

ENERGIEBIG®

PTSC2

Assembly and operating instructions



Version: EN 0523

Table of contents

Foreword	3
Safety regulations	3
MAINTENANCE	4
Disposal	4
Scope of delivery	4
MOUNTING THE UNIT	5
Opening the unit	5
Dimensions (mm)	5
EXAMPLE SYSTEM CONFIGURATIONS	6
Variant 1 (up to 3kW)	7
Variant 2 (up to 9kW)	7
Variant 3 (with heat exchanger and pump)	8
Variant 4 (overload protection for the battery inverter)	8
ELECTRICAL CONNECTION	9
Overview	9
SENSOR CONNECTION	9
Battery voltage input [U-DC]	9
Current sensor [I-AC] (variant 4)	9
Temperature sensor [Temp. 1] and [Temp. 2]	10
Controller output [0-10V]	10
12V Outputs [A1], [A2] and [A3]	10
230V connection	10
SETTING THE PARAMETERS	11
Changing default values on micro SD card	11
DIP switch	12
COMMISSIONING	13
LED displays	13
Attention! Inverter search mode not possible	13
Energy-saving tip	13
TROUBLESHOOTING	14
TECHNICAL DATA	14
EU DECLARATION OF CONFORMITY	15
WARRANTY CONDITIONS	16

Foreword

The PTSC2 control and regulation electronics, in combination with an electric heating element and a power controller, is used to utilise surplus electrical energy, especially for stand-alone PV systems with battery storage.

Existing stand-alone PV systems can also be retrofitted at any time without having to replace existing components.

Current information and further documents can be found on the Internet at:
www.netzfern.com > PTSC2

Safety regulations



The controller may only be opened when it is disconnected from mains supply! All installation and connection work must be carried out by competent persons. The local legal and safety regulations must be observed.

- Select a dry interior as the installation location.
- It must be possible to disconnect the controller from the AC supply by means of an all-pole disconnecting device.
- For the purpose of installation and wiring work, the unit must be disconnected from the power supply and secured against being switched on again.
- Never interchange the terminals of the protective extra-low voltage connections (measuring inputs, 12V outputs) with the terminals of the AC connection. Destruction of the unit and the connected components as well as life-threatening voltages are possible.
- The controller must not be used as a substitute for voltage limitation of the battery. Overcharging of the battery must in any case be safely prevented by other devices.
- The battery voltage at the measuring input must not exceed 62V!
- The connected heating elements must have appropriate safety precautions to prevent overheating in any case. The temperature measurement of the controller must not be used as the sole temperature limiter!
- Safe operation is no longer guaranteed if the unit or operating equipment connected to it shows visible damage, no longer functions as intended or is contaminated by unfavourable ambient conditions. In this case, put the unit out of operation and secure it against unintentional restarting.

MAINTENANCE

When operated properly, the unit does not require any special maintenance. Make sure that the controller is mounted in a clean environment and prevent the ingress of corrosive and conductive substances.

For external cleaning, use a dry cloth.

If repairs are carried out on the unit, make sure that the unit has been restored to its original condition before putting it back into operation.

Disposal

- Equipment that can no longer be repaired requires special disposal by an authorised collection point and must never be treated as ordinary residual waste.
- If the electronics and plastic parts are separated from the stainless steel housing, the components may be recycled.
- On request, we can take care of the environmentally friendly disposal of the devices sold by Energiebig® Energie und Umwelttechnik GmbH.
- Incorrect disposal can cause significant environmental damage.

Scope of delivery

- 1x ready-to-connect electronics in stainless steel housing including cable glands
- Connection fuse for battery voltage measurement
- 1x micro SD card
- Assembly and operating instructions

Additionally necessary:

- Power controller with 0-10V control input (part of the **Basic-Set**)
- Electric heater with thermostat up to 9kW (3x3kW max. purely resistive)

Optional:

- Solid state relay 12V control voltage
- Temperature sensor KTY or PT1000
- Current sensor JC10F-050-V (5 VDC / 50A)

MOUNTING THE UNIT

The unit is fixed to a flat surface with 2 5mm screws through the elongated holes in the side lugs. The unit may only be installed and operated in clean, dry places. During installation, the cover should be in place and screwed on.

