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1. **Read this first!**

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

Lodam electronics holds the copyright to this user’s manual. The user shall follow any instructions given in this user manual entirely and not only partly. Any non-following of this user manual result in exclusion of all warranties, guarantees, and liabilities.

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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.

**Reading instructions**

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

ℹ️ Important information.
Danger!! General danger.

Danger!! High voltage. Danger of electrical current or voltage.

Reading
Text listed as Installer.Service, references to an entry in the menu system, please see the full menu system in Menu system.

User manual

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).

Installation of the LMC320 must be performed by authorized personnel only. All warranties are excluded in case installation is performed by unauthorized personnel or in case the LMC320 has not been correctly installed. Electrical plant failures are to be immediately solved, even though no immediate danger exists; the LMC320 must not be operating.

Safety

The LMC320 is not a safety component and can not be used in “medical” or “life support” equipment. The LMC320 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.

Although the LMC320, LOM309 and the LUP200 are approved against the specified EMC standards, the final condensing unit must also be tested against the applying standards.
2. General

Lodam’s Heat Pump Controller, LMC320 enable you to gain total control of domestic hot water and heating for domestic comfort – thereby optimizing your system to save time, money and energy. Our Lodam Heat Pump Controller is designed for most heat pump applications.

The LMC320 Lodam Heat Pump controller can be used in most heat pump applications to obtain highest possible COP.
- Ground - Brine / Water Heat Pumps
- Air / Water Heat Pumps
- Water / Water Heat Pumps
- Domestic Hot tap water Heat Pumps
- Hot tap water Heat Pump with attached solar panel
- House heating with Heat Pump and optional supply heat

Some benefits from the LMC320 Heat Pump Controller
- Energy and cost saving through intelligent capacity control via frequency inverter
- Higher maximum capacity of compressors using frequency inverter
- Intelligent Defrost Scheduling – Saves energy and ensures low capacity waste
- Intelligent Winter/Summer and Ambient temperature compensation – Provides comfort and saves energy.
- Use of a solar panel for Domestic Hot Tap Water
- Air or Ground source
- User friendly

This user manual applies to software version 1.00 of LMC320.

Lodam support
www.Lodam.com

Phone +45 73 42 37 37
### 3. Definitions

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>COP</td>
<td>Coefficient Of Performance</td>
</tr>
<tr>
<td>Fi</td>
<td>Frequency inverter</td>
</tr>
<tr>
<td>HW</td>
<td>Hardware/electronics</td>
</tr>
<tr>
<td>I/O</td>
<td>Input / Output (electrical signals in and out of a unit)</td>
</tr>
<tr>
<td>Limiter</td>
<td>Shortform for a limiting function which monitors the operating conditions</td>
</tr>
<tr>
<td>LMT</td>
<td>Lodam Multi Tool (PC communication tool for Lodams controllers)</td>
</tr>
<tr>
<td>NC</td>
<td>Normally Closed (relay)</td>
</tr>
<tr>
<td>NO</td>
<td>Normally Open (relay)</td>
</tr>
<tr>
<td>Pdis</td>
<td>Discharge pressure</td>
</tr>
<tr>
<td>Psuc</td>
<td>Suction pressure</td>
</tr>
<tr>
<td>PWM</td>
<td>Pulse Width Modulated. Achieve an average value over time</td>
</tr>
<tr>
<td>RS485</td>
<td>Serial communication interface</td>
</tr>
<tr>
<td>SW</td>
<td>Software</td>
</tr>
<tr>
<td>Tamb</td>
<td>Ambient temperature</td>
</tr>
<tr>
<td>Tc</td>
<td>Condensing temperature calculated from saturated discharge temperature</td>
</tr>
<tr>
<td>Tdis</td>
<td>Discharge temperature (NTC temperature sensor)</td>
</tr>
<tr>
<td>To</td>
<td>Suction temperature calculated from saturated suction pressure</td>
</tr>
</tbody>
</table>

A LMC320 Heat pump controller kit from Lodam includes:

- 1 Pc Lodam Heat Pump controller (LMC320)
- 1 Pc Optional board for extra I/O (LOM309)
- 1 Pc Lodam full graphical colour display (LUP200)
- 1 Pc Cabinet and foil for LUP200
- 1 Pc Connector kit for LMC320+LOM309
- 1 Pc Access license to Lodam Multi Tool
4. Overview of the LMC320 Heat Pump Controller
5. How to ...

Use the display and the menu system
The buttons on the user panel have the following functions:

- **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.
Show User information
The following menu is the main menu and the default. The user panel returns to this after 10 min without user activity.

From the main menu, press the Right arrow to highlight the User icon and press the Enter button to show the User menu.

<table>
<thead>
<tr>
<th>31-01-2010</th>
<th>09:31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Heating</td>
</tr>
<tr>
<td>Seasonal status</td>
<td>Winter</td>
</tr>
<tr>
<td>Room temperature</td>
<td>21°C</td>
</tr>
<tr>
<td>Alarm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>31-01-2010</th>
<th>User</th>
<th>09:31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Room temp. Set point</td>
<td>21.0°C</td>
<td></td>
</tr>
<tr>
<td>Hot water set point</td>
<td>45.0°C</td>
<td></td>
</tr>
<tr>
<td>Ambient curve offset</td>
<td>0.0°C</td>
<td></td>
</tr>
<tr>
<td>Seasonal mode</td>
<td>Auto</td>
<td></td>
</tr>
<tr>
<td>New password</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Display actual measured temperatures
Show the user information as listed above and use the Down arrow to highlight the Display menu line. Press the Enter button to show the Display menu with measured temperatures and status.

<table>
<thead>
<tr>
<th>31-01-2010</th>
<th>Display</th>
<th>09:31</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
<td><strong>Heating</strong></td>
<td></td>
</tr>
<tr>
<td>Heating supply temp.</td>
<td>35.7°C</td>
<td></td>
</tr>
<tr>
<td>Heating return temp.</td>
<td>30.9°C</td>
<td></td>
</tr>
<tr>
<td>Water tank temp.</td>
<td>44.0°C</td>
<td></td>
</tr>
<tr>
<td>Ambient temp.</td>
<td>2.1°C</td>
<td></td>
</tr>
<tr>
<td>Room temp.</td>
<td>20.8°C</td>
<td></td>
</tr>
<tr>
<td>Heating tank temp.</td>
<td>35.5°C</td>
<td></td>
</tr>
<tr>
<td>Cold side supply temp.</td>
<td>-3.3°C</td>
<td></td>
</tr>
<tr>
<td>Cold side return temp.</td>
<td>0.0°C</td>
<td></td>
</tr>
<tr>
<td>Evaporator temp.</td>
<td>-0.5°C</td>
<td></td>
</tr>
<tr>
<td>Heating set point</td>
<td>35.4°C</td>
<td></td>
</tr>
<tr>
<td>Hot water set point</td>
<td>45.0°C</td>
<td></td>
</tr>
<tr>
<td>Compressor frequency</td>
<td>4.71V</td>
<td></td>
</tr>
<tr>
<td>Solar panel Status</td>
<td>Ready</td>
<td></td>
</tr>
<tr>
<td>Solar panel temp.</td>
<td>19.3°C</td>
<td></td>
</tr>
<tr>
<td>Solar panel water temp.</td>
<td>34.7°C</td>
<td></td>
</tr>
</tbody>
</table>

Set hot water temperature
Open the User menu and scroll to the Hot water set point with the Up or Down arrows. Press the Enter button to enter editing mode and adjust the temperature of the hot tap water setpoint to the desired temperature. Save the new setting by pressing the Enter button.

<table>
<thead>
<tr>
<th>31-01-2010</th>
<th>User</th>
<th>09:31</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Language</strong></td>
<td><strong>English</strong></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Alarm</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Room temp. Set point</td>
<td>21.0°C</td>
<td></td>
</tr>
<tr>
<td><strong>Hot water set point</strong></td>
<td>45.0°C</td>
<td></td>
</tr>
<tr>
<td>Ambient curve offset</td>
<td>0.0°C</td>
<td></td>
</tr>
<tr>
<td>Seasonal mode</td>
<td>Auto</td>
<td></td>
</tr>
<tr>
<td>New password</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Set room temperature for heating
Open the User menu and scroll to the Room temp. set point with the Up or Down arrows. Press the Enter button to enter editing mode and adjust the temperature of the Room temperature set point to the desired temperature. Save the new setting by pressing the Enter button.

