

DeltaTherm® PV

RESOL®

beginning with firmware version 1.02

Power-to-Heat controller for the direct control of an electric heater

Manual for the
specialised craftsman

**Installation
Operation
Functions and options
Troubleshooting**



11211343



The Internet portal for easy and secure access to
your system data – www.vbus.net

Thank you for buying this RESOL product.

Please read this manual carefully to get the best performance from this unit. Please keep this manual safe.

en

Manual

www.resol.com

Safety advice

Please pay attention to the following safety advice in order to avoid danger and damage to people and property.

Danger of electric shock:

- When carrying out works, the device must first of all be disconnected from the mains.
- It must be possible to disconnect the device from the mains at any time.
- Do not use the device if it is visibly damaged.

Instructions

Attention must be paid to the valid local standards, regulations and directives!

Information about the products

Proper usage

The controller is designed for the direct control of an electric heater for using excess current for heating a water store in compliance with the technical data specified in this manual.

Improper use excludes all liability claims.

EU Declaration of conformity

The product complies with the relevant directives and is therefore labelled with the CE mark. The Declaration of Conformity is available upon request, please contact the manufacturer.



Note

Strong electromagnetic fields can impair the function of the device.

- Make sure the device as well as the system are not exposed to strong electromagnetic fields.

Target group

These instructions are exclusively addressed to authorised skilled personnel. Only qualified electricians are allowed to carry out electrical works. Initial commissioning must be effected by authorised skilled personnel.

Description of symbols

WARNING!

Warnings are indicated with a warning triangle!



→ They contain information on how to avoid the danger described.

Signal words describe the danger that may occur, when it is not avoided.

- **WARNING** means that injury, possibly life-threatening injury, can occur.
- **ATTENTION** means that damage to the appliance can occur.



Note

Notes are indicated with an information symbol.

- Arrows indicate instruction steps that should be carried out.

- Dispose of the packaging in an environmentally sound manner.
- At the end of its working life, the product must not be disposed of as urban waste. Old appliances must be disposed of by an authorised body in an environmentally sound manner. Upon request we will take back your old appliances bought from us and guarantee an environmentally sound disposal of the devices.



Subject to technical change. Errors excepted.

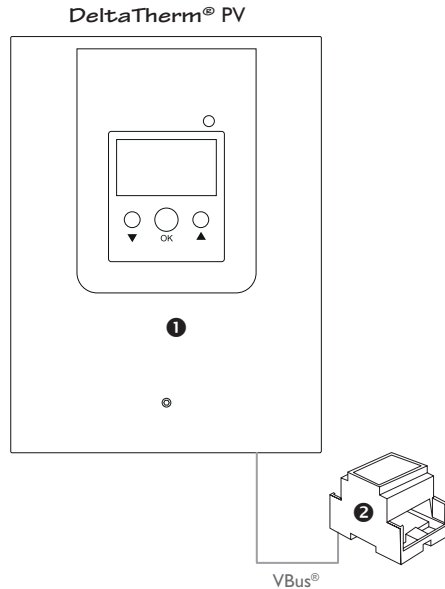
The DeltaTherm® PV controller detects excess current, e.g. produced by PV systems, calculates the energy available and redirects it to an electric heater. Thus, excess current can be directly converted into thermal energy and stored.

Single-phase electromechanical immersion heaters up to 3 kW with an operating voltage of 230 V~ and with a thermal cut-out can be used.

Electronically controlled immersion heaters are not suitable.

Included with the DeltaTherm® PV

- ❶ Controller with power unit (DeltaTherm® PV)
- ❷ Measuring unit and current sensors (DeltaTherm® E sensor)



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1 DeltaTherm® PV

- Use of excess current for heating a water store
- Electric heater of up to 3 kW, variable and grid compliant
- Direct control of the electric immersion heater in the store
- Can be fitted to all stores equipped with an electric immersion heater
- Reliable household power priority
- Economical solution for using excess current

Technical data controller with power unit (DeltaTherm® PV)

Inputs: 3 Pt1000 temperature sensors, 2 digital switching inputs, 0-10V control input

Outputs: 2 digital switching outputs, variable power control up to 3 kW (electric immersion heater)

Power supply: 100–240 V~ (50–60 Hz)

