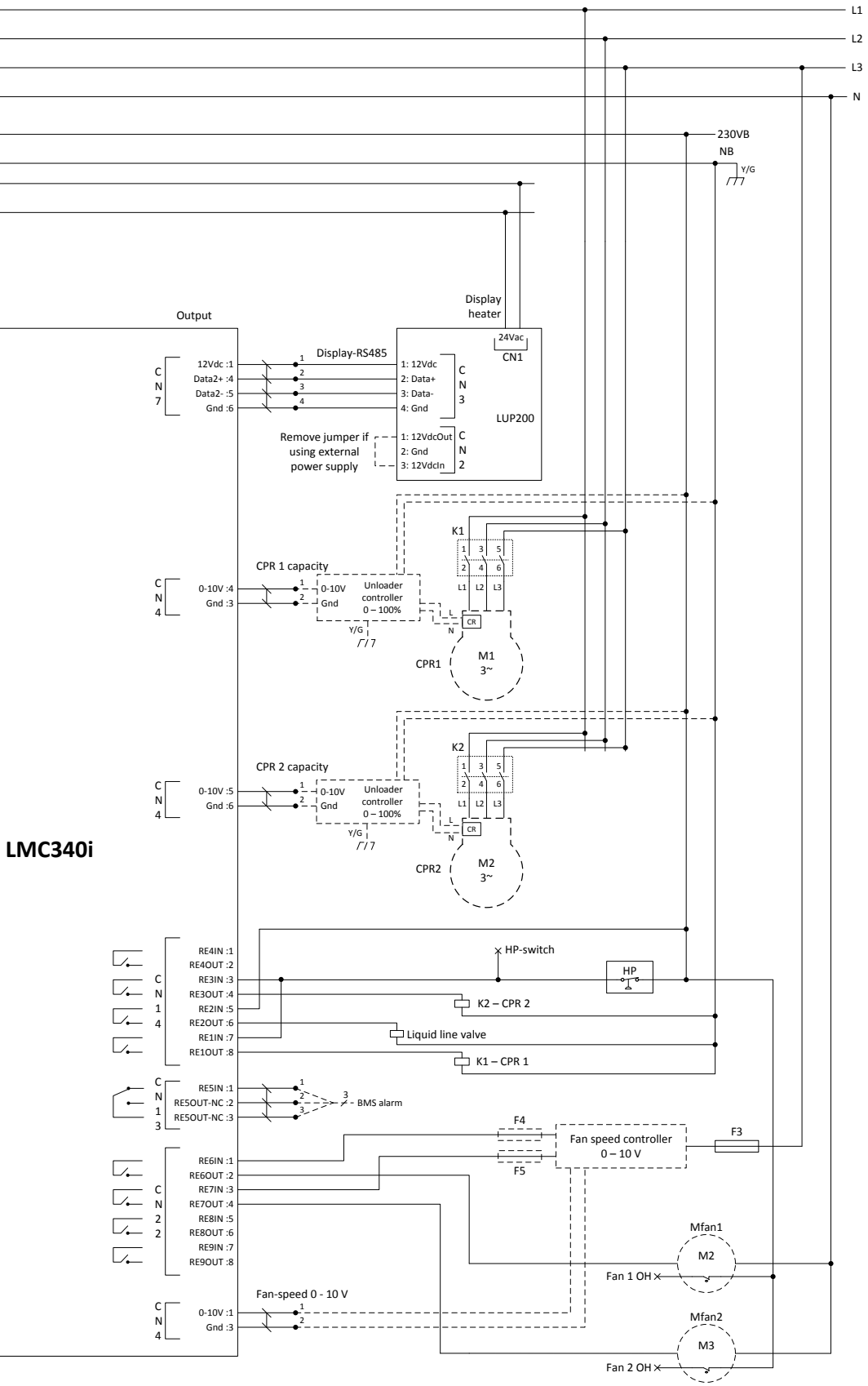
6.5. Wirediagram – dual compressors with FI or step less CR



