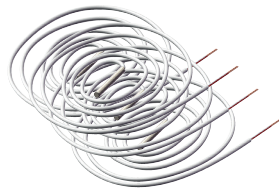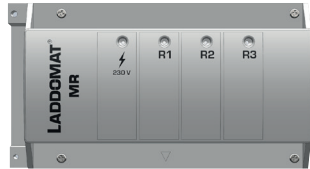# LADDOMAT® MR 40
User & Installation instruction

Scope of delivery

Valve package Laddomat 41-200 with:

- Charge and discharge valve with 2 non-return valves and thermal three-way valve.
- 2 pumps, LM9A-130.
- 3 shut-off valves Cu28 or R32
- Submersible tube for boiler sensor. Connection R10, L = 50–480 mm
- 3 x 3-bulb submersible tubes for bulbs with D=6 mm. R15, L=150 m
- 2 x sensor holders and hose ties for pipe fitting
- EPP insulation for the thermal valves supplied as standard.

For boiler output max. 45 kW

Electronic charge regulator Laddomat MR

- Laddomat MR, complete with 4 sensors and with relay outputs for 2 pumps and booster heating.
- DIN rail for wall mounting of AC and 2 bags with screws and plugs MP and AC are also included.

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Function Sys 40

Charging

When firing up, the boiler quickly reaches its working temperature. Charge pump T1 is started when boiler sensor T1 exceeds the set value. Hot water from the top of the boiler is mixed with cold water from the bottom of the tank to around around 60°C in the Laddomat 41-200 valve, and is sent to the boiler bottom for re-heating. There is no risk of condensation, with subsequent corrosion, due to low bottom temperature. The tank top is supplied with hot water at a low flow, providing efficient layering* of the heat in the tank. The hot, and therefore lighter water, rises to the top of the tank, without mixing with the cold water farther down.


Laddomat 41-200
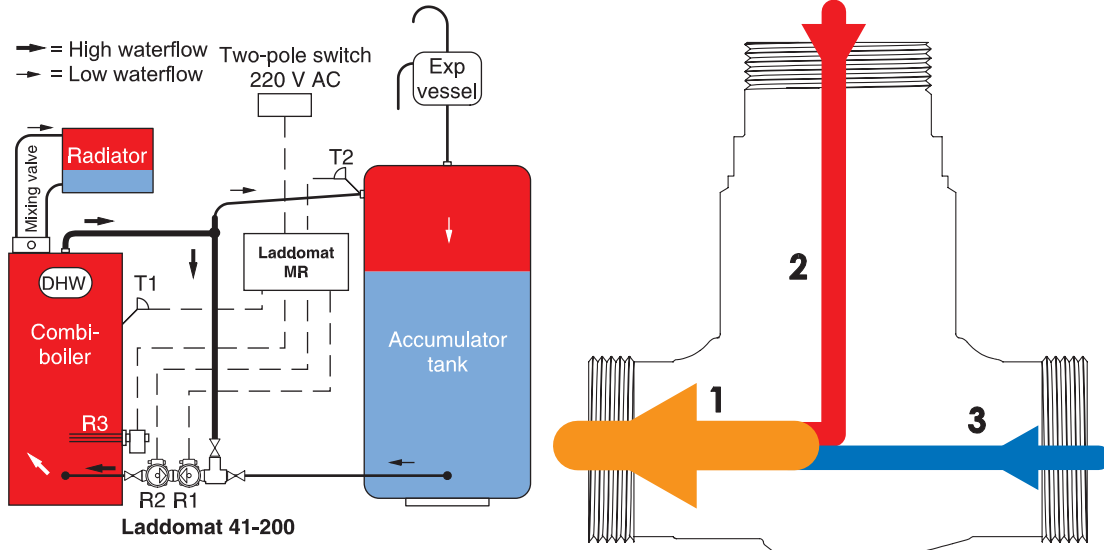
Discharge

When firing stops, the boiler cools and the charge pump is stopped when the boiler sensor T1 is less than the set value.

When the boiler has cooled so that the boiler sensor is less than the set value, discharge pump R2 starts, and the now cold water at the bottom of the boiler is pumped over to the bottom of the tank. At the same time, hot water is sent to the top of the boiler. This takes place at a low flow because the Laddomat 41-200 valve is equipped with a strong choke. Efficient layering* of the heat is thereby achieved both in the tank and the boiler.

NB! Discharge can only be started if the temperature is higher at T2 than T1, i.e. the tank is hotter than the boiler.

Laddomat 41-200
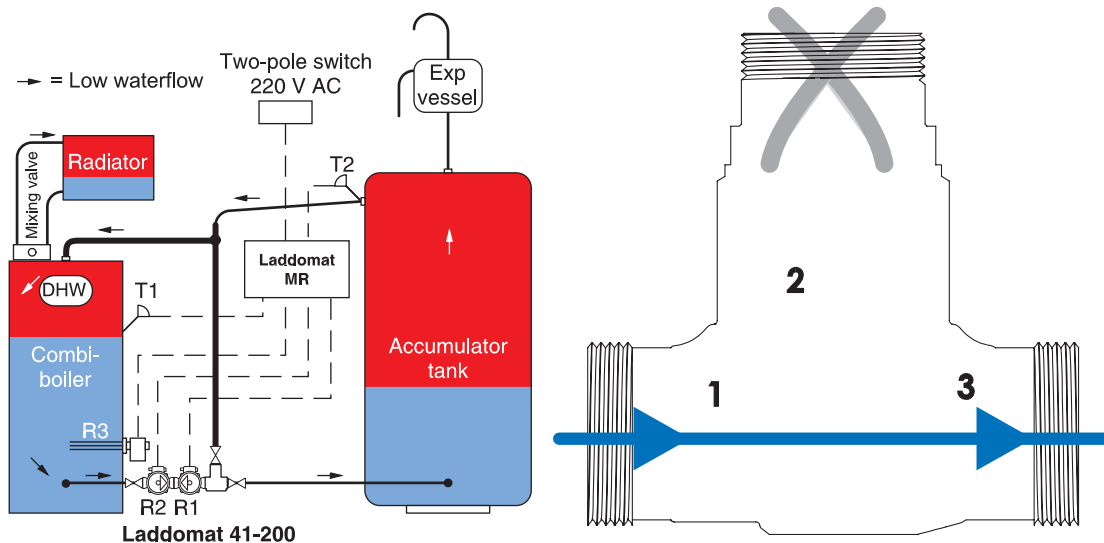
Booster heating

Discharge is interrupted when tank top sensor T2 is less than the set value, and the booster heating, if any, is then started in addition.