Supply connection: type X attachment

Standby: 1.45 W

Rated impulse voltage: 2.5 kV

Data interface: VBus®

VBus® current supply: 35 mA

Functions: Controller and power controller, internal backup heating

Housing: sheet metal, powder-coated

Mounting: wall mounting

Indication / Display: full graphic display

Operation: 3 buttons

Protection type: IP 20/EN 60529

Protection class: I

Ambient temperature: 0... 40 °C

Degree of pollution: 2

Dimensions: approx. 226 x 302 x 84 mm

Technical data measuring unit (DeltaTherm® E sensor)

Inputs: 3 current inputs and 3 voltage inputs for SW16 current sensors

Power supply: 100–240 V~ (50–60 Hz)

Supply connection: type Y attachment

Standby: < 1 W

Rated impulse voltage: 1.0 kV

Data interface: VBus®

Functions: energy measuring unit

Housing: plastic, PC (UL 94V-0)

Mounting: DIN rail in the domestic distribution board

Indication / Display: 2 operating control LEDs

Protection type: IP 20/EN 60529

Protection class: II

Ambient temperature: 0... 40 °C

Degree of pollution: 2

Dimensions: 71 x 90 x 58 mm

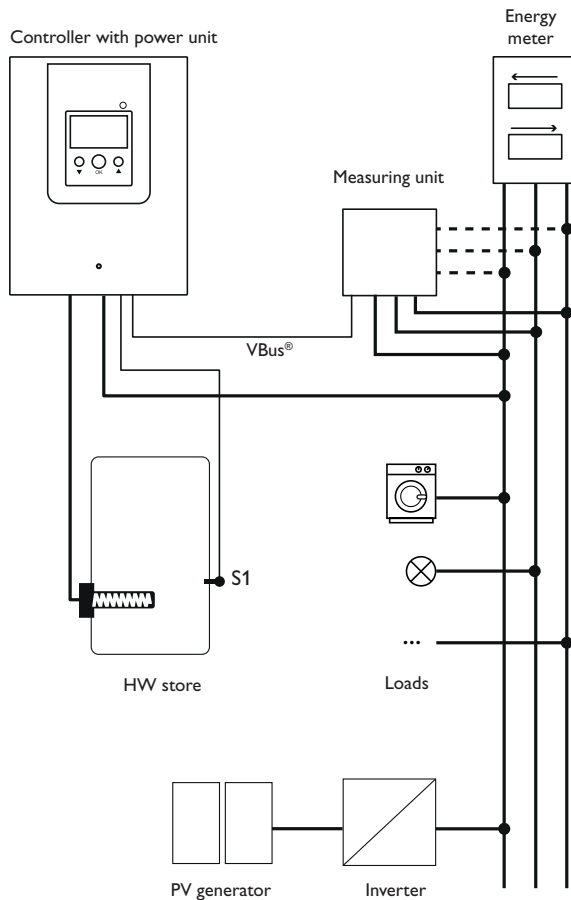
Technical data current sensor (SW16)

Nominal current: 5 ... 300 A

Frequency range: 50 ... 400 Hz

Ambient temperature: -15 ... +60 °C

2 System overview



Sensors		
S1	Temperature store	1/GND
S2	optional	2/GND
S3	optional	3/GND

Output		
Out1	Electric immersion heater	Out1/N/⊕

The control unit consists of the controller with power unit and the measuring unit. The measuring unit measures the current flow directly in front of the energy meter. If the power generated is high enough, the excess current can be used for electrically heating the water in the store.

Optional function internal backup heating (with booster).
If the store maximum temperature is reached (S1), loading will stop.
Optional power control by means of an external 0-10 V signal.

3 Installation

3.1 Mounting

WARNING! Electric shock!

Upon opening the housing, live parts are exposed!

→ **Always disconnect the device from power supply before opening the housing!**



Note

Strong electromagnetic fields can impair the function of the device.

→ Make sure the device as well as the system are not exposed to strong electromagnetic fields.

