AUTOMIX

TERMOMAT 4 - Mounting and Operating Instruction

Electronic differential temperature controller and performance monitor for solar heating systems.

TERMOMAT 4

ELECTRONIC DIFFERENTIAL TEMPERATURE CONTROLLER AND PERFORMANCE MONITOR FOR SOLAR HEATING SYSTEMS.

TERMOMAT 4 automatic solar heating controller consists of the following components:

1. Electronic temperature controller TM4 — x1
2. Mains cable 1.5 m — x1
3. Temperature sensor T1 3 m — x1
4. Temperature sensor T2 5 m — x1
5. Temperature sensor T3 (PT-1000) 20 m — x1
6. Sensor housing 150 mm — 2 pcs
7. Sensor housing 90 mm — x1
8. Mounting and operating instructions — x1
9. Mounting socket (mounting screws & plugs) — x1

Overview:

|	
P Control	Program selection; see adjacent table
SU/Tmax Control	Summer position/Boil-over protection
F Control	Pump speed control
EH/EC Control	Extra heating/extra cooling
Button	Browse functions/displays
LED green	Extra heating/extra cooling indicator
LED yellow	Pump indicator
LED T1	Upper storage tank temp. indicator
LED T2	Lower storage tank temp. indicator
LED T3	Solar collector temperature indicator
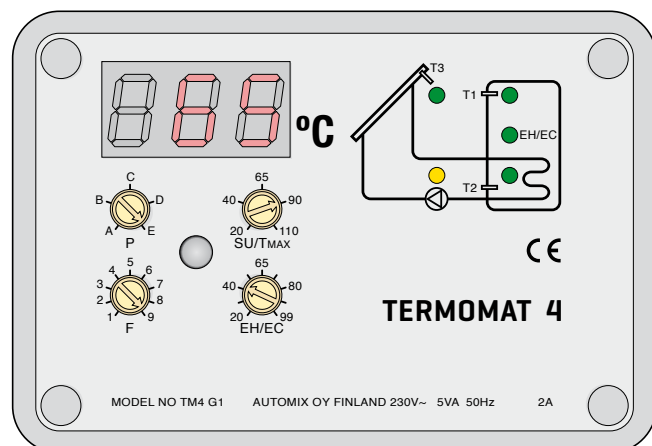
Image 1

P Control (Program table)
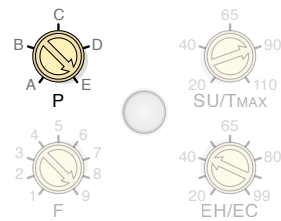
Image 2

Termomat 4 starts the circulation pump when the temperature difference between sensors T3 and T2 exceeds the set value Ton.

When the pump is operating, the yellow pump indicator LED is ON. The pump stops and the indicator LED is switched off when the temperature difference falls below the set value Toff.

Setting the temp. diff. Tdiff = Ton - Toff		Pump ON Ton	Pump OFF Toff	Temp. diff. Tdiff	Boil-over protection Tmax
Control P	Display code	[°C]	[°C]	[°C]	[°C]
A	3H 2L	3	2	1	30
B	4H 2L	4	2	2	Control Tmax
C	6H 3L	6	3	3	Control Tmax
D	10H 4L	10	4	6	Control Tmax
E	E	5	3	Pump speed control	Control Tmax

In **position A ("swimming pool")** Tmax = 30 °C regardless of the setting of the SU/Tmax Control.

Position E selects the "pump speed control" mode. In this mode, the temperature is controlled by changing the pump speed to maintain a temperature difference of 7 degrees. The pump will start when the temperature difference reaches 5 °C. As the temperature difference increases, the unit will increase the speed of the pump continuously, until maximum speed is reached.
Correspondingly, when the temperature difference decreases, the unit will decrease the speed of the pump. When minimum speed has been reached and the temperature difference drops below 3 °C, the pump will stop completely.

When the pump is started, it always runs at maximum speed for 5 seconds. This ensures that the pump starts properly. The power setting of the pump must be at maximum.
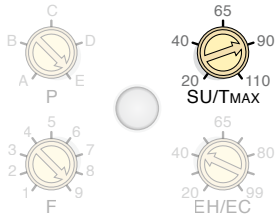
SU/Tmax Control (Boil-over protection)

Image 3

The boil-over protection temperature can be set with the Tmax Control continuously between +20 °C and +110 °C. When the temperature T2 has risen above this value, the pump will stop. During a boil-over situation, the display shows "HE".
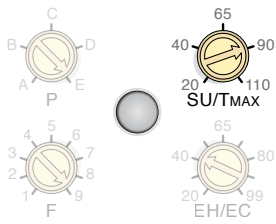
Adjustment of boil-over protection

Image 4

1. Keep the **button** pressed down and wait for the decimal points to show in the display.
2. Turn the **SU/Tmax Control** approx. 90 degrees, until the green EH/EC LED switches ON.
3. Turn the SU/Tmax Control to the desired setting (>20 °C) and release the button.

