

AC•THOR / AC•THOR 9s

Photovoltaic-Power-Manager for hot water and space heating

Operation Manual



Firmware a0010100		
Operating modes	AC•THOR	AC•THOR 9s
M1 Hot water	✔	✔
M2 Hot water stratified charging	✔	✔
M3 Hot water 6kW	✔	
M4 Hot water + heat pump	✔	✔
M5 Hot water + space heating	✔	✔
M6 Space heating	✔	✔
M7 Hot water + PWM	✔	✔
M8 Frequency mode	✔	✔

Contents

1. Assembly	3
2. Commissioning; putting back into service.....	3
3. Controls and displays.....	4
Homescreen.....	4
Status symbol.....	5
Data logger.....	5
Status information on the display	6
Settings	7
Help	7
4. Operating modes.....	7
M1: Hot water.....	7
Explanation.....	8
Specific settings for operating mode M1	8
Temperature sensors (only with AC•THOR 9s).....	10
M2: Hot water stratified charging	10
Explanation.....	10
Specific settings for operating mode M2	11
M3: Hot water 6 kW	12
Explanation.....	12
Specific settings for operating mode M3	13
M4: Hot water + Heat pump	13
Explanation.....	13
Specific settings for operating mode M4	14
M5: Hot water + Space heating.....	15
Explanation.....	15
Specific settings for operating mode M5	16
Temperature sensors	17
M6: Space heating.....	17
Explanation.....	18
Specific settings for operating mode M6	18
Temperature sensors	19
M7: Hot water + PWM.....	19
Explanation.....	19
Specific settings for operating mode M7	20
M8: Frequency mode.....	21
Explanation.....	21
Specific settings for operating mode M8	21
5. General settings	23
6. Web-Interface.....	25
Home (homepage)	26
Data logger.....	26
Status information	27


Settings	27
Special setting possibilities in the web interface.....	30
Legionella boost outputs (only with AC•THOR 9s)	30
Power Timeout	31
Block time	31
Control type: Adjustable Modbus TCP (Sunspec etc)	31
Multi units	32
Debug-Mode.....	35
Help	35
7. Potential-free input for external control	35
8. Description of the protocols for http and Modbus TCP	36
9. Firmware update	36
Update of server	36
Automatic update.....	36
Manual Update	36
Update with SD card.....	36
10. Device Key.....	36
11. Status codes	37
12. Temperature sensors: Assignment and function (only with AC•THOR 9s).....	37
13. Fault temperature sensors	37
14. Error messages on the Display	37
15. Fault signals by the AC•THOR Logo	38

1. Assembly

Before placing into operation it is essential to read the assembly instructions provided with the device.

2. Commissioning; putting back into service

This takes just a few moves and is performed the first time the AC•THOR is operated or when it has been reset to factory settings.

1. Select language
Use the cursor keys on the left and right to view further possibilities.
2. Select operating mode
See chapter headed "Operating modes".
3. Select control of the signal source for the AC•THOR
 - a. Power meter automatic: Connection to my-PV power meter in the network is set up automatically.
 -  NOTE: setting up the connection may take up to a minute.
 - b. Power meter manual: Connection to my-PV power meter in the network is set up by entering the IP address manually.
 - c. Power meter direct: Connection to my-PV power meter is set up without network directly by using a crossover network cable.
 - d. List of possible compatibility partners:
For certain compatible partners the choice between „Auto“ (automatic IP-search of the device) or „Manual“ (manual entry of the IP address of the source) is possible.

„Manual“ is for instance necessary when there are several compatible sources in the network and a special one of them should be chosen as the control system.

- e. Further protocols: **http, Modbus TCP, Adjustable Modbus TCP**
Adjustable Modbus TCP has to be configured in the Web-Interface.
(see chapter „Special setting possibilities in the web interface“)

4. Temperature sensor assignment

A number is assigned to the sensor in the order in which it is selected. The selection can be deselected by tapping on the key once more.
To assign a sensor to the respective entry in the list, the serial numbers can be identified on a label attached to the sensor wire.



TIP: As the measuring value of the sensor is already shown in the selection list, an assignment can alternatively also be made by simply altering the temperature on the sensor.

5. Save the settings

3. Controls and displays

Homescreen



The "Home" button always returns you to the home screen. The upper bar shows the current date, time, the unit number and the operating mode (mode M1 – Mx). On the right, symbols show the unit's current status.

The contents of the home screen vary according to the operating mode and shows how much power the AC•THOR is currently feeding into the load. Depending on how many, if any, temperature sensors are defined, the measured values are also shown.

Homescreen AC•THOR:

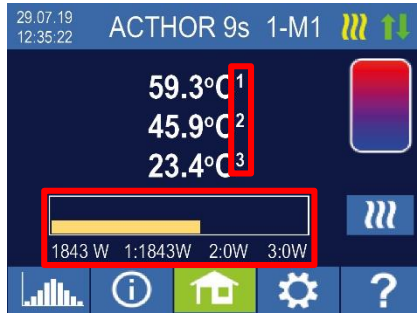
The screenshot shows the AC•THOR homescreen with the following elements and labels:

- Date, time:** 03.05.18, 15:14:53
- Device number:** ACTHOR
- Operating mode:** 1 - M1
- Status:** Three wavy lines and two vertical bars (one green, one red).
- Temperature:** 23.1°C
- Heating Power:** 2075W
- Single-Boost:** A red button with three wavy lines.
- Main menu:** A bottom bar with icons for a bar chart, information, home, settings, and help.
- Presentation according to operating mode:** A bracket on the left side of the screen.

Homescreen AC•THOR 9s:

With the AC•THOR 9s, the power display consists of three bars.

- Load output Out-3
- Load output Out-2
- Load output Out-1



If several temperature sensors are used, the sensor number is displayed.



The button "Single boost" only appears in hot water operating modes if the function for ensuring a minimum temperature is activated. Actuating the button starts a once-only boost backup mode. This can also be deactivated while it is in operation. If the boost backup is actuated automatically based on the day of the week, time of day or temperature, it cannot be deactivated by using the button.

Status symbol



Lights up = set temperature reached, Flashes = stand-by, waits for excess



Lights up = heats with PV excess. Flashes = boost backup mode



Lights up = no control signal



Lights up = physical connection to the RJ45 network connection is intact



Lights up = no intact physical connection to the RJ45 network connection

Data logger



Recorded production data, meter values and temperatures can be read off at any time. The respective values can be selected using the "Open" button. These can be presented in the three views of the current year, month or day using the "Calendar" button.



TIP: Type directly in the diagram on the individual bars to present the data in their next level of definition and on the button of the data logger again to return to the previous level.

The following data can be displayed:

Total power: Shows the total power figures for all the connected loads. The yellow bars indicate the PV excess power used, the green bars the proportion of grid energy when the optional temperature boost backup is active.

Meter: indicates the value of the total power drawn from the grid (red) including household loads and grid feed-in (green) at the metering point.

Power 1: shows the power data for load 1.

Power 2: shows the power data for load 2.

Temperature 1-4: shows the data of the temperature probe.

Status information on the display



The data of all variables relevant to the operation are shown in a list.

Output: shows the current output of the AC•THOR power unit.

Meter: shows the current data for the meter at the measuring point. A positive value shows drawing from the grid, a negative value, feeding into the grid.

PV Power: data not currently available.

Load: shows the nominal power of the load (at 230 V) which is currently being supplied by the AC•THOR output unit. This value can be determined from an output of 500 W. With AC•THOR 9s, the load status (0 or 1) at the three outputs is displayed at this point.

Temperature 1: Current data probe 1

Temperature 2: Current data probe 2

Temperature 3: Current data probe 3

Temperature 4: Current data probe 4

IP: shows the current IP address of the AC•THOR.

Ctrl IP: shows the current IP address of the signal source. Shown in addition in the line below is the designation of the signal source and the current measured value. A positive value shows drawing from the grid, a negative value, feeding into the grid.

Status: Shows the unit's current status. See chapter "Status codes".

For AC•THOR 9s the number consists of two parts. On the left the status code of power unit AC•THOR 9s, on the right the status code of power unit AC•THOR.

Grid voltage: shows the current input voltage at the AC•THOR (only with AC•THOR)

Grid power: shows the current input power at the am AC•THOR (only with AC•THOR)

Output voltage: shows the current output voltage of the AC•THOR (only with AC•THOR)

Power 1: Power at output Out-1 (only with AC•THOR 9s)

Power 2: Power at output Out-2 (only with AC•THOR 9s)

Power 3: Power at output Out-3 (only with AC•THOR 9s)

Frequency: shows the current grid frequency. This information is of particular interest in operating mode M8.

Temperature output unit: shows the current temperature of the AC•THOR power electronics.

Fan: shows the current speed setting of the internal fan.

Serial number: shows the unit serial number.

MAC address: shows the MAC address of the unit.

Version: shows the current firmware version of the unit.

Version power stage: shows the current firmware version of the AC•THOR output unit. For AC•THOR 9s the firmware version of the PS consists of two parts.

pXXX: Power stage AC•THOR

sXXX: Power stage AC•THOR 9s

Device number: shows the unit number set. This is also visible on the home screen.

Operating mode: shows the operating mode set (M1 – Mx). This is also visible on the home screen.

Latest firmware: shows the latest firmware version, or "current" is displayed.

Update status: Ok, loading (number of files), or waiting for installation

Output unit update status: Ok, loading, or waiting for installation

Ethernet (E) Firmware: Shows the status of the firmware, last version, update progress.

Power stage (P) Firmware: Shows the status of the firmware, last version, update progress.