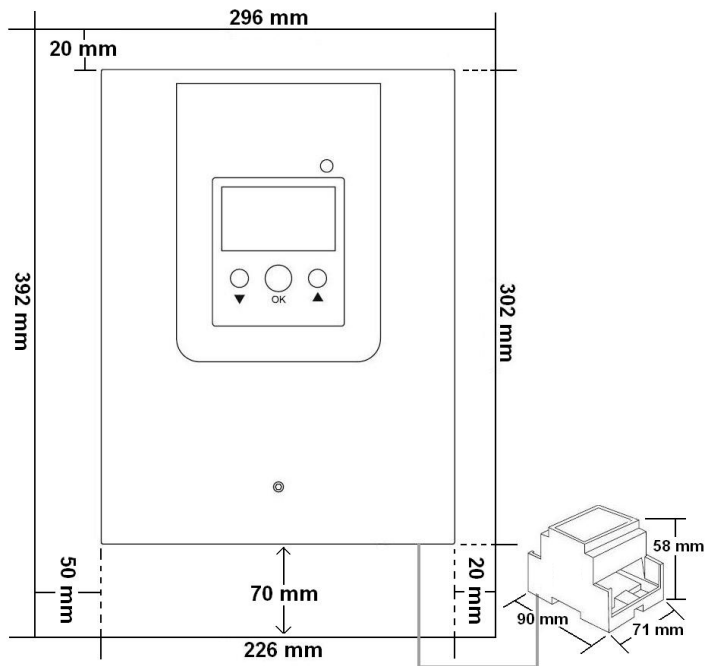
The devices must only be located in dry and dust-free interior rooms.

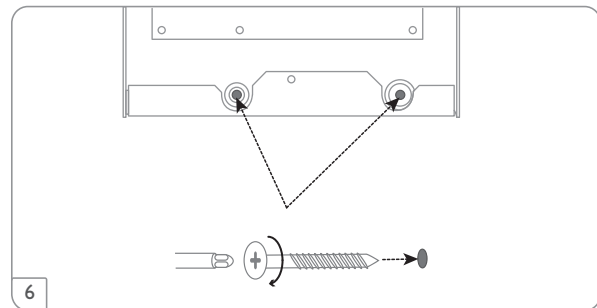
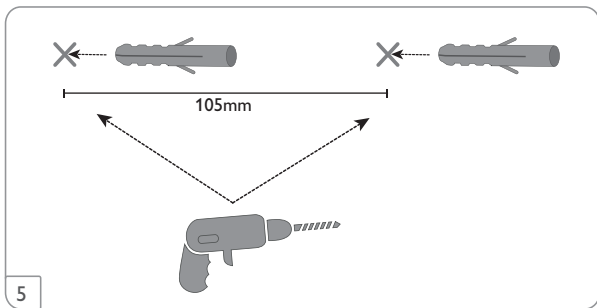
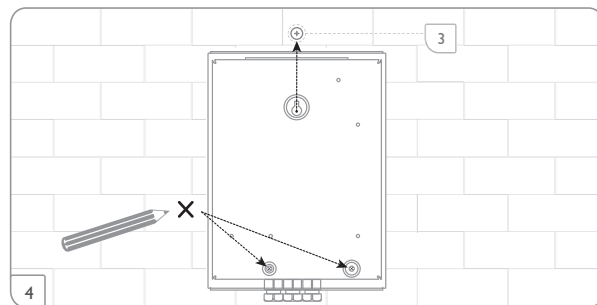
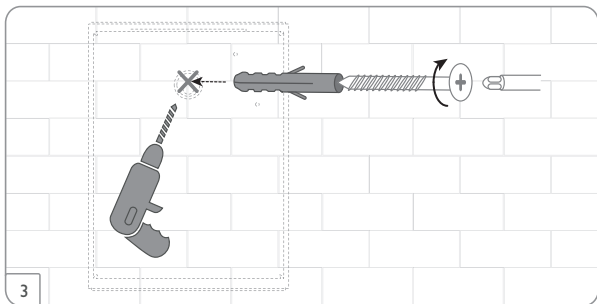
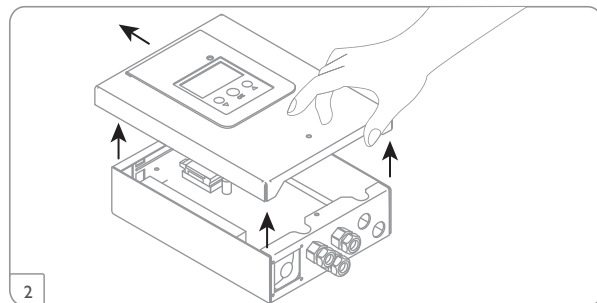
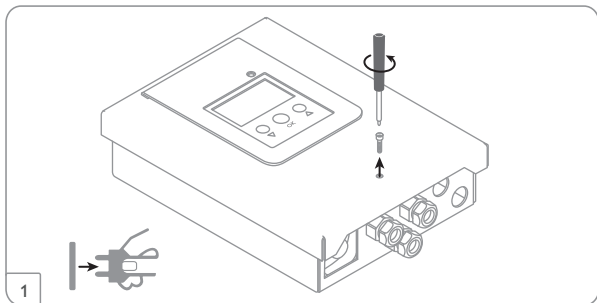
If the device is not equipped with a mains connection cable and a plug, the device must additionally be supplied from a double pole switch with contact gap of at least 3 mm. Please pay attention to separate routing of sensor cables and mains cables.