The boil-over protection has now been set at the new value. Adjusting the **SU/Tmax Control** no longer affects the value of the Tmax setting: instead, it now affects the value of the summer position setting. To check the value of the boil-over protection setting, disconnect and re-connect power to the unit and review the initial information displayed.

Summer position, storage tank cooling during the night

The value of the summer position is set with the **SU/Tmax Control**. When the temperature difference is sufficient, the summer setting transfers excess heat from the storage tank to the panels. If the temperature of both the storage tank sensors **T1** and **T2** exceeds the value of the **SU/Tmax Control** setting and the panel temperature has fallen 20 °C below the temperature of the storage tank (night-time), the pump will start. The pump will operate at maximum power, until **T2** or **T1** reaches 10 °C below the set value or until the difference with the panel is less than 20 °C.
Summer position OFF – set Su > Tmax.

Panel boil-over protection

When the lower storage tank temperature sensor **T2** exceeds the value of the **Tmax** setting (20 to 110 °C), the pump is stopped by the normal boil-over protection setting. However, if this causes **T3** temperature to rise above +115 °C, the unit overrides the boil-over protection temporarily (panel boil-over protection). The pump will operate at maximum power until the panel has cooled by 10 degrees, i.e. to +105 °C. The maximum temporary override figure is 10 °C, i.e. a T2 reading between 30 and 120 °C. This is not used in the swimming pool position! However, it is used in the forced OFF mode.

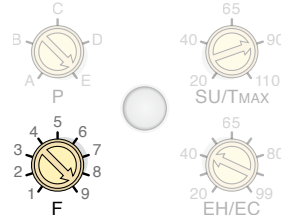## F Control (Pump speed control)

Image 5

This control is used to limit the maximum speed and consequently the maximum flow of the pump. This function is used in all adjustment programs. The unit is equipped with a Triac-controlled PWM adjustment, which adjusts the effective value of the pump voltage according to the diagram below.
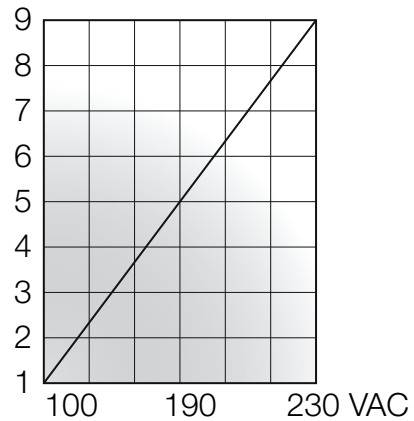

Image 6

Maximum power is used at limitation setting 9, and minimum power is used at limitation setting 1. When using the "E" program mode, setting the limitation to the maximum value of 9 is recommended.
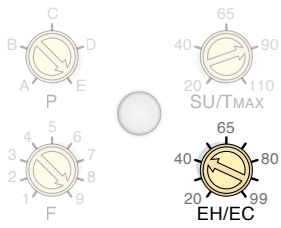
EH/EC Control (Extra heating/extra cooling)

Image 7

Extra heating

When the upper storage tank sensor **T1** reading falls below the set value, a voltage free relay switches on. This enables the unit to control an extra heating source. The temperature at which extra heating is connected is set with the **EH/EC Control**. When the extra heating is connected, the green EH/EC LED is ON.

Extra cooling

Extra cooling is the opposite of extra heating – it switches the relay on when the storage tank needs to be cooled down. The extra cooling temperature is adjusted with the same **EH/EC Control** as the extra heating. The cooling requirement is determined by the T1 sensor, and an indicator LED is switched ON during cooling.

When the T1 temperature in the storage tank exceeds the set value, a voltage free relay is switched on and a green EH/EC LED is switched ON. When the T1 falls below the value, cooling is ended.

Excess heat is directed via the additional relay to e.g. a swimming pool or an external condenser.
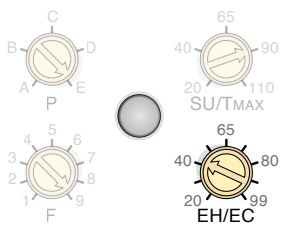
Enabling extra cooling

Image 8

1. Keep the button pressed down and wait for the decimal points to show in the display.
2. Turn the **EH/EC Control** approximately 90 degrees. The green LED is switched ON.
3. Turn the **EH/EC Control** to the desired setting (>20 °C) and release the **button**.

Extra cooling is now in use. Adjusting the **EH/EC Control** no longer affects the value of the setting.