The thermostat on, e.g. an electric heater, is set to be high enough to provide hot water and heating.

## Function Sys 41 – Burner control + Charging/Discharging

The burner is started by tank top sensor T2. The burner continues until sensor T3 in the bottom of the tank exceeds the set temperature.

When the burner stops, the tank empties little by little. When it is completely empty and the temperature at sensor T2 at the top of the tank is less than the set temperature, the burner re-starts.

The charge pump can either start when the burner starts, or when the boiler exceeds the set temperature.
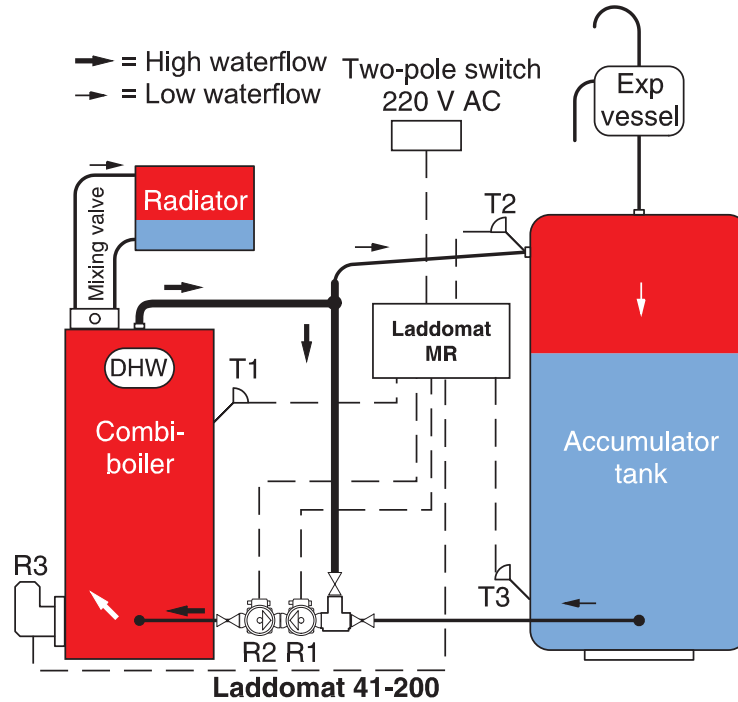
Positioning the sensors

Laddomat 41-200
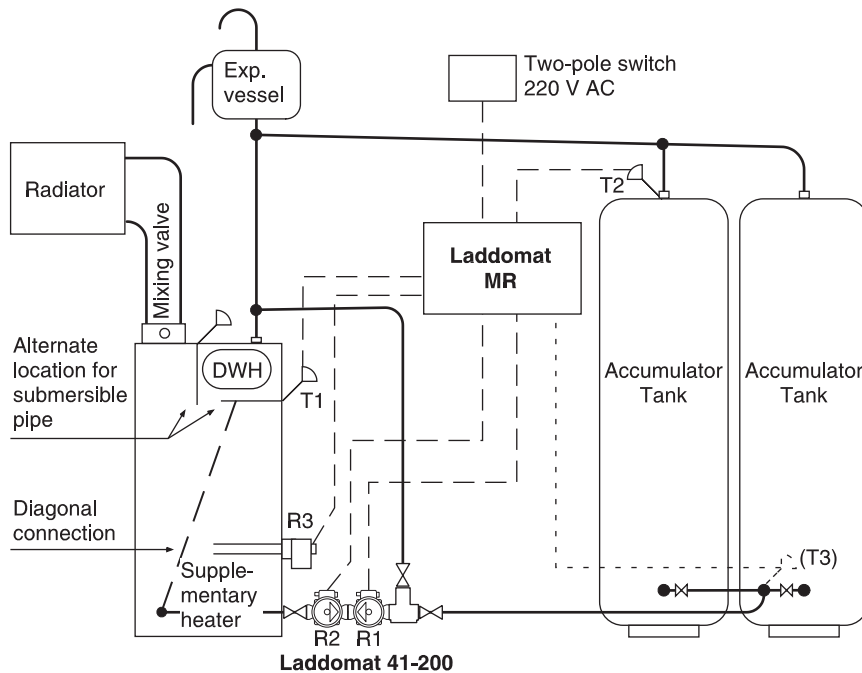
Location of boiler sensor T1

Conditions A and B must be met

A. For the best discharge function, fit the boiler sensor:
1. Below the mixing valve's hot water intake in order to ensure sufficient heat to the radiator circuit.

2. Below half the hot water heater to get good hot water supply. Below everything if there is an array coil in the boil.

B. For the best charging function, the boiler sensor is fitted as high as possible in the boiler. Although no higher than in the above instructions.

Fitting boiler sensor T1

The boiler sensor is most easily fitted in the supplied submersible which, due to its length and possibility to be annealed, can be pushed far in, and thereby customised to most boilers' existing intakes.

Certain boilers have existing integrated submersible tubes that can be used. If there are no suitable intakes, the sensor can be fitted directly to the boiler shell with the supplied attachment device.

Always select the submersible tube option yourself.

Spread contact paste on the sensor's contact surfaces for best function.

Fitting boiler sensor T2

Attach the sensor directly to the pipe as close to the tank top as possible, using the sensor holder. Use contact paste between the sensor and pipe for the best function. Insulate the pipe around the sensor.

The sensor can also be fitted in a submersible tube in the tank top. The job of the tank sensor is to interrupt discharging and, if necessary, start booster heat when there is no more heat in the tank.
In Sys 41, sensor T2 starts the burner.

Fitting tank sensor T3 (NB Sys 41)

Sensor T3 is fitted in a submersible tube directly in the tank or clamped into place on the return pipe to the boiler. The submersible tube must be positioned at least 10 cm above the bottom outlet. There is otherwise a risk that the burner will not stop when it should.