In order to mount the device to the wall, carry out the following steps:

- Unscrew the screw from the cover and remove it along with the cover from the housing.
- Mark the upper fastening point on the wall. Drill and fasten the enclosed wall plug and screw leaving the head protruding.
- Hang the housing from the upper fastening point and mark the lower fastening points (centres 105 mm).
- Insert lower wall plugs.
- Fasten the housing to the wall with the lower fastening screws and tighten.
- Carry out the electrical wiring in accordance with the terminal allocation (see page 8).
- Put the cover on the housing.
- Attach with the fastening screw.

Dimensions and minimum distances





Step-by-step installation:

ATTENTION! Damage through overheating!



Commissioning the power stage in a system electrically connected, but not hydraulically filled can lead to damage caused by overheating!

→ **Make sure the hydraulic system is filled and ready for operation.**

- Make sure the store is filled and ready for operation.
- Mount the measuring unit on a DIN rail in the domestic distribution board as close as possible to the energy meter. Make sure that no load is installed between the measuring unit and the energy meter.
- Connect the current sensors and the conductors of the measuring unit in phase directly in front of the energy meter (see page 10).
- Connect the measuring unit with the *DeltaTherm*[®] PV by means of the VBus[®] (see page 8 and page 11).
- Establish the power supply of the controller (see page 11).
- Run the commissioning menu (see page 16).
- Carry out the desired adjustment in the controller menu (see page 20).

3.2 Electrical connection

WARNING! Electric shock!



Upon opening the housing, live parts are exposed!

→ **Always disconnect the device from power supply before opening the housing!**

ATTENTION! ESD damage!



Electrostatic discharge can lead to damage to electronic components!

→ **Take care to discharge properly before touching the inside of the device! To do so, touch a grounded surface such as a radiator or tap!**



Note

Connecting the devices to the power supply must always be the last step of the installation!

Do not use the devices if they are visibly damaged!

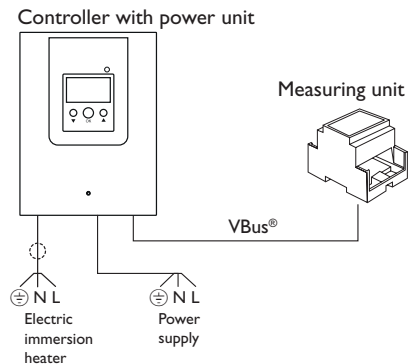
The controller is supplied with power via a mains cable. The power supply of the device must be 100...240 V~ (50...60 Hz). The cross section of the cable must be 2.5 mm².



Note

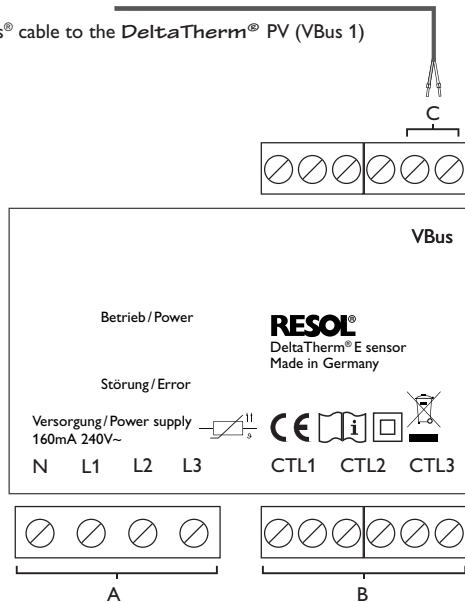
Connect the immersion heater with a **shielded cable** with a cross section of 3 x 2,5 mm² (see page 11).

The cable length must not exceed 5 m.