In the Ambient / Room temperature compensation menu, Installer – Ambient / Room compensation the level of compensation can be set.

Access to the installer section
To activate access to the installer section the correct password must be entered. The default installer password is 2. Select the Password icon from the main menu and press Enter. The password menu is shown.
Press the Enter button to start editing mode and enter the correct password with use of the up and down arrows. Press the Enter button to select it.

Press the Esc button to return to main menu from where there now is access to the installer section:

Select the Installer icon with the right arrow and press Enter button to show the Installer menu:
Set control mode for the installation
Open the Installer menu and scroll to the line with Service. Under Service menu open the sub menu Manual by pressing the Enter button.

<table>
<thead>
<tr>
<th>31-01-2010</th>
<th>Manual</th>
<th>09:31</th>
</tr>
</thead>
<tbody>
<tr>
<td>MainSwitch</td>
<td>On</td>
<td></td>
</tr>
<tr>
<td>RE1 - Compressor</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>RE2 - Heater</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>RE3 - Hot water</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>RE4 - Cold pump</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>RE5 - Hot pump</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>RE7 - Solar panel pump</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>RE8 - Cold pump low</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>RE9 - Aux circ pump</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>RE10 - Defrost valve</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>AN1 - Compressor speed</td>
<td>0.0 %</td>
<td></td>
</tr>
<tr>
<td>AN1 - Compressor speed</td>
<td>0.0 V</td>
<td></td>
</tr>
</tbody>
</table>

In MainSwitch field, **On** means the unit is running, **Off** the unit is stopped and **Manual** that the outputs can be operated from this menu for service purposes. Manual mode should be used by trained personnel only!

Setting the defrost function
Open the Installer section, Installer menu and scroll to the line with Defrost settings

<table>
<thead>
<tr>
<th>31-01-2010</th>
<th>Installer</th>
<th>09:31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat pump settings</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Hot water settings</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Heating settings</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td><strong>Defrost settings</strong></td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Solar panel settings</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Service</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>New password</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Press the Enter button to show the Defrost menu
Enable use of a solar panel

Open the Installer section, Installer menu and scroll to the line with Hot water settings.

Press the Enter button to open the Hot water settings menu.
In Hot water source select a setting which uses the solar panel: **SP, HP+SP, SP+EH, HP+EH+SP, SP+HP-DUAL**. Default setting is only to use the heat pump, **HP**.

Settings for the solar panel can be set by opening the Solar panel settings menu.

After pressing the Enter button the Solar panel settings menu will be shown.

### Solar panel settings

<table>
<thead>
<tr>
<th>Date</th>
<th>Installer</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>31-01-2010</td>
<td>Installer</td>
<td>09:31</td>
</tr>
<tr>
<td>Heat pump settings</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Hot water settings</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Heating settings</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Defrost settings</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Solar panel settings</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Service</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>&gt;</td>
<td></td>
</tr>
<tr>
<td>New password</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

### Water tank

<table>
<thead>
<tr>
<th>Sensor selection</th>
<th>Water tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start temp. diff.</td>
<td>5.0 °C</td>
</tr>
<tr>
<td>Stop part</td>
<td>0.0 °C</td>
</tr>
<tr>
<td>Max solar panel temp</td>
<td>95.0 °C</td>
</tr>
<tr>
<td>Max water temp.</td>
<td>70.0 °C</td>
</tr>
<tr>
<td>Max restart temp.</td>
<td>70.0 °C</td>
</tr>
</tbody>
</table>
6. Functions of the LMC320

The LMC320 controller is designed for heat pumps for domestic heating. The system contains an evaporator for cooling air or brine, a compressor with either fixed or variable speed and either a common or dual condensers for heating of water. For air evaporator a defrost control system for hot gas bypass or air defrost is available.

The system can also contain a solar panel for heating of domestic hot water. On the water system a change-over valve between production of domestic hot water and hot water for heating is controlled. Control of the pumps when using a heating accumulation tank is included. Electrical heaters in series with the heat pump condenser are used for backup.

The controller includes a number of functions which are listed below.

**Seasonal mode - summer/winter operation**
During the summer period there is no need for heating and to save energy the controller will only generate hot tap water using the heat pump and/or an optional solar panel. On the main (default) menu, the actual seasonal status is shown.

The user can manually select between Summer and Winter on the User menu.

The unit will switch automatically if set to Auto based on the settings below:
- If the temperature has been above 17 °C for 24 hours, the unit switches to Summer mode.
- If the temperature has been below 13 °C for 24 hours, the unit switches to Winter mode.

**Ambient room temperature compensation / heating setpoint control**
There are the following heating setpoint control modes which use different strategies to calculate the needed capacity:
- Min comp.
- Ambient
- Room
- Amb + room
- Room On/Off
**Heating control – Min comp.**
Compensation is disabled and setpoint for return water temperature is set to minimum allowed return water temperature.

**Heating control – Ambient**
Use the actual ambient temperature to calculate a needed setpoint. It is possible to pre-program the setpoint for the return water temperature with respect to the actual ambient temperature. The desired return water temperature is adjusted for 5 ambient temperatures: -20 °C, -10 °C, 0 °C, +10 °C and -20 °C.
Based on these settings, the needed return water temperature is calculated based on interpolation between the given temperatures. Below -20 °C and above +20 °C the programmed settings for -20 °C respectively +20 °C are used.

There are 10 pre-programmed curves. Please see section Ambient compensation curves for actual curves.

**Heating control – Room**
Compensation of return water temperature is calculated using only the room temperature.

The return water temperature control is based only on the measured room temperature and the selected setpoint.

Return water temperature is limited by Heating.Set point Min and Heating.Set point Min + Ambient/Room comp.Max room comp. It is therefore important to set these values accordingly.

**Heating control Amb + room**
Room temperature compensation with respect to both ambient and room temperature.
Compensation of return water temperature based on ambient temperature is not always sufficient since influence of wind and sun can affect the heating demand significantly.
Room temperature compensation has the possibility to ensure the wanted room temperature in a selected “representative” room where the best achievable comfort is desired.

Room temperature compensation will raise the return water
temperature if the room temperature in the critical room can not be maintained with the calculated return water temperature setpoint form ambient compensation.

Room compensation has two settings, first the wanted setpoint in the room and second the maximum number of degrees the return water temperature may be increased to maintain the wanted room temperature. Typical values would be 20 °C for room temperature and 10 °C for maximum increase of return water temperature – Ambient/room comp.Max room comp.

Room temperature compensation can only increase the return water temperature with respect to the calculated return water temperature from the ambient compensation function. It is therefore important that the ambient compensation is adjusted to minimum values for return water temperature

**Heating control – On/Off room temperature control**

Room temperature can be controlled based on a simple start and stop of the heatpump.

Room temperature setpoint is set on the user menu – Room temp. Set point and the acceptable difference is set in installer menu - Heating settings.Heating neutral zone.

When the room temperature is below the setpoint minus half of the difference, the heat source reference setpoint is set to the maximum allowable temperature. When the room temperature is above the setpoint + half of the allowable difference, the heat source is stopped by setting the reference setpoint to minimum allowable temperature.

Minimum and maximum return water temperatures are respected and so are the restart times for the compressor. Hot tap water production can overrule this function.

If the room temperature sensor is defect, the reference for the returns water temperature is set to Heating.Set point Min.

**Heating control**

If heating is activated, the controllers will primarily use the heat pump controller for heating and only use supplemental (electrical or boiler) heating if the capacity of the heat pump is too low.
There are four modes of the heating control

1. On/Off compressor control based on return water temperature
2. Modulating compressor control based on supply water temperature
3. On/Off compressor control based on heating accumulator water tank temperature
4. Modulating compressor control based on heating accumulator water tank temperature – uses inverter

In heating control modes 2 and 4 the capacity is controlled by a PI controller. The output is the requested capacity. The actual capacity is formed based on the requested capacity (CapReq). The rate of actual capacity (CapAct) change is limited to max +/-1% per second and if evaporator sensor temperature is close to a preset value (MinTevap) the rate of change limited according to the graph below. Gain (Gain) and integration time (Tn) is adjustable.