Use contact paste between the sensor and pipe for the best function. Insulate the pipe around the sensor.
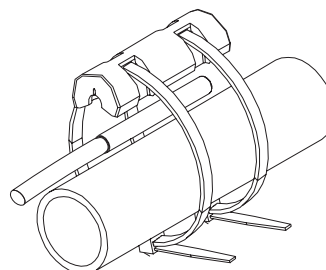
⚠️ **Sensors should not be fitted in fluid-filled submersible pipes.**

4

Installation

Check flow direction and function of the pumps according to drawings and instructions.

Pipe connections

Pipe connections to the boiler must be in accordance with the boiler supplier's instructions, or according to the figure on the previous page. See also page 7.

NB The ideal location for the T pipe from the the top of the boiler to the Laddomat valve is on the expansion pipe. This means that any air from the tank can pass to the expansion vessel without being sucked into the pump.

Avoid air pockets when laying pipes. If this is unavoidable, fit vents.

Pipe dimensions

Connect at least Cu28 or equivalent for boiler ratings of up to 35 kW.

Fit Laddomat 41-200 at the accumulator tank if the total pipe length is greater than12 metres.

Electrical connection

See page 8. We have the following recommendation for Burner control (Sys 41):

Burners can be started and stopped in two different ways:

A. With power supply via LMR. This connection is most common when connecting an oil burner.

B. With direct power supply via separate working switches. Start and stop controlled by potential-free outputs directly to the terminal block R3 in LMR. This connection is most used for pellets burners that must always have a power supply for internal control functions.

Oil, pellets or wood chips burners must always be connected with an operational and safety thermostat (double thermostat).

Settings, temperatures

Settings are described on page 8–12.

First firing

During the first firing there can often be operational disturbances as there is a lot of air bound in fresh water in the form of microbubbles.

Certain waters bind greater volumes of air than others.

This air aerates successively for several weeks until all of the water has been heated up as close to 100°C as possible. For this reason, heat the entire system up to as high a temperature as possible during the first firings.

Air that aerates can disturb circulation, with boiling as a result. This takes place especially easily in small-bore systems.

The following actions can be taken to avoid boiling:

1. In water with only a little air, it is sufficient to bleed the system in the normal way.
During operation you close the circulation pump for 20 seconds in order to allow the air to rise up the pipes. You then let the pump run for 20 seconds. Repeat this three or four times.

2. When there are larger air problems you can fit a thermostat with a lower opening temperature of e.g. 53°C and then charge the tank successively until it is up to 100°C.

The system should then function normally.

Thermostat cartridge

Recommended replacement interval for the thermostat cartridge is every three years. See page 6.

Service
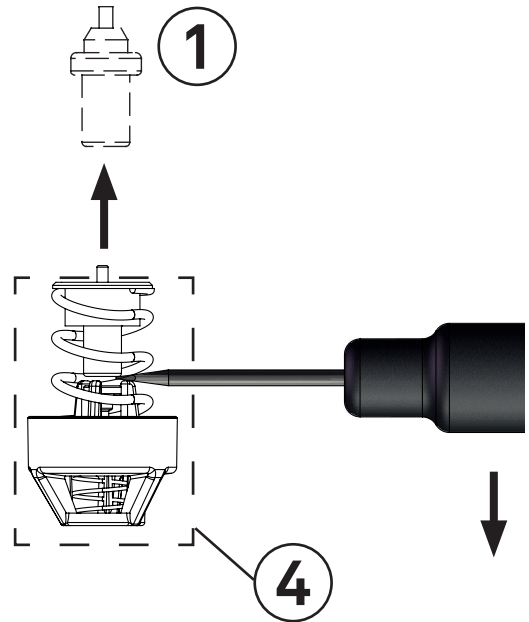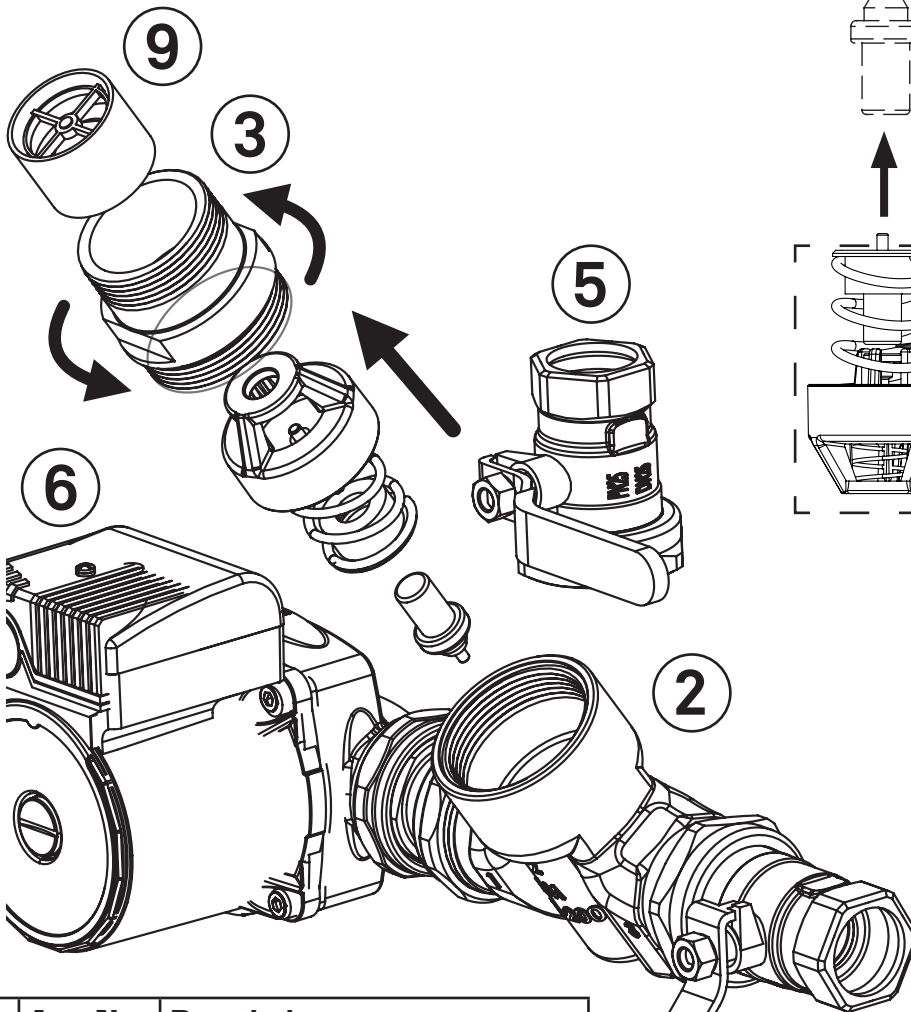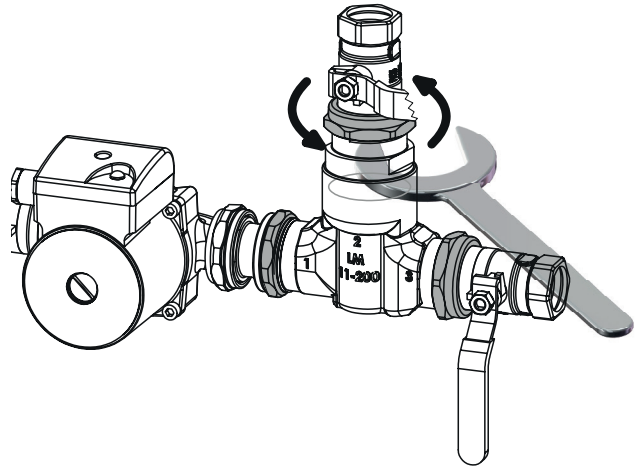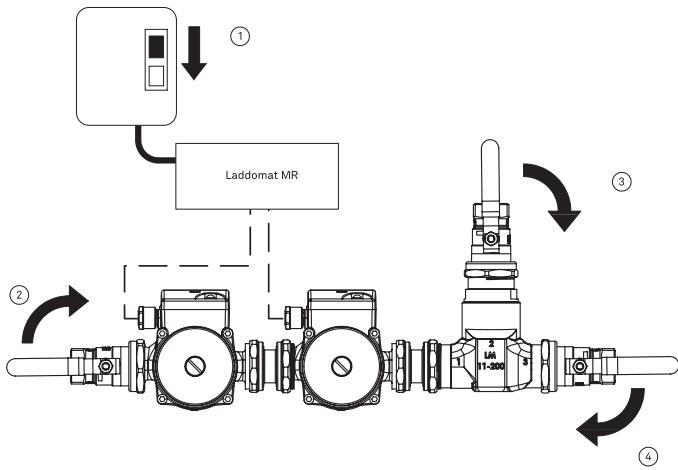
No.	Art. No.	Description
1	110063	Thermostat cartridge 63°C, 5839
2	214263	Thermal valve LM41-200, complete
3	411702	Connection cover LM11-200
4	211201	Regulation kit LM11-200
5a	141015	Ball valve R40-Cu28
5b	141301	Ball valve R40-R32
6	146042	Pump Laddomat LM9A-130
7	413400	Laddomat MR Control Centre
8	113005	NTC-sensor, 50kOhm, 3 m
9	242011	Check valve LM11-200