Measuring unit

VBus® cable to the DeltaTherm® PV (VBus 1)



A

Power supply:

Neutral conductor N
Conductor 1 L1
Conductor 2 L2
Conductor 3 L3

B

SW16 current sensors:

Current sensor CTL1
Current sensor CTL2
Current sensor CTL3

C

Data communication/VBus®

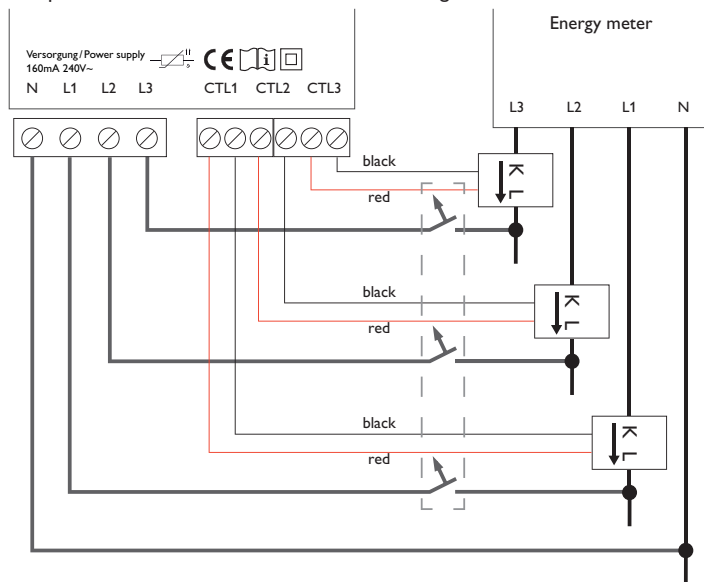
The connection is to be carried out at the terminals marked **VBus** (any polarity).

The bus cable can be extended by means of a 2-wire cable (bell wire). The cable carries extra-low voltage and must not run together in a cable conduit with cables carrying a higher voltage than 50 V (please pay attention to the valid directives). The cross section must be at least 0.5 mm² and the cable can be extended up to 50 m in the case of a single connection.

Three-phase connection

- Connect the current sensors and the conductors of the measuring unit in phase directly in front of the energy meter. The arrow indicated on the current sensors must point in the direction of the loads.

All 3 phases have to be connected to the measuring unit.

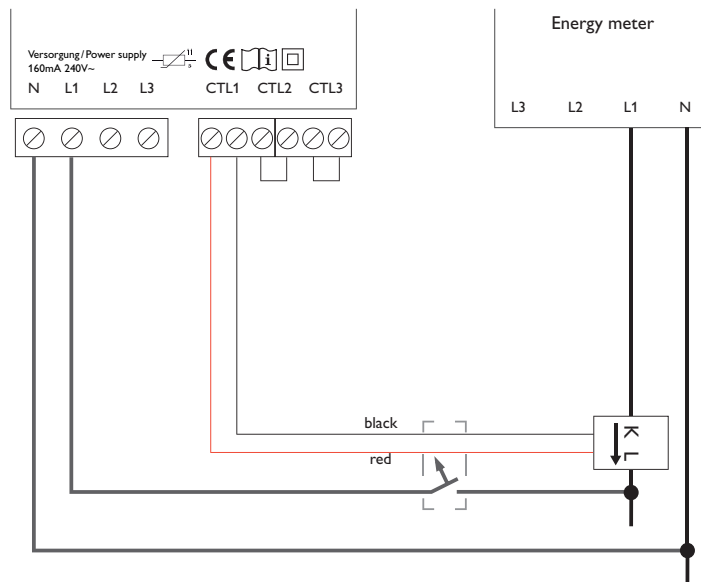


Note

The 3 phases have to be protected by means of a three-phase 16 A circuit-breaker (not included with the device).