In heating control modes 1 and 3 the compressor is started when the selected temperature is below the setpoint – neutral zone. The compressor is stopped when the temperature is above the setpoint.

When capacity exceeds a preset value (StartCap) the compressor is started. When the capacity is lower than a preset value (Stop Cap) the compressor is stopped. The PI controller runs continuously also during off periods.

The compressor relay is open when the compressor is stopped.

![](chart.png)
The first 5 seconds after start a constant preset voltage (Ustart) is sent to the inverter. After that a voltage linear to the capacity is sent to the output (see graph below). The rate of capacity change is limited to max 1% per second.

**Supplemental heating**

If the heat pump has insufficient capacity external heating, electrical or a boiler will be used as supplemental heat source. The default delay before the supplemental heating is activated is 30 min – after a compressor start.

**Hot water control**

Hot water is produced using the heat pump, a supplemental heating, a solar panel or a combination of these heat sources. Supplemental heating has a lower set point and is only meant as a backup function for producing hot water. The solar panel is delivering hot water when it can and is operated in parallel with the other two heat sources.

If the compressor is controlled by a frequency inverter, the capacity (speed) is kept at a constant level during hot water production. This setting, **Hot water capacity** is default at 80% of maximum speed and can be adjusted to the most energy efficient setting of the compressor and installation.

Since the mechanical losses are reduced with reduced speed and the losses at each start are minimized, a compressor with a frequency inverter has a more stable water temperature, a longer lifetime and better energy efficiency.
**Hot tap water valve**
The output for the 3-way valve is inactive when the water temperature is within the setpoint – neutral zone setting. When there is a request for more hot water in the tank, the relay is activated whether the compressor or supplemental heating is used. The solar panel is independent of this 3-way valve.

If an installation is with a dual condenser, see Examples of application use, the output can be used for a circulation pump.

**Anti-Legionella function/treatment**
In hot water tanks with lower hot water temperatures there can be a growth in Legionella bacteria’s in the water. To prevent this growth, the controller can be scheduled for regularly Legionella treatments where the water temperature is raised to 60 °C. This is done using the heat pump, external heat supply if available and solar panel if available.

If the temperature is not reached after 5 hours within two attempts with normal time interval, alarm 607 Legionella failed is raised.

**Solar panel control**
The heat pump installation can be equipped with a solar panel as a supplemental hot water source. The solar panel must have its own coil for heat exchange in the water tank and must be self-secured against overheating if there is no more need for hot water in the hot water tank. See section Examples of application use.

The solar panel is controlled by its own state machine and is only affected from the main program if a total stop condition occurs. This will also stop the solar panel heating.

In section [Installer – Solar panel settings](#) the different parameters and ranges are described.

**Defrost handling**
A ground / water heat pump does not need defrosting, so for this type of installation the automatic defrost must be deactivated.

Since an air evaporator in air/water heat pumps can be filled with
frost at low ambient temperatures the LMC320 is equipped with an automatic defrost system.

The defrost method can be Air, Hot gas, Auto or Off. Air means only the fan is used for melting the ice in the evaporator. Hot gas uses a hot gas/bypass valve to let the hot gas from the discharge side of the compressor though the evaporator and thereby melting the ice from the “inside”. In Auto mode hot gas is only used at ambient temperatures below 3 °C. Off is used to disable automatic defrost.

The settings are accessible on the Installer – Defrost settings menu where the different settings are also described.

Safety cut out
There are three safety cut outs:
High pressure  The controller will attempt 3 restarts before user intervention is needed
Low pressure  The user must acknowledge the alarm for starting again
Brine leakage  The user must acknowledge the alarm for starting again

Sensor monitoring
The sensors are monitored against short circuit or lost connection and the appropriate alarm is set. Please see section Alarm system and trouble shooting for a list of alarms and how to trouble shoot an alarm.

Hot side pump control
The relay for the hot side pump can be used for different configurations. However the hot side pump is running together with the compressor except during defrosting. This pump is also motioned during pump exercises.

Cold pump control
After the heat pump has stopped, the fan / brine pump will run another 1 min to ensure there evaporator temperature is stabilized. The next compressor start will have lower pressure difference across the compressor and give less mechanical wear on the compressor. At start up of the heat pump, the fan / brine pump starts a little later
to allow heat to be created.

A low limit ambient temperature can be set and below this temperature the fan / brine pump will run continuously even if the heat pump is stopped. Default this setting is off. There is also a high limit ambient temperature for the fan / brine pump. Above this setting the continuous operation of the fan/brine pump is cancelled.

**Aux pump control**
The aux pump is used for circulating heating water from the heating accumulator tank to the radiators in the building.

**Pump exercise function**
If a pump is standing still for longer periods, dirt and minerals can grow so solid the pump is sticking. To prevent this, the pumps are exercised at regularly intervals for short time, default 15 s. The interval can be adjusted.

**Freeze protection**
The controller has anti-freeze protection functions to prevent damages to the installation. These anti-freeze functions are always active including in the Off-mode. Malfunctioning sensors could prevent these functions to work.

- If the ambient temperature drops below 2 °C, the circulation pump for central heating is started. Hereby the installation in cold areas is secured and the water temperature can be monitored.
- If hot tap water temperature or heating water temperature drops below 2 °C, all circulations pumps are started together with the heat pump and supplemental heating to try to raise the water temperatures above 5 °C.

A warning, AL604 Frost protection will be set if the start condition is set but there is no temperature rise.

**Minimum evaporator/brine temperature limiter**
If the brine temperature of the brine gets too low, there is a risk of freezing the brine and thereby damaging the installation. If this limit is reached, the heat pump is turned off but the pump is kept running constantly.
7. Menu system

Overview of the menu system
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.

Status shows the status of the heat pump
Seasonal status can be Summer or Winter. This affects the settings.
Room temperature shows the temperature at the room control sensor.

If the alarm icon is flashing, the listed alarm is active or unacknowledged.

Password menu
Enter the password for the desired user category.
Default passwords:
User  1
Installer  2
**User menu**

**Language:**
At the moment only English is available.

**Display:**
View values from the unit

**Alarm:**
A list with up to 16 alarms

**Time:**
Set the time

**Room temp. Set point:**
View or adjust the wanted room temperature
Range 5.0 – 40.0 °C
Default 20.0 °C

**Hot water set point:**
View or adjust the wanted hot water temperature
Range 5.0 – 55.0 °C
Default 20.0 °C

**Ambient curve offset:**
Set an adjustment/fine tuning for the selected temperature curve.
This offset is applied for the entire curve regardless of selected curve.
Range -10.0 – 10.0 °C
Default 0.0 °C

**Seasonal mode:**
Switch between only producing hot water and hot water and heating.
Summer: Only hot water is produced
Winter: Hot water and heating is produced
Auto: The ambient temperature is used for automatic switching between Summer and Winter
Default is Auto.

**New password:**
New code for the user section
User - Display menu

View readings and settings for the heat pump.

**Status:**
- Heating, Hot water, Off

**Heating supply temp.**:
Supply temperature for heating system.

**Heating return temp.**:
Return temperature for heating system.

**Water tank temp.**:
Temperature of the water in the hot tap water tank.

**Ambient temp.**:
Ambient temperature

**Room temp.**:
Show actual room temperature.

**Heating tank temp.**:
Temperature of the heating tank.

**Cold side supply temp.**:
Inlet temperature of the cold side.

**Cold side return temp.**:
Outlet temperature of the cold side.

**Evaporator temp.**:
Evaporator temperature.

**Heating set point**:
Heating set point

**Hot water setpoint**:
Hot water setpoint

**Compressor frequency**:
Actual voltage sent to the inverter for the compressor

**Solar panel status**:
Off, Heating, Forced stop

**Solar panel temp.**:
Temperature of the solar panel.

**Solar panel water temp.**:
Water temperature of the solar panel
User- Alarm menu
Show active or unacknowledged alarm and warnings. Only alarms starting with a capital before the text Warning, Alarm or Critical can be acknowledged and will be cleared from the list. Default is No alarm.

User - Time setting menu
Set the hour and minute in the real time clock of the controller.

