

Modbus Interface

Condensing Unit Controller



LMC340i Lodam Condensing Unit Controller Modbus Interface

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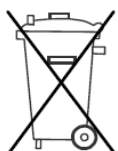
1. Read this first!

The contents of this manual are subject to change without notice.

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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. Reading instructions

The following symbols are used to draw the reader's attention to different warning levels.




Important information.




Danger!! General danger.

1.2. User manual

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

Special care should be taken when installing and connecting external equipment (Modbus communication cables) and handling the modules correctly according to protection against ESD.

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

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.

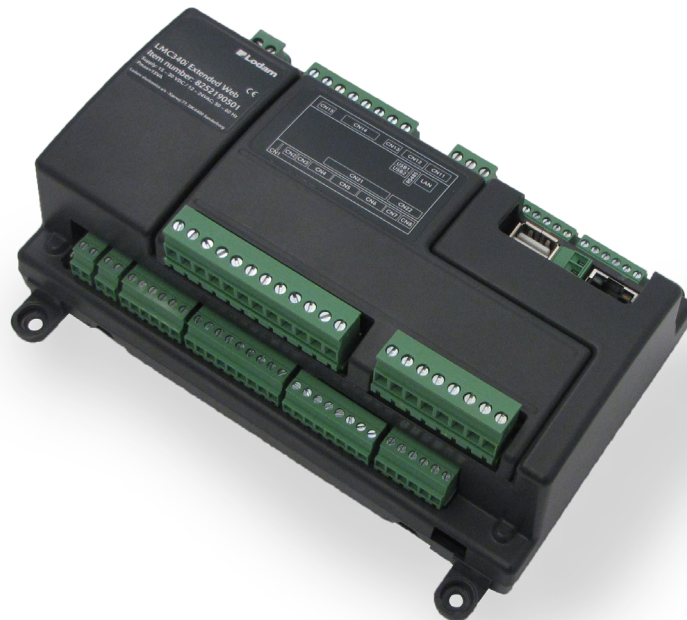
Remote control of the controller is via Modbus over a RS485 connection and this document describes the settings for this.

Lodam support
www.Lodam.com

Phone +45 73 42 37 37

3. Definitions

HW	Hardware/electronics
LMT	Lodam Multi Tool (PC communication tool for Lodam controllers)
Modbus	Application-layer messaging protocol - http://www.modbus.org/specs.php
RS485	Hardware communication standard