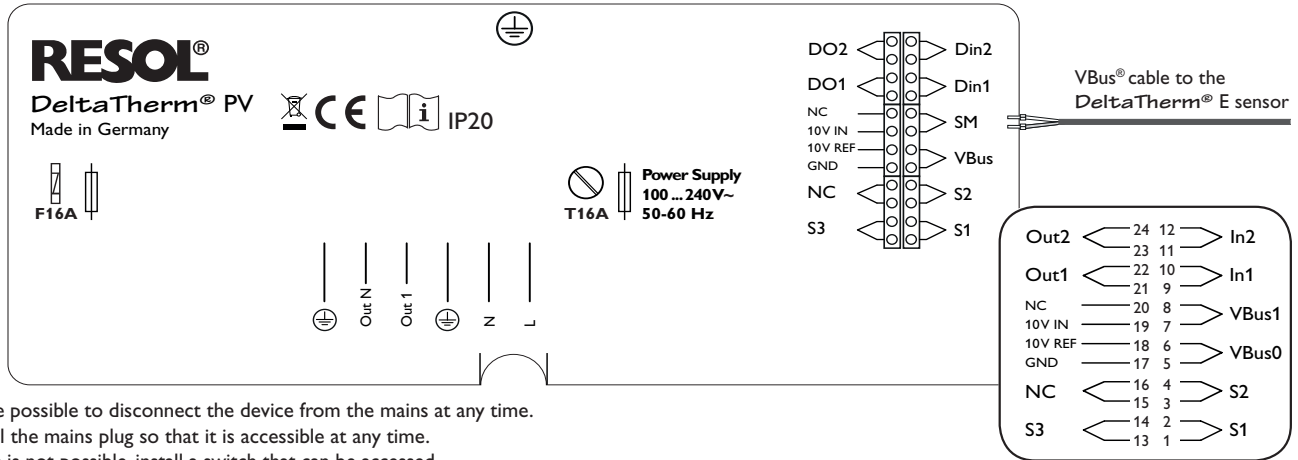
Single-phase connection

- Connect the current sensor and the conductor L1 of the measuring unit directly in front of the energy meter. The arrow indicated on the current sensor must point in the direction of the loads.
- Short circuit the connections of CTL2 as well as those of CTL3.



Note

The phase has to be protected by means of a single-phase 16 A circuit-breaker (not included with the device).



Power supply of the controller (A)	
Conductor	L
Neutral conductor	N
Protective earth conductor	⊕
Connection of the electric heater (B) (see illustration on page 12)	
Out 1	
Out N	
Protective earth conductor	⊕ Protective earth conductor and shield
0-10 V switching input	
external power control	Terminals 17/19
Temperature sensors	
S1 = temperatur store (above the electric immersion heater)	Terminals 1/2
S2 = temperature sensor 2 (optional)	3/4
S3 = temperature sensor 3 (optional)	13/14

Digital switching inputs	
not assigned	Terminals 9/10 and 11/12
Digital switching outputs	
not assigned	Terminals 21/22 and 23/24
VBus® terminals	
The controller is equipped with the VBus® for data communication. The connection is to be carried out at the terminals marked VBus (either polarity). The measuring unit has to be connected to VBus1 (terminals 7/8).	
VBus1 = measuring unit	7/8
VBus0 = additional module (e.g. Datalogger)	5/6

Note
For more details about the commissioning procedure see page 16.

Connection of the electric heater

→ Connect the immersion heater with a **shielded cable** with a cross section of $3 \times 2,5 \text{ mm}^2$ and a length of maximum 5 m.

ATTENTION! Damage to the device!



Using a cable longer than 5 m can lead to damage to the device!

→ **Make sure that the cable length does not exceed 5 m.**

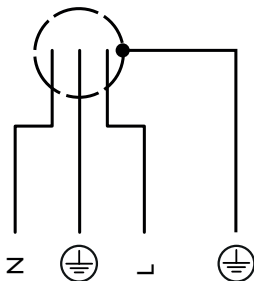


Note

→ Connect the shield to the protective earth conductor of the DeltaTherm® PV only.

To do so, use the clip inside the housing of the device.

Do **not** connect the shield to the electric immersion heater.

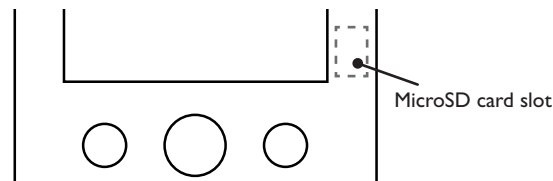


3.3 MicroSD slot of the controller

The controller is equipped with a MicroSD card slot.

With a MicroSD card, the following functions can be carried out:

- Store measurement and balance values onto the MicroSD card. After the transfer to a computer, the values can be opened and visualised, e. g. in a spreadsheet.
- Prepare adjustments and parameterisations on a computer and transfer them via the MicroSD card.
- Store adjustments and parameterisations on the MicroSD card and, if necessary, retrieve them from there.
- Download firmware updates from the Internet and install them on the controller via MicroSD card.