Opening the unit

After the unit has been mounted in a suitable place, the 4 screws on the front panel can be unscrewed and the cover can be removed by carefully lifting it on the sides. Be careful not to damage the light guides sticking out on the back.

Dimensions (mm)

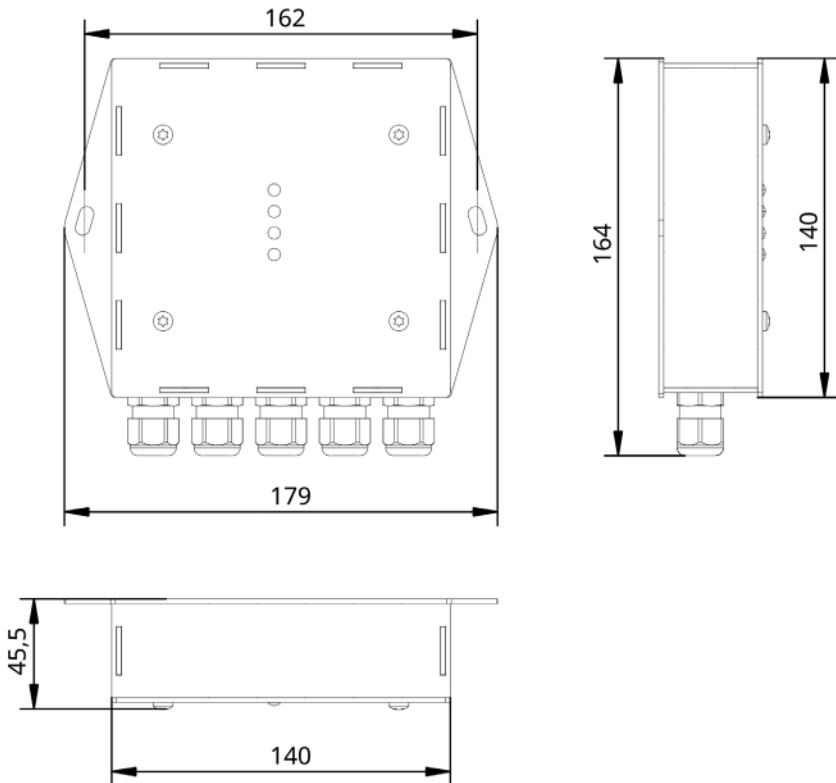


Figure 1

EXAMPLE SYSTEM CONFIGURATIONS

The maximum total power of the connected heating elements should in any case be selected lower than the maximum continuous power of the battery inverter!

If more than one heating element is connected, heating element 1 first regulates to 100%, then jumps back to 0% while heating element 2 is switched on and then continues to regulate. This enables stepless heating from 0 to a maximum of 9 kW with one controlled and 2 switched heating elements.