To check if extra cooling is enabled, disconnect and re-connect power to the unit and review the initial information displayed to see whether "EC" or "EH" is shown. "EC" refers to extra cooling.

Disabling extra cooling

Use the same procedure as during enabling, but set a value of exactly 20 degrees. The green LED is switched OFF during the adjustment to indicate the function has been disabled.
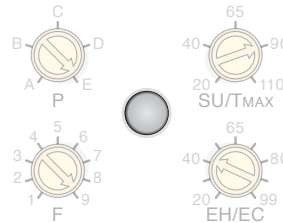
Push button

Image 9

Button operation

Every press of the button jumps to the next stage.
After power has been connected to the unit, the program is at stage 1.

1. T3, display shows T3 temperature, and T3 LED is ON. Automatic operation.
2. T2, display shows T2 temperature, and T2 LED is ON. Automatic operation.
3. T1, display shows T1 temperature, and T1 LED is ON. Automatic operation.
4. Browse function, temperatures T3, T2 and T1 alternate on the display, LEDs switch ON indicating the temperature in question. Automatic operation.
5. Forced OFF, temperatures T3, T2 and T1 and OFF alternate on the display. Pump operation disabled. Boil-over protection in use!
6. Forced ON, temperatures T3, T2 and T1 and ON alternate on the display. The pump operates at maximum power.
7. E, Energy counter. Display shows the amount of energy collected by the unit.

The next press of the button returns to stage 1.
If the button is pressed for over 5 seconds, the initial values are shown on the display.

Switching off the mains power always resets the Termomat 4 unit to position 1 and displays the setting values (1 to 10) found on page 5.
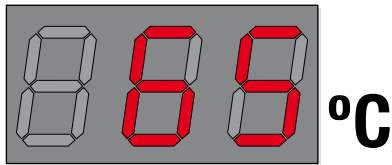
Energy counter

Image 10

The energy counter estimates the amount of collected heat in kWh or MWh.
The energy counter can be displayed by pressing the button (image 9) 6 times. The display briefly shows "E" before being replaced by the energy counter reading.

The energy counter displays either kWh or MWh units according to the counter reading. The dot indicates the unit: if a dot is not displayed, the reading is in kWh, and if a dot is displayed, the reading is in MWh.
The energy counter will stop at 9.99 MWh. The calculation can be started over by resetting the counter.

Resetting the counter

The energy counter can be reset by keeping the button (image 9) pressed for at least 3 seconds in the energy counter display mode.

Calibrating the energy counter

To calibrate the energy counter, turn the P Control (image 2) to position A before switching to the calibration mode.
Enter the calibration mode by keeping the button (image 9) pressed when connecting the mains power.
Keep the button pressed for approximately one second. The display remains blank for as long as the button is pressed. The display shows "EC". Pressing the button shows a calibration factor of 0.5...2.0 in the display. Set the value with the E Control. Save the setting by pressing the button again.
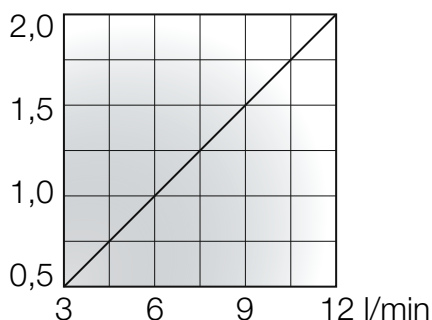
The correct calibration value depends on the flow rate of the system, i.e. the total flow during one minute when the pump operates at maximum power. The factory setting is 1.0, which holds true if the maximum flow rate is approx. 6 l/min. Correspondingly, if the flow rate is approx. 9 l/min, the calibration factor must be set to 1.5, according to the table.

Start-up assistance

The so-called start-up assistance is required for correct metering and for the smooth operation of the system.

The panel sensor is not always in the warmest location (in the housing), or it might react slowly. The start-up assistance is activated when the temperature of the T3 sensor has risen by 3 degrees in the last 4 minutes, even if the normal charging conditions were not met.
The start-up assistance operates the pump for 5 seconds. If normal charging conditions are met during this time, normal charging will start.
The start-up assistance can be re-activated only after 4 minutes.
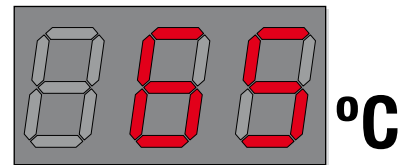The start-up assistance is available in all programs.

Temperature display

Image 11

The various temperatures (T1, T2 and T3) can be browsed with the button.

When the T3 temperature rises above +205 °C, the display shows "I--I". If the temperature falls below -20 °C, the display shows "-II-".

T1 and T2 can display temperatures between -9 °C and +110 °C. If the temperature falls below -9 °C, the display shows "-II-". If the temperature rises above +110 °C, the display shows "I--I".