Installer menu
Heat pump settings:
Settings for the heat pump
Hot water settings:
Settings for the hot water.
Heating settings:
Heating setup
Defrost settings:
Adjustment of defrost function
Solar panel settings:
Use of the solar panel
Service:
Access to the service menus
Date:
Set the data for the controllers real time clock
New password:
Set a new password for the installer section
Installer - Heat pump settings

Settings for controlling the heat pump.

**HP stop sensor:**
Control sensor to use for stopping the heat pump at high temperature
Return, Supply, None.
Default Return.

**Stop all sensor:**
Control sensor to stop the entire unit including the solar panel.
Return, Supply, None.
Default Supply

**HP stop temp.:**
The heat pump will stop when this temperature is reached
Range 30.0 °C – 70.0 °C
Default 70.0 °C

**Stop all temp.:**
All supply heat will be stopped when this temperature is reached
Range 30.0 °C – 90.0 °C
Default 70.0 °C

**Control mode:**
Control methods of the heat pump when generating heating
*Ret On/Off:* On/Off control of the heat pump based on the return temperature of the heating system
*HTank On/Off:* On/Off control of the heat pump based on the temperature of the heating accumulator tank

**Sup Modul:**
Speed control of compressor via a FI based on supply temperature of the heating system.

**HTank Mod.:**
Speed control of compressor via a FI is based on temperature of heating accumulator tank
Default: Ret On/Off

**Min comp stop time:**
Minimum off time for the compressor.
Range 1 – 15 min
Default 6 min.

**Electrical heat delay:**
Minimum wait time before the electrical supply heating is turned on.
Range 0 – 60 min
Default 30 min.

**Heat pump start up time:**
Time from pump start to compressor start.
Range 15 – 120 s
Default 60 s.

**Pump exercise interval:**
Select how often the pumps should be activated to prevent pump damage during standstill periods of the heat pump.
The pumps will run for 15 s
Range 0 – 60 d
Default 1 d.

**Fan stop delay:**
Select how long time the fans/ cold pump should run after the compressor stops.
Range 0 – 60 s
Default 15 s.

---

### Installer - Hot water settings

Setup of hot water sources, temperature and control.

**Hot water source:**
Different sources and combinations.
NONE: No one defined
HP: Heat pump
HP-DUAL: Heat pump with dual condenser
EH: Electrical heat
SP: Solar panel
HP+EH
HP+SP
SP+EH
HP+EH+SP: All sources are used according to best energy efficiency
SP+HP-DUAL
Default: HP

**Hot water set point:**
- Desired hot water temperature
- Range 5 ° to 55 °C
- Default 45 °C

**Hot water neutral zone:**
- Neutral band from hot water setpoint.
- Range 0.1 to 15.0 °C
- Default 4.0 °C

**Hot water capacity:**
- Use a specific capacity / speed when producing hot water (only for modulating control).
- A frequency inverter controlled heatpump may have a better energy efficiency at lower speed than at max speed.
- Range 10 – 100 %
- Default 80 %

**Hot water minimum:**
- If hot tap water temperature is below hot water minimum for more then “Electrical heat delay”, the electrical heater is turned on.
- If hot tap water temperature is above hot water minimum, the heater is turned off.
- Range 5 – 55 °C
- Default 35 °C

**Legionella interval:**
- Intervals between anti-Legionella operations.
- Range 0 – 21 d
- 0 d = Off.
- Default 7d
Installer - Heating settings
Setup of house heating control.

Heating source:
Different heat sources are selectable:
- HP: Heat pump
- EH: Electrical heat supply
- HP + EH: Heat pump and electrical heat supply.
Default HP

Heating controller:
Heat controller setup menu

Room/ambient compensation:
Menu for setup of room temperature compensation according to actual ambient temperature. Installation specific.

Set point Min:
Low limit for heating setpoint.
Range 0.5 – 55.0 °C
Default 20.0 °C

Set point Max:
High limit for heating setpoint.
Range 0.5 – 55.0 °C
Default 55.0 °C

Heating setpoint:
Calculated setpoint for heating.
Only view, calculated according to ambient / room compensation settings and setpoint min / max.

Heating neutral zone:
Neutral band for On/Off control (not for modulating control).
Range 0.1 – 15 °C
Default 4.0 °C
Installer - Heating controller menu

The settings in this menu are only used when frequency inverter operation is used – modulating control.

Setup of the heating controller.
The heating control is a PI-regulator that calculates a capacity request. Please see the function.

Stop capacity:
Capacity is 0 to 100 %, below this setting the heating is stopped.
For use with frequency inverter
Range 0.1 – 100 %
Default 10.0 %

Start difference cap.:
Hysteresis in capacity before heating is started again.
For use with frequency inverter
Range 0 - 100%
Default 30%

Voltage at 0%:
Output voltage to achieve stop capacity + start difference with a frequency inverter
Range 0.0 – 10.0 V
Default 2.0 V

Voltage at 100%:
Output voltage to achieve 100% capacity with a frequency inverter
Range 0.0 – 10.0 V
Default 10.0 V

Start voltage:
Initial start-up capacity/speed of the compressor with a frequency inverter.
Range 0.0 – 10.0 V
Default 1.0 V

Gain:
Gain of the heating
PI-regulator
Range 1 – 20
Default 5.0
**Integration time:**
Integration time for the heating PI-regulator.
- Range 30 – 600 s
- Default 240 s

**Evaporator temp. min:**
Limit for limitation function.
- When the evaporator temperature is below this value, the capacity is reduced to avoid low pressure cut-out.
- Range -70.0 – 0 °C
- Default -70.0 °C

---

**Installer - Ambient / Room temperature compensation menu**
The controller will try to maintain a stable room temperature if heating is enabled.

A heating setpoint is calculated according to the settings on this menu.

To maintain a comfortable room temperature the controller can compensate for ambient temperature and/or room temperature. This is achieved using different compensation curves where the effect of different ambient temperatures on the heating setpoint can be set.

Please see section for a full description.

**Temp control mode:**
- With or without ambient / room temperature compensation.

**Options:**
- Min comp: No ambient compensation, fixed setpoint
- Ambient: With ambient compensation.
- Room: Only room compensation.
- Amb+room: With ambient and room compensation.
- Room on/off: No ambient compensation.
- Default: Min comp
**Ambient curve:**
Select between 10 preconfigured curves or a manual configured curve
Default curve 1

**Curve -20°C:**
Corrected room temperature setpoint at ambient temperature of -20 °C
Range -100.0 – 100.0 °C
Default 45.0 °C (Curve 1)

**Curve -10°C:**
Corrected room temperature setpoint at ambient temperature of -10 °C
Range -100.0 – 100.0 °C
Default 42.0 °C (Curve 1)

**Curve 0°C:**
Corrected room temperature setpoint at ambient temperature of 0 °C
Range -100.0 – 100.0 °C
Default 39.0 °C (Curve 1)

**Curve +10°C:**
Corrected room temperature setpoint at ambient temperature of +10 °C
Range -100.0 – 100.0 °C
Default 33.0 °C (Curve 1)

**Curve +20°C:**
Corrected room temperature setpoint at ambient temperature of +20 °C
Range -100.0 – 100.0 °C
Default 30.0 °C (Curve 1)

**Max room comp.:**
Maximum allowed corrected room temperature setpoint.
Range -100.0 – 100.0 °C
Default 5.0 °C
### Installer - Defrost settings

Settings for the automatic defrost of the evaporator in air evaporator systems. Not used for brine systems.

To achieve maximum efficiency of the evaporator the defrost handling can be fine tuned to the actual installation.

Defrost start criteria is fulfilled when:

\[ T_{\text{evap}} < \text{Ice level setting} \quad \text{and} \quad (T_{\text{ambient}} - T_{\text{evap}}) > \text{Relative ice level setting} \]

**Defrost method:**

- **Auto:** Automatic defrost method selection
  - Hot gas is only used at ambient temperatures below 3 °C
- **AIR:** Only use air for defrost
- **HG:** Only use hot gas
- **OFF:** No defrost

Default is OFF

**Ice level:**

Defines the maximum evaporator temperature at which ice is formed.

- Range: -70 – 10 °C
- Default: 0.5 °C

**Relative ice level:**

Defines the minimum temperature difference between ambient temperature and evaporator temperature at which ice is formed.