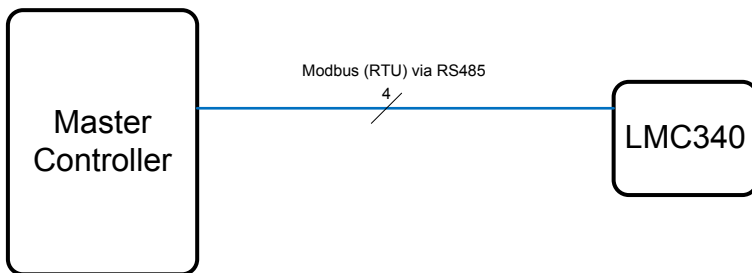


4. How to ...

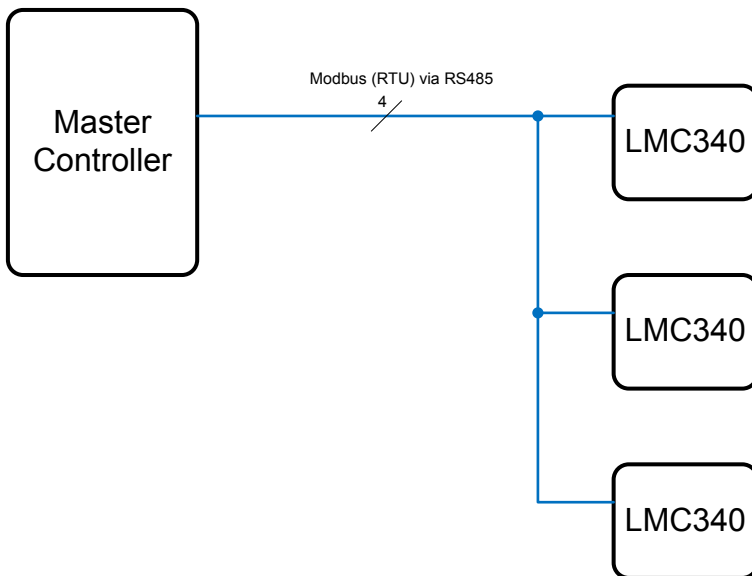
4.1. Connection samples

The Modbus communication is connected using a 4 wired, twisted pair connector (RS485). The connection can be multi-drop with up to 16 LMC340i on the same communication line. The LMC340i is always the client (slave unit).

One master controller and one LMC340i.

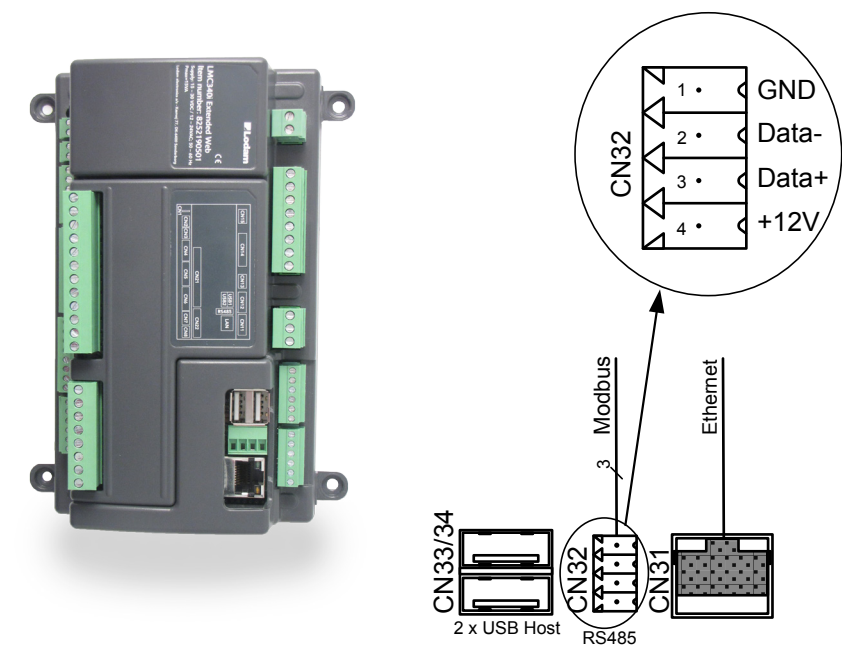


One master controller and several LMC340.



5. Connections

5.1. Connections on the LMC340i



Terminal	Description
CN32 - RS485	Modbus connection
GND:	Neutral
Data-	Inverted signal
Data+	Signal
+12V	Power supply for RS485 connection; +12 VDC; max. 100 mA. Not used for Modbus communication