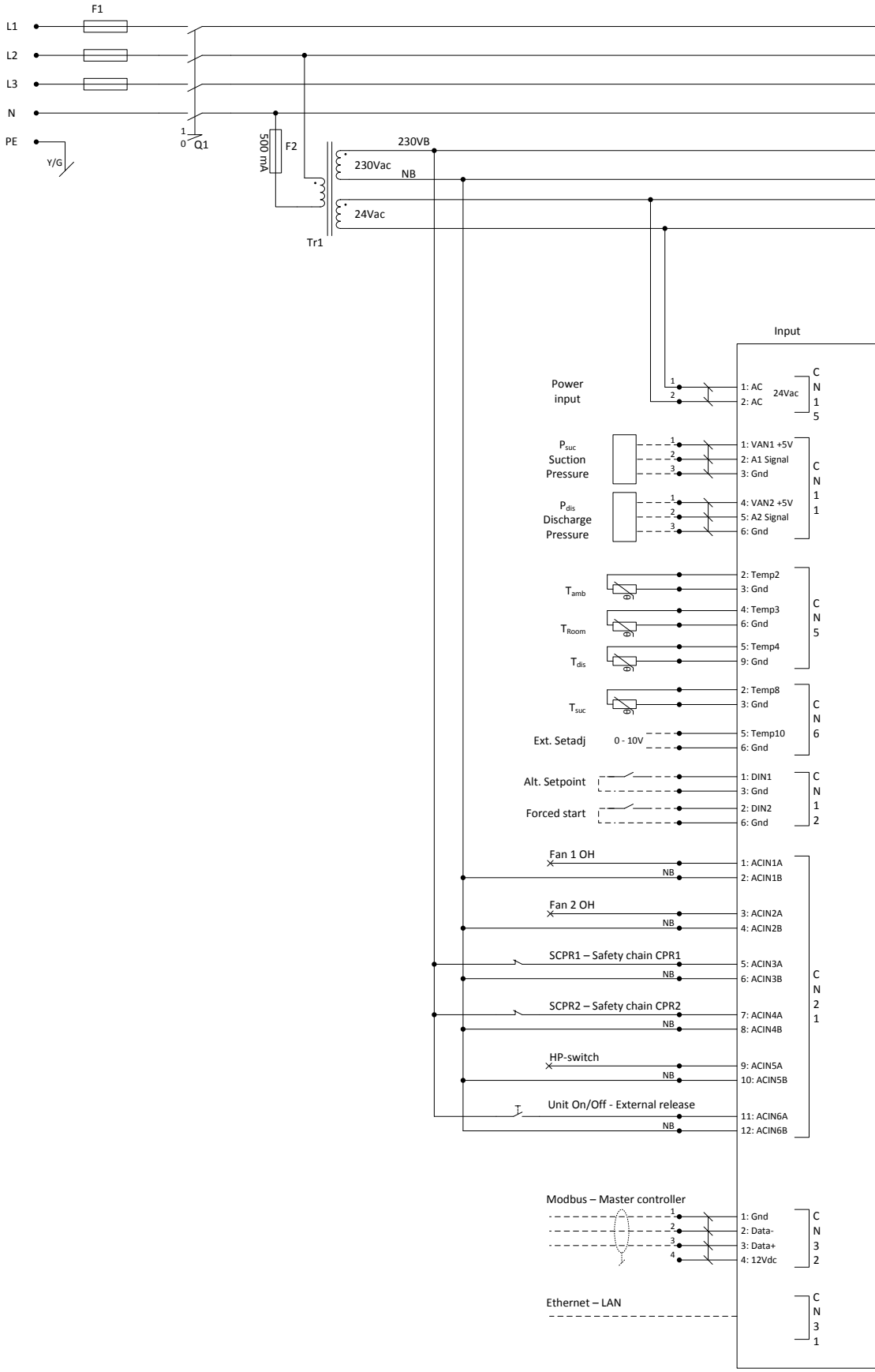

L1
L2
L3
N
230VB
NB
Y/G
Output
Display heater
24Vac
CN1
Display-RS485
CN7
12Vdc :1
Data2+ :4
Data2- :5
Gnd :6
1: 12Vdc
2: Data+
3: Data-
4: Gnd
CN3
LUP200
Remove jumper if using external power supply
1: 12VdcOut
2: Gnd
3: 12VdcIn
CN2
K1
L1 L2 L3
CPR 1 capacity
CN4
0-10V :4
Gnd :3
0-10V
Gnd
FI 1
0 – 10 V
U V W Y/G
CPR1
M
3~
K2
CPR 2 capacity
0-10V :5
Gnd :6
FI 2
0 – 10 V
CPR2
LMC340i
CN14
RE4IN :1
RE4OUT :2
RE3IN :3
RE3OUT :4
RE2IN :5
RE2OUT :6
RE1IN :7
RE1OUT :8
HP-switch
HP
K2 – CPR 2
Liquid line valve
K1 – CPR 1
CN13
RE5IN :1
RE5OUT-NC :2
RE5OUT-NC :3
BMS alarm
F4
F5
Fan speed controller
0 – 10 V
F3
CN22
RE6IN :1
RE6OUT :2
RE7IN :3
RE7OUT :4
RE8IN :5
RE8OUT :6
RE9IN :7
RE9OUT :8
Mfan1
M2
Fan 1 OH
Fan-speed 0 – 10 V
0-10V :1
Gnd :3
Mfan2
M3
Fan 2 OH

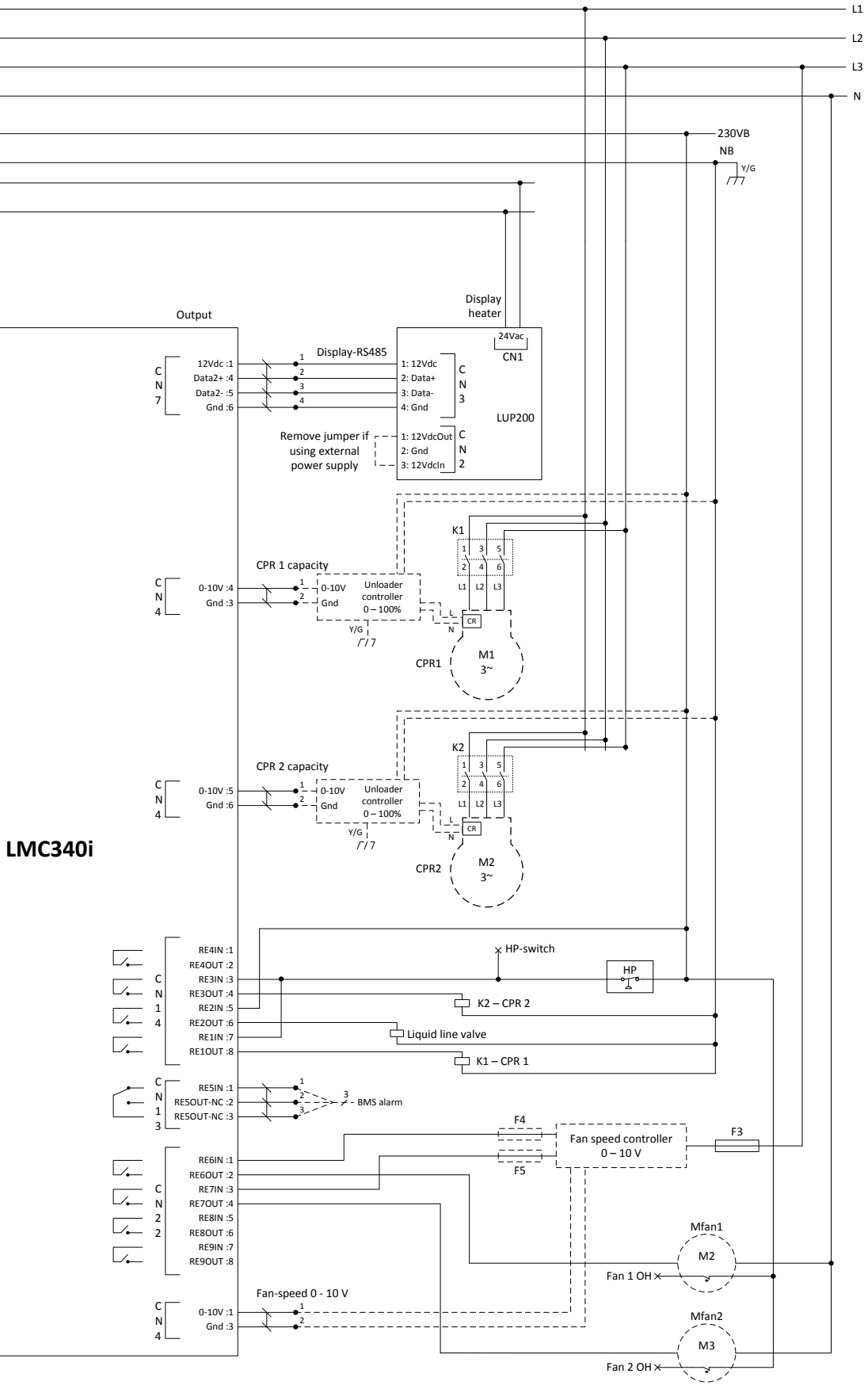
6.6. Wirediagram – dual compressor use with unloaders