- Define at ambient temperature of 0 °C.
- Range: 2.0 – 15.0 °C
- Default: 6.0 °C

**Ice time:**

Defines the time the defrost start criteria must be fulfilled before a defrosting is started.

- Range: 0 – 240 min
Default 20 min

**Min time between defrost:**
Minimum time between two automatic defrosts.
Range 10 – 480 min
Default 60 min

**Evaporator stop temp.:**
Defrost stops when the evaporator temperature exceeds this setting.
Only used for hotgas defrost.
Range 1.0 – 25.0 °C
Default 5.0 °C

**Max defrost time:**
Maximum allowable time for the evaporator temperature to reach the Evaporator stop temp during a defrost.
Defrost stops when defrost time exceeds this setting.
Range 1 – 240 min
Default 10 min

**Advanced defrost setting:**
Menu for advanced defrost settings

---

**Installer - Advanced defrost settings menu**
In this menu a further fine tuning of the installation can be done for air to water installations.
Instead of operating with fixed defrost intervals an ‘ice timer’ is used for calculating time for the next defrost.

**Ice melt temperature:**
Defines the ambient temperature above which the ice timer is decremented when the compressor is switched off or when the evaporator temperature is above 1 °C.
Range -70.0 – 30.0 °C
Default 3.0 °C

---

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Ice melt temperature</th>
<th>Fast ice melt temp.</th>
<th>Force fan ambient min</th>
<th>Force fan ambient max</th>
<th>Forced fan Tevap stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>31-01-2010</td>
<td>09:31</td>
<td>3.0 °C</td>
<td>8.0 °C</td>
<td>-30.0 °C</td>
<td>3.0 °C</td>
<td>2.0 °C</td>
</tr>
</tbody>
</table>
**Fast ice melt temp.:**
Defines the ambient temperature above which the ice timer is decremented fast when the compressor is switched off or when the evaporator temperature is above 1 °C.
Range -70.0 – 30.0 °C
Default 8.0 °C

**Force fan ambient min:**
Min limit for continuous run of brine pump/fan when heat pump has stopped.
Range -70.0 – 10.0 °C
Default -30.0 °C

**Force fan ambient max:**
Max limit for continuous run of brine pump/fan when heat pump has stopped.
Range -70.0 – 10.0 °C
Default 3.0 °C

**Forced fan Tevap stop:**
Run brine pump/fan continuous until evaporator temperature exceeds this setting.
Range -70.0 – 10.0 °C
Default 2.0 °C

---

**Installer - Solar panel settings**
Settings for use of the solar panel. The settings are only relevant if a solar panel is set as a heating source for hot water or heating.

**Sensor selection:**
Selection of the controlling sensor.
- Water tank: Temperature sensor in the water tank
- Solar water: Temperature sensor in the solar panel
- Default: Water tank

**Start temp. diff.:**
Hysteresis for starting the circulation pump for the solar panel.
Range 1.0 – 40.0 °C
Default 5.0 °C
Stop part:
   Scale of Start temp. diff used for stopping hot water production again.
   0.0: stop at set point;
   0.5: stop at ½ * Start temp. diff
   Range 0.0 – 1.0
   Default 0.0 (Stop at setpoint)

Max solar panel temp.:
   Max allowable solar panel temperature.
   Above this the circulation pump is stopped to prevent damage on the rest of the installation.
   Range 70.0 – 120.0 °C
   Default 100.0 °C

Max water temp.:
   Max allowable water tank temperature.
   Above this temperature the circulation pump is stopped.
   If “Solar water” sensor is selected, both water tank temperature and solar water temperature must be below this setting.
   Range 50.0 – 90.0 °C
   Default 70.0 °C

Max restart temp.:
   Solar panel temperature at which operation can be continued again after an stop due to overheat of the solar panel.
   Range 30.0 – 90.0 °C
   Default 70.0 °C
User Manual - Lodam Heat Pump Controller

Installer - Service menu
Show software version, runtime counters and use manual mode for trouble shooting purposes.

LMC 320 v.:  
Software version of the LMC320 heat pump controller.

LUP 200 v.:  
Software version of the LUP 200 operating panel

Counters:  
Menu with various runtime counters for the installation

Manual:  
Menu with controller outputs which can be controlled manually when the unit is in manual mode for trouble shooting or service purposes.

Installer - Date menu
Set the date of the controller

Year: Set the year of the controller
Month: Set the actual month
Day: Set the actual day
Installer - Runtime counters
Hour counter or activation counters for different functions in the controller

<table>
<thead>
<tr>
<th>Date</th>
<th>Run time</th>
<th>Main Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>31-01-2010</td>
<td>09:31</td>
<td>On</td>
</tr>
</tbody>
</table>

31-01-2010  Run time  09:31
Heat pump  217h
Compressor  173h
Heater  34h
Hot water  45h
Cold side pump  187h
Hot side pump  200h
Solar panel pump  5h
Cold side pump low  0h
Aux circ pump  217h
Defrost valve  2h
Hot gas defrost count  24
Air defrost count  13

Installer – Manuel mode menu
For trouble shooting purposes the outputs listed to the left can be activated to check the functionality.
The controller must first be set in manual mode in the Heat pump menu in the field Control mode.
If the controller is not in manual mode all settings will always be Off or 0.00V.

MainSwitch:
Operation mode.
Off: Unit is stopped
On: Unit is running
Manual: Unit is in manual mode for service
Default: On

RE1 – compressor:
If set to On the relay for the compressor is activated.

RE2 – Heater:
If set to On the relay for the heater is activated.

RE3 – Hot water:
If set to On the relay for the 3-way valve is activated.
RE4 – Cold pump: 
If set to On the relay for the cold pump is activated.

RE5 – Hot pump: 
If set to On the relay for the hot water circulation pump is activated.

RE7 – Solar panel pump: 
If set to On the relay for the solar panel pump is activated.

RE8 – Cold pump low: 
If set to On the relay for the cold pump low is activated.

RE9 – Aux circ pump: 
If set to On the relay for the aux circulation pump is activated.

RE10 – Defrost valve: 
If set to On the relay for the defrost valve is activated.

AN1 – Compressor speed: 
The entered percentage will be sent out to output ANOUT0 as a voltage for compressor speed based on entered scaling.
Range 0.0 – 100.0 %.
Default 0.0 %

AN1 – Compressor speed: 
The shown voltage is the calculated voltage sent out to output ANOUT0 for compressor speed.
8. Examples of application use

Air to water, compressor On/Off control, solar panel connected to hot water tank

Ground source to water, no solar panel, heating tank on heating system

Ground source heat pump with dual condenser
9. Connections

Connections on the LMC300

LMC320 Heat Pump Controller
LMC300 512 kB + LOM309

Supply 24V ac
R1 Compressor
R2 Heater
R3 3-way valve
R4 Cold pump
R5 Hot side pump
R6 Di1 HP switch compressor
R7 Solar panel pump
R8 Aux circulation pump
R9 Defrost valve
R10 Alarm
R11 Alarm

AO0 Compressor inverter
0-10V

T1 Heating supply temp.
T2 Heating return temp.
T3 Water tank temp.
T4 Ambient temp.
T5 Room temp.
T6 Heating tank temp.
T7 Cold side supply temp.
T8 Cold side return temp.
T9 Evaporator temp.
T10 Solar water temp.
T11 Solar panel temp.