5.2. Cable specification

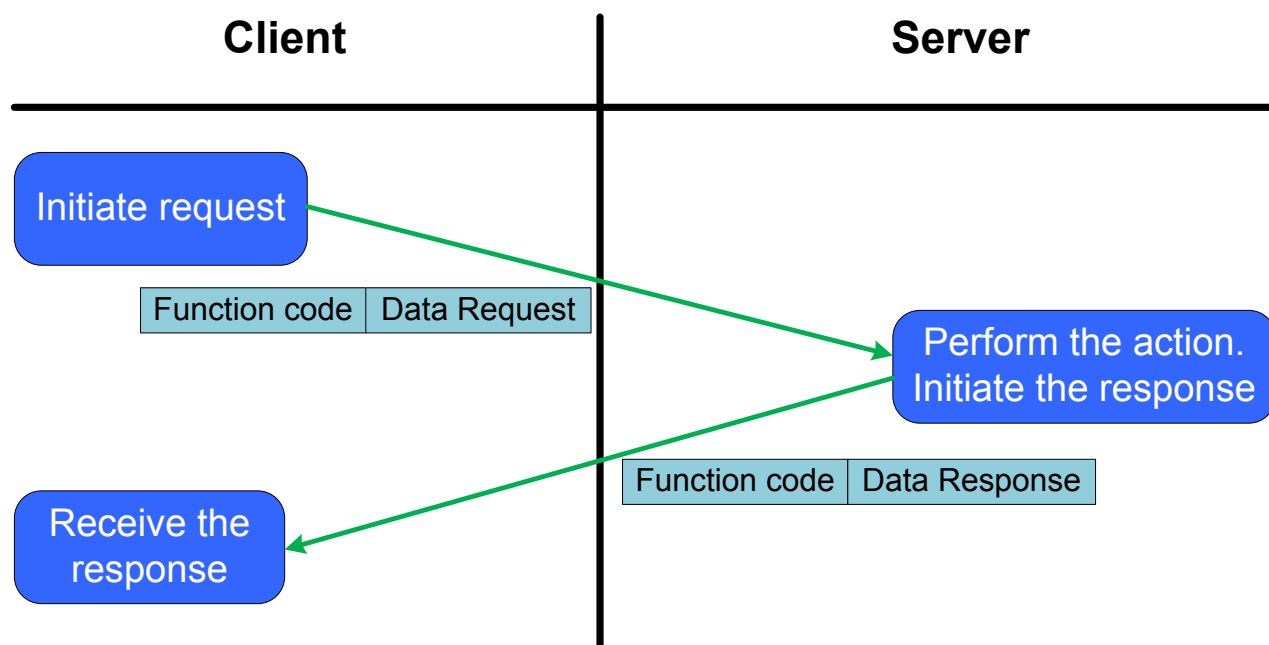
Communication is half duplex.

Max. 100m twisted pair cable, grounded shield, shunt capacitance < 50pF/m, 100Ω resistance, AWG24, 2 * 120Ω termination.

Receiver impedance >= 12kΩ.

6. Setup

Communication with the LMC340i is via Modbus (RTU). Configuration and reading of settings and readings from the LMC340i is described in the following sections.



6.1. Modbus configuration

Specification of the protocol:

Protocol:	Modbus (RTU mode). Se http://www.modbus.org/specs.php
Modbus node address:	LMC340i uses default address 1; can be changed on the LUP200 display
Baud rate:	Default 115200; 4800, 9600, 19200, 38400, 57600 are selectable
Number of data bits:	8
Parity:	Default Even; None and Odd parity are selectable
Number of stop bits:	Default 1; 2 (2 only if Parity is None)
Packet size:	Maximum 32 register in a row

Settings are configured on the LUP200 display of the LMC340i controller in the **Service->LOM MB config** menu.

Please observe that register numbers used in this manual are zero-based as the LMC340i uses PDU telegrams.

6.2. Data values, scaling and data types

Following is a description of used scaling and data types.

Scale 1, 10 and 100 refers to where the decimal point is implied, as a decimal value can't be transmitted via Modbus.

Scale 1: The value is the exact value

Scale 10: To transmit a value it must be multiplied by 10;
i.e. 12.3 -> 123

A received value must be divided by 10;
i.e. 123 -> 12.3

Scale 100: To transmit a value it must be multiplied by 100;
i.e. 1.23 -> 123

A received value must be divided by 100;
i.e. 123 -> 1.23

uint8: unsigned 8-bit integer

uint16: unsigned 16-bit integer

sint16: signed 16-bit integer

uint32: unsigned 32-bit integer

sint32: signed 32-bit integer

6.3. Modbus function codes

Function	Code (hexadecimal)	Code (decimal)
Read Holding Registers	03	03
Read Input Register	04	04
Write Single Register	06	06
Read/Write Multiple Registers	17	23

6.4. Modbus exception codes

Code	Name	Meaning
01	Illegal function	The function code is not valid.
02	Illegal data address	The specified register is not valid
03	Illegal data value	The value is not allowed

7. Functions

For all registers apply that a more specific description of the parameters are to be found in the User manual for the LMC340i.

The parameter names in brackets are the complete parameter name as listed in LMT.

7.1. Status information

This section contains status information parameters. Many are directly visible on the main menu of the LUP200 display.