L1
L2
L3
N
230VB
NB
Y/G
Display heater
Output
24Vac
CN1
Display-RS485
1: 12Vdc
2: Data+
3: Data-
4: Gnd
CN3
LUP200
Remove jumper if using external power supply
1: 12VdcOut
2: Gnd
3: 12VdcIn
CN2
CN7
12Vdc :1
Data2+ :4
Data2- :5
Gnd :6
K1
CPR 1 capacity
0-10V :4
Gnd :3
0-10V
Gnd
Unloader controller 0 – 100%
CR
CPR1
M1
3~
K2
CPR 2 capacity
0-10V :5
Gnd :6
CPR2
M2
3~
LMC340i
CN14
RE4IN :1
RE4OUT :2
RE3IN :3
RE3OUT :4
RE2IN :5
RE2OUT :6
RE1IN :7
RE1OUT :8
HP-switch
HP
K2 – CPR 2
Liquid line valve
K1 – CPR 1
CN13
RE5IN :1
RE5OUT-NC :2
RE5OUT-NC :3
BMS alarm
F4
F5
Fan speed controller 0 – 10 V
F3
CN22
RE6IN :1
RE6OUT :2
RE7IN :3
RE7OUT :4
RE8IN :5
RE8OUT :6
RE9IN :7
RE9OUT :8
Mfan1
M2
Fan 1 OH
Fan-speed 0 - 10 V
0-10V :1
Gnd :3
Mfan2
M3
Fan 2 OH

6.7. Wirediagram - dual compressor with one FI and one On/Off compressor




L1
L2
L3
N
230VB
NB
Y/G
Output
Display heater
24Vac
CN1
Display-RS485
C N 7
12Vdc :1
Data2+ :4
Data2- :5
Gnd :6
1: 12Vdc
2: Data+
3: Data-
4: Gnd
C N 3
LUP200
Remove jumper if using external power supply
1: 12VdcOut
2: Gnd
3: 12VdcIn
C N 2
K1
CPR 1 capacity
C N 4
0-10V :4
Gnd :3
0-10V
Gnd
Unloader controller 0 – 100%
CR
CPR1
M1 3~
K2
CPR 2 capacity
0-10V :5
Gnd :6
CPR2
M2 3~
LMC340i
C N 14
RE4IN :1
RE4OUT :2
RE3IN :3
RE3OUT :4
RE2IN :5
RE2OUT :6
RE1IN :7
RE1OUT :8
HP-switch
HP
K2 – CPR 2
Liquid line valve
K1 – CPR 1
C N 13
RE5IN :1
RE5OUT-NC :2
RE5OUT-NC :3
BMS alarm
F4
F5
Fan speed controller 0 – 10 V
F3
C N 22
RE6IN :1
RE6OUT :2
RE7IN :3
RE7OUT :4
RE8IN :5
RE8OUT :6
RE9IN :7
RE9OUT :8
Mfan1
M2
Fan 1 OH
Fan-speed 0 - 10 V
0-10V :1
Gnd :3
Mfan2
M3
Fan 2 OH

7. I/O list for the LMC340i Condensing Unit controller

7.1. Single compressor configuration

Type: A, D, S, P (Analogue, Digital, Serial, Power)
I, O, B (Input, Output, Bidirectional)

I/O list, LMC340i Condensing Unit controller - Single compressor configuration				
Name	Type	Pin	Logic	Description
Fan 1 OH	DI	ACIN1A CN21:1	NC	Klixon for fan motor 1 overheated 230 VAC ±15 %, 50/60Hz; min 5mA
Fan 2 OH	DI	ACIN2A CN21:3	NC	Klixon for fan motor 2 overheated 230 VAC ±15 %, 50/60Hz; min 5mA
Cpr. OH	DI	ACIN3A CN21:5	NC	Compressor overheated. Signal from compressor protection module 230 VAC ±15 %, 50/60Hz, min 5mA
Low oil level	DI	ACIN4A CN21:7	NC	Compressor oil level alarm. Signal from compressor protection module 230 VAC ±15 %, 50/60Hz, min 5mA
HP-Switch	DI	ACIN5A CN21:9	NC	High pressure safety switch signal 1 Activated by shortcutting to ground. 230 VAC ±15 %, 50/60Hz, min 5mA
Unit ON/OFF (Run) External release	DI	ACIN6A CN21:11	NO	Run command (On = Run) 230 VAC ±15 %, 50/60Hz, min 5mA
Alt. setpoint (Digital input 1)	DI	DIN1 CN12:1	NO	Toggle setpoint (function for digital input 1) Signal activated by short circuiting to ground. 3.3VDC, max 3.3mA, 1kΩ. 2 Not galvanic isolated.
Forced_start (Digital input 2)	DI	DIN2 CN12:2	NO	Start a forced start (function for digital input 2) Signal activated by short circuiting to ground. 3.3VDC, max 3.3mA, 1kΩ. 2 Not galvanic isolated.
(Reset Password)	DI	DIN3 CN12:4	NO	Resets passwords when short circuiting to ground for more than 3 seconds. 3.3VDC, max 3.3mA, 1kΩ. Not galvanic isolated.
(Not used)	DI	DIN4 CN12:5	NO	Not used 3.3VDC, max 3.3mA, 1kΩ. Not galvanic isolated.
Tamb Ambient temperature	T	Temp2 CN5:2		Ambient temperature Lodam NTC sensor Measurement range: -40°C to 130°C Accuracy: • ±1°C in the range -10°C to 60°C • ±3°C in the range -40°C to -10 °C • ±3°C in the range +60°C to 130°C 2 terminals per input • Signal • Gnd
Troom Room temperature	T	Temp3 CN5:4		Room (coldstore) temperature Lodam NTC sensor Measurement range: -60°C to 100°C Accuracy: • ±1°C in the range -30°C to 60°C • ±3°C in the range -60°C to -30 °C • ±3°C in the range +60°C to 100°C 2 terminals per input • Signal • Gnd