Power stage 9s (S) Firmware: Shows the status of the firmware, last version, update progress.

Relay status: shows the current status of the switch output (0 or 1).

For AC•THOR 9s this number has four digits. The first digit shows the status of the switch output (0 or 1), the second digit whether Out-3 is switched (0 or 1), the third digit whether Out-2 is switched (0 or 1) and the fourth digit shows the output that is currently supplied by the power stage (1, 2 or 3).

Settings



See chapter "General settings" for general unit settings, also chapter "Operating modes" for settings specific to the respective operating mode.

Help



After activation, brief information on the current view appears on the display. In the web interface the button leads to the online Operation Manual which corresponds to the firmware version installed.

4. Operating modes



You will find wiring diagrams for the respective operating modes and for wiring three-phase heating elements in the assembly instructions supplied with the AC•THOR, as well as in the latest version at any time on www.my-pv.com.

M1: Hot water

AC•THOR: Hot water with a single-phase immersion heater

AC•THOR 9s: Hot water with a three-phase immersion heater or with 3 single-phase immersion heaters



TIP for AC•THOR:

A single-phase heating element does not necessarily have to have 3kW power. Of course, smaller outputs such as 2kW are also possible!




TIP for AC•THOR 9s:

A three-phase heating element does not necessarily have to have 9kW power.


Smaller outputs such as 4.5kW, 6kW or 7.5kW are also possible!
Likewise, three single-phase elements can have a power of less than 3kW!

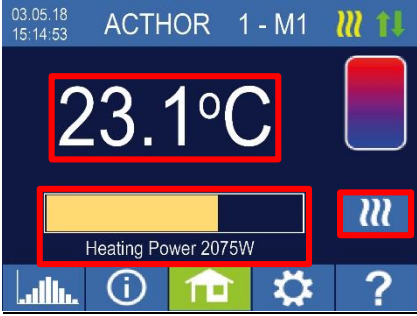
Explanation

In this operating mode, an electric heating element is supplied linearly with excess PV energy. It can be fitted with a bimetal thermostat to switch off when the temperature for which it is set is reached. Otherwise the my-PV temperature sensor is to be used.

 With AC•THOR 9s in operation with three single-phase heating elements, bimetal thermostats must be present on all three immersion heaters!

Optionally, the AC•THOR can also take over guaranteeing the hot water temperature. For this, the my-PV temperature sensor is to be used.

 The my-PV temperature sensor is in all cases to be installed in the storage tank above the heating element to provide a reliable reading!



Data my-PV temperature sensor

Current power output

Single-Boost
Starts a once-only boost backup mode (button only appears if boost backup is activated)

Homescreen




TIP: With the hot water boost backup, limit the use of grid power by avoiding the switch-off at maximum temperature. To do this, set the value higher than the cut out temperature on the immersion heating element thermostat and site the temperature sensor between the immersion heating element and the top edge of the storage tank. In this way, in boost backup mode only the volume above the sensor will be heated to the minimum temperature, while when there is excess PV, the entire contents above the immersion heating element will be heated.

Specific settings for operating mode M1

Hot water 1 temperatures

Adjustable is the maximum permitted temperature to be reached at the my-PV temperature sensor (factory setting = 60 °C). This has nothing to do with a bimetal thermostat which may be installed!

 If the cut out temperature of an immersion heating element with a bimetal thermostat is set too low, the AC•THOR may possibly be unable to reach the desired temperature!

If the optional automatic temperature boost backup is shown "On" in the window on the right (factory setting "Off") or the relay output has been selected, a minimum temperature can then be set (factory setting 50 °C). It cannot be set higher than the maximum temperature.

Automatic temperature boost backup "On":

The AC•THOR can ensure a minimum temperature at the my-PV temperature sensor through the immersion heating element connected. This is supplied with maximum power.

Relay output:

Alternatively, the minimum temperature can be maintained by enabling an external heat source. Enablement is by means of a potential-free contact. For details of wiring the potential-free contacts, please refer to the assembly instructions in the chapter "Connections".



TIP for AC•THOR (not AC•THOR 9s):

If as an external heat source a second immersion heating element (maximum 3 kW) is used, it can be suitably connected up for 6 kW operation. This differs from the 6 kW operating mode in that here the second immersion heating element is only used for temperature boost backup and not as an extension to the normal control range!

Hot water 1 min switching times

This setting can be selected when the temperature boost backup is "On" under "Hot water 1 temperatures", or when the relay output has been selected.

There are two time windows available to maintain the minimum temperature on the my-PV temperature sensor. Start and finish can each be defined at full hours. Factory settings suggest switching times of 5 to 11 pm and 5 to 7 am.



TIP: Restrict the times when the minimum temperature has to be maintained to mornings and evenings, to increase your own PV consumption through the day!

Hot water 1 min weekdays

This setting can be selected when the temperature boost backup is "On" under "Hot water 1 temperatures", or when the relay output has been selected.

You can select the weekdays on which the minimum temperature has to be maintained. In the factory settings, all weekdays are activated.

Legionella program

For ensuring drinking water hygiene, a period can be specified by the end of which a set minimum temperature must again be reached after the last time it was reached. The number of days in this period can be set between 1 and 14. A time at which the legionella program is to start can also be specified. Factory settings are number of days 7, starting time 8 pm, temperature is 60 °C, the legionella program is "Off".

The immersion heating element is supplied with maximum power.

Load priority (only with AC•THOR 9s)

Defines the sequence in which the three load outputs are controlled.

Out 1-2-3: Standard, for a three-phase immersion heater.

Out 3-2-1: For stratified charging with three single-phase immersion heater.



For Out 3-2-1, it is essential to observe the order of the load outputs according to the wiring diagram!

Boost output (only with AC•THOR 9s)

If boost backup is activated for AC•THOR 9s, it is possible to specify which load outputs are to be used for this purpose. All three outputs are activated at the factory.



TIP: If, for example, 3 single-phase heating elements are used, it may only be necessary to use the boost function on the top heating element. This keeps storage capacities free for excess energy, which can significantly improve the degree of self-

sufficiency!

TIP: If not all three outputs of a three-phase heating element are used for boosting, control power is still available in case of excess energy!

Temperature sensors (only with AC•THOR 9s)

Optionally, three temperature sensors can also be used in the operation of three single-phase heating elements. The assignment must be made vice versa to the load outputs.

Note: One temperature sensor is always enclosed with the AC•THOR, other sensors must be purchased separately.

Load output / heater	Sensor number
Out-3 / Top	1
Out-2 / Center	2
Out-1 / Bottom	3

Excess power control and boost backup are then carried out individually for each heating element; the settings in " Hot water 1 temperatures" affect all three elements. If only one sensor is used, this only switches off the upper heating element, the other heating elements must be controlled via thermostats.

M2: Hot water stratified charging

AC•THOR: Hot water with two single-phase immersion heaters

AC•THOR 9s: Hot water with two three-phase immersion heaters

Explanation

In a water tank in this operating mode, two immersion heating elements are supplied successively and linearly with excess PV power. The upper element has priority. The aim is to reach the desired temperature at the tapping point as quickly as possible before further excess power heats up the remaining contents of the tank.

As soon as the upper immersion heating element reaches the target temperature the lower heater will be supplied. If no my-PV temperature sensor is used, the switch-over takes place via the thermostats of the heating elements, the AC•THOR then regularly checks whether the upper heating element is available again. If the my-PV temperature sensor is used, the changeover takes place when the temperature at the sensor reaches the set maximum value.




Both heating elements must be equipped with a bimetal thermostat to switch off when the set temperature is reached!

With AC•THOR, the switchover between the single-phase heating elements takes place directly via the integrated relay (see wiring diagram). With the AC•THOR 9s, the relay operates a three-pole NC contact and a three-pole NO contact (see wiring diagram), which then switch over the three-phase heating elements.



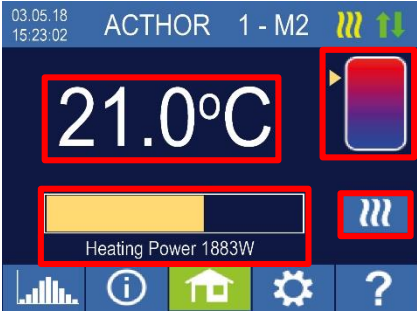
TIP: It is also possible to control two immersion heating elements in separate tanks. The "upper" heater would then for instance be located in a drinking water tank, the "lower" heater in a buffer tank alongside it.

Optionally, the AC•THOR can also take over the boost backup of the hot water temperature at the upper immersion heater. For this, the my-PV temperature sensor is to be used.

 The my-PV temperature sensor must in any event be installed in the hot water tank above the upper heater to provide a reliable reading!

Data my-PV temperature sensor

Current power output



Homescreen


An arrow shows which heater is currently being supplied. (upper or lower)

Single-Boost
Starts a once-only boost backup mode (button only appears if boost backup is activated)

Specific settings for operating mode M2

Hot water 1 temperatures

Adjustable is the maximum permitted temperature to be reached at the my-PV temperature sensor (factory setting = 60 °C). This has nothing to do with a bimetal thermostat which may be installed!

 If the cut out temperature of an immersion heating element with a bimetal thermostat is set too low, the AC•THOR may possibly be unable to reach the desired temperature!

If the optional automatic temperature boost backup is shown "On" in the window on the right (factory setting "Off"), a minimum temperature can then be set (factory setting 50 °C). It cannot be set higher than the maximum temperature.