Connection
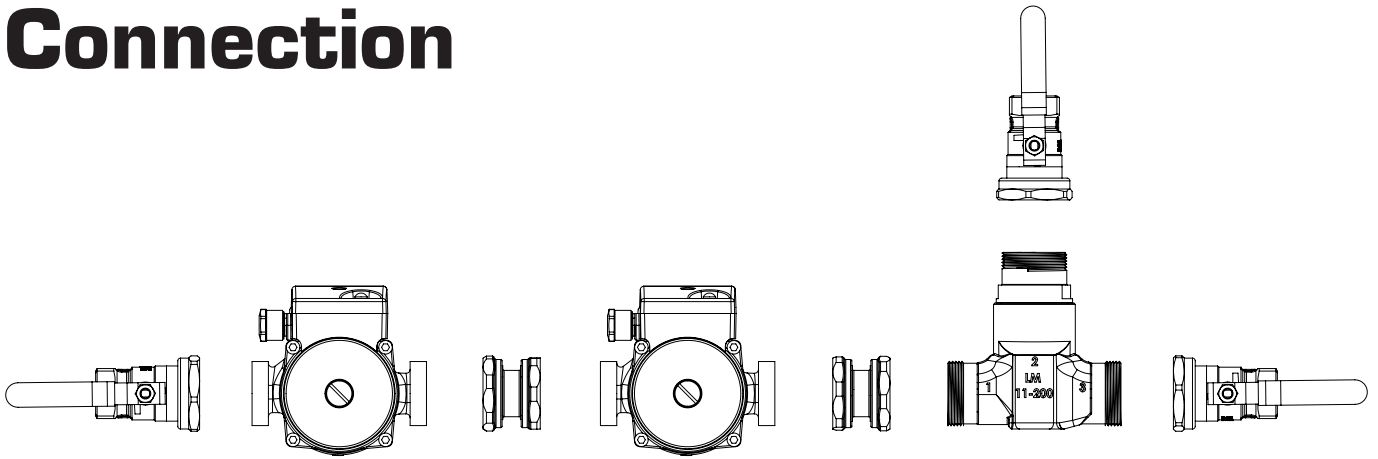
Connection of two or more tanks to Laddomat MR 40

To top of boiler

To bottom of boiler

### Parallel connection

Use at least Cu28 pipes between the tanks so that the flow can be distributed equally between the tanks.