I/O list, LMC340i Condensing Unit controller - Single compressor configuration				
Name	Type	Pin	Logic	Description
Tdis Discharge temperature	T	Temp4 CN5:5		Discharge temperature Lodam NTC sensor Measurement range: -40°C to 130°C Accuracy: • ±1°C in the range -10°C to 60°C • ±3°C in the range -40°C to -10 °C • ±3°C in the range +60°C to 130°C 2 terminals per input • Signal • Gnd
Tsuc Suction line temperature	T	Temp8 CN6:2		Suction line temperature Lodam NTC sensor Measurement range: -60°C to 100°C Accuracy: • ±1°C in the range -30°C to 60°C • ±3°C in the range -60°C to -30 °C • ±3°C in the range +60°C to 100°C 2 terminals per input • Signal • Gnd
Ext. Setadj External setpoint adjustment	T	Temp10 CN6:5		External setpoint adjustment. • 0 – 10V • 4 – 20 mA: A 150 Ω resistor must be mounted from Temp10 to Gnd Not galvanic isolated.
Psuc Suction pressure	AI	A1 CN11:2		Suction pressure For use with Sensata 2CP5-49 200 psia (absolute) 0 – 5V
Pdis Discharge pressure	AI	A2 CN11:5		Discharge pressure For use with Sensata 2CP5-47 500 psig (rel.) 0 – 5V
Fan-speed 0 – 10 V	AO	Anout0 CN4:1		Fan speed for condenser fan controller 0 – 10V, 5mA Not galvanic isolated.
FI-Speed	AO	Anout1 CN4:2		Compressor speed – for test purposes 0; 2.5 – 8.7V (Off; 25 – 87Hz) 0 – 10V, 5mA Not galvanic isolated.
N/A	AO	Anout2 CN4:4		N/A
N/A	AO	Anout3 CN4:5		N/A
FI-Com	S	Data1+ CN7:2 Data1- CN7:3 GND CN6:8 (RS485)		RS 485 cable for FI communication Half duplex, max. 100m twisted pair cable, grounded shield, shunt capacitance < 50pF/m, 100Ω resistance, AWG24, 2 * 120Ω termination. Receiver impedance >= 12kΩ • GND • Data+ (A1) • Data- (/B1)
Display (LUP200)	S	Data2+ CN7:4 Data2- CN7:5 GND CN7:6 (RS485)		RS 485 cable for display communication (LUP200) Half duplex, max. 100m twisted pair cable, 2 * 120Ω termination. Receiver impedance >= 12kΩ • +12V (I-limit approx. 100mA) • GND • Data2+ (A2) • Data2- (/B2)
Ethernet	S	Ethernet CN31		10/100 Mbit TIA/EIA 568
Modbus External master controller	S	Data+ CN32:3 Data2- CN32:2 GND CN32:1 (RS485)		RS 485 cable for Modbus communication with external controller Half duplex, max. 100m twisted pair cable, 2 * 120Ω termination. Receiver impedance >= 12kΩ • +12V (I-limit approx. 100mA) • GND • Data+ (A) • Data- (/B)
Fan control power	P	12PWR CN2:1 GND CN2:2		Power for fan speed controller 12V, max 500 mA.
K1 Compressor FI power	DO	RE1OUT CN14:8		Relay for compressor ON Max 10A@250VAC/10A@30VDC
LLV Liquid line valve	DO	RE2OUT CN14:6		Relay for solenoid valve in liquid line / Signal that oil return function is active Max 10A@250VAC/10A@30VDC

I/O list, LMC340i Condensing Unit controller - Single compressor configuration				
Name	Type	Pin	Logic	Description
Oil heater	DO	RE3OUT CN14:4		Relay for oli heater Max 10A@250VAC/10A@30VDC
CPR protect	DO	RE4OUT CN14:2		Relay for power for compressor protection modules Max 10A@250VAC/10@30VDC
BMS Alarm	DO	RE-5OUT-NO CN13:3		Relay for alarm Max 10A@250VAC/10@30VDC
Mfan1	DO	RE6OUT CN22:2		Relay for fan motor 1 Max 10A@250VAC/5A@30VDC
Mfan2	DO	RE7OUT CN22:4		Relay for fan motor 2 Max 10A@250VAC/5A@30VDC
Mcpr	DO	RE8OUT CN22:6		Relay signal that compressor is running (for compressor protection device) Max 10A@250VAC/5A@30VDC
Compressor ready/ Unloader	DO	RE9OUT CN22:8		Relay for an expansion valve release / Unloader relay when using in compressor with unloader mode for capacity regulation Max 10A@250VAC/5A@30VDC
Power supply	P	AC CN15:1/2		Power supply for the LMC340i 12 – 24 VAC / 15 – 30 VDC; 4 – 15 VA

Note 1: Power to the compressor must be cut off by external safety chain when high pressure switch is activated!

Note 2: For the digital input DIN1 and DIN2 a galvanic isolated microcurrent relay must be used with a minimum current of 1 mA as the controller outputs 3.3 V / 3.3 mA on these terminals.