Automatic temperature boost backup "On":

The AC•THOR can ensure a minimum temperature at the my-PV temperature sensor with the upper heater. This is supplied with maximum power.

Hot water 1 min switching times

This setting can be selected when the temperature boost backup is "On" under Hot water 1 temperatures".

There are two time windows available to maintain the minimum temperature on the my-PV temperature sensor. Start and finish can each be defined at full hours. Factory settings suggest switching times of 5 to 11 pm and 5 to 7 am.



TIP: Restrict the times when the minimum temperature has to be maintained to mornings and evenings, to increase your own PV consumption through the day!

Hot water 1 min weekdays

This setting can be selected when the temperature boost backup is "On" under Hot water 1 temperatures".

You can select the weekdays on which the minimum temperature has to be maintained. In the factory settings, all weekdays are activated.

Legionella program

For ensuring drinking water hygiene, a period can be specified by the end of which a set minimum temperature must again be reached after the last time it was reached. The number of days in this period can be set between 1 and 14. A time at which the legionella program is to start can also be specified. Factory settings are number of days 7, starting time 8 pm, temperature is 60 °C, the legionella program is "Off".

The upper immersion heating element is here supplied with maximum power.

Boost output (only with AC•THOR 9s)

If boost backup is activated for AC•THOR 9s, it is possible to specify which load outputs are to be used for this purpose. All three outputs are activated at the factory.



TIP: If not all three outputs of a three-phase heating element are used for boosting, control power is still available in case of excess energy!

M3: Hot water 6 kW

AC•THOR: Hot water 6kW

AC•THOR 9s: 6kW control power is possible with operating mode M1

Explanation

In this operating mode, two heating elements each of 3 kW are supplied with excess PV power in a water storage tank. One of them be regulated continuously variable, the other cuts in as soon as more than 3 kW excess PV is available. When this occurs, the first heater starts again from 0 with the power regulation. Thus taken together, a control range from 0 to 6 kW is available.

Both heaters can be fitted with a bimetal thermostat to cut out when the set temperature is reached. Otherwise the my-PV temperature sensor is to be used.

Optionally, the AC•THOR can also take over boost backup of the hot water temperature with both immersion heating element s. For this, the my-PV temperature sensor is to be used.



The my-PV temperature sensor must in any event be installed in the hot water tank above the upper heater to provide a reliable reading!

The screenshot shows the AC•THOR 1-M3 homescreen. At the top left, the date is 03.05.18 and the time is 16:26:31. The unit name 'ACTHOR 1 - M3' is displayed in the top center. On the left, there are two labels: 'Data my-PV temperature sensor' pointing to a large digital display showing '23.1°C', and 'Current power output' pointing to a horizontal bar chart and a text label 'Heating Power 1553W'. On the right, there is a 'Single-Boost' button (a red-to-blue gradient square) and a 'Boost Backup' button (a blue square with three wavy lines). A note next to the buttons states: 'Single-Boost Starts a once-only boost backup mode (button only appears if boost backup is activated)'. At the bottom, there is a navigation bar with icons for a bar chart, information, home, settings, and help.

Note: in this operating mode as well, the maximum output of the units can only be set to 3 kW, as this specification affects the AC•THOR output unit.

Specific settings for operating mode M3

Hot water 1 temperatures

Adjustable is the maximum permitted temperature to be reached at the my-PV temperature sensor (factory setting = 60 °C). This has nothing to do with a bimetal thermostat which may be installed!



If the cut out temperature of an immersion heating element with a bimetal thermostat is set too low, the AC•THOR may possibly be unable to reach the desired temperature!

If the optional automatic temperature boost backup is shown "On" in the window on the right (factory setting "Off"), a minimum temperature can then be set (factory setting 50 °C). It cannot be set higher than the maximum temperature.

Automatic temperature boost backup "On":

With both immersion heating elements, the AC•THOR can assure a minimum temperature at the my-PV temperature sensor. These are supplied with 6 kW power.

Hot water 1 min switching times

This setting can be selected when the temperature boost backup is "On" under Hot water 1 temperatures".

There are two time windows available to maintain the minimum temperature on the my-PV temperature sensor. Start and finish can each be defined at full hours. Factory settings suggest switching times of 5 to 11 pm and 5 to 7 am.



TIP: Restrict the times when the minimum temperature has to be maintained to mornings and evenings, to increase your own PV consumption through the day!

Hot water 1 min weekdays

This setting can be selected when the temperature boost backup is "On" under Hot water 1 temperatures".

You can select the weekdays on which the minimum temperature has to be maintained. In the factory settings, all weekdays are activated.

Legionella program

For ensuring drinking water hygiene, a period can be specified by the end of which a set minimum temperature must again be reached after the last time it was reached. The number of days in this period can be set between 1 and 14. A time at which the legionella program is to start can also be specified. Factory settings are number of days 7, starting time 8 pm, temperature is 60 °C, the legionella program is "Off".

The immersion heating elements are supplied with a total power of 6 kW.

M4: Hot water + Heat pump

AC•THOR: Hot water with a single-phase immersion heater

AC•THOR 9s: Hot water with a three-phase immersion heater

Explanation

In this operating mode the electric immersion heating element of a heat pump is linearly supplied with excess PV power. This can be equipped with a bimetal thermostat to switch off when the set temperature is reached. Otherwise the my-PV temperature sensor must be used.



The my-PV temperature sensor must in any event be installed in the hot water tank above the upper heater to provide a reliable reading!

On exceeding a given excess power threshold, operation of the heating pump will be enabled. This threshold can be set. Similarly a minimum time for which this threshold must be exceeded. At the same time as the heat-pump is working, the additional excess power can be passed by the AC•THOR to the immersion heating element . This is activated in the factory settings.

After the defined excess power threshold has been exceeded for a specified time ($t_{P>}$), the heat-pump starts for the minimum operating time (t_{run}). This may also result in power being drawn from the grid!

When the minimum operating time has expired, the heat-pump remains enabled, provided there is still excess PV power available and the target temperature at the my-PV temperature sensor is not yet reached. If this now causes a fall in the excess PV power, the heat-pump will only be disabled after 60 seconds.

Once the heat-pump is disabled, it will not be reactivated for a period which can be set (t_{wait}).

Optionally, the AC•THOR can also take over guaranteeing the hot water temperature. This is carried out by enabling the heat-pump, when the immersion heating element will continue to be linearly supplied with excess.



The target temperature of the heat-pump control is not to be set lower than the AC•THOR minimum temperature, as this could then no longer be guaranteed!

The screenshot shows the AC•THOR homescreen with the following elements:

- Top status bar:** Shows date and time (03.05.18, 17.06.56), device name (ACTHOR), and mode (1 - M4). There are also icons for a fan and a power plug.
- Temperature display:** A large digital display shows 23.0°C, highlighted with a red box. To its right is a fan icon and the text "t run 30 min".
- Power output:** A horizontal bar chart shows the current power output, with the text "Heating Power 1415W" below it. To the right is a red box containing a power plug icon.
- Bottom navigation bar:** Contains icons for a bar chart, information, home, settings, and help.

Labels on the left side of the screenshot:

- "Data my-PV temperature sensor" points to the 23.0°C display.
- "Current power output" points to the bar chart and the 1415W text.

Labels on the right side of the screenshot:

- "Time period and time counter value of the HP control" points to the "t run 30 min" text.
- "Single-Boost Starts a once-only boost backup mode (Button appears only when the relay output is activated)" points to the red box with the power plug icon.

Centered below the screenshot is the text "Homescreen".

Specific settings for operating mode M4

Hot water 1 temperatures

Adjustable is the maximum permitted temperature to be reached at the my-PV temperature sensor (factory setting = 60 °C). This has nothing to do with a bimetal thermostat which may be installed!



If the cut out temperature of an immersion heating element with a bimetal thermostat is set too low, the AC•THOR may possibly be unable to reach the desired temperature!

If the optional automatic temperature boost backup with relay output has been selected, a minimum temperature can then be set (factory setting 50 °C). It cannot be set higher than the maximum temperature.

Relay output:

The AC•THOR can also maintain the minimum temperature at the my-PV temperature sensor by enabling the heat-pump.

Hot water 1 min switching times

This setting can be selected when the relay output is selected under "Hot water 1 temperatures".

There are two time windows available to maintain the minimum temperature on the my-PV temperature sensor. Start and finish can each be defined at full hours. Factory settings suggest switching times of 5 to 11 pm and 5 to 7 am.



TIP: Restrict the times when the minimum temperature has to be maintained to mornings and evenings, to increase your own PV consumption through the day!

Hot water 1 min weekdays

This setting can be selected when the relay output is selected under "Hot water 1 temperatures".

You can select the weekdays on which the minimum temperature has to be maintained. In the factory settings, all weekdays are activated.

Legionella program

For ensuring drinking water hygiene, a period can be specified by the end of which a set minimum temperature must again be reached after the last time it was reached. The number of days in this period can be set between 1 and 14. A time at which the legionella program is to start can also be specified. Factory settings are number of days 7, starting time 8 pm, temperature is 60 °C, the legionella program is "Off".

This enables the heat-pump and the immersion heating element remains in "excess" operation.

Selecting switching thresholds

As switching threshold for a heat-pump, any output between 0 and 9,999 W can be set. Factory setting is 500 W. An alteration to this output threshold only becomes effective after the end of the current control cycle or after the AC•THOR is restarted.

Optionally, simultaneous control of the AC•THOR load output can be deactivated on the right of the screen.