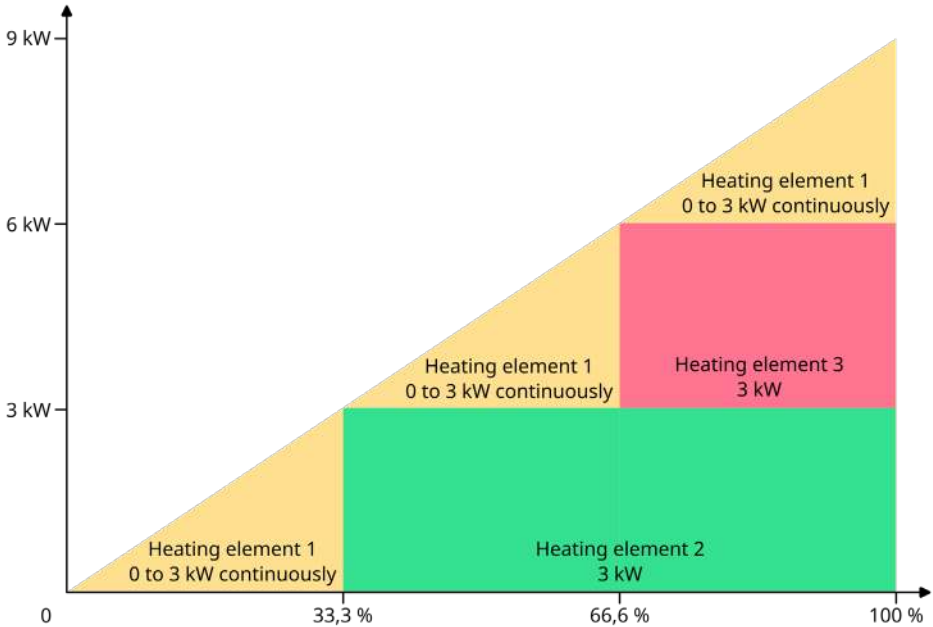


Figure 2

Heat production is only started when the battery voltage U_{max} preset on the SD card is reached. The electricity production of the PV system continues without restriction, but the battery charging current decreases (battery becomes „full“) and the heating is increased.

When operating with more than one heating element, the excess heating starts 0.1V below the preset battery voltage to avoid frequent switching of heating elements 2 and 3.

Variant 1 (up to 3kW)

1 heating element in the storage tank, battery voltage measurement only, temperature measurement optional.

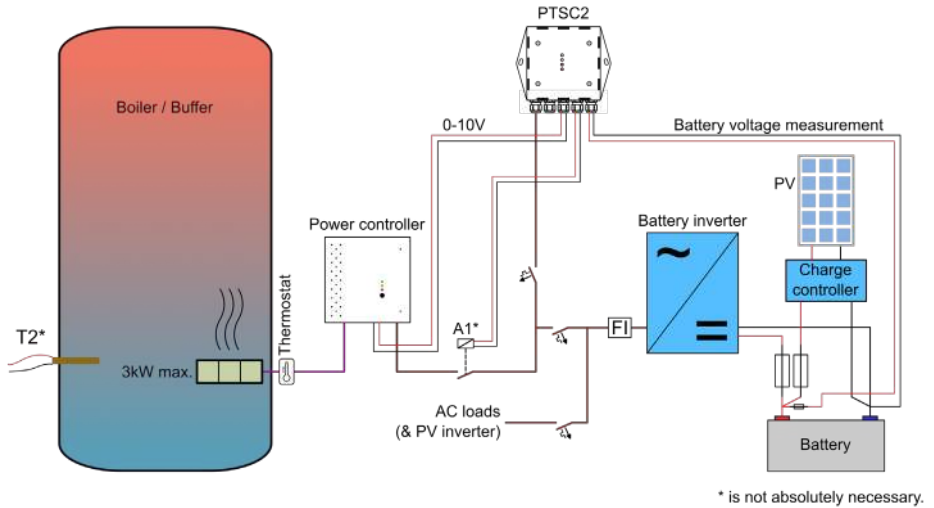


Figure 3

Variant 2 (up to 9kW)

up to 3 heating elements in the storage tank, only battery voltage measurement, temperature measurement optional.