7.2. Dual compressor configuration

Type: A, D, S, P (Analogue, Digital, Serial, Power)
I, O, B (Input, Output, Bidirectional)

I/O list, LMC340i Condensing Unit controller - Dual compressor configuration				
Name	Type	Pin	Logic	Description
Fan 1 OH	DI	ACIN1A CN21:1	NC	Klixon for fan motor 1 overheated 230 VAC ±15 %, 50/60Hz; min 5mA
Fan 2 OH	DI	ACIN2A CN21:3	NC	Klixon for fan motor 2 overheated 230 VAC ±15 %, 50/60Hz; min 5mA
SCPR1	DI	ACIN3A CN21:5	NO	Security chain compressor 1. Signal from compressor protection modules 230 VAC ±15 %, 50/60Hz, min 5mA
SCPR2	DI	ACIN4A CN21:7	NO	Security chain compressor 2. Signal from compressor protection modules 230 VAC ±15 %, 50/60Hz, min 5mA
HP-Switch	DI	ACIN5A CN21:9	NC	High pressure safety switch signal 1 Activated by shortcutting to ground. 230 VAC ±15 %, 50/60Hz, min 5mA
Unit ON/OFF (Run)	DI	ACIN6A CN21:11	NO	Run command (On = Run) 230 VAC ±15 %, 50/60Hz, min 5mA
Alt. setpoint (Digital input 1)	DI	DIN1 CN12:1	NO	Toggle setpoint (function for digital input 1) Signal activated by short circuiting to ground. 3.3VDC, max 3.3mA, 1kΩ. 2 Not galvanic isolated.
Forced_start (Digital input 2)	DI	DIN2 CN12:1	NO	Start a forced start (function for digital input 2) Signal activated by short circuiting to ground. 3.3VDC, max 3.3mA, 1kΩ. 2 Not galvanic isolated.

I/O list, LMC340i Condensing Unit controller - Dual compressor configuration				
Name	Type	Pin	Logic	Description
(Reset Password)	DI	DIN3 CN12:4	NO	Resets passwords when short circuiting to ground for more than 3 seconds. 3.3VDC, max 3.3mA, 1kΩ. Not galvanic isolated.
Tamb Ambient temperature	T	Temp2 CN5:2		Ambient temperature Lodam NTC sensor Measurement range: -40°C to 130°C Accuracy: • ±1°C in the range -10°C to 60°C • ±3°C in the range -40°C to -10 °C • ±3°C in the range +60°C to 130°C 2 terminals per input • Signal • Gnd
Troom Room temperature	T	Temp3 CN5:4		Room (coldstore) temperature Lodam NTC sensor Measurement range: -60°C to 100°C Accuracy: • ±1°C in the range -30°C to 60°C • ±3°C in the range -60°C to -30 °C • ±3°C in the range +60°C to 100°C 2 terminals per input • Signal • Gnd
Tdis Tdis Discharge temperature	T	Temp4 CN5:5		Discharge temperature Lodam NTC sensor Measurement range: -40°C to 130°C Accuracy: • ±1°C in the range -10°C to 60°C • ±3°C in the range -40°C to -10 °C • ±3°C in the range +60°C to 130°C 2 terminals per input • Signal • Gnd
Tsuc Suction line temper-ature	T	Temp8 CN6:2		Suction line temperature Lodam NTC sensor Measurement range: -60°C to 100°C Accuracy: • ±1°C in the range -30°C to 60°C • ±3°C in the range -60°C to -30 °C • ±3°C in the range +60°C to 100°C 2 terminals per input • Signal • Gnd
Ext. Setadj External setpoint adjustment	T	vTemp10 CN6:5		External setpoint adjustment. A 10 k Ω resistor must be mounted from Temp10 to Gnd • 0 – 10V • 4 – 20 mA (a 150Ω resistor must be mounted parallel with the 10 kΩ resistor) Not galvanic isolated.
Psuc Suction pressure	AI	A1 CN11:2		Suction pressure For use with Sensata 2CP5-49 200 psia (absolute) 0 – 5V
Pdis Discharge pressure	AI	A2 CN11:5		Discharge pressure For use with Sensata 2CP5-47 500 psig (rel.) 0 – 5V
Fan speed 0-10V	AO	Anout0 CN4:1		Fan speed for condenser fan controller 0 – 10V, 10mA Not galvanic isolated.
FI Speed	AO	Anout1 CN4:2		Compressor capacity – for test purposes 0 – 10V (0 – 100%) 0 – 10V, 5mA Not galvanic isolated.
CPR1-CAP	AO	Anout2 CN4:4		Compressor 1 capacity 0 – 10V, 5mA Not galvanic isolated.
CPR2-CAP	AO	Anout3 CN4:5		Compressor 2 capacity 0 – 10V, 5mA Not galvanic isolated.
FI-Com	S	Data1+ CN7:2 Data1- CN7:3 GND CN6:8 (RS485)		RS 485 cable for FI communication Half duplex, max. 100m twisted pair cable, grounded shield, shunt capacitance < 50pF/m, 100Ω resistance, AWG24, 2 * 120Ω termination. Receiver impedance >= 12kΩ • GND • Data+ (A1) • Data- (/B1)

I/O list, LMC340i Condensing Unit controller - Dual compressor configuration				
Name	Type	Pin	Logic	Description
Display (LUP200)	S	Data2+ CN7:4 Data2- CN7:5 GND CN7:6 (RS485)		RS 485 cable for display communication (LUP200) Half duplex, max. 100m twisted pair cable, 2 * 120Ω termination. Receiver impedance >= 12kΩ • +12V (I-limit approx. 100mA) • GND • Data2+ (A2) • Data2- (/B2)
Ethernet	S	Ethernet CN31		10/100 Mbit TIA/EIA 568
Modbus External master controller	S	Data+ CN32:3 Data2- CN32:2 GND CN32:1 (RS485)		RS 485 cable for Modbus communication with external controller Half duplex, max. 100m twisted pair cable, 2 * 120Ω termination. Receiver impedance >= 12kΩ • +12V (I-limit approx. 100mA) • GND • Data+ (A) • Data- (/B)
Fan control power	P	12PWR CN2:1 GND CN2:2		Power for fan controller 12V, max 500 mA.
CPR1	DO	RE1OUT CN14:8	NO	Relay for compressor 1 ON/OFF Max 10A@250VAC/10A@30VDC
LLV Liquid line valve	DO	RE2OUT CN14:6	NO	Relay for solenoid valve in liquid line / Signal that oil return function is active Max 10A@250VAC/10A@30VDC
CPR2	DO	RE3OUT CN14:4	NO	Relay for compressor 2 ON/OFF Max 10A@250VAC/10A@30VDC
Unloader 1 (3)	DO	RE4OUT CN14:2	NO	Relay for unloader capacity regulation CPR 1 Max 10A@250VAC/10@30VDC
BMS Alarm	DO	RE- 5OUT-NO CN13:3	NC	Relay for alarm for external system Max 10A@250VAC/10@30VDC
Mfan1	DO	RE6OUT CN22:2	NO	Relay for fan motor 1 ON/OFF Max 10A@250VAC/5A@30VDC
Mfan2	DO	RE7OUT CN22:4	NO	Relay for fan motor 2 ON/OFF Max 10A@250VAC/5A@30VDC
Unloader 2 (3)	DO	RE9OUT CN22:8	NO	Relay for unloader capacity regulation CPR 2 Max 10A@250VAC/10@30VDC
Power supply	P	AC CN2:1/2	–	Power supply for the LMC340i 12 – 24 VAC / 15 – 30 VDC; 4 – 15 VA