Switching delay

A period in minutes is laid down ($t_{P>}$), during which the switching threshold above must at least be exceeded before the heat-pump is enabled. The factory setting suggests 15 minutes. After this, a minimum operating period (t_{run}) and a minimum pause duration (t_{wait}) can be set for the heat-pump. Factory settings suggest 30 minutes for both these values

M5: Hot water + Space heating

AC•THOR: Hot water + one heating zone

AC•THOR 9s: Hot water + two heating zones

Explanation


This operating mode is intended for buildings with hot water and space heating by electricity. Electrical heat sources are supplied with PV surplus one after the other linearly with power. The immersion heating element for the hot water supply takes priority. As soon as the hot water target temperature at the respective my-PV temperature sensor is reached, next the electric space heating is supplied until here too the target value at the my-PV temperature sensor is reached.


Optionally, the AC•THOR can also take over guaranteeing the hot water temperature.

Two my-PV temperature sensors are required for AC•THOR!

Three my-PV temperature sensors are required for AC•THOR 9s!

Note: One temperature sensor is always included with the AC•THOR, other sensors must be purchased separately.

 The first my-PV temperature sensor is in any case to be sited over the heater in the hot water tank to provide a reliable reading!

 For controlling the space heating, the respective my-PV temperature sensor is to be installed in a suitable place to provide a reliable reading!
With electric underfloor heating for instance in a probe-tube in the floor.
If measuring the air in the room, avoid direct sunlight.



TIP: When specifying room temperatures, to avoid using power from the public grid the minimum values for day and night should be set correspondingly low. See explanation "SH 1 temperatures".

Data my-PV temperature sensors

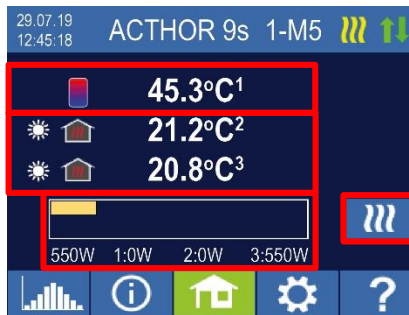
Water temperature

Room temperature 2

Room temperature 1

(sun = daytime operation)

Current power output



Single-Boost
Starts a once-only hot water boost backup
(button only appears if boost backup is activated)


Homescreen

On the display a sun or moon symbol shows which time period is currently controlling the room temperature. Different minimum temperatures can be specified for day and night.

Specific settings for operating mode M5

Hot water 1 temperatures

The maximum temperature permitted to be reached at my-PV temperature sensor 1 can be adjusted (factory setting 60 °C). This has nothing to do with a bimetal thermostat which may be installed!

 If the cut out temperature of an immersion heating element with a bimetal thermostat is set too low, the AC•THOR may possibly be unable to reach the desired temperature!

If the optional automatic temperature boost backup is shown "On" in the window on the right (factory setting "Off"), a minimum temperature can then be set (factory setting 50 °C). It cannot be set higher than the maximum temperature.

Automatic temperature boost backup "On":

The AC•THOR can ensure a minimum temperature at the my-PV temperature sensor through the immersion heating element connected. This is supplied with maximum power.

Hot water 1 min switching times

This setting can be selected when the temperature boost backup is "On" under Hot water 1 temperatures".

There are two time windows available to maintain the minimum temperature on the my-PV temperature sensor. Start and finish can each be defined at full hours. Factory settings suggest switching times of 5 to 11 pm and 5 to 7 am.



TIP: Restrict the times when the minimum temperature has to be maintained to mornings and evenings, to increase your own PV consumption through the day!

Hot water 1 min weekdays

This setting can be selected when the temperature boost backup is "On" under Hot water 1 temperatures".

You can select the weekdays on which the minimum temperature has to be maintained. In the factory settings, all weekdays are activated.

Legionella program

For ensuring drinking water hygiene, a period can be specified by the end of which a set minimum temperature must again be reached after the last time it was reached. The number of days in this period can be set between 1 and 14. A time at which the legionella program is to start can also be specified. Factory settings are number of days 7, starting time 8 pm, temperature is 60 °C, the legionella program is "Off".

The immersion heating element is supplied with maximum power.

SH 1 temperatures (with AC•THOR 9s SH 1 und SH 2)

The maximum room temperature permitted to be reached at my-PV temperature sensor 2 or 3 (sensor 1 is for hot water) can be adjusted (factory setting 22 °C), as are the minimum temperatures which should be maintained in the day and night periods (factory setting 20 °C in each case).

SH 1 Switching times (with AC•THOR 9s SH 1 und SH 2)

Start and finish of the night period can both be adjusted with hours and minutes. The factory setting suggests the period between 10 pm and 5 am. This setting can be selected as desired for all days of the week with corresponding selection of the button alongside the time (MON-SUN, MON-FRI, SAT-SUN).

Temperature sensors

Sensor assignment AC•THOR:

Application	Sensor number
Hot water	1
Space heating	2

Sensor assignment AC•THOR 9s:

Excess power control and boost backup are then carried out individually for each load output.

Load output / Application	Sensor numb
Out-3 / Hot water	1
Out-2 / Space heating 2	3
Out-1 / Space heating 1	2

M6: Space heating

AC•THOR: One heating zone

AC•THOR 9s: Three heating zones

Explanation

In this operating mode an electric space heating is supplied linearly with excess PV power.

One my-PV temperature sensors are required for AC•THOR!

Three my-PV temperature sensors are required for AC•THOR 9s!

Note: One temperature sensor is always included with the AC•THOR, other sensors must be purchased separately.



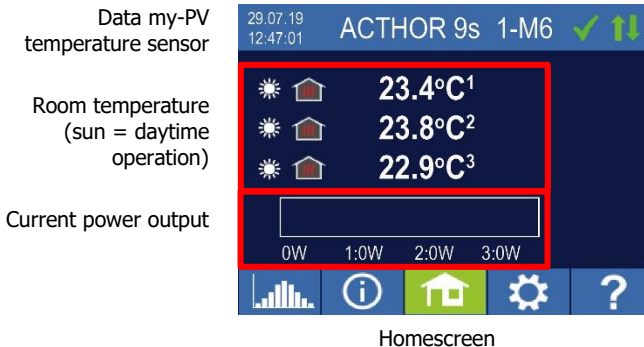
To control the space heating, the respective my-PV temperature sensor is to be installed in a suitable location to provide a reliable reading!

With electric underfloor heating for instance in a probe-tube in the floor.

If measuring the air in the room, avoid direct sunlight.



TIP: When specifying room temperatures, to avoid using power from the public grid the minimum values for day and night should be set correspondingly low. See explanation "SH 1 temperatures".



On the display a sun or moon symbol shows in which time period the room temperature control is currently operating. Different minimum temperatures can be specified for day and night.

Specific settings for operating mode M6

SH 1 temperatures (with AC•THOR 9s SH 1 und SH 2)

The maximum room temperature permitted to be reached at the my-PV temperature sensors can be adjusted (factory setting 22 °C), as are the minimum temperatures which should be maintained in the day and night periods (factory setting 20 °C in each case).

SH 1 Switching times (with AC•THOR 9s SH 1 und SH 2)

Start and finish of the night period can both be adjusted with hours and minutes. The factory setting suggests the period between 10 pm and 5 am. This setting can be selected as desired for all days of the week with corresponding selection of the button alongside the time (MON-SUN, MON-FRI, SAT-SUN).

Temperature sensors

Sensor assignment AC•THOR:

Application	Sensor number
Space heating	1

Sensor assignment AC•THOR 9s:

Excess power control and boost backup are then carried out individually for each load output.

Load output / Application	Sensor numb
Out-3 / Space heating 3	3
Out-2 / Space heating 2	2
Out-1 / Space heating 1	1

M7: Hot water + PWM

AC•THOR: Hot water with a single-phase immersion heater

AC•THOR 9s: Hot water with a three-phase immersion heater

Explanation

In this operating mode, an electric heating element is supplied linearly with excess PV energy. In addition, the AC•THOR can send out a temperature-dependent PWM signal. This can for instance control the speed of a pump.

This function was tested by my-PV with the pump type **Wilo Yonos Para PWM1 and PWM2**. For PWM2, the setting command `xxx.xxx.xxx.xxx.xxx/setup.html?pwmt=2` must be entered in the URL of the webinterface. For other pumps, the function cannot be certified.



In this operating mode, two my-PV temperature probes are required!

Optionally, the AC•THOR can also take over guaranteeing the hot water temperature. For this, a third my-PV temperature sensor is to be used.

Note: A temperature sensor is always included with the AC•THOR, other sensors must be purchased separately.

The screenshot shows the AC•THOR homescreen with the following elements:

- Top status bar: 03.05.18, 18.08.48, ACTHOR 1 - M7, and a signal strength icon.
- Temperature sensors: Two large digital displays showing 22.3°C and 44.8°C, highlighted with a red box. To the left, the text "Data my-PV temperature sensors" is present.
- Power output: A bar graph and a digital display showing "Heating Power 48W", highlighted with a red box. To the left, the text "Current power output" is present.
- PWM status: A digital display showing "PWM 36%" and a signal strength icon, highlighted with a red box. To the right, the text "Status PWM Output signal" is present.
- Single-Boost mode: A button with a signal strength icon, highlighted with a red box. To the right, the text "Single-Boost Starts a once-only boost backup mode (button only appears if boost backup is activated)" is present.
- Bottom navigation bar: Icons for a bar chart, information, home, settings, and help.

Homescreen

Specific settings for operating mode M7

Hot water 1 temperatures

Adjustable is the maximum permitted temperature to be reached at the my-PV temperature sensor (factory setting = 60 °C). This has nothing to do with a bimetal thermostat which may be installed!