Connections

Connections on the LMC300
Connection between LMC300 and LUP200

LMC300
CN7
12VU
A1
/B1
A2
/B2
Gnd

LUP200
RS485

<table>
<thead>
<tr>
<th>LMC300</th>
<th>LUP200</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN7</td>
<td>RS485</td>
</tr>
<tr>
<td>12VU</td>
<td>+12 VDC In</td>
</tr>
<tr>
<td>A1</td>
<td>A</td>
</tr>
<tr>
<td>/B1</td>
<td>/B</td>
</tr>
<tr>
<td>A2</td>
<td>2</td>
</tr>
<tr>
<td>/B2</td>
<td>3</td>
</tr>
<tr>
<td>Gnd</td>
<td>4</td>
</tr>
</tbody>
</table>

Connections on the LUP200

- Display heater
- Power supply
- RS485
- USB

- Gnd
- +12 VDC In
- Max. 1.5 A
- Gnd
- +12 VDC Out
- +12 VDC In Ext

Remove jumper if external power supply is used
## Technical data

LMC320 Heat Pump Controller with LOM309 Slave I/O Board

<table>
<thead>
<tr>
<th>Technical specifications, LMC320+LOM309:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>175mm (l) * 100mm (w)</td>
</tr>
<tr>
<td>Power supply</td>
<td>12VDC (Vbat); 15 - 30VDC/12 - 24VAC; 110 - 230 VAC +/- 10%, 50-60 HZ</td>
</tr>
<tr>
<td>CPU</td>
<td>SAM7S512, 32bit 48 MHz - 512kB program memory</td>
</tr>
<tr>
<td>External flash</td>
<td>1 MB ~ 8 MB</td>
</tr>
<tr>
<td>Saving of parameter setting</td>
<td>10 kB</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20°C ~ +60°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-30°C ~ +60°C</td>
</tr>
<tr>
<td>Temperature inputs, T1 to T11</td>
<td>11; for NTC sensors -40°C ~ +99°C, +/- 1°C accuracy; 2 can be used for 0-10V input*, 9 can be used for digital inputs</td>
</tr>
<tr>
<td>Analog inputs, Al1 to Al2</td>
<td>2; 0 - 10V with 12 Volt supply, 0-5V with 5 Volt supply for radiometric pressure transmitters; Rin: 25KΩ</td>
</tr>
<tr>
<td>Digital inputs</td>
<td>4; not galvanic isolated - 0-5V with pull-up resistor, 2 can be used for secure inputs for RE1-2</td>
</tr>
<tr>
<td>Analog outputs, AO1 to AO4</td>
<td>4, 0-10V, +/- 3%; max 10mA; max frequency 1Hz</td>
</tr>
<tr>
<td>RAM</td>
<td>64kB</td>
</tr>
<tr>
<td>Safety relay outputs, RE1 and RE2</td>
<td>2; can be used together with digital inputs 1 and 2. - 10A 24VDC / 10A 250VAC</td>
</tr>
<tr>
<td>Relay outputs, RE3 to RE5</td>
<td>3; 10A 24VDC / 10A 250VAC. RE5 is a toggle relay</td>
</tr>
<tr>
<td>RS485 ports</td>
<td>2 with 12V 100mA outputs</td>
</tr>
<tr>
<td>USB port (slave mode only)</td>
<td>1; for software update and communication with a PC</td>
</tr>
<tr>
<td>Option connectors 1 and 2</td>
<td>2; 24 pins for option boards</td>
</tr>
<tr>
<td>Real time clock</td>
<td>With 1 year battery back up</td>
</tr>
<tr>
<td>12VDC output</td>
<td>Up to 1A depending on application</td>
</tr>
</tbody>
</table>

Note 1: The maximum cable length for a NTC temperature sensor is 30m.

Note 2: On the LMC300 board the wire jumper closest to Relay 5, between Relays 4 and 5, must be mounted. It must be mounted parallel with the relays.
### Technical specifications, LUP200:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Display</strong></td>
<td>262k colors, graphical display 320x240 pixels</td>
</tr>
<tr>
<td><strong>PCB dimensions</strong></td>
<td>85mm (l) * 60mm (w) * 20mm (h)</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>12V – 24VDC</td>
</tr>
<tr>
<td><strong>CPU</strong></td>
<td>AT91SAM7, ARM7 processor</td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>-20°C ~ + 60°C</td>
</tr>
<tr>
<td><strong>Storage temperature</strong></td>
<td>-30°C ~ + 60°C</td>
</tr>
<tr>
<td><strong>RAM</strong></td>
<td>16 MB</td>
</tr>
<tr>
<td><strong>RS485 ports</strong></td>
<td>1 port with 2 x connections and possibility of connecting 4 units in &quot;daisy chain&quot;</td>
</tr>
<tr>
<td><strong>USB port</strong></td>
<td>1 mini B connector (device mode only)</td>
</tr>
<tr>
<td><strong>Temperature sensor</strong></td>
<td>1 onboard NTC temperature sensor</td>
</tr>
<tr>
<td><strong>Display backlight lifetime</strong></td>
<td>30,000 hours at 20°C and &quot;normal&quot; brightness</td>
</tr>
<tr>
<td><strong>Light intensity sensor</strong></td>
<td>1 onboard light intensity sensor</td>
</tr>
<tr>
<td><strong>Number of buttons</strong></td>
<td>6 buttons</td>
</tr>
<tr>
<td><strong>Languages</strong></td>
<td>Ready for multiple languages &amp; &quot;special&quot; characters</td>
</tr>
<tr>
<td><strong>IP</strong></td>
<td>66 (^1)</td>
</tr>
</tbody>
</table>

\(^1\): IP66 if the LUP200 is mounted in a metal sheet cabinet of at least 1.5mm thickness and level accuracy better than 0.1mm.

Note2: Maximum cable length between the LMC320 and the LUP200 is 100 m.
## Technical specifications, LOM320:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>92mm (w) * 78mm (h)</td>
</tr>
<tr>
<td>Power supply</td>
<td>12 VDC</td>
</tr>
<tr>
<td>CPU</td>
<td>ARM920T, 32bit, 200MHz</td>
</tr>
<tr>
<td>Operating temperatures</td>
<td>-20°C ~ +60°C</td>
</tr>
<tr>
<td>Storage temperatures</td>
<td>-30°C ~ +60°C</td>
</tr>
<tr>
<td>Ethernet</td>
<td>1; 10/100 Mbit</td>
</tr>
<tr>
<td>RS485 ports</td>
<td>1</td>
</tr>
<tr>
<td>USB host</td>
<td>2 ports with A connector</td>
</tr>
<tr>
<td>USB device</td>
<td>1 port with mini B connector</td>
</tr>
<tr>
<td>(External) flash / Flash for data logging</td>
<td>16MB</td>
</tr>
<tr>
<td>RAM</td>
<td>64MB</td>
</tr>
<tr>
<td>GPRS/GSM</td>
<td>Modem Siemens MC55 incl. sim card reader</td>
</tr>
<tr>
<td>Option connector</td>
<td>24 pins for connection to LMC300</td>
</tr>
<tr>
<td>Optimized for linux applications</td>
<td>2 x USB host, webservers, mail, GSM/GPRS, datalog via internet, software update via internet, 4 LEDs, 1 button, 485 termination jumper</td>
</tr>
</tbody>
</table>

Note: The LOM320 Ethernet board is optional.
# 11. I/O list for the LMC320 Heat Pump Controller

Software interface consists of signals also mentioned in the hardware chart as I/O.