8. Menu system on the LMC340i

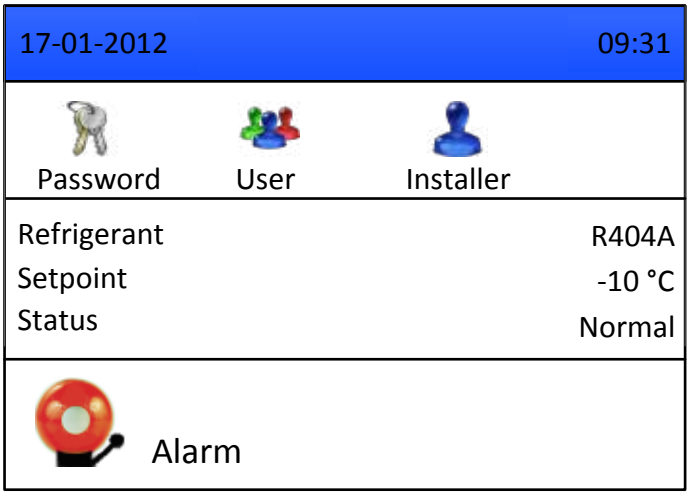
The menu system is used to configure the LMC340i controller, adjust parameters or enable / disable functions of the LMC340i.

8.1. Using the display and the menu system

The buttons on the user panel have the following functions:

LUP200 buttons:		
Esc	Esc button	Cancel editing of a setting / Return to higher level menu
	Left arrow	Select icon to the left
	Right arrow	Select icon to the right
	Up arrow	Select menu item one step up / Increase value in editing mode. Holding the button down in editing mode will increase step speed.
	Down arrow	Select menu item one step down / Decrease value in editing mode Holding the button down in editing mode will increase step speed.
	Enter button	Open sub-menu under the icon or lines ending with a ">" / Start editing mode. The value on the line is shown with inverted colours.

8.2. Main menu



When the user – or installer password has been entered, the respective icon appears. By moving the cursor to the wanted icon and pressing Enter key, the submenus are shown.

Setpoint shows the actual setpoint. Capacity [0 – 100%] is the actual cooling capacity needed at the moment Refrigerant is used refrigerant of the installation.

If the alarm icon is flashing, an alarm is active. If the icon is steady an alarm is not active anymore but not yet unacknowledged.

Depending on the configuration there might be up to three icons more in the lower menu. Here are Second setpoint and Week program active

8.3. Password menu

Enter the password for getting access to the wanted level of information.

Default passwords:

6. Opens access to user level information.
7. Installer settings are now available

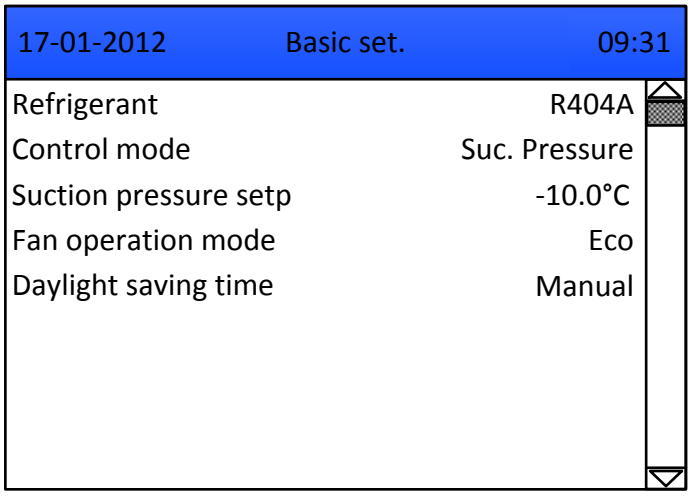
8.4. Commissioning on site

When all the electrical connections have been established, the piping is done and refrigerant is charged the unit is ready to start.

The controller basically only needs confirmation or adjustment of the following information to start operation:

- Refrigerant – default is R404A
- Temperature control mode – default is Suction pressure
- Setpoint – default is -10 ºC in Suction pressure mode
- Fan mode – default is Eco mode

All basic commission settings are made in the Installer – Basic settings menu:



Refrigerant
Refrigerant selection
R22, R134a, R404A, R407C, R410A,
R507A. Default is R404A

Control mode
Temperature control mode.
Suction pressure or Room temperature.
Default is Suction pressure

Suction pressure setp
Set the setpoint for Room temperature
or Suction pressure control mode.
Range -45 ºC to +30 ºC
Default +2 ºC

Fan operation mode
Set the regulating mode of the fans, Eco or LowSound.
Default is Eco

Daylight saving time
Handling of summertime shift by the real time clock.
Manual or Auto (MET). Default Manual

Select the line where the setting must be changed with the arrow keys if the line is not highlighted. Press the Enter button to edit the selected setting and confirm the new setting with another press on the Enter button.

Under Installer – Settings the advanced setting can be adjusted.

When all the settings are in place the unit can be started by setting Mode to On in the User menu.

Settings can also be changed during operation, however some changes like changing refrigerant will make the unit stop and reset setpoint to the default setting!

Please see the Condensing unit user manual for more detailed information.

9. FAQ

Q:
The condensing unit does not start.

A:
There are several possibilities, however the status information gives a good hint to what the problem is. See "Status line" on the Main menu.

1) Is the external signal set to On? The signal must be applied.

2) Is the unit in On mode? Set the unit in On mode.

3) Is there an active alarm that prevents start of the unit? Check the alarm list and solve possible alarms.

4) There has been an alarm and the unit is in restart – wait mode. After the restart timeout period of 10 min or 15 min the unit will make a restart attempt again – except in case of low oil level alarm. Check the alarm list and solve problems if there are any.