If the cut out temperature of an immersion heating element with a bimetal thermostat is set too low, the AC•THOR may possibly be unable to reach the desired temperature!

If the optional automatic temperature boost backup is shown "On" in the window on the right (factory setting "Off") or the relay output has been selected, a minimum temperature can then be set (factory setting 50 °C). It cannot be set higher than the maximum temperature.

Automatic temperature boost backup "On":

The AC•THOR can ensure a minimum temperature at the my-PV temperature sensor through the immersion heating element connected. This is supplied with maximum power.

Relay output:

Alternatively, the minimum temperature can be maintained by enabling an external heat source. Enablement is by means of a potential-free contact. For details of wiring the potential-free contacts, please refer to the assembly instructions in the chapter "Connections".



TIP for AC•THOR (not AC•THOR 9s):

If as an external heat source a second immersion heating element (maximum 3 kW) is used, it can be suitably connected up for 6 kW operation. This differs from the 6 kW operating mode in that here the second immersion heating element is only used for temperature boost backup and not as an extension to the normal control range!

Hot water 1 min switching times

This setting can be selected when the temperature boost backup is "On" under "Hot water 1 temperatures", or when the relay output has been selected.

There are two time windows available to maintain the minimum temperature on the my-PV temperature sensor. Start and finish can each be defined at full hours. Factory settings suggest switching times of 5 to 11 pm and 5 to 7 am.



TIP: Restrict the times when the minimum temperature has to be maintained to mornings and evenings, to increase your own PV consumption through the day!

Hot water 1 min weekdays

This setting can be selected when the temperature boost backup is "On" under "Hot water 1 temperatures", or when the relay output has been selected.

You can select the weekdays on which the minimum temperature has to be maintained. In the factory settings, all weekdays are activated.

Boost output (only with AC•THOR 9s)

If boost backup is activated for AC•THOR 9s, it is possible to specify which load outputs are to be used for this purpose. All three outputs are activated at the factory.



TIP: If not all three outputs of a three-phase heating element are used for boosting, control power is still available in case of excess energy!

M8: Frequency mode

AC•THOR: Hot water with a single-phase heating load

AC•THOR 9s: Hot water with a three-phase heating load

Explanation

In this operating mode, a dump-load in an AC island network is linearly supplied with excess PV power. The output of the AC•THOR is specified to the unit by a battery inverter through alteration of the grid frequency via power-grid connection. Wiring for intercommunication is not required!

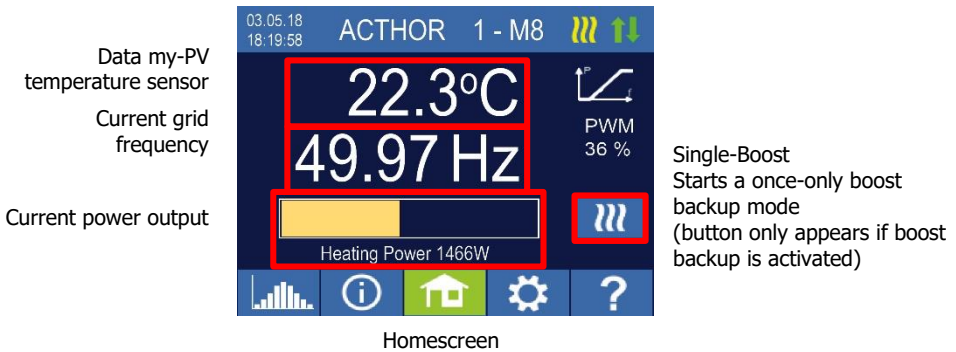
If an immersion heating element is used as a dump load, the AC•THOR can optionally also take over boost backup of the hot water temperature. For this, the my-PV temperature sensor is to be used.



In this application, the my-PV temperature sensor in the storage tank must in any event be installed above the immersion heating element to provide a reliable reading!



In boost backup mode, the battery must be expected to discharge!



TIP: Using several AC•THORs, each one may specify a different frequency range. In this way it is also possible to set priorities for several dump loads.

Specific settings for operating mode M8

Frequency

The frequency range in which the adjustable power can be linearly fed can be altered. As lower limit (no power) and upper limit (maximum power) a range between 45 and 65 Hz is available. The factory settings are 50 Hz and 51 Hz.

The frequency range must be at least 1.0 Hz!

Maximum power

The input of maximum power of the heating load is extremely important for this operating mode. This is why this setting possibility appears here in second place again, in addition to its normal position in the settings. See "General Settings" for details.

Hot water 1 temperatures

Adjustable is the maximum permitted temperature to be reached at the my-PV temperature sensor (factory setting = 60 °C). This has nothing to do with a bimetal thermostat which may be installed!



If the cut out temperature of an immersion heating element with a bimetal thermostat is set too low, the AC•THOR may possibly be unable to reach the desired temperature!

If the optional automatic temperature boost backup is shown "On" in the window on the right (factory setting "Off") or the relay output has been selected, a minimum temperature can then be set (factory setting 50 °C). It cannot be set higher than the maximum temperature.

Automatic temperature boost backup "On":

The AC•THOR can ensure a minimum temperature at the my-PV temperature sensor through the immersion heating element connected. This is supplied with maximum power.

Relay output:

Alternatively, the minimum temperature can be maintained by enabling an external heat source. Enablement is by means of a potential-free contact. For details of wiring the potential-free contacts, please refer to the assembly instructions in the chapter "Connections".



TIP for AC•THOR (not AC•THOR 9s):

If as an external heat source a second immersion heating element (maximum 3 kW) is used, it can be suitably connected up for 6 kW operation. This differs from the 6 kW operating mode in that here the second immersion heating element is only used for temperature boost backup and not as an extension to the normal control range!

Hot water 1 min switching times

This setting can be selected when the temperature boost backup is "On" under "Hot water 1 temperatures", or when the relay output has been selected.

There are two time windows available to maintain the minimum temperature on the my-PV temperature sensor. Start and finish can each be defined at full hours. Factory settings suggest switching times of 5 to 11 pm and 5 to 7 am.



TIP: Restrict the times when the minimum temperature has to be maintained to mornings and evenings, to increase your own PV consumption through the day!

Hot water 1 min weekdays

This setting can be selected when the temperature boost backup is "On" under "Hot water 1 temperatures", or when the relay output has been selected.

You can select the weekdays on which the minimum temperature has to be maintained. In the factory settings, all weekdays are activated.

Legionella program

For ensuring drinking water hygiene, a period can be specified by the end of which a set minimum temperature must again be reached after the last time it was reached. The number of days in this period can be set between 1 and 14. A time at which the legionella program is to start can also be specified. Factory settings are number of days 7, starting time 8 pm, temperature is 60 °C, the legionella program is "Off".

The immersion heating element is supplied with maximum power.

Boost output (only with AC•THOR 9s)

If boost backup is activated for AC•THOR 9s, it is possible to specify which load outputs are to be used for this purpose. All three outputs are activated at the factory.



TIP: If, for example, 3 single-phase heating elements are used, it may only be necessary to use the boost function on the top heating element. This keeps storage capacities free for excess energy, which can significantly improve the degree of self-sufficiency!

TIP: If not all three outputs of a three-phase heating element are used for boosting, control power is still available in case of excess energy!

5. General settings

For settings specific to the different operating modes, please see the chapter "Operating modes". Under the settings these are accessed on the first sheet "Setup 1/X" and some of them on sheet two, "Setup 2/X".

Time zone: The time zone can be set for the time. In addition, summer time is activated for Europe.

Date: The date can be entered in the format dd.mm.yy.

Time: The time can be entered in the format hh:mm:ss.

NTP server: (NTP = Network Time Protocol) As long as the router provides an Internet, the AC•THOR draws its time information automatically from the Internet. However, the respective time zone is not specified. NTP-Timeserver-address can be changed if necessary. The factory setting is 131.130.251.107.



With a direct connection from the AC•THOR to the my-PV power meter, there is no Internet connection. Hence the time cannot be taken!

IP DHCP/static: As standard, DHCP is activated, i.e., the unit will get an IP address from the router to which it is connected. This only works when the router is configured as a DHCP server. If no DHCP server is active in the grid or if a static assignment is required, a fixed IP address is needed.



The settings have to fit with the router, otherwise the device become invisible in the network!

IP address: can only be set when "Static IP" has been selected and there is no direct connection to the my-PV power meter.

Subnet mask: can only be set when "Static IP" has been selected and there is no direct connection to the my-PV power meter.

Gateway address: can only be set when "Static IP" has been selected and there is no direct connection to the my-PV power meter.

DNS server: can only be set when "Static IP" has been selected and there is no direct connection to the my-PV power meter.

Display duration: the number of seconds elapsing until the display is turned off can be set. A value between "10" and "250" seconds can be entered.

Display brightness: brightness of the display can be adjusted in ten steps.

Logo brightness: brightness of the illuminated AC•THOR logo on the unit can be adjusted in ten steps. "0" indicates that the logo will not be turned off

Control: In this section the choice of the signal source for the AC•THOR is made. See chapter "Commissioning".

Ctrl IP: The IP address of the signal source can be selected manually. For example, this is necessary when there are several compatible sources in the network and a special one of them should be chosen as the control system.

Control target value: here the set value of the power at the metering point is specified. A negative value means feed-in. The factory pre-set of the set-point is -50 W. This parameter can be freely chosen in a range between -999 and +999 W.