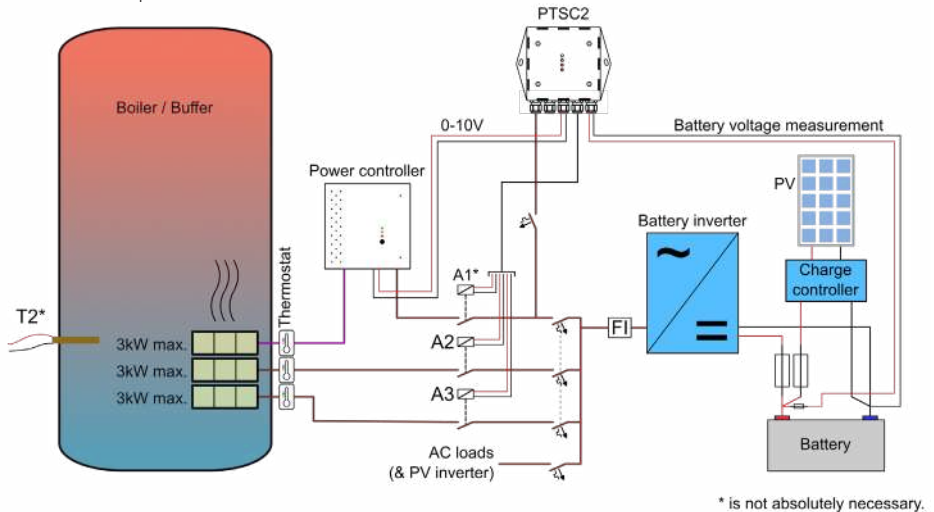


Figure 4

Variant 3 (with heat exchanger and pump)

1 to 3 heating elements in external heat exchanger with pump, 2 temperature sensors required.

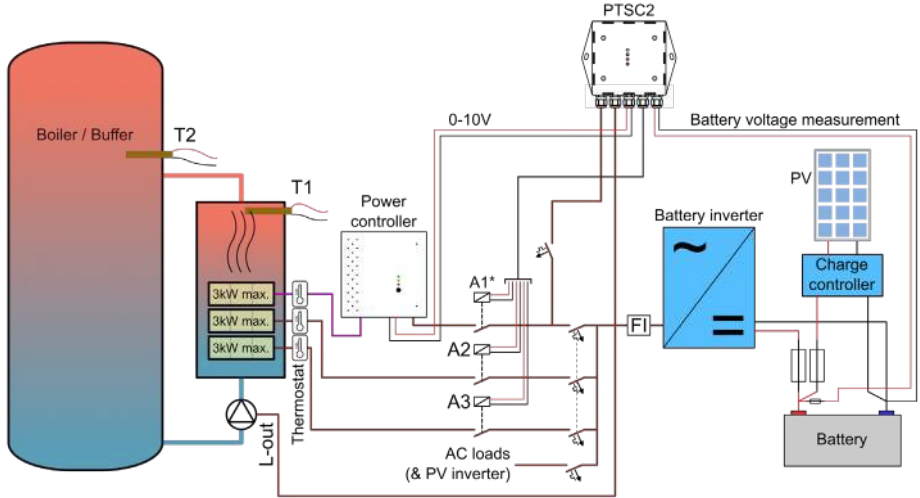


Figure 5

Variant 4 (overload protection for the battery inverter)

Use of the AC current sensor. (PV power on the battery side higher than inverter power)