5) There is not enough charge on the system. Check the sight glass in the receiver if the refrigerant level is sufficient.

6)The connection to the FI has been interrupted and a restart attempt will be done. The alarm 500 FI missing will be in-active in this period. Check the communication cable to the FI and the FI.

7)The expansion valve is closed and the To limiter prevents a start. Check that the evaporator temperature is ok. Check if the expansion valve is operating properly.

8) The condensing unit is the coldest place in the system and at low ambient temperatures the refrigerant may stay in the unit and an opening of the expansion valve does not lead to at change in the suction pressure. Check that the winter start function is enabled in suction pressure mode.

9) The oil level is too low. Activate the oil return function. The compressor is running long periods at speeds below power frequency (50 Hz/ 60Hz) and as a result the oil stays in the evaporator due gas speed below the designed criteria. Activate the oil return function.

10) A control sensor has a malfunction. Check that the control sensor is valid. Suction pressure transmitter in suction pressure control mode and coldstore temperature sensor in room temperature control mode.

11) Only one compressor in dual compressor mode is used. The load is too low to start the other compressor and the load levelling has not yet reached the level of switching over to use the other compressor. Check also possible alarms for the compressor as there are no restart attempts due to the missing distinction between low oil level and compressor overheat.

12) Several temperatures shows -100°C in the display menu.The model code is still set to None. The controller needs a Model code for configuration of the inputs and outputs.

10. Alarm list and troubleshooting

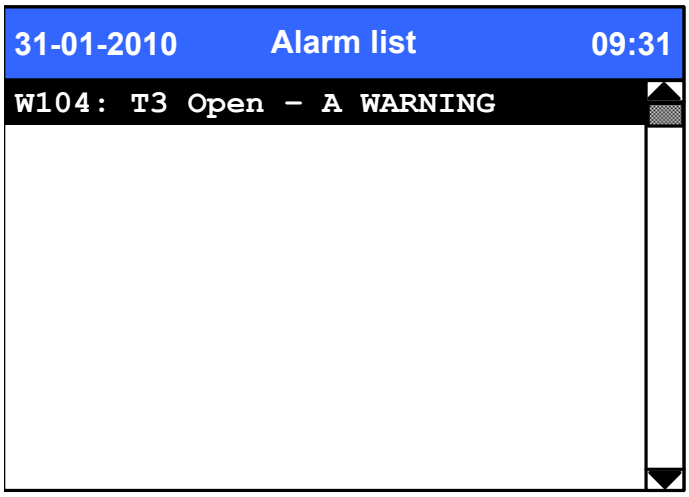
he LMC340i controller is equipped with a failure and alarm diagnoses system. There are three alarm levels: Warning, Alarm and Critical. A warning does not stop the unit but affects its temperature control precision. An alarm will stop the unit and it will restart after the restart delay.

A critical alarm will make the unit stop, turn on the alarm LED and turn off the CTS relay.

If the first letter is in uppercase, Axxx, Cxxx or Wxxx the alarm or warning is still standing and can't be acknowledged until the problem is solved. If the first letter is lower case, axxx, cxxx or wxxx the alarm situation is not active anymore and the alarm or warning can be acknowledged by pressing the Enter button.

There is also a short text to an alarm number. On the sample, W104 tells that temperature input T3 has an open connection and the problem is still there since W is in uppercase. The alarm cannot be acknowledged before the connection has been fixed.

Up to 16 alarms at the same time can be shown



10.1. Alarm list and trouble shooting

The severity is indicated by the letter in front of the number: Warning, Alarm and Critical.

Failure code	Cause	Troubleshooting
Requesting data	Communication between display and controller faulty or interrupted.	Check cable and connector LMC340i:CN7/1/4/5/6 <-> LUP200. Controller LED must be blinking
Temperature and pressure sensors		
W100/ W101	Circuit of discharge gas temperature sensor open or short circuit	Check cables and connector LMC340i:CN5:1/6. Check resistance of sensor according to table: NTC temperature/resistance table
W102/ W103	Circuit of ambient temperature sensor open or short circuit	Check cables and connector LMC340i:CN5:2/3. Check resistance of sensor according to table: NTC temperature/resistance table
W104/ W105	Circuit of cold store temperature sensor open or short circuit	Check cables and connector LMC340i:CN5:4/9. Check resistance of sensor according to table: NTC temperature/resistance table
W106/ W107	Circuit of discharge gas temperature sensor open or short circuit	Check cables and connector LMC340i:CN5:1/6. Check resistance of sensor according to table: NTC temperature/resistance table
W114/ W115	Circuit of suction line temperature sensor open or short circuit	Check cables and connector. Check resistance of sensor according to table: NTC temperature/resistance table.
C122/ C123	Circuit of low pressure transmitter open or short circuit	Check cables and connector LMC340i:CN11:1/2/3. Replace low pressure transmitter
W124/ W125	Circuit of high pressure transmitter open or short circuit	Check cables and connector LMC340i:CN11:4/5/6. Replace high pressure transmitter
Frequency inverter (FI)		
C500	No BUS communication to FI	Check data cable and connector LMC340i:CN6:/8 and LM-C340i:CN7:2/3. Check power supply of FI. Replace data cable or FI if necessary.
C501	FC local control	The FI is set I local control mode. Use a hand terminal to change the setting to remote control.
C502	FC EEPROM error	The FI is defect
C503	FC stator error	The wiring between the FI and the compressor motor is wrong. Wire correct.
C504	FC AnalogRef 1 error	Signal level to the FI analogue input 1 is faulty
C505	FC AnalogRef 2 error	Signal level to the FI analogue input 2 is faulty
C506	FC AnalogRef31 error	Signal level to the FI analogue input 3 is faulty
C507	FC Serial communication Error	Check the communication cable from LMC340i:CN6:8, CN7:2 and CN7:3 to the FI. The Serial port of the FI is defect.
C508	Short circuit in power cable from FI to compressor	Check cable between FI and compressor
C509	Internal failure of the FI	Disconnect power for 10 min. Restart. Replace FI if necessary.
C510	Earth fault in electric cable from FI to compressor or in compressor itself.	Check insulation of the FI -> compressor and resistance of compressor motor.
C511	Overcurrent at FI	Operation beyond compressor application limits or compressor damaged. Disconnect supply voltage of FI for 10 min. Then restart. Check operating conditions, replace compressor if necessary.
C512	Compressor motor too hot	Check motor cooling, discharge gas temperature sensor and oil level.
C513	FI overloaded / too hot	Check cooling of FI. Disconnect supply voltage of FI for 10 min. Restart. Replace FI or compressor if necessary.
C514	FI has unpermitted under-voltage	Supply voltage too low.
C515	FI has unpermitted over-voltage	Supply voltage too high.
A516	Phase failure at FI	Check supply voltage and all 3 phases at FI input.
C517	FI overloaded	Interrupt supply voltage to FI. Wait 5 min. Check cooling of FI. Restart. Replace FI or compressor if necessary.
C518	Switching frequency of FI too high	Check supply voltage and data cable to FI.