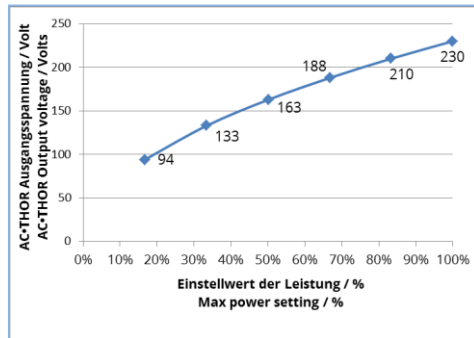
Sensors: Here the temperature sensor is selected for the operating mode. See chapter "Commissioning".

Operating mode: Detailed description will be found in the chapter "Operating modes".

Language: Apart from German, the following languages can be selected: English, Italian, French, Dutch and Spanish.

Unit number: Ex-factory, every AC•THOR carries the number 1.
The possibility of setting higher numbers is to allow for future functions.

Maximum power: This setting limits the output voltage of the AC•THOR. This results in a reduction factor of the nominal power of the load, i. the actual maximum output power depends on the rated power of the load. The maximum output voltage as a function of the parameter results from the following characteristic curve:



The value can be set on the display between 17 – 100 percent.

With AC•THOR 9s this value can only be set in frequency mode.

⚠ Adjustment is generally only required if the rated load power is bigger than the power available for the AC•THOR.
(protection, inverter power in frequency mode)

⚠ Even in operating mode M3 (DHW 6kW), the maximum unit output can be set to a maximum of 3,000 W since this specification affects the regulated output. DO NOT limit the power in this operating mode, otherwise there will be a jump in the power control.

Access level: according to user level (1 – 3), different setting possibilities are enabled on the AC•THOR. In level 3 all settings are enabled. As factory setting, this level is active. It is possible to restrict the setting options enabled.

Level 2 offers slightly restricted setting possibilities for experienced users. Some examples of settings which cannot be altered are those for communication, operating mode, basic settings, sensor assignment and control settings.

In level 1 the setting possibilities are limited to temperature specifications and switching times for space heating (only relevant in operating modes M5 and M6), as well as the brightness and duration of the display settings and brightness of the AC•THOR logo.

A password is required to be able to return to a higher level. The password for level 2 is "1970", that for level 3, "1965".

Hysteresis: switch hysteresis can be set for hot water and room heating. This does not cause too high a target temperature! After reaching the target temperature, the value is allowed to fall by the set amount before the heating process is restarted.

Hot water maximum temperature (factory setting 3.0 °C)
Hot water minimum temperature (factory setting 3.0 °C)
Space heating maximum temperature (factory setting 0.5 °C)
Space heating minimum temperature (factory setting 0.5 °C)

Fault record: See chapter "Fault messages"

Factory settings:

Factory settings: tapping on the menu point resets the AC•THOR to its factory settings. This will cause all altered settings in the unit to be deleted!

CAUTION! No security confirmation is requested!

Check for new firmware:



Internet access is required!

Start check for new updates manually. When a new version is available, it will be stored on the SD card. This procedure takes several minutes. The AC•THOR will operate normally during this period.

Start firmware update: if a newer software version is present on the SD card, the update can be started manually. After the update, the unit will be restarted automatically.

Start power firmware update: if a newer output unit software version is present on the SD card, the update can be started manually. After the update, the unit will be restarted automatically.

6. Web-Interface

In principle, in the web-browser, the web interface offers the same presentation and settings possibilities as the AC•THOR display. Consider that the appearance and the scope of options can change with updated software versions.



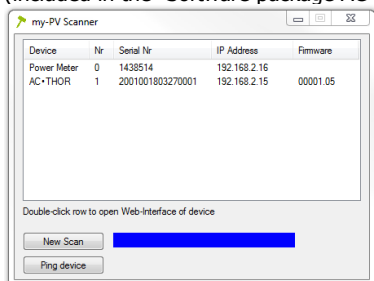
You can only access the web interface if the AC•THOR is in a network. If it has a direct connection to the power meter, this access is not possible!



If you cannot access the AC•THOR in the network, check the network settings on the display!

Expiry of the network connection:

1. After the connection using a patch lead the AC•THOR is assigned a dynamic IP address by the router. It can then be searched for in the network using the program "my-PV Scanner.exe" (included in the "Software package AC•THOR.zip" on www.my-pv.com).



2. If there are several AC•THOR units in the network, the unit to be configured can be identified by the serial number (on the rating plate on the back of the unit).
3. The web interface opens by double clicking on the respective search result.



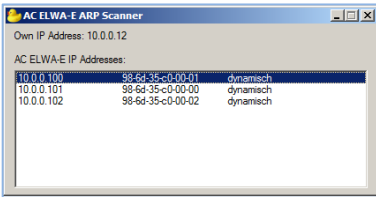
Scanning is performed via UDP port 16124. Firewalls (or specific router settings) may prevent the AC•THOR from being found.

TIP: You will also find the IP address of the AC•THOR on the display or in the DHCP



list in the router!

Alternatively, the second scan program "Scan AC ELWA-E ARP.exe" can be used, which sends an ARP query to the router and displays the connected my-PV devices. Since the router takes some time to update the ARP table it may be that the ARP scan takes some time to show AC ELWA-E results.

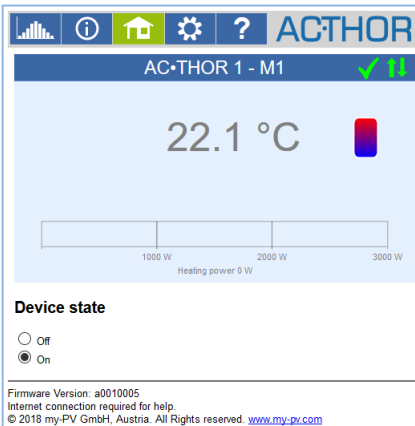


my-PV does not recommend to connect the AC•THOR to the Internet via port forwarding access!

Home (homepage)



The AC•THOR start page in the web browser gives the same information as the home screen on the display. Navigation using the symbols bar is carried out in the same way. Further information in the chapter "Control and display elements".



With device state "Off", the load control can be switched off.

Data logger



The AC•THOR data logger in the web browser gives the same information as the data logger on the display. The selection of values and time period is possible using the menu bar above the diagram. Further information in the chapter "Control and display elements".



TIP: Move the mouse over the bar and the exact values will be shown!



Yellow bars indicate the proportion of energy that comes from the photovoltaic system, green bars indicate the proportion of optional boost-backup.



In the case of third-party control, for example through Modbus TCP, the bars always appear green because a distinction is not possible!

Status information



The status information in the web browser contains more details than that on the AC•THOR display. The following additional values are given. An explanation of the other values is given in the chapter "Status information in the display".

Power share PV:

this value shows the share of the total power from photovoltaics.

Power share grid:

this value shows the share of the total power from the electricity grid.

Power 1 share PV:

this value shows the share of the power for load 1 from photovoltaics.

Note: In operating mode M3 (hot water 6 kW) a figure is also only shown for power 1.

Power 1 share grid:

this value shows the share of the power from load 1 from the grid.

Power 2 share PV:

this value shows the share of the power for load 2 from photovoltaics.

Power 2 share grid:

this value shows the share of the power from load 2 from the grid.

Power 3 share PV: (only with AC•THOR 9s)

this value shows the share of the power for load 3 from photovoltaics.

Power 3 share grid: (only with AC•THOR 9s)

this value shows the share of the power from load 3 from the grid.

Hot water boost backup status: active for codes >0.

Next legionella cycle:

days remaining before next legionella cycle is run.

Settings



The setting possibilities in the web browser are slightly more extensive than those in the AC•THOR display. See next section "Special possibilities for settings in the web interface".

An explanation of the other general unit settings is included in the chapter "General settings".

An explanation of the other specific unit settings for the different operating modes is included in the chapter "Operating modes".



Access level

Level:	Level 3 ▾	Password:	<input type="text"/>
Save			

Mode

Mode:	1: Hotwater 9 kW ▾
Load priority:	Out 1-2-3 ▾
Save	

Hotwater

Temperature:	max °C	Min °C				
	60 ▾	50 ▾				
Boost-Mode:	<input checked="" type="radio"/> Off	<input type="radio"/> On	<input type="radio"/> Relay			
Boost-Output:	1, 2 and 3 ▾					
Timeframe:	start hour	stop hour	and	start hour	stop hour	
	17 ▾	23 ▾		5 ▾	7 ▾	
Weekday	<input checked="" type="checkbox"/> Mon	<input checked="" type="checkbox"/> Tue	<input checked="" type="checkbox"/> Wed	<input checked="" type="checkbox"/> Thu	<input checked="" type="checkbox"/> Fri	<input checked="" type="checkbox"/> Sat <input checked="" type="checkbox"/> Sun
Save						

Legionella-Mode

Prevention of legionella:	<input checked="" type="radio"/> Off	<input type="radio"/> On
Legionellen-Boost Outputs:	1, 2 and 3 ▾	
Activation-Interval:	7 ▾	Days
Start-Hour:	20 ▾	
Target-Temperature:	60 ▾ °C	
Save		

Spaceheating 1

Temperature:	max °C	min Day °C	min Night °C		
	22 ▾	20 ▾	20 ▾		
Weekly program: Night during	Hr	Min	until	Hr	Min
Monday:	22 ▾	0 ▾	-	5 ▾	0 ▾
Tuesday:	22 ▾	0 ▾	-	5 ▾	0 ▾
Wednesday:	22 ▾	0 ▾	-	5 ▾	0 ▾
Thursday:	22 ▾	0 ▾	-	5 ▾	0 ▾
Friday:	22 ▾	0 ▾	-	5 ▾	0 ▾
Saturday:	22 ▾	0 ▾	-	5 ▾	0 ▾
Sunday:	22 ▾	0 ▾	-	5 ▾	0 ▾
Save					