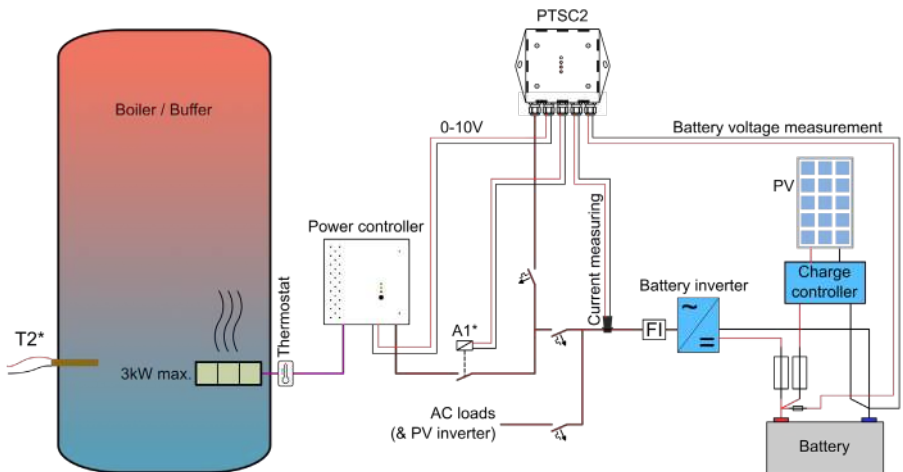


Figure 6

ELECTRICAL CONNECTION

Overview

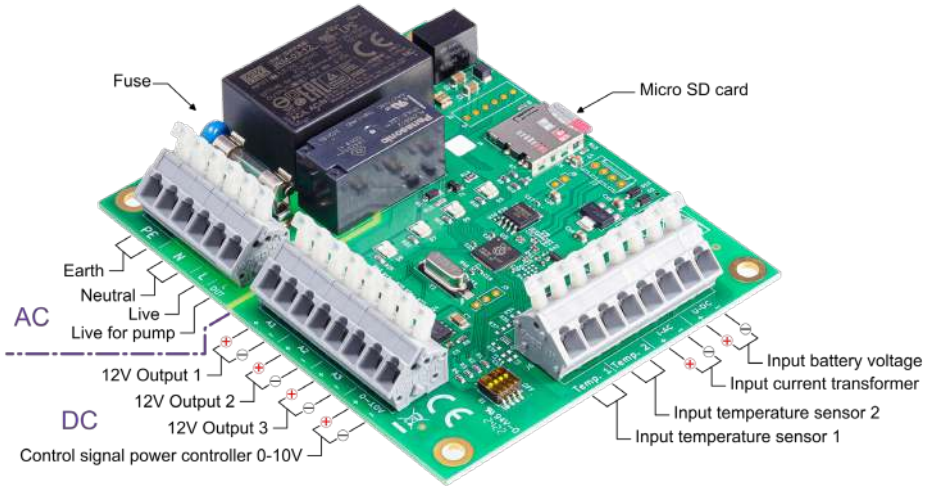


Figure 7

SENSOR CONNECTION

Battery voltage input [U- DC]

In any case, the measuring input for the battery voltage must be connected. The cables for + and - connection should not be fused higher than 500mA.

**IMPORTANT: It is essential to pay attention to the correct polarity.
A reverse polarity connection can result in the destruction of the unit!
Maximum voltage: 62V**

Current sensor [I-AC] (variant 4)

The folding current sensor (available as an option) is to be attached to the AC output of the battery inverter and must detect the total AC current flowing through the battery inverter. The current sensor is only necessary if the maximum continuous power of the inverter is less than the PV power (kWp) coupled to the battery.

**IMPORTANT: It is essential to pay attention to the correct polarity.
A reverse polarity connection can result in the destruction of the unit!**

Temperature sensor [Temp. 1] and [Temp. 2]

Either KTY or PT1000 temperature sensors can be used, but both sensors must be of the same type! DIP switch #4 is used to set which sensor type is used: OFF > KTY / ON > PT1000.

Controller output [0- 10V]

Communication with the power controller is via a 0-10V signal. The cable length should be kept as short as possible and must not exceed 20 metres. Any 2-pole cable with a conductor cross-section of 0.5-1.5 mm² can be used.

MAKE ABSOLUTELY SURE THAT THE POLARITY IS CORRECT AND USE THE TERMINALS PROVIDED FOR THIS PURPOSE ON THE POWER CONTROLLER.

(See power controller instructions)

12V outputs [A1], [A2] and [A3]

Only 12V relay coils with a maximum current consumption of 50mA may be connected. The three +12V connections are electrically connected to each other on the board.

The negative connection is switched in each case!

A1: On during excess heating. To switch on the power controller via power relay only when needed to avoid standby losses (approx. 15 W).

A2: Switches power relay for heating element 2.

A3: Switches power relay for heating element 3.

It is recommended to use the optionally available solid-state relays or switches with the same functionality.