Failure code	Cause	Troubleshooting
C520	FC over speed	FI speed is above setpoint. Check compressor valves, a broken valve can give this alarm
C521	FI Auto tune Error	After replacement of a FI the auto tune failed. Check wiring to the compressor motor.
C564	FI Brake Resistor	The temperature in the F3 FI is too high. Power off for 5 min and see if it settles. Check refrigerant charge as this is used for FI cooling.
W574	FI overloaded	Interrupt supply voltage to FI. Wait 5 min. Check power out connector of FI and cooling of FI. Restart. Replace FI or compressor if necessary.
W579	Voltage of the intermediate circuit of the FI too low or operation outside of the application limits of the compressor.	Check supply voltage on input of FI and make sure that operation is within the application limits of the compressor.
W591	Phase failures at FI	Check supply voltage and all three phases at FI input.
W595/ W597	FI overloaded / too hot	Interrupt supply voltage to FI. Wait 5 min. Check cooling of FI. Restart. Replace FI or compressor if necessary.
A519 / A556 W572 / W583 W588 / W590 W596	Internal failure of the FI	Disconnect power for 10 min. Restart. Replace FI if necessary.
C599	Number of faults has exceeded critical threshold	Check previous alarm messages, eliminate causes and delete messages. Disconnect power for 10 min. Restart. Replace FI if necessary.
Operation		
C600	High pressure limiter switch has cut out	Condenser fans blocked? Check condenser. Is operating point within application limits?
C601	Compressor overheat protection device has cut out or relay module LOM301 is defect.	Check signal voltage (230VAC).
C602	Oil level too low.	Check oil level. Check and protect oil return. Check oil level detector circuit.
W603/ W604/ W605	Motor of fan 1 or fan 2 or both overheated.	Fan blocked? Check cables and fan thermostat. Replace fan if necessary.
W606	External setpoint adjustment beyond allowed limits.	Check cables and signal level and power supply. Check potential levels.
C607	A sensor, transmitter or a cable belonging to it is damaged.	Search alarm messages for failure and eliminate cause. Switch of main switch and restart after 2 minutes.
C608	Tdis limiter activated repeatedly	Check if the fans are operating ok.
C609	Tc, condenser temperature limiter activated repeatedly	Check if the condenser is blocked/dirty.
C610	FI current limiter activated repeatedly	Interrupt supply voltage to FI. Wait 10 min. Restart. Replace FI or compressor if necessary.
C611	To, suction temperature activated repeatedly	The capacity of the compressor is too high or too small expansion valve.
C620	Dual pressure switch active	High or low pressure fault, check fans and expansion valves. Unit restarts when signal is valid again.
C621	Compressor 1 failure (Dual compressor mode)	Check temperature and oil level. Safety chain for compressor 1 is faulty.
C622	Compressor 2 failure (Dual compressor mode)	Check temperature and oil level. Safety chain for compressor 2 is faulty.
C623	HP faults	Too many successive high pressure faults. Unit stops.
W624	Liquid in suction line	Check injection regulators on the evaporator. Check the defrost interval.
C625	Liquid in suction line	Check injection regulators on the evaporator. Check the defrost interval.
W626	Liquid in discharge line	Check injection regulators on the evaporator. Check the defrost interval.
C627	Liquid in discharge line	Check injection regulators on the evaporator. Check the defrost interval.
C628	Multiple liquid discharge line	Check injection regulators on the evaporators or adjust settings for detection of multiple times liquid in the discharge line
C629	Multiple liquid suction line	Check injection regulators on the evaporators or adjust settings for detection of multiple times liquid in the suction line
Controller		
W905	Failure in the data base of the controller	Note all changed settings and perform a factory reset in the Installer. Service section. Update LMC340i controller software. Replace LMC340i controller if necessary.
W907	Failure of the LM340 controllers real time clock	Replace the LMC340i controller.
W908	Voltage of battery of real time clock too low. Controller been switched of too long.	Set date and time of controller in menu system. Replace LMC340i controller if necessary.

Failure code	Cause	Troubleshooting
W909	No model code	Some temperatures will also show -100 °C. Open the factory menu and set the correct compressor control mode in the Model Code field.
W998	Test version	The software in the controller is a test version. Update the LMC340i controller software to a released version
W999	The unit is in manual mode	Change mode from Manual to On in User.Mode

11. NTC temperature/ resistance table

Table with relation between temperature of the NTC sensor and the measured resistance in the NTC sensor. Resistance is in Ohm and temperature in ºC.

Temp. [ºC]	Temp. [Ohm]	Temp.+ 2K [Ohm]	Temp.+ 4K [Ohm]	Temp.+ 6K [Ohm]	Temp.+ 8K [Ohm]
°C	+ 0 °C	+ 2 °C	+ 4 °C	+ 6 °C	+ 8 °C
-50	667828	579718	504230	439445	383712
-40	335671	294193	258307	227196	200184
-30	176683	156199	138322	122687	108991
-20	96974	86415	77121	68927	61693
-10	55298	49663	44610	40150	36183
0	32651	29500	26688	24173	21922
10	19904	18093	16465	15001	13683
20	12494	11420	10450	9572	8777
30	8056	7402	6807	6266	5774
40	5325	4916	4542	4200	3887
50	3601	3339	3098	2877	2674
60	2487	2315	2157	2011	1876
70	1752	1637	1530	1432	1341
80	1256	1178	1105	1037	975
90	916	862	811	768	720
100	679	640	604	571	540
110	510	483	457	433	401
120	389	369	350	332	315

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