Name	Possible Values	Default	Description	Register type	Address
2ndSetp	Unit None Scale 1 unit8	0	2nd Setpoint is active (Animation.2ndSetp) 0: Off 1: Active	Input register	1537
LowSound	Unit None Scale 1 unit8	0	LowSound fan mode is active (Animation.LowSound) 0: Off 1: Active	Input register	1538
WinterStart	Unit None Scale 1 unit8	0	WinterStart is enabled (Animation.WinterStart) 0: Off 1: Enabled	Input register	1539
HeatRecover	Unit None Scale 1 unit8	0	Heat recovery is enabled (Animation.HeatRecover) 0: Off 1: Enabled	Input register	1540
SetPointSrc	Unit None Scale 1 unit8	0	What setpoint is used right now (Animation.SetPointSrc) 0: User setpoint 1: 2nd Setpoint 2: Week program	Input register	1541
StatusIcon	Unit None Scale 1 unit8	0	Unit status - as on the displays main menu (Animation.StatusIcon) 0: Normal 1: Min run 2: Min pause 3: Oil return 4: Stopped 5: Li m Tc 6: Lim Tdis 7: Lim Tfc 8: Lim dp 9: Lim Psuc 10: Lim Ifc 11: Off 12: Manual 13: Restarting 14: FC Emergency 15: Psuc Emergency 16: Critical Stop	Input register	1542
MinRun	Unit None Scale 1 unit8	0	Min. compressor run time is active (Animation.MinRun) 0: Off 1: Active	Input register	1543

Name	Possible Values	Default	Description	Register type	Address
MinPause	Unit None Scale 1 unit8	0	Min. compressor pause is active (Animation.MinPause) 0: Off 1: Active	Input register	1544
LimTc	Unit None Scale 1 unit8	0	TC limiter is active (Animation.LimTc) 0: Off 1: Active	Input register	1545
LimTdis	Unit None Scale 1 unit8	0	Tdis limiter is active (Animation.LimTdis) 0: Off 1: Active	Input register	1546
LimTfi	Unit None Scale 1 unit8	0	Temp. FI limiter is active (Animation.LimTfi) 0: Off 1: Active	Input register	1547
LimdP	Unit None Scale 1 unit8	0	dP limiter is active (Animation.LimdP) 0: Off 1: Active	Input register	1548
LimPsuc	Unit None Scale 1 unit8	0	Psuc limiter is active (Animation.LimPsuc) 0: Off 1: Active	Input register	1549
LimIfi	Unit None Scale 1 unit8	0	FI current limiter is active (Animation.LimIfi) 0: Off 1: Active	Input register	1550

7.2. Inputs

The section lists analogue and digital readings from the LMC340i controller.

Name	Possible Values	Default	Description	Registertype	Address
T0	Unit °C Scale 100 sint16	-	Saturated suction temperature (Input.T0) -10000 °C – 12000 °C	Input register	1552
Troom	Unit °C Scale 100 sint16	-	Room temperature (Input.Troom) -10000 °C – 12000 °C	Input register	1553
TC	Unit °C Scale 100 sint16	-	Saturated discharge (condenser) temperature (Input.TC) -10000 °C – 12000 °C	Input register	1554
Tdis	Unit °C Scale 100 sint16	-	Discharge temperature (Input.Tdis) -10000 °C – 12000 °C	Input register	1555
Tamb	Unit °C Scale 100 sint16	-	Ambient temperature (Input.Tamb) -10000 °C – 12000 °C	Input register	1556
Tsuc	Unit °C Scale 100 sint16	-	Suction temperature (sensor is not always mounted) (Input.Tsuc) -10000 °C – 12000 °C	Input register	1557
Tsh	Unit °C Scale 100 sint16	-	Suction superheat temperature (Input.Tsh) -10000 °C – 12000 °C	Input register	1558
Tsh_dis	Unit °C Scale 100 sint16	-	Discharge superheat temperature (Input.Tsh_dis) -10000 °C – 12000 °C	Input register	1559
TFC	Unit °C Scale 100 sint16	-	Frequency inverter temperature (Input.TFC) -10000 °C – 12000 °C	Input register	1560
IFC	Unit A Scale 100 sint16	-	Frequency inverter current (Input.IFC) 000 A – 10000 A	Input register	1561
Ext_Ref	Unit None Scale 100 sint16	-	External input offset The offset range is set under capacity regulation (Input.Ext_Ref) -10000 °C – 10000 °C	Input register	1562
Psuc	Unit bar Scale 100 sint16	-	Suction pressure (Input.Psuc) 000 bar – 1300 bar	Input register	1563
Pdis	Unit bar Scale 100 sint16	-	Discharge pressure (Input.Pdis) 100 bar – 3300 bar	Input register	1564
HP_Switch	Unit Boolean Scale 1 uint8	-	High pressure switch input (Input.HP_Switch) 0: Off 1: Active	Input register	1565