Hysteresis

Hotwater max	Hotwater min	Spaceheating max	Spaceheating min
3 ▾ °C	3 ▾ °C	0.5 ▾ °C	0.5 ▾ °C
Save			

Relay-Function

Power threshold	ACTHOR regulates when relay is on		
500 <input type="text"/>	W	<input type="radio"/> Off <input checked="" type="radio"/> On	
Time threshold exceeded	Min. time on	Min. time off	
15 <input type="text"/> Minutes	30 <input type="text"/> Minutes	30 <input type="text"/> Minutes	
<input type="button" value="Save"/>			

Frequency-Modus

Frequency start	Frequency end
50 <input type="text"/> Hz	51 <input type="text"/> Hz
<input type="button" value="Save"/>	

Time settings

Current time:	Wed, 13 Jun 2018 08:15:59
Timezone:	+01:00 CET <input type="text"/>
Daylight saving mode:	<input type="radio"/> Off <input checked="" type="radio"/> On
NTP server IP address:	131 <input type="text"/> . 130 <input type="text"/> . 251 <input type="text"/> . 107 <input type="text"/>
<input type="button" value="Save"/>	

Control type

Signal source: <small>Author Number >1: only "Slave" selectable</small>	Power Meter Auto <input type="text"/>
<input type="button" value="Save"/>	

Control settings

IP address of the signal source:	0 <input type="text"/> . 0 <input type="text"/> . 0 <input type="text"/> . 0 <input type="text"/>
Control status:	No Control <input type="text"/>
Power timeout:	10 <input type="text"/> Seconds
Control target: <small>Negative value means feed-in. Only change this value if you are familiar with the control strategy - red Help for more details.</small>	-50 <input type="text"/> W
Block Start-Hour:	0 <input type="text"/> Block Stop-Hour: 0 <input type="text"/>
<input type="button" value="Save"/>	

Multi units

Mode	<input checked="" type="radio"/> Off	<input type="radio"/> Synchron	<input type="radio"/> Stratify
<input type="button" value="Save"/>			

IP settings

MAC Address:	98-6D-35-C0-00-FF			
Current IP Address:	192.168.2.21			
Current Subnet Mask:	255.255.255.0			
Current Gateway:	192.168.2.1			
Use static IP only if you are familiar with network administration.				
<input checked="" type="radio"/> DHCP <input type="radio"/> Static IP				
IP Address:	192	168	2	21
Subnet Mask:	255	255	255	0
Gateway:	192	168	2	1
DNS Server:	192	168	2	1
<input type="button" value="Save"/>				

Basic settings

Device-Number (for Multi Mode):	1
Max Power:	3000 W
<input type="button" value="Save"/>	

Debug-Mode

Enable debug mode only after consulting my-PV. Enabled Disabled

System

Ethernet:	a0010100	Status:	Not checked	<input type="button" value="Install update"/>
Power stage:	102	Status:	Up to date	<input type="button" value="Install PS update"/>
Power stage 9s:	100	Status:	Up to date	<input type="button" value="Install 9s update"/>
<input type="button" value="Auf Update prüfen"/>				
Serial No.:	2003001907250000			
Export & Import settings:	<input type="button" value="Export"/>	<input type="button" value="Import"/>		
<input type="button" value="Reboot device"/>				
<input type="button" value="Factory reset"/>				

Special setting possibilities in the web interface

The following unit settings are only possible in the web interface and cannot be carried out on the AC•THOR display.

Legionella boost outputs (only with AC•THOR 9s)

With the AC•THOR 9s, a selection of the load outputs to be used in the Legionella program can be made in the web interface. All three outputs are activated in the factory.

Legionella-Mode	
Prevention of legionella:	<input checked="" type="radio"/> Off <input type="radio"/> On
Legionellen-Boost Outputs:	1, 2 and 3
Activation-Interval:	7 Days
Start-Hour:	20
Target-Temperature:	60 °C
<input type="button" value="Save"/>	



TIP: If, for example, 3 single-phase heating elements are used and only one of them is in a drinking water storage tank, then the Legionella programme should only be used on this heating element!

Power Timeout

In the event that the control signal is only transmitted at intervals, or if there are transmission problems, the run-out time of the AC•THOR can be altered with this value. The factory setting is 10 seconds.

Control settings

Signal source: Power Meter Auto

IP address of the signal source: 0 . 0 . 0 . 253

Control status: No Control

Power timeout: 10 Seconds

Control target:
Negative value means feed-in. Only change this value if you are familiar with the control strategy - red Help for more details.
-50 W

Block Start-Hour: 0 Block Stop-Hour: 0

Save

Block time

This function makes it possible to lay down a period during which the AC•THOR is not to be in operation. Unlike the two time frames for hot water securing the transition to the following day is possible (Start Hour is higher than Stop Hour).



TIP: For example the function can be used to give an existing battery time for charging and to start the heat generation subordinate.



Changes of the time settings are effective within one minute.

Control type: Adjustable Modbus TCP (Sunspec etc)

With the "Adjustable Modbus TCP" control mode, the AC•THOR receives the power-value in the feed-in point from an inverter or Modbus counter. The required register parameters can be set in 5 input fields.

Device ID must be set to the Modbus ID of the external device.

Control type

Signal source: Adjustable Modbus TCP (Sunspec etc)
ACTHOR Number >1: only "Slave" selectable

Save

Control settings

Device ID: 1

Meter Register: 1000 Int16 - feed in

Scale Register / Factor: 1001 none

Modbus Port: 502

IP address of the signal source: 192 . 168 . 2 . 14

Control status: Conn. to Power Meter, P=2

Power timeout: 10 Seconds

Control target:
Negative value means feed-in. Only change this value if you are familiar with the control strategy - red Help for more details.
-50 W

Block Start-Hour: 0 Block Stop-Hour: 0

Save

Signalsource	Device ID	Meter Register		Scale Register		Modbus Port	Comments	
Fronius	240	40097	Float	-feed in		none	502	Smart Meter required. Sunspec must be activated.
KACO TL1 + TL3	1	40084	Int16	+ feed	40085	Sunspec	502	Sunspec must be enabled on inverter

				in				
Kostal PIKO IQ Plenticore plus	71	252	Float-sw	- feed in	-	-	1502	Suitable electricity meters please refer to the Kostal descriptions
Kostal Smart Energy Meter	*	40087	Int16	-feed in	40091	Sunspec	502	* as set on the device
MEC electronics	1	40098	Float	- feed in	-	-	502	Approved for meter type MECmeter
SolarEdge	1	40206	Int16	+ feed in	40210	Sunspec	502	Sunspec must be enabled on SolarEdge
Victron	0	820	Int16	-feed in		none	502	For Multiplus and Quattro.



This type of control is currently only conditionally approved for hybrid systems with battery storage.



With the settings "Adjustable Modbus TCP (Sunspec etc)", the IP address of the signal source must not change during operation (eg by a DHCP router), otherwise the AC•THOR loses the control signal.



When controlled by an inverter, a feed-in meter is required in the system. The query of the inverter otherwise provides no data.



We ask for your understanding that we cannot do any binding support for third-party products. For questions about third-party products, please contact the technical support of the respective company.



Operation with battery may require additional control parameters. In this case, please contact the technical support of my-PV.

Multi units

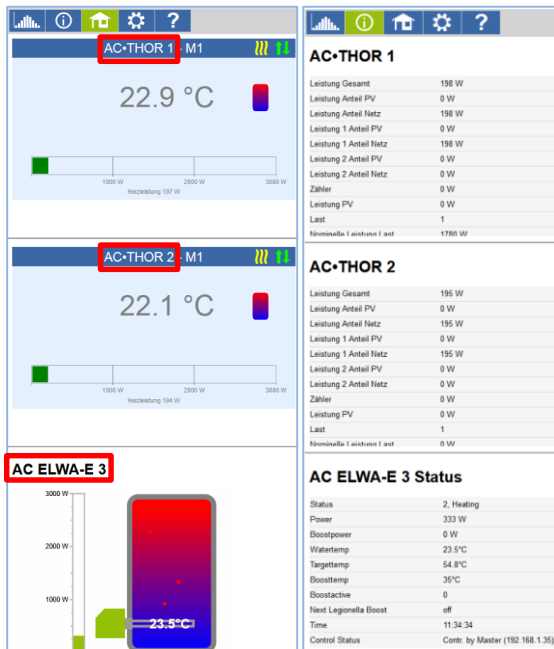
Multiple AC•THORs can be used in a network. Operation is based on the master / slave principle.



TIP: Also the product AC ELWA-E from my-PV can be used as a master or a slave!
See Operation Manual of AC ELWA-E at www.my-pv.com.

Note for AC•THOR 9s: In combination with AC ELWA-E or AC•THOR the AC•THOR 9s in firmware a0010100 can only be used as master, not yet as slave!

To display all devices, the displays of **Home** and **Status** are expanded in the master's web-interface. Each unit is additionally identified by a number.



When using several units the following things have to be considered:

- All AC•THORs must be connected to the router via network cable.
- Only one master can be assigned to a signal source and vice versa.
- Up to 10 slaves can be controlled in one network.
- A maximum of 5 slaves are possible per master.
- All slaves in the network must have different device numbers, even if these are assigned to different masters.
- **All devices must be assigned by permanent IP addresses.** This can be done in two ways:
 - In the web interface of the respective device (see IP Settings)
 - On the display of AC•THOR
 - By the router (recommended)

Settings on Slaves

For the slaves only the device numbers has to be specified (see Basic Settings). All other settings are only required on the master.