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Pin</th>
<th>Logic</th>
<th>Description</th>
</tr>
</thead>
</table>
| High pressure switch compressor HP | DI   | DIN1| NO    | High pressure safety switch signal  
Signal activated by short circuiting to ground.  
3,3VDC, max 3,3mA, 1kΩ.  
Not galvanic isolated. |
| Low pressure switch compressor LP  | DI   | DIN2| NO    | Low pressure switch signal  
Signal activated by short circuiting to ground.  
3,3VDC, max 3,3mA, 1kΩ.  
Not galvanic isolated. |
| Brine pressure switch BP           | DI   | DIN3| NO    | Brine pressure switch signal  
Signal activated by short circuiting to ground.  
3,3VDC, max 3,3mA, 1kΩ.  
Not galvanic isolated. |
| Start defrost                      | DI   | DIN4| NO    | External signal, start defrost  
Signal activated by short circuiting to ground.  
3,3VDC, max 3,3mA, 1kΩ.  
Not galvanic isolated. |
| Heating supply temperature T1      | T    | Temp1|       | Heating supply temperature  
Lodam NTC sensor  
Measurement range: -60°C to 130°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 130°C  
2 terminals per input  
● Signal  
● Gnd |
| Heating return temperature T2      | T    | Temp2|       | Heating return temperature  
Lodam NTC sensor  
Measurement range: -60°C to 130°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 130°C  
2 terminals per input  
● Signal  
● Gnd |
<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Pin</th>
<th>Logic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water tank temperature T3</td>
<td>T</td>
<td>Temp3</td>
<td></td>
<td>Water tank temperature Lodam NTC sensor Measurement range: -60°C to 130°C Accuracy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ±1°C in the range -30°C to 60°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range -60°C to -30 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range +60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 terminals per input • Signal • Gnd</td>
</tr>
<tr>
<td>Ambient temperature T4</td>
<td>T</td>
<td>Temp4</td>
<td></td>
<td>Ambient temperature Lodam NTC sensor Measurement range: -60°C to 130°C Accuracy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ±1°C in the range -30°C to 60°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range -60°C to -30 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range +60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 terminals per input • Signal • Gnd</td>
</tr>
<tr>
<td>Room temperature T5</td>
<td>T</td>
<td>Temp5</td>
<td></td>
<td>Room temperature Lodam NTC sensor Measurement range: -60°C to 130°C Accuracy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ±1°C in the range -30°C to 60°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range -60°C to -30 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range +60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 terminals per input • Signal • Gnd</td>
</tr>
<tr>
<td>Heating tank temperature T6</td>
<td>T</td>
<td>Temp6</td>
<td></td>
<td>Heating tank temperature Lodam NTC sensor Measurement range: -60°C to 130°C Accuracy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ±1°C in the range -30°C to 60°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range -60°C to -30 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range +60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 terminals per input • Signal • Gnd</td>
</tr>
<tr>
<td>Cold side supply temperature T7</td>
<td>T</td>
<td>Temp7</td>
<td></td>
<td>Cold side supply temperature Lodam NTC sensor Measurement range: -60°C to 130°C Accuracy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ±1°C in the range -30°C to 60°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range -60°C to -30 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range +60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 terminals per input • Signal • Gnd</td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Pin</td>
<td>Logic</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------</td>
<td>-------</td>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cold side return temperature</td>
<td>T</td>
<td>Temp8</td>
<td></td>
<td>Cold side return temperature</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lodam NTC sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Measurement range: -60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Accuracy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ±1°C in the range -30°C to 60°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range -60°C to -30°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range +60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>2 terminals per input</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Signal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Gnd</td>
</tr>
<tr>
<td>Evaporator temperature</td>
<td>T</td>
<td>Temp9</td>
<td></td>
<td>Evaporator temperature</td>
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<td></td>
<td></td>
<td></td>
<td>Lodam NTC sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Measurement range: -60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Accuracy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ±1°C in the range -30°C to 60°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range -60°C to -30°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range +60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 terminals per input</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Signal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Gnd</td>
</tr>
<tr>
<td>Solar water temperature</td>
<td>T</td>
<td>Temp10</td>
<td></td>
<td>Solar water temperature</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>Lodam NTC sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Measurement range: -60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Accuracy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ±1°C in the range -30°C to 60°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range -60°C to -30°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range +60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 terminals per input</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Signal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Gnd</td>
</tr>
<tr>
<td>Solar panel temperature</td>
<td>T</td>
<td>Temp11</td>
<td></td>
<td>Solar panel temperature</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lodam NTC sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Measurement range: -60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Accuracy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ±1°C in the range -30°C to 60°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range -60°C to -30°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• ± 3°C in the range +60°C to 130°C</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>2 terminals per input</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• Signal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Gnd</td>
</tr>
<tr>
<td>Compressor speed for inverter</td>
<td>AO</td>
<td>Anout0</td>
<td></td>
<td>Compressor speed for inverter</td>
</tr>
<tr>
<td>0-10V</td>
<td></td>
<td></td>
<td></td>
<td>0 – 10V, 5mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not galvanic isolated.</td>
</tr>
<tr>
<td>Display</td>
<td>SB</td>
<td>A2</td>
<td></td>
<td>RS 485 for communication with LUP200</td>
</tr>
<tr>
<td>(LUP200)</td>
<td></td>
<td>/B2</td>
<td></td>
<td>Half duplex, max. 100m twisted pair cable, 2 * 120Ω termination. Receiver</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gnd</td>
<td></td>
<td>impedance &gt;=12kΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12VU</td>
<td></td>
<td>+12V ±10% (I-limit approx. 100mA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GND</td>
</tr>
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<td></td>
<td>A2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>/B2</td>
</tr>
<tr>
<td>Compressor</td>
<td>DO</td>
<td>RE1OUT</td>
<td>NO</td>
<td>Relay for compressor ON</td>
</tr>
<tr>
<td>R1</td>
<td></td>
<td></td>
<td></td>
<td>Max 10A@250VAC/10A@30VDC</td>
</tr>
<tr>
<td>Heater</td>
<td>DO</td>
<td>RE2OUT</td>
<td>NO</td>
<td>Relay for Heater ON</td>
</tr>
<tr>
<td>R2</td>
<td></td>
<td></td>
<td></td>
<td>Max 10A@250VAC/10A@30VDC</td>
</tr>
<tr>
<td>Hot tap water</td>
<td>DO</td>
<td>RE3OUT</td>
<td>NO</td>
<td>Relay for 3-way Hot tap water valve</td>
</tr>
<tr>
<td>R3</td>
<td></td>
<td></td>
<td></td>
<td>Max 10A@250VAC/10A@30VDC</td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Pin</td>
<td>Logic</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>------</td>
<td>--------</td>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Cold pump R4</td>
<td>DO</td>
<td>RE4OUT</td>
<td>NO</td>
<td>Relay for Cold pump ON Max 10A@250VAC/10A@30VDC</td>
</tr>
<tr>
<td>Hot side pump R5</td>
<td>DO</td>
<td>RE5OUT</td>
<td>NO (NC)</td>
<td>Relay for Hot side pump ON Max 10A@250VAC/10A@30VDC</td>
</tr>
<tr>
<td>Solar panel pump R7</td>
<td>DO</td>
<td>RE2OUT LOM309</td>
<td>NO</td>
<td>Relay for Solar panel pump ON Max 10A@250VAC/5A@30VDC</td>
</tr>
<tr>
<td>Aux circulation pump R9</td>
<td>DO</td>
<td>RE4OUT LOM309</td>
<td>NO</td>
<td>Relay for Aux circulation pump ON Max 10A@250VAC/5A@30VDC</td>
</tr>
<tr>
<td>Defrost valve R10</td>
<td>DO</td>
<td>RE3OUT LOM309</td>
<td>NO</td>
<td>Relay for Defrost (bypass) valve ON Max 10A@250VAC/5A@30VDC</td>
</tr>
<tr>
<td>Alarm R11</td>
<td>DO</td>
<td>RE6OUT LOM309</td>
<td>NO</td>
<td>Relay for Alarm active Max 10A@250VAC/5A@30VDC</td>
</tr>
<tr>
<td>Supply 24 VAC</td>
<td>P</td>
<td>AC</td>
<td></td>
<td>Controller Power Supply 24 VAC Max 18 VA</td>
</tr>
</tbody>
</table>
12. Drawings

All dimensions in mm.

**LMC300**

Mounting dimensions.
13. Standards

- EN61000-6-1 (EMC, Immunity for residential, commercial and light-industrial environments).
- EN61000-6-3 (EMC, Emission standard for residential, commercial and light-industrial environments).
14. Alarm system and trouble shooting

The LMC320 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 can not be acknowledged before the connection has been fixed.