Name	Possible Values	Default	Description	Register type	Address
Oil_Switch	Unit Boolean Scale 1 uint8	-	Oil level failure (Input.Oil_Switch) 0: Off 1: Active	Input register	1566
Cpr_OH	Unit Boolean Scale 1 uint8	-	Compressor overheated (Input.Cpr_OH) 0: Ok 1: Failure	Input register	1567
Fan1_OH	Unit Boolean Scale 1 uint8	-	Fan1 overheated (Input.Fan1_OH) 0: Ok 1: Failure	Input register	1568
Fan2_OH	Unit Boolean Scale 1 uint8	-	Fan2 overheat (Input.Fan2_OH) 0: Ok 1: Failure	Input register	1569
DigIn1	Unit Boolean Scale 1 uint8	-	Digital input 1 (Input.DigIn1) 0: Off 1: Active	Input register	1570
DigIn2	Unit Boolean Scale 1 uint8	-	Digital input 2 (Input.DigIn2) 0: Off 1: Active	Input register	1571
ExtOnOff	Unit Boolean Scale 1 uint8	-	External release input (Input.ExtOnOff) 0: Off 1: Active	Input register	1572
SC_Cpr1	Unit Boolean Scale 1 uint8	-	Security chain for compressor 1 (Only valid in dual compressor mode) (Input.SC_Cpr1) 0: Ok 1: Failure	Input register	1573
SC_Cpr2	Unit Boolean Scale 1 uint8	-	Security chain for compressor 2 (Only valid in dual compressor mode) (Input.SC_Cpr2) 0: Ok 1: Failure	Input register	1574

7.3. Outputs

Status of relay outputs

Name	Possible Values	Default	Description	Register type	Address
RE1	Unit Boolean Scale 1 uint8	-	Contactor K1 for frequency inverter / compressor (Output.RE1) 0: Off 1: On	Input register	1584
RE2	Unit Boolean Scale 1 uint8	-	Liquid Line Valve / Oil Return signal (Output.RE2) 0: Off 1: On	Input register	1585
RE3	Unit Boolean Scale 1 uint8	-	Crankcase heater (Output.RE3) 0: Off 1: On	Input register	1586
RE4	Unit Boolean Scale 1 uint8	-	Power for OLC and SE-B1 (Output.RE4) 0: Off 1: On	Input register	1587
RE5	Unit Boolean Scale 1 uint8	-	Alarm relay (Output.RE5) 0: Off 1: On	Input register	1588
RE6	Unit Boolean Scale 1 uint8	-	Fan 1 on (Output.RE6) 0: Off 1: On	Input register	1589
RE7	Unit Boolean Scale 1 uint8	-	Fan 2 on (Output.RE7) 0: Off 1: On	Input register	1590
RE8	Unit Boolean Scale 1 uint8	-	Compressor running signal for OLC (Output.RE8) 0: Off 1: On	Input register	1591
RE9	Unit Boolean Scale 1 uint8	-	Release signal for electronic expansion valve (Output.RE9) 0: Off 1: On	Input register	1592

7.4. Alarms

Alarm section with up to 16 alarms at a time. The alarms are sorted with highest priority in Code1 parameter. When an alarm becomes inactive the priority is less and it is moved to a new parameter CodeNo > Code1.

An alarm number is coded, meaning status, severity level and alarm number are encoded in the number in the parameters Code1 – Code16.