To top of boiler

To bottom of boiler
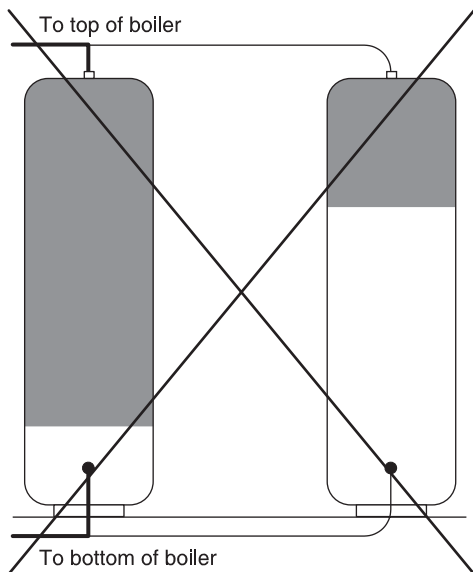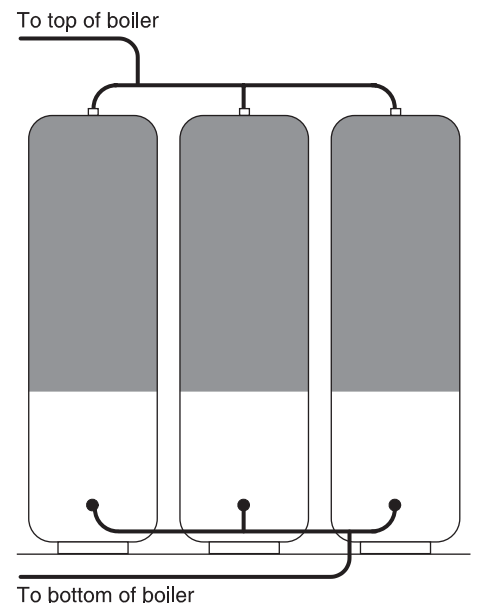
There will be imbalance between the tanks if the distance is large and/or the pipes used are too small.

The result will be that one of the tanks will only partly be in operation.

To top of boiler

Bleeding

To bottom of boiler
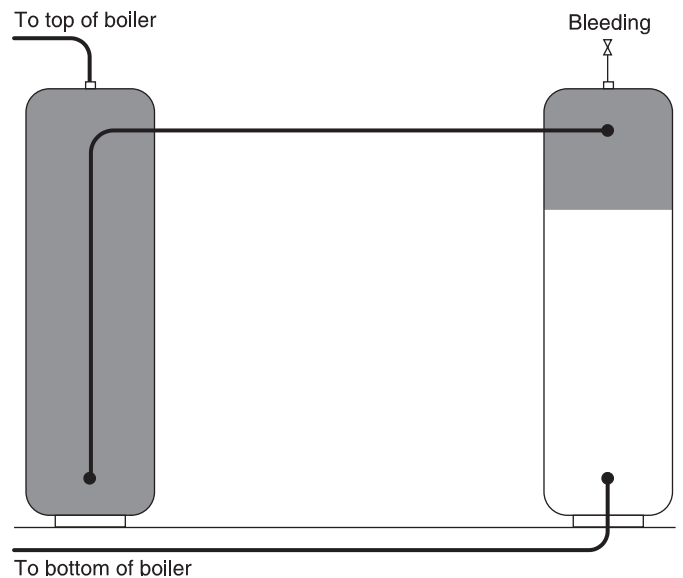
Serial connection

Can be used to avoid uneven charging when the tanks are at a distance from each other.

Good layering is achieved by filling and emptying the tanks one at a time.

Always use Cu28 pipes or larger.

7

LADDOMAT® MR
## Installation and instructions for use

Laddomat MR is a control device with separate Connection Centre (CC) with a total of three relays and 4 temperature sensor inputs. A number of different control schemes/options are available. All settings are made in the separate Control Panel (CP).

Technical data

The connection centre has:
3 relay outputs, one of which is potential free. 250V, 5A.
4 x temperature sensor inputs, NTC 10 or 50 kOhms @ 25°C (selectable in _____ s is
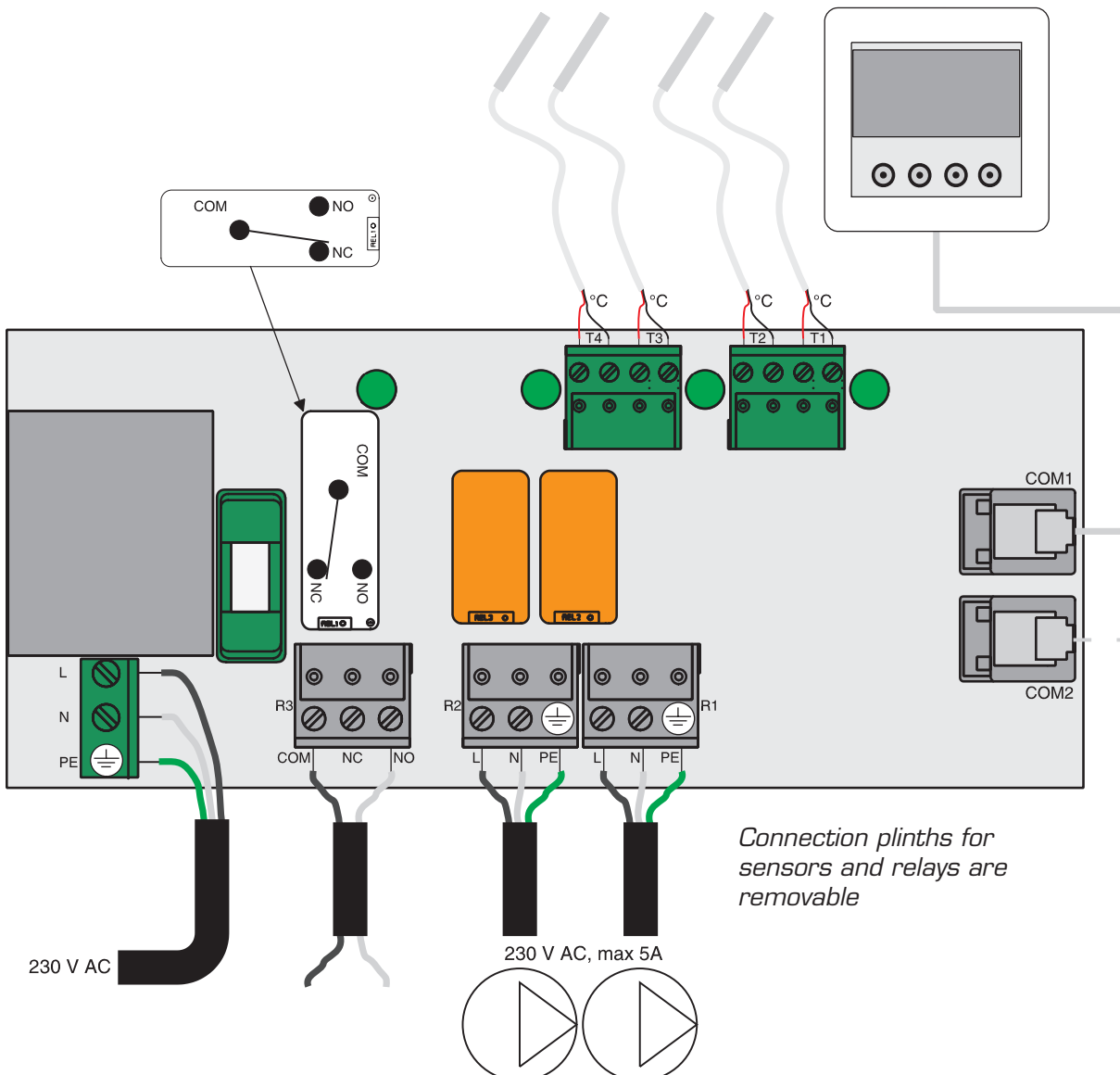Permissible ambient temperature for operation: 0–55°C, 95% RH