CAUTION: A short circuit can damage the output and render the unit unusable.

230V Connection

For connecting the AC supply and an optional circulation pump, 2 terminals each are available for protective earth [PE] and neutral [N]. The terminal [L] is used for connecting the mains live supply, the switched pump live can be connected to the terminal [L-OUT].

If the input fuse is blown, it may only be replaced with a fuse of the same design with a maximum of 3.5A.

SETTING THE PARAMETERS

Changing default values on micro SD card

A micro SD card with adapter is supplied with the unit. Open and change the text file on the card using a card reader on a computer. Then push the card into the receptacle of the unit (see figure 7) until it clicks into place.

For regulation to the desired battery voltage, this value must be entered correctly on the SD card. A slightly lower voltage than the charge controllers float-voltage should be selected. For example, with a charging voltage of 14 volts, a regulation voltage of 13.6 volts can be set for the PTSC2.

If the optional current sensor is used, a value must also be stored on the SD card. Enter the maximum continuous power output of the battery inverter here.

If a circulation pump is used, temperature sensors must be used in the heat exchanger and in the storage tank for correct control. However, a temperature sensor can also be used when installing the heating element inside the storage tank (operation without pump). If one or both temperature sensors are connected, a maximum value and a differential value must be stored on the SD card.

The text file on the SD card must be named SETUP.TXT and the contents must be formatted as follows:

```
13.6 // Umax    ATTENTION: Dot as decimal point, no comma.  
3000 // Pmax  
5 // dT  
75 // Tmax
```

Umax: Battery control voltage for the excess heating in volts.

Table 1: Recommended settings for Umax

System voltage	Control voltage PTSC2 (Umax)		Charge controller Float voltage	
	Lead-acid AGM	LiFePo4 (4S/8S/16S)	Lead-acid AGM	LiFePo4 (4S/8S/16S)
12V	13.6V	13.3V	14.0V	13.5V
24V	27.4V	26.6V	28.0V	27V
48V	54.8V	53.4V	56.0V	54V

Pmax: Important only when using the AC current sensor if the solar power fed in on the DC side (Pmpp) is greater than the maximum output power of the battery inverter. **Pmax** should not exceed the maximum continuous power of the battery inverter.

dT: Temperature difference for switching a pump and for the maximum temperature in °C. If no temperature sensor is connected, this value is irrelevant.

Tmax: Maximum temperature at which the excess heating stops. Heating does not restart until the measured temperature is **dT** below **Tmax** liegt. If no temperature sensor is connected, this value is irrelevant.

DIP switch

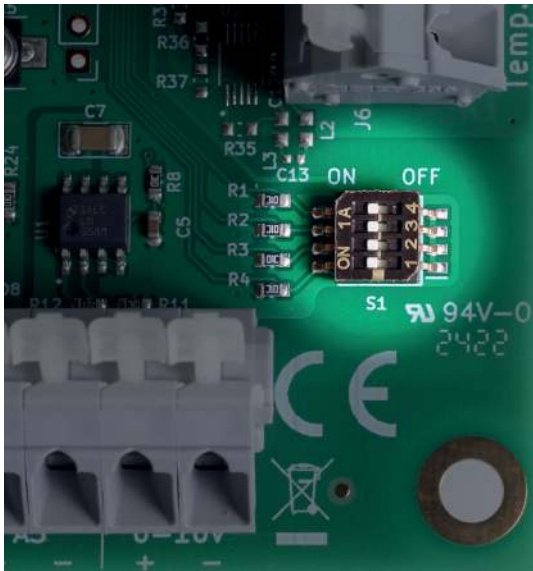


Figure 8

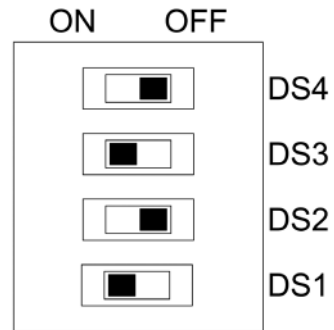


Abbildung 9

Bsp.: DS4 Temp. sensor type: KTY.
DS3 Operation with pump.
DS2 A3 Unused.
DS1 A2 Switches heater 2.