Leftmost bit = Bit16; rightmost bit = Bit0.

Bit1 – Bit10: Alarm number; 100 – 999. Code1 AND 1023_{dec} = alarm number.

Bit11 – Bit13: Alarm level; 0 – 6 as listed for Level in the table below.

Code1 AND 7168_{dec} = level.

Bit16: Alarm status; 1: Alarm active; 0: Alarm inactive.

Code1 AND 32768_{dec} = status.

Name	Possible Values	Default	Description	Register type	Address
Count	Unit None Scale 1 uint16	0	Number of alarms in the list, active and inactive (Alarm.Count) 0 - 16 alarms	Input register	1600
CountActive	Unit None Scale 1 uint16	0	Number of active alarms (Alarm.CountActive) 0 – 16	Input register	1601
Level	Unit None Scale 1 uint16	0	Highest alarm level of the active alarms (Alarm.Level) 0: None 1: Log 2: Event 3: Info 4: Warning 5: Critical 6: Fault	Input register	1602
Alarm Reset	Unit None Scale 1 uint16	-	Alarm reset command variable (Alarm.Reset) Range 0 – 65535 100 – 999: Resets the specific alarm – if the alarm is resettable 65535: Reset all resettable alarms	Holding register	1603
Code1	Unit None Scale 1 uint16	0	Alarm number of most severe alarm (Alarm.Code1) 0: No alarm 100 – 40935: Alarm number	Input register	1604
Code2	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code2) 0: No alarm 100 – 999: Alarm number	Input register	1605
Code3	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code3) 0: No alarm 100 – 999: Alarm number	Input register	1606
Code4	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code4) 0: No alarm 100 – 999: Alarm number	Input register	1607
Code5	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code5) 0: No alarm 100 – 999: Alarm number	Input register	1608

Name	Possible Values	Default	Description	Register type	Address
Code6	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code6) 0: No alarm 100 – 999: Alarm number	Input register	1609
Code7	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code7) 0: No alarm 100 – 999: Alarm number	Input register	1610
Code8	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code8) 0: No alarm 100 – 999: Alarm number	Input register	1611
Code9	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code9) 0: No alarm 100 – 999: Alarm number	Input register	1612
Code10	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code10) 0: No alarm 100 – 999: Alarm number	Input register	1613
Code11	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code11) 0: No alarm 100 – 999: Alarm number	Input register	1614
Code12	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code12) 0: No alarm 100 – 999: Alarm number	Input register	1615
Code13	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code13) 0: No alarm 100 – 999: Alarm number	Input register	1616
Code14	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code14) 0: No alarm 100 – 999: Alarm number	Input register	1617
Code15	Unit None Scale 1 uint16	0	Alarm number of less severe alarm (Alarm.Code15) 0: No alarm 100 – 999: Alarm number	Input register	1618
Code16	Unit None Scale 1 uint16	0	Alarm number of least severe alarm (Alarm.Code16) 0: No alarm 100 – 999: Alarm number	Input register	1619

7.5. Control

Parameters used to view and control operation of the LMC340i controller.