Information displayed when switching the unit ON
(factory settings in brackets)

1. "1.03" (software version)
2. "HE" (Tmax)
3. Tmax setting value   (90)
4. "SU" (summer position)
5. Summer position setting value   (85)
6. "EH" for extra heating, "EC" for extra cooling
7. Extra heating/cooling setting value   (45)
8. "E" (pump speed control)
9. Pump speed setting value   (9)
10. Adjustment program setting value   (E)

Electrical connections

The electrical connections should be made according
to image 12.

Power supply
L   Factory connected phase.
N   Factory connected neutral.
PE Factory connected protective ground.

Circulation pump
P   Circulation pump phase (pump speed).
N   Circulation pump neutral.
PE Circulation pump protective ground.

Additional relays
1   Voltage free relay second switch **NC = normally closed**
2   Voltage free relay common terminal
3   Voltage free relay second switch **NO = normally open**
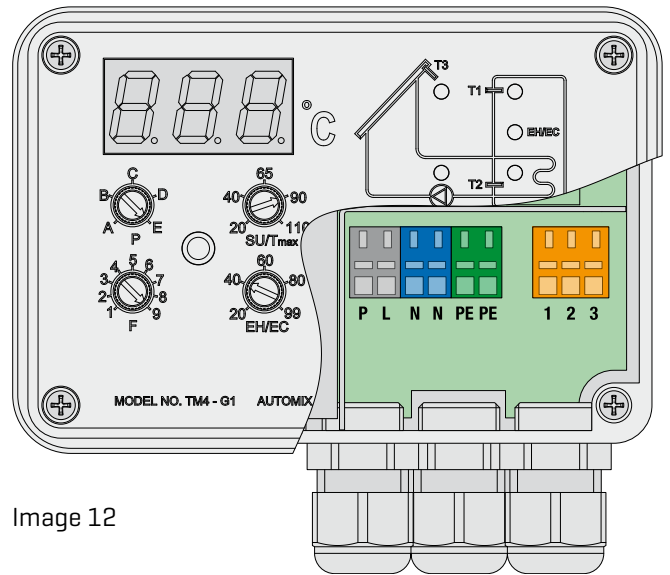
Image 12

Temperature sensors

Correct placement of the sensors is important for the operation
of the system.

The T1 and T2 cables are 3 and 5 metres long, respectively.
The T3 cable is 20 metres long, 3 metres of which is heat and
weather resistant cabling. The sensors can be extended with a
sensor lenghtening.

The T1 sensor should be placed near the top edge of the
storage tank. The best readings are achieved using a sensor
housing.

The T2 sensor is placed in the lower part of the storage tank,
near the solar panel pipe outlet connection. Here, too, the best
readings are achieved using a sensor housing.

The T3 sensor is placed in a housing in the solar collector, or in
a "hot" outlet pipe in the upper part of the collector, as close to
the solar panel as possible. Please note that it is very important
both to place the sensor carefully to obtain the best possible
reading and to insulate the sensor properly. The rest of the
cable must be placed inside the building and not exposed to
the elements.

The sensor cables must not be routed together with power
cables to avoid interference.

CHECKLIST
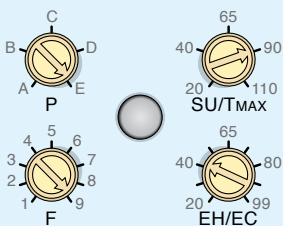
THE UNIT WILL FUNCTION WITH THE FACTORY SETTINGS (see image)!
P =   E
F =   9
SU =   85
EH/EC =   45
Keeping the middle push button pressed down longer than
5 seconds displays the setting values

· DO NOT CHANGE THE FACTORY SETTINGS BEFORE INITIAL START-UP OF THE UNIT

· ENSURE THE PUMP NEVER RUNS DRY DURING THE CHARGING STAGE

· CHECK THE MECHANICAL FLOW METER TO ENSURE THAT THE FLUID IS CIRCULATING IN THE PIPES
  (see the Automix Solar instruction)

· IF YOU SUSPECT THERE IS AN AIR POCKET, STOP THE PUMP AND BLEED THE SYSTEM

· DO NOT EXTEND THE SENSOR CABLES UNLESS YOU KNOW EXACTLY WHAT YOU ARE DOING

· SHORT-CIRCUIT IN THE SENSOR CIRCUIT = VERY LOW TEMPERATURE INDICATED IN THE DISPLAY (-II-)

· BREAK IN THE SENSOR CIRCUIT = VERY HIGH TEMPERATURE INDICATED IN THE DISPLAY (I—I)

· SETTING VALUES CAN BE DISPLAYED BY DISCONNECTING AND RE-CONNECTING THE MAINS PLUG

  THE POWER SETTING OF THE PUMP MUST BE AT MAXIMUM