DS4: Temperature sensor type

On: PT1000

Off: KTY

DS3: Pump

On: Pump connected and switched according to temperature -> 2 temperature sensors!

Off: Pump output not operated -> no temperature sensor required.

DS2: Heating element 3 (Can only be used if heating element 2 is also connected.)

On: Heating element 3 connected

Off: Heating element 1 and if DS1 ON Heating element 2 connected

DS1: Heating element 2

On: Heating element 2 connected

Off: Only heating element 1 connected

COMMISSIONING

Once all electrical connections have been made and checked, the SD card is inserted with the correct values and the DIP switches are set correctly, close and screw the cover of the control unit. After switching on the power supply, the unit starts working. Check for proper functioning of the system while excess PV energy is present.

LED-Displays

LED 4 lights up, LED 3 flashes

SD card not inserted or cannot be read.

LED 4 flashes

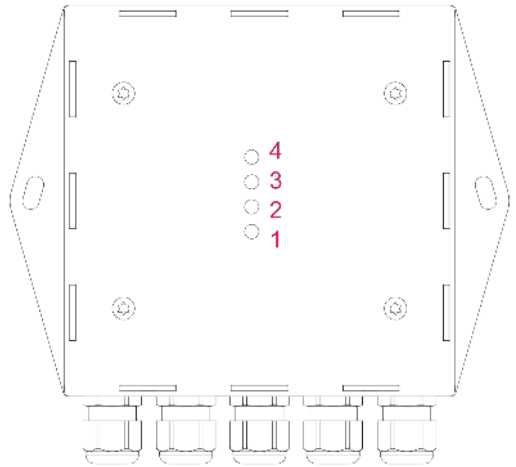
Maximum temperature reached, no heating.

LED 1 flashes

Standby, no surplus.

LED 1 to LED 4

Depending on the excess heating, the LEDs, starting with LED 1, light up with different brightness. The heating power is displayed from 0 to 100%. At 100% heating power, all 4 LEDs light up brightly.



ATTENTION!

Inverter search mode not possible.

The power consumption of the control system is too low to switch the inverter from search mode to operating mode. Other measures should be taken to prevent standby losses.


ENERGY SAVING TIP

To prevent battery discharge due to self-consumption of the inverter, it should be switched off while no alternating current is required. In order to still be able to utilise surplus PV energy, it makes sense to switch on the inverter automatically only when there is sufficient solar power. Many charge controllers have a programmable output that can be used to operate a remote control input on the inverter.

TROUBLESHOOTING

Charge controller reduces charge before excess heating begins.	Check the charging end voltages at charge controller and inverter. These must be slightly higher than the control voltage U_{max} of the PTSC2. If necessary, check with a measuring device and correct U_{max} downwards.
PTSC2 shows excess heating, but heating element does not „work“.	If the system is operated without a temperature sensor, this condition is normal if the thermostat on the heating element interrupts the heating. Otherwise, check the power controller, the temperature sensors and the thermostat and safety thermostat of the heating element for faults.
PTSC2 incorrectly indicates overtemperature.	Check temperature sensor for cable breakage, short circuit and correct placement. Check the maximum temperature T_{max} stored on the micro SD card and increase it if necessary.
With temperature sensor connected, the thermostat switches off before PTSC2 indicates overtemperature.	Check temperature sensor for cable break, short circuit and correct placement. If the error persists, reduce the maximum temperature T_{max} on the micro SD card or set the thermostat to a higher temperature.
Pump does not or insufficiently transport heat from heat exchanger to storage tank.	Check temperature sensor for cable breakage, short circuit and correct placement. Check the temperature difference dT stored on the micro SD card.
Pump continues to run without excess heating.	Check temperature sensor for cable breakage, short circuit and correct placement. Check the temperature difference dT stored on the micro SD card and increase it if necessary.
Battery inverter is overloaded during surplus heating.	Check the connection and placement of the current transformer. Check the set value P_{max} on the micro SD card and reduce it if necessary.