Name	Possible Values	Default	Description	Register type	Address
Mode	Unit None Scale 1 uint8	0	Overall unit mode (Control.PM_Mode) 0: Off 1: On 2: Manual	Holding register	1632
Control Mode	Unit Boolean Scale 1 uint8	0	Temperature control mode (Control.CapMode) 0: Suction pressure 1: Room temp control mode	Holding register	1633
Runtime Hours	Unit None Scale 1 uint16	-	Runtime in hours, wrap around after 7.5 years (Control.RuntimeHours)	Input register	1634
MBExtOnOff	Unit Boolean Scale 1 uint8	0	Same function as Input.ExtOnOff, but for Modbus (Control.MBExtOnOff) 0: Unit Stopped 1: Unit Released	Holding register	1635
TC Setpoint	Unit °C Scale 100 sint16	-	Condenser TC setpoint Only used if ambient compensation = Off (Condens.TC_set) 000 °C - 8500 °C	Holding register	1636
Fan Mode	Unit Boolean Scale 1 uint8	0	Fan control mode (Condens.Economy) 0: Eco 1: LowSound	Holding register	1637
Ambient Comp.	Unit Boolean Scale 1 uint8	1	Use ambient compensation or fixed condenser setpoint (Condens.AmbComp) 0: Off 1: On	Holding register	1638
Setpoint	Unit °C Scale 100 sint16	-	Capacity controller setpoint Range depends on compressor and refrigerant (Capacity.Tset) -4500 °C - 3500 °C	Holding register	1639
2nd Setpoint	Unit °C Scale 100 sint16	-	Secondary setpoint Activated by a digital input. Range depends on compressor and refrigerant (Capacity.2ndTset) -4500 °C - 3500 °C	Holding register	1640
Act. Setpoint	Unit °C Scale 100 sint16	-	Actual setpoint (read only) (Capacity.ActTset) -4500 °C - 3500 °C	Holding register	1641
Cap. Request	Unit % Scale 100 sint16	-	Capacity request Calculated capacity request (Capacity.CapReq) 0 - 10000 %	Input register	1642

Name	Possible Values	Default	Description	Register type	Address
Cap. Actual	Unit % Scale 100 sint16	-	Actual capacity Actual capacity request – limiters might have reduced the requested capacity (Capacity.CapAct) 0 - 10000 %	Input register	1643
Fl frequency	Unit Hz Scale 100 sint16	-	Actual Fl frequency in Hz (Capacity.FrqAct) 0 - 10000 Hz	Input register	1644
Cpr. Running	Unit Boolean Scale 1 uint8	-	Is the compressor running (Compres.CprlsRunning) 0: No 1: yes	Input register	1645

7.6. Modbus sample communication

Note: The following sample is a general Modbus communication sample and is not for the LMC340i!

Request: 0b041000000e75a4

Response: 0b041cffff0000095008b0e4a80014000b000108e108f1ffff000f0002fff39f8e

Request (Input register)		
0x0b	Slave address	1 byte
0x04	Function code	1 byte
0x1000	Start addr	2 bytes
0x000e	Quantity	2 bytes
0x75a4	CRC	2 bytes

Response		
0x0b	Address	1 byte
0x04	Function code	1 byte
0x1c	NB bytes of data	1 byte
0xffff	Value1	2 bytes
0x0000	Value2	2 bytes
0x0950	Value3	2 bytes
0x08b0	Value4	2 bytes
0xe4a8	Value5	2 bytes
0x0014	Value6	2 bytes
0x000b	Value7	2 bytes
0x0001	Value8	2 bytes
0x08e1	Value9	2 bytes
0x08f1	Value10	2 bytes

0xffff	Value11	2 bytes
0x000f	Value12	2 bytes
0x0002	Value13	2 bytes
0xfff3	Value14	2 bytes
0x9f8e	CRC	2 bytes

Request 0b03200000018f60
Response: 0b030200002045

Request (Holding register)		
0x0b	Slave address	1 byte
0x03	Function code	1 byte
0x2000	Address	2 bytes
0x0001	Quantity	2 bytes
0x8f60	CRC	2 bytes

Response		
0x0b	Slave address	1 byte
0x03	Function code	1 byte
0x02	Quantity	1 byte
0x0000	Value1	2 bytes
0x2045	CRC	2 bytes

8. Standards

The product is manufactured according to the following standards.

RoHS 2002/95/EC

Low voltage 206/95/EC

EMC 2004/108/EC

61000-6-x Generic EMC

The following standards have been used

EN 61010-1 Safety requirement for electrical equipment for measurement and control.

EN 61000-6-2 Immunity standard for industrial environments.

EN 61000-6-3 Emission standard for residential, commercial and light-industrial environments.

CE approved.

9. Trouble shooting

- Check if there is power to the LMC340i, range 15 - 30 VDC/12 – 24 VAC.
- Check if Data+ and Data- wires have been switched.
- Check if the communication node address setting matches the selected.
Note: Node address should be between 1 and 247, both included.
- Check if the communication speed matches the selected.
- Check if communication is running.
The LUP200 display will show readings and commands.

10. Notes