Dimensions:

CC: H = 88 mm, W = 160 mm, D = 60 mm
CP: H = 78 mm, W = 78 mm, D = 35 mm
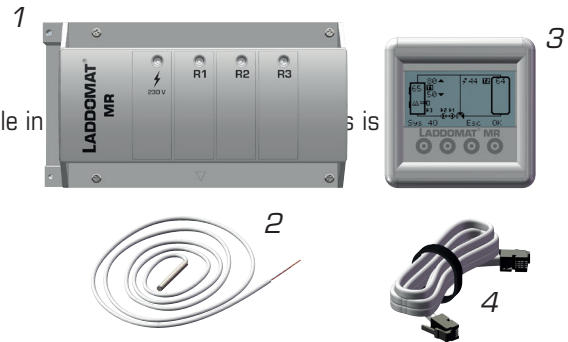
Connection

Connect the Control Panel with the attached cable

Connection plinths for sensors and relays are removable
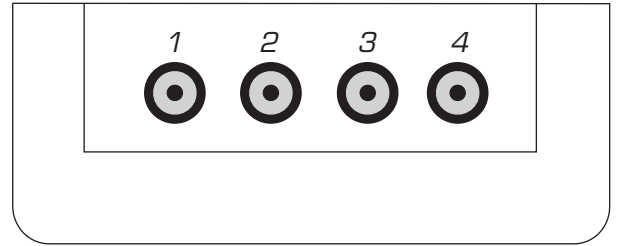
230 V AC

230 V AC, max 5A

Introduction and explanation

Controls

A.

Press any of the buttons to start the display. The buttons' function is then displayed above the respective buttons. See the pictures on this page for examples.

B.

NB! None of the values can be changed "by mistake". In all of the modes in which it is possible to change a value, you will be prompted whether you are sure that you want to make the change before the value is actually changed.

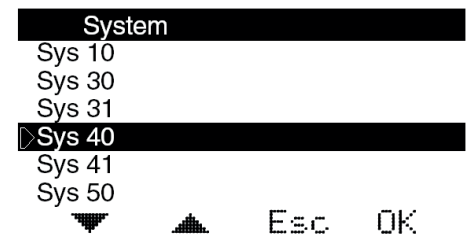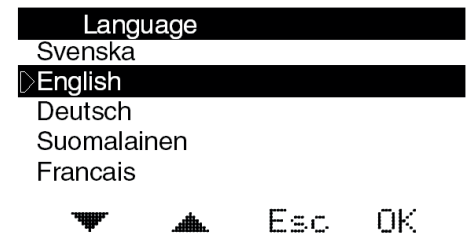| Change |
| --- |
| Change wanted? |
| ▼   ▲   No   Yes |
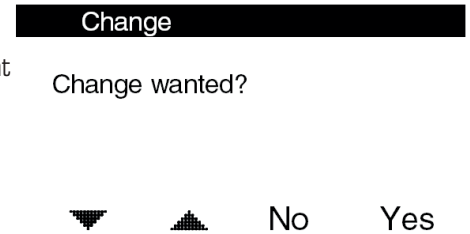
Initial start-up - Choice of language and system schedule:

The first time LMR is started (and after factory reset), LADDOMAT is displayed first. Press OK to move to the next menu for language selection.
The factory default language is English. Press Esc to proceed.

The next menu is the selection of system schedule. The factory preset schedule is Sys 40. Press Esc to proceed.

Once this is done you will see the main menu that shows the selected system schedule.

Language
Svenska
▷English
Deutsch
Suomalainen
Francais
▼   ▲   Esc   OK

System
Sys 10
Sys 30
Sys 31
▷Sys 40
Sys 41
Sys 50
▼   ▲   Esc   OK

Main Menu

The main menu shows all set point settings and current actual values of the sensors. Even if only 2 or 3 sensors are used for control, there is always the option to connect up to 4 sensors. If other sensors are not connected, this is not shown in the display. If a sensor that is included in chosen control system is not connected, a sensor error will be indicated.

T1 = Main sensor 1
T2 = Main sensor 2
T3 + T4 = Optional extra sensors. Displayed in the temperature menu.
The sensors can be installed in submersible tubes or on the outside of a pipe.

R1 = Pump 1, 230V 5A
R 2 = Pump 2, 230V 5A
R3 = Booster (potential-free relay), alternating NO/NC, max 250V 5A

S1-S5 = Set point settings 1-5

Main menu settings

Pressing any button lights the display and pressing the OK button activates the menu. First, the set point flashes, along with a dotted line until the set point starts or stops. Use the arrow keys to move between the set points.

To change a set point, press OK so the value is marked with a black box (see picture on right). Use the +/- buttons to change the value and press OK to save.

Actual Values
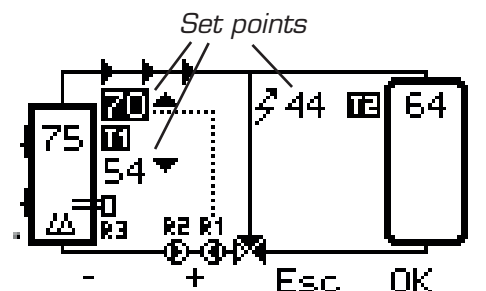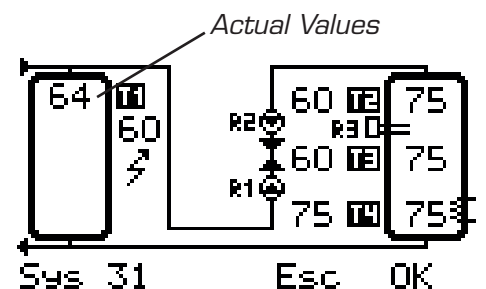
Set points

Sys 40
Charge/Discharge for boiler/tank

Basic mode

The menu shows all set point settings and current actual values of the sensors. Thermal valve type Laddomat 41-200 must be fitted for optimum performance. Laddomat 41-200 ensures that the boiler quickly achieves and maintains a high operating temperature and has check valves that allow reverse discharge.