TECHNICAL DATA

AC supply	100 - 240 VAC, 47 – 63 Hz (pump output L-OUT and unit together fused 3,15A)
Standby power consumption	< 0,5 W
Protection rating	IP30
Protection class	I – protective ground conductor 
Operating temperature	0 – 45 °C
Max. Connected load of pump (L OUT)	200 W
12 V outputs (A1 - A3)	Max. 50 mA per output
0 – 10 V output	Max. 10 mA
Temperature sensors	2 x KTY (2KΩ / 25 °C) or 2x PT1000
Measurement I-AC	0 – 50 A with sensor JC10F-050-V (5 VDC / 50A)
Measurement U-DC	0 – 62 V
Dimensions	179 x 164 x 45,5 mm
Weight	1,2 kg

EU – DECLARATION OF CONFORMITY

Document no. / date: E22002 / 11.11.2022
Manufacturer: Energiebig® Energie und Umwelttechnik GmbH
Address: A-6020 Innsbruck, Bachlechnerstraße 21-23

The sole responsibility for issuing this declaration of conformity lies with the manufacturer.

Product designation: PTSC2
Brand name: Energiebig® Energie und Umwelttechnik GmbH
Product description: Energy management controller

The subject matter of the declaration described above complies with the provisions of the Directives:

2014/35/EU	Low Voltage Directive
2014/30/EU	Electromagnetic compatibility
2011/65/EU	RoHS Restriction of the use of certain hazardous substances

Applied harmonised standards:

EN 60730-1: 2021	Automatic electrical controls - Part 1: General requirements
EN IEC 61000-6-2: 2019	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
EN IEC 61000-6-3: 2022	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for equipment in residential environments
EN IEC 63000: 2019	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Affixing of the CE marking: On packaging, Assembly and operating instructions, type plate



Issuer: Energiebig® Energie und Umwelttechnik GmbH
A-6020 Innsbruck, Bachlechnerstraße 21-23

This declaration certifies compliance with the above-mentioned directives, but does not imply any assurance of properties. The safety instructions in the supplied product documents must be observed.

WARRANTY CONDITIONS

Note: The following warranty conditions do not restrict the statutory right to warranty, but extend your rights as a consumer.

1. Energiebig® Energie und Umwelttechnik GmbH grants a one-year warranty from the date of sale to the end user for the PTSC2 device. Defects must be reported immediately upon discovery and within the warranty period. Contacting us immediately will help to avoid unnecessary effort in troubleshooting.
2. The guarantee covers repairs free of charge (but not the cost of determining the fault on site, removal, installation and dispatch) due to faults in workmanship and materials which impair the function. If, after assessment by Energiebig®, a repair is not reasonable for cost reasons, the goods will be replaced.
3. Damage caused by the effects of overvoltage or abnormal environmental conditions is excluded. Likewise, no warranty can be accepted if the defects on the unit are due to transport damage for which we are not responsible, improper installation and assembly, misuse, non-observance of operating or assembly instructions or lack of care.
4. The warranty becomes void if repairs or interventions are carried out by persons who are not authorised to do so or who have not been authorised by us, or if our units are fitted with spare parts, supplements or accessories that are not original parts.
5. The defective parts must be sent to our factory, enclosing a copy of the purchase receipt and giving a precise description of the fault. Prior clarification of the defect with our technical support is helpful.
6. Warranty services do not extend the warranty period nor do they start a new warranty period. The warranty period for installed parts ends with the warranty period of the entire appliance.
7. Further or other claims, in particular those for compensation for damage occurring outside the device, are - insofar as liability is not mandatory by law - excluded.

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