As soon as an assignment has been made, further control settings are no longer possible or required. The IP address field is disabled and **Slave** appears in the Control type field.

Control type

Signal source:
Author Number >1: only "Slave" selectable

Control settings

IP address of the signal source:

Control status:

Power timeout: Seconds

Control target: W
Negative value means feed-in. Only change this value if you are familiar with the control strategy. red Help for more details.

Block Start-Hour: Block Stop-Hour:

Settings on Master

Only for devices with number 1 (= master) the following display appears in the setup:

Multi units

Mode Off Synchron Stratify

To make the settings for several devices on the master, first choose between **Synchron** and **Stratify**. In the case of synchronous charging, the power is evenly distributed to the master and its slaves. In the case of stratified charge, the devices are controlled one after the other according to their numbers, in each case until the set target temperature is reached.

After the selection, please click **Save** (left) to display the button **Scan for Slaves** (right).

Multi Units / Mehrere Geräte

Mode / Modus Off / Aus Synchron Stratify / Schicht

Slaves / Sekundärregler:	Unit No. : / Gerät Nr.:	IP Address: / IP Adresse:	Enable / Aktiv
	2	not available / nicht verfügbar	<input type="checkbox"/>
	3	not available / nicht verfügbar	<input type="checkbox"/>
	4	not available / nicht verfügbar	<input type="checkbox"/>
	5	not available / nicht verfügbar	<input type="checkbox"/>
	6	not available / nicht verfügbar	<input type="checkbox"/>
	7	not available / nicht verfügbar	<input type="checkbox"/>
	8	not available / nicht verfügbar	<input type="checkbox"/>
	9	not available / nicht verfügbar	<input type="checkbox"/>
	10	not available / nicht verfügbar	<input type="checkbox"/>
	11	not available / nicht verfügbar	<input type="checkbox"/>

With the search the slaves in the network are displayed. Assign the found slaves to the master by activating them. The IP address now leads directly to the Web interface of the respective slave as a hyperlink.

Multi Units / Mehrere Geräte

Mode / Modus Off / Aus Synchron Stratify / Schicht

Slaves / Sekundärregler:	Unit No. : / Gerät Nr.:	IP Address: / IP Adresse:	Enable / Aktiv
	2	10.0.0.101	<input checked="" type="checkbox"/>
	3	10.0.0.102	<input type="checkbox"/>
	4	not available / nicht verfügbar	<input type="checkbox"/>
	5	not available / nicht verfügbar	<input type="checkbox"/>
	6	not available / nicht verfügbar	<input type="checkbox"/>
	7	not available / nicht verfügbar	<input type="checkbox"/>
	8	not available / nicht verfügbar	<input type="checkbox"/>
	9	not available / nicht verfügbar	<input type="checkbox"/>
	10	not available / nicht verfügbar	<input type="checkbox"/>
	11	not available / nicht verfügbar	<input type="checkbox"/>



Scanning is performed via UDP port 16124. Firewalls (or specific router settings) may prevent that other units can be found.

Debug-Mode

In order to simplify the analysis in the case of possible connection problems, a debug mode can be activated in coordination with our technical support.

Help



In the web interface the button leads to the online Operation Manual which corresponds to the firmware version installed.

7. Potential-free input for external control

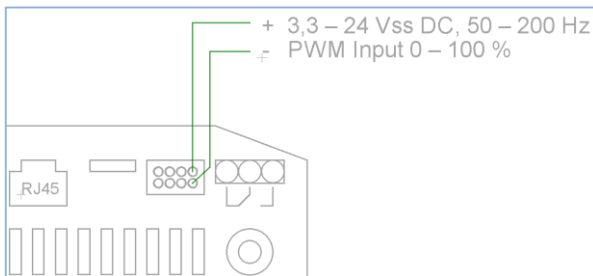
Control with 3.3 - 24 V DC voltage from external source

The AC•THOR can also be operated via an external PWM signal with variable power. The corresponding signal input is located at the 8-pin connector to which the temperature sensor is also connected.



This control is independent of the selected operating mode. If a PWM signal is present, all other control signals that might be available via a network are also overridden. If the boost backup mode is set at the AC•THOR, it remains valid.

As soon as a PWM signal is present, it is displayed in percent on the bottom right of the display above the help button.



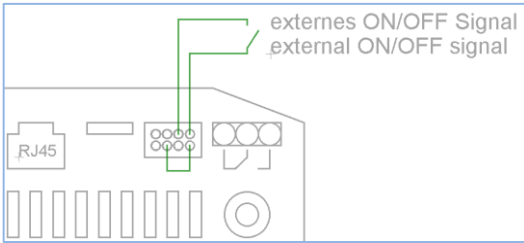
Observe the polarity of the DC voltage!



Without a temperature sensor, the AC•THOR will not switch off. This must then be done by the external signal source or by switching off by thermostat!

Control by potential-free contact

The AC•THOR can also be operated rigidly with maximum power via an external signal.



8. Description of the protocols for http and Modbus TCP

These are described in a separate document which can be provided on request.

9. Firmware update

Update of server



Internet access is required!

Automatic update

If the device has access to the Internet, it automatically detects if a new firmware is available and downloads it to the SD card. The automatic update takes place the following night.

Manual Update

Display - Settings - Factory settings:

Check for new firmware: Start check for new updates manually. When a new version is available, it will be stored on the SD card. This procedure takes several minutes. The AC•THOR will operate normally during this period.

Start firmware update: if a newer software version is present on the SD card, the update can be started manually. After the update, the unit will be restarted automatically.

Start power firmware update: if a newer output unit software version is present on the SD card, the update can be started manually. After the update, the unit will be restarted automatically. With AC•THOR 9s the update for both power stages is started.

Update with SD card

This possibility is provided for installations without Internet access. Consultation with our technical support is necessary.



Never remove the SD card while the unit is operational!



Never exchange an SD card between one unit and another! It contains data specific to the serial number of the unit.

10. Device Key

The device key is shown on a sticker in the Assembly instructions supplied. Keep it safe. It serves for access to the future online platform www.my-pv.live.

11. Status codes

AC•THOR:	0.... Off 1-8... Unit start-up 9... Operation >=200 Fault conditions power stage
AC•THOR 9s:	0-15 ... internal states for support purposes >=200 Error states power stage 9s

12. Temperature sensors: Assignment and function (only with AC•THOR 9s)

Sensor assignment:

Operating mode	M1		M2	M4	M5	M6	M7	M8
Load priority	1-2-3	3-2-1	1-2-3	1-2-3	3-2-1	3-2-1	1-2-3	1-2-3
OUT-3	Sensor 1	Sensor 1	Sensor 1	Sensor 1	Sensor 1 HW	Sensor 3 SH3	Sensor 1	Sensor 1
OUT-2	Sensor 1	Sensor 2	Sensor 1	Sensor 1	Sensor 3 SH2	Sensor 2 SH2	Sensor 1	Sensor 1
OUT-1	Sensor 1	Sensor 3	Sensor 1	Sensor 1	Sensor 2 SH1	Sensor 1 SH1	Sensor 1	Sensor 1

Sensor function:

Operating mode	M1		M2	M4	M5	M6	M7	M8
Load priority	1-2-3	3-2-1	1-2-3	1-2-3	3-2-1	3-2-1	1-2-3	1-2-3
Sensor 1	Max / Min	Max / Min	Switch-over	Max / Min	Max / Min	Max / Min	Max	Max / Min
Sensor 2	none	Max / Min	none	none	Max / Min	Max / Min	PWM	none
Sensor 3	none	Max / Min	none	none	Max / Min	Max / Min	Min	none

13. Fault temperature sensors

0°	Broken probe
85°	Data disruption temperature sensor

14. Error messages on the Display

Error messages are only displayed on the home screen of the display. They are not shown in the web interface.

Error 101	No phase detected on the middle relay contact
Error 102	Temperature sensor 1 required for hot water boost backup Check if the sensor has been activated!
Error 103	Temperature sensor 1 required for 6 kW operating mode Check if the sensor has been activated!
Error 104	Temperature sensor 1 required for space heating Check if the sensor has been activated!
Error 105	Temperature sensor 1 required for hot water Check if the sensor has been activated!
Error 106	Power restriction <3 kW

Error 107	Temperature sensor 2 required for space heating Check if the sensor has been activated!
Error 108	Temperature sensor 2 required for PWM Check if the sensor has been activated!
Error 109	Temperature sensor 1 required for legionella protection Check if the sensor has been activated!
Error 110	Firmware update unsuccessful communication fault with output unit Restart the unit
Error 111	Firmware update unsuccessful Problem with p-file. Switch off the unit. Insert SD card with p-file. See Operating instructions www.my-pv.com Restart the unit
Error 112	Temp sensor 3 required for hot water boost backup Check if the sensor has been activated!
Error 113	Output unit communication timeout. Restart the unit.
Error 114	Output unit stuck in bootloader. Restart the unit.
Error 115	Temperature sensors 2+3 required for spaceheating Check if sensors have been activated!
Error 116	Powerstage overload. Check installation
Error 117	Powerstage overtemperature. Device restarts after cool down.

15. Fault signals by the AC•THOR Logo

1x blinking ►	SD Card error
2x blinking ►	Firmware defective
3x blinking ►	Display error

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Subject to change without notice.