T1 = Boiler temperature
T2 = Tank temperature
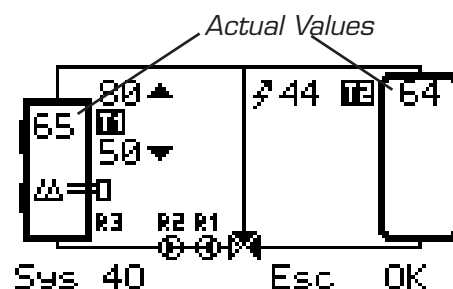T3 + T4 = Optional additional sensors

R1 = Charge Pump
R2 = Discharge Pump
R3 = Booster heat
S1 = Charge temperature setting
S2 = Discharge Temperature setting
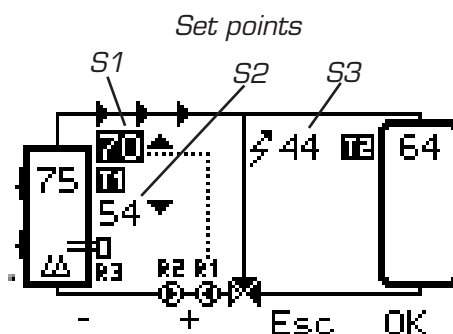S3 = Stop Discharge setting/Start Booster

Actual Values

Charging

Charging means that heat is sent from top of the boiler to the top of the tank.

When the boiler temperature T1 exceeds the set value S1, charge pump R1 starts and pumps heat to the tank.
Selectable start values for charging are 40-95°C. The factory setting is 60°C.

*Set points*

S1   S2   S3

Discharge

Discharge means that the heat is sent back from the tank top to the top of the boiler when it cools.

When the boiler temperature falls below the set value for Discharge S2, Discharge pump R2 starts and heat is pumped back to the boiler.
The selectable values for Discharge are 25-90°C. The factory setting is 50 °C.

Using **Hysteresisis** it is also possible to set how many degrees above the set value that the temperature must rise before the pump stops again. Selectable values for this **Hysteresisis** are 0-20°C. The factory setting is 0.

NB! In order for Discharge to take place, the temperature in boiler T1 must be lower than the tank temperature T2.
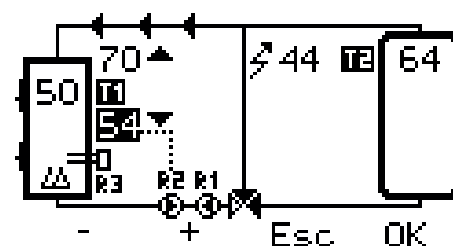
Stop Discharge/Start Booster

When the sensor in the tank T2 is below the set value for the Stop Discharge S3, Discharge pump R2 is stopped and Booster heat R3 may be started in the boiler.

Selectable values for Stop Discharge are 25-85°C. The factory setting is 45°C. The recommended setting is 1-5°C below the Discharge temperature setting. If the setting is too low there is a risk that the Discharge pump will run unnecessarily when there is no more heat in the main tank.

To avoid, e.g. that the immersion heater switches on and off very often, it is possible to set a **Delay time** for the start of the Booster heat. When T2 is below the set value for S3, the Booster only starts after the set time, 0-10 minutes. The factory setting is 0.
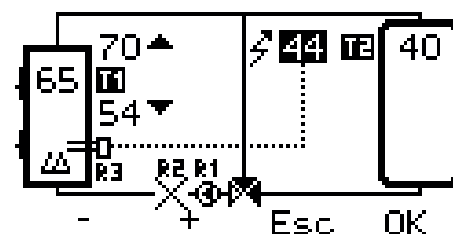
Sys 41
Charge/Discharge for boiler/tank with burner control

Basic mode

The menu shows all set point settings and current actual values of the sensors. Thermal valve type Laddomat 41-200 must be fitted for optimum performance. Laddomat 41-200 ensures that the boiler quickly achieves and maintains a high operating temperature and has check valves that allow reverse discharge.

T1 = Temperature Boiler
T2 = Tank Top Temperature
T3 = Tank Bottom Temperature
T4 = Optional additional sensors

R1 = Charge Pump
R2 = Discharge Pump
R3 = Burner
S1 = Charge temperature setting
S2 = Discharge temperature setting
S3 = Burner start temperature setting
S4 = Burner stop temperature setting

Burner start + stop

Burner R3 starts when the sensor T2 at the top of the tank is under the set value for Start burner S3. Selectable values are from 30 to 90°C. The factory setting is 60°C.

The burner stops when the sensor T3 in the tank bottom is above the value set for Stop burner S4. Selectable values are from 30 to 90°C. The factory setting is 60°C.
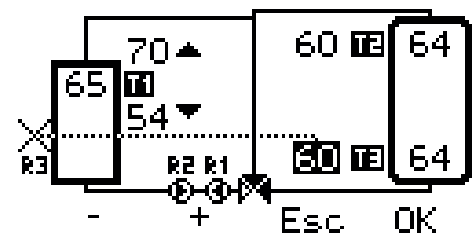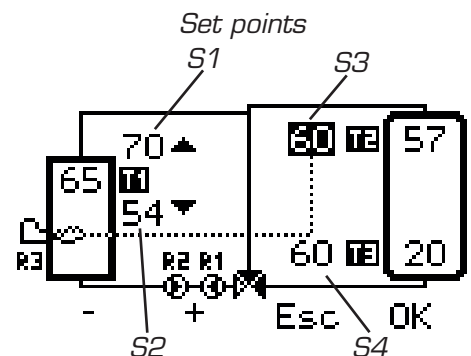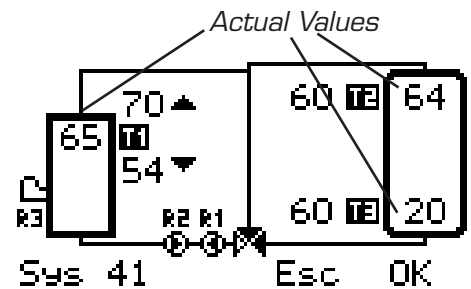
Charging

Charging means that heat is sent from the boiler to the tank.