Up to 16 alarms at the same time can be shown.
## Alarm list

<table>
<thead>
<tr>
<th>Alarm number</th>
<th>Type</th>
<th>Name</th>
<th>Description</th>
<th>Elimination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Warning</td>
<td>T1</td>
<td>Open Heating supply temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>101</td>
<td>Warning</td>
<td>T1</td>
<td>Short Heating supply temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>102</td>
<td>Warning</td>
<td>T2</td>
<td>Open Heating return temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>103</td>
<td>Warning</td>
<td>T2</td>
<td>Short Heating return temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>104</td>
<td>Warning</td>
<td>T3</td>
<td>Open Water tank temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>105</td>
<td>Warning</td>
<td>T3</td>
<td>Short Water tank temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>106</td>
<td>Warning</td>
<td>T4</td>
<td>Open Ambient temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>107</td>
<td>Warning</td>
<td>T4</td>
<td>Short Ambient temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>108</td>
<td>Warning</td>
<td>T5</td>
<td>Open Room temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>109</td>
<td>Warning</td>
<td>T5</td>
<td>Short Room temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>110</td>
<td>Warning</td>
<td>T6</td>
<td>Open Heating tank temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>111</td>
<td>Warning</td>
<td>T6</td>
<td>Short Heating tank temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>112</td>
<td>Warning</td>
<td>T7</td>
<td>Open Cold supply temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>113</td>
<td>Warning</td>
<td>T7</td>
<td>Short Cold supply temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>114</td>
<td>Warning</td>
<td>T8</td>
<td>Open Cold return temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>115</td>
<td>Warning</td>
<td>T8</td>
<td>Short Cold return temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>116</td>
<td>Warning</td>
<td>T9</td>
<td>Open Evaporator sensor temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>117</td>
<td>Warning</td>
<td>T9</td>
<td>Short Evaporator sensor temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>118</td>
<td>Warning</td>
<td>T10</td>
<td>Open Solar water temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>119</td>
<td>Warning</td>
<td>T10</td>
<td>Short Solar water temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>120</td>
<td>Warning</td>
<td>T11</td>
<td>Open Solar panel temperature open connection</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>121</td>
<td>Warning</td>
<td>T11</td>
<td>Short Solar panel temperature short-circuited</td>
<td>Check cable and connectors</td>
</tr>
<tr>
<td>Alarm number</td>
<td>Type</td>
<td>Name</td>
<td>Description</td>
<td>Elimination</td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>-----------------------</td>
<td>-------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><strong>Hardware</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>Critical</td>
<td>LOM9 missing</td>
<td>LOM9 missing</td>
<td>Check connection</td>
</tr>
<tr>
<td></td>
<td><strong>Operation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>Warning</td>
<td>Hi Pres</td>
<td>High pressure switch active</td>
<td>The unit restarts when the pressure drops below high pressure switch low-limit again. Check hot side pump/overflow valve on high temperature side. After 3rd cutout the alarm must be acknowledged to start the unit again.</td>
</tr>
<tr>
<td>601</td>
<td>Critical</td>
<td>Low pres.</td>
<td>Low pressure switch active</td>
<td>Check refrigerant charge and expansion valve. The alarm must be acknowledged to start the unit again.</td>
</tr>
<tr>
<td>602</td>
<td>Critical</td>
<td>Leakage</td>
<td>Low pressure in brine - brine pressure switch active</td>
<td>Leakage check of the brine system. The alarm must be acknowledged to start the unit again.</td>
</tr>
<tr>
<td>603</td>
<td>Critical</td>
<td>Hi pres</td>
<td>High pressure switch repeatedly active</td>
<td>Check hot side pump/overflow valve on high temperature side. The alarm must be acknowledged to start the unit again.</td>
</tr>
<tr>
<td>604</td>
<td>Warning</td>
<td>Frost protection</td>
<td>Temperature too low (state freeze protect)</td>
<td>Heat pump and electrical heater running full capacity. Check that setting are not turned off.</td>
</tr>
<tr>
<td>605</td>
<td>Warning</td>
<td>Heat pump overheat</td>
<td>Supply temperature too high (condition total stop)</td>
<td>Check hot side pump/overflow valve on high temperature side.</td>
</tr>
<tr>
<td>606</td>
<td>Warning</td>
<td>Solar panel overheat</td>
<td>Solar panel is in forced stop condition. (SP state Forced stop)</td>
<td>Check connection to external temperature adjustment.</td>
</tr>
<tr>
<td>607</td>
<td>Warning</td>
<td>Legionella failed</td>
<td>Anti Legionella function has timed out twice.</td>
<td>Check electrical heaters and supply of heat to brine circuit.</td>
</tr>
<tr>
<td></td>
<td><strong>Internal controller error</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>904</td>
<td>Warning</td>
<td>Datalog</td>
<td>Error with internal log</td>
<td>Reserved. Not implemented yet.</td>
</tr>
<tr>
<td>905</td>
<td>Warning</td>
<td>Database</td>
<td>Error with internal database</td>
<td>Controller may be defect. Try update the firmware or replace the controller.</td>
</tr>
<tr>
<td>907</td>
<td>Warning</td>
<td>RTC err</td>
<td>Error with the internal real time clock</td>
<td>Replace the controller.</td>
</tr>
<tr>
<td>908</td>
<td>Warning</td>
<td>RTC inv</td>
<td>Invalid data from the real time clock</td>
<td>Unit powered off to long. Set time and date. Else replace the controller.</td>
</tr>
<tr>
<td>998</td>
<td>Warning</td>
<td>TestVer</td>
<td>The software is a test version</td>
<td>Use the release version of the software.</td>
</tr>
<tr>
<td>999</td>
<td>Warning</td>
<td>Manual mode</td>
<td>The unit is in manual mode</td>
<td>Change mode from Manual to On.</td>
</tr>
</tbody>
</table>
15. **Network**  
The LOM320 Ethernet board is optional.

16. **Firmware update**  
Firmware update is done with Lodam Multi Tool, LMT.  
This will update the software in the LMC320 controller and the LUP200 display if necessary.

17. **Accessories**  
Lodam has the following NTC temperature sensors in stock for use with the LMC320 controller.  
In the table are the suggested variant to use and an alternative sensor.  
Only the listed NTC temperature sensors can be used as the characteristic of the NTS element must match.

433015 NTC temperature sensor, Ø6 mm * 20 mm house, cable length 5 m  
433016 NTC temperature sensor, Ø6 mm * 20 mm house, cable length 2 m  
433028 NTC high temperature sensor, max 240 °C, Ø6 mm * 20 mm house, cable length 0.95 m

<table>
<thead>
<tr>
<th>ID</th>
<th>Description</th>
<th>NTC temperature sensor</th>
<th>Alternative sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Heating supply temperature</td>
<td>433016 – 2 m cable</td>
<td>433015 – 5 m cable</td>
</tr>
<tr>
<td>T2</td>
<td>Heating return temperature</td>
<td>433016 – 2 m cable</td>
<td>433015 – 5 m cable</td>
</tr>
<tr>
<td>T3</td>
<td>Water tank temperature</td>
<td>433016 – 2 m cable</td>
<td>433015 – 5 m cable</td>
</tr>
<tr>
<td>T4</td>
<td>Ambient temperature</td>
<td>433015 – 5 m cable</td>
<td>433016 – 2 m cable</td>
</tr>
<tr>
<td>T5</td>
<td>Room temperature</td>
<td>433015 – 5 m cable</td>
<td>(433016 – 2 m cable)</td>
</tr>
<tr>
<td>T6</td>
<td>Heating tank temperature</td>
<td>433015 – 5 m cable</td>
<td>433016 – 2 m cable</td>
</tr>
<tr>
<td>T7</td>
<td>Cold side supply temperature</td>
<td>433016 – 2 m cable</td>
<td>433015 – 5 m cable</td>
</tr>
<tr>
<td>T8</td>
<td>Cold side return temperature</td>
<td>433016 – 2 m cable</td>
<td>433015 – 5 m cable</td>
</tr>
<tr>
<td>T9</td>
<td>Evaporator temperature</td>
<td>433016 – 2 m cable</td>
<td>433015 – 5 m cable</td>
</tr>
<tr>
<td>T10</td>
<td>Solar water temperature</td>
<td>433016 – 2 m cable</td>
<td>433015 – 5 m cable</td>
</tr>
<tr>
<td>T11</td>
<td>Solar panel temperature</td>
<td>433028 – 0.95 m cable</td>
<td>–</td>
</tr>
</tbody>
</table>
18. Ambient compensation curves

The user can choose between 10 predefined curves and also adjust a user specific curve. A curve is used to calculate the reference setpoint for the return water temperature. Interpolation is used between the temperatures.

A poor insulation level means a higher impact of the ambient temperature on the room temperature and requires a higher calculated return water temperature.

The flat curves are for floor heating systems.

Curve 0 is reserved for a user defined curve. Curve 9 is the one with the least adjustment and is for the best insulated house.

The calculated reference setpoint can be offset adjusted with User. Ambient curve offset.
# 19. NTC temperature/resistance table

Table with relation between temperature and measured resistance in the NTC sensor. Resistance is in $\Omega$ (Ohm) an temperature in °C.

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