The charge pump R1 can be started in two ways:
a) When the boiler temperature T1 is above the value set for Charging S1, the charge pump R1 starts and pumps the heat to the tank.
b) In mode C the charge pump runs as long as the burner is running. If the boiler is hot after the burner stops, the pump runs as long as T1 is above 85°C.

Selecting **Optional time 1** in the Service menu allows the pump to run from 0 to 20 minutes after the burner stops, even if T1 is below 85°C.
Selectable values are 0-20 minutes. The factory setting is 0.

Selectable values for charging are 50-90°C. The factory setting is 60°C. Mode C is selected by setting the temperature higher than 90°C.
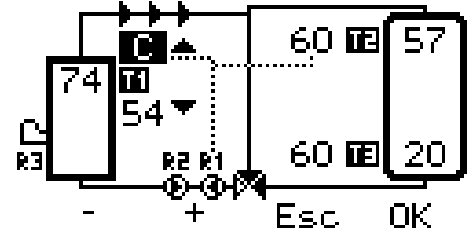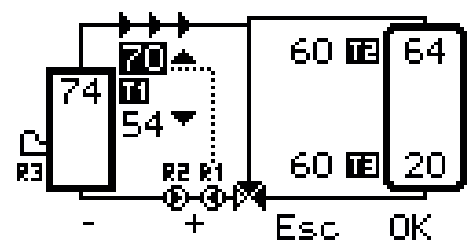
Discharge

Discharge means that the heat is sent back from the tank to the boiler when it cools.

When the boiler temperature falls below the set value S2 the Discharge pump R2 starts and heat is pumped back to the boiler.
The selectable values for discharge are 25-90°C. The factory setting is 50°C.

Using **Hysteresisis** it is also possible to set how many degrees above the set value that the temperature must rise before the pump stops again. Selectable values for this **Hysteresisis** are 0-20°C. The factory setting is 0.

NB! In order for Discharge to take place, the temperature in boiler T1 must be lower than the tank temperature T2.

11
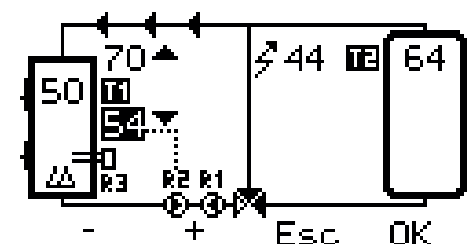
Menus and Settings

Temperature

This menu displays the read temperatures for all sensors.
NB. The figures in parentheses in the middle show a possible calibration for each sensor, but this is only displayed if you activate the row.
Press OK to activate the menu, then press the arrow keys up/down and OK once more to change the calibration.
Selectable values are - 10 to + 10°C. The factory setting is 0.

```
       Temperature
▶T1          (+0)        48°C
 T2          (+0)        55°C
 T3          (+0)        47°C
 T4          (+0)        38°C


   ▼         ▲      Esc    OK
```

Service

Basic settings are made in the Service menu.

```
         Service
▶Settings
 Save/Restore set.
 Manual Test
 Security code
 Language

   ▼         ▲      Esc    OK
```

Settings

Settings Sys 40

Hysteresis – When Discharge starts, you can set that the temperature in Boiler T1 should increase a specific number of degrees above the set temperature before Discharge is stopped again. Selectable values are 0-20°C. The factory setting is 0.

NTC Sensor Type – The type of sensor to be used; NTC 10k or 50k @ 25°C. The factory setting is 50k.

Delay time – Used to wait a time after there is no more heat in tank T2 before Booster heat is started. This is to reduce the risk of frequent on/offs if the temperature in the Tank "swings" up and down.
Selectable values are 0-10 minutes. The factory setting is 0.

Settings Sys 41

Hysteresis – When Discharge starts, you can set that the temperature in Boiler T1 should increase a specific number of degrees above the set temperature before Discharge is stopped again. Selectable values are 0-10 °C. The factory setting is 0.

Optional time 1 – When the pump is in Constant mode "C", you can set the pump to continue to run for a given time after the burner is stopped. Selectable values are 0-20 minutes. The factory setting is 0.

NTC Sensor Type – The type of sensor to be used; NTC 10k or 50k @ 25°C. The factory setting is 50k.

Save/Restore Settings

Used to save the user's settings, restore your settings or restore factory settings. Reset to factory settings is the only way to change the system after initial start-up.
NB: to avoid factory reset by mistake, the "Yes" button must be held in for 1 second.

```
      Save/Restore set.
▶Save settings
 Restore prev
 Restore Factory


   ▼         ▲      Esc    OK
```

Manual test

Used to run each relay manually. When a relay is activated but not deactivated, this is active for 10 minutes or until you leave the menu.

```
         Manual Test
▶R1                     Off
 R2                     Off
 R3                     Off


   ▼         ▲      Esc    OK
```

Security code

If you want to prevent unauthorised persons from accessing other than the Basic menu, you can set a button combination that must be pressed to make changes. The lock is activated 30 seconds after the last button press.

Languages

```
        Security code
▶ - -

 1 + 2
 1 + 3
 2 + 4
 2 + 3
 3 + 4
   ▼         ▲      Esc    OK
```

Troubleshooting

In the event of any malfunction it is easy to see from the display if any of the temperatures are not correct. In addition, all the features of Laddomat MR will be deactivated.

If there is a communication error between the Control panel and Connection Centre "COMM ERROR" will appear on the display. This may be due to a fault on the cable or a connector is not properly inserted.

If there is a sensor fault (or the temperature is outside the normal range), two different characters will be displayed, depending on the type of sensor fault.
At short circuit or too high temperature "--" is displayed instead of the temperature.
If there is an open circuit or too low temperature "XX" will be displayed instead of the temperature.