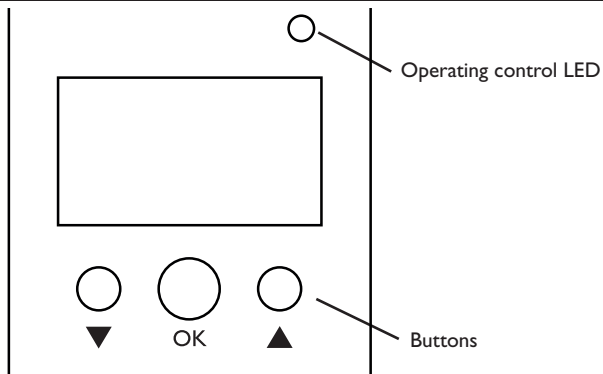


Note

For more information about using a MicroSD card, see page 22.

4 Operation and function of the controller

4.1 Buttons



The controller is operated via the 3 buttons below the display:

Left button (▼) - scrolling downwards / reducing adjustment values

Centre button (OK) - confirming / selecting

Right button (▲) - scrolling upwards, increasing adjustment values

4.1.1 Operating control LED

The controller is equipped with a bicolour LED indicating the following states:

Colour	Permanently shown	Flashing
Green	Everything OK	Manual mode of the power stage
Red	VBus® defective/no communication with the measuring unit	Sensor line break, sensor short circuit

4.1.2 Selecting menu points and adjusting values

During normal operation of the controller, the display shows the Status menu.

If no button is pressed for 1 min, the display illumination will switch off. After 3 more minutes, the controller switches to the Status menu.

➔ In order to scroll through a menu or to adjust a value, press buttons ▲ and ▼.

- ➔ To open a submenu or to confirm a value, press the centre button (OK).
- ➔ To enter the previous menu, scroll upwards by pressing button ▲ or scroll downwards by pressing button ▼ until **back** is indicated.
- ➔ Press the centre button (OK).

Status: Meas. ... E 12:48		
S1	85.0 °C	»»
S2	55.2 °C	»»
S3	90.3 °C	»»

If the symbol »» is shown behind a menu item, pressing the centre button (OK) will open a new submenu.

Values and adjustments can be changed in different ways:

Maxtemp.		
60 °C		
35	▲ = 60	90

Numeric values can be adjusted by means of a slide bar. The minimum value is indicated to the left, the maximum value to the right. The large number above the slide bar indicates the current adjustment. By pressing buttons ▼ and ▲, the upper slide bar can be moved to the left or to the right.

Only after the adjustment has been confirmed by pressing the centre button (OK) will the number below the slide bar indicate the new value. The new value will be saved if it is confirmed by pressing the right centre (OK) again.

Auto DST	
▶	<input checked="" type="radio"/> Yes
	<input type="radio"/> No

If only one item of several can be selected, they will be indicated with radio buttons. When one item has been selected, the radio button in front of it is filled.

Adjusting the timer

When the **Timer** option is activated, a timer is indicated in which time frames for the function can be adjusted.

In the **Day selection** channel, the days of the week are available individually and as frequently selected combinations.

If more than one day or combination is selected, they will be merged into one combination for the following steps.

The last menu item after the list of days is **Continue**. If **Continue** is selected, the timer menu opens, in which the time frames can be adjusted.

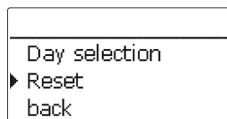
Adding a time frame:

In order to add a time frame, proceed as follows:

➔ Select **New time frame**.

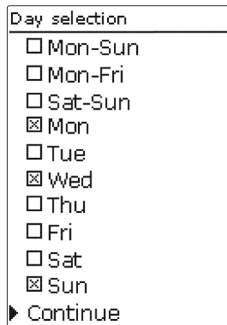
➔ Adjust **Start** and **Stop** for the desired time frame.

The time frames can be adjusted in steps of 5 min.



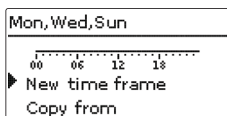
Day selection

- ▶ Reset
- back



Day selection

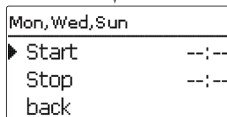
- Mon-Sun
- Mon-Fri
- Sat-Sun
- Mon
- Tue
- Wed
- Thu
- Fri
- Sat
- Sun
- ▶ Continue



Mon, Wed, Sun

00 06 12 18

- ▶ New time frame
- Copy from



Mon, Wed, Sun

- ▶ Start --:--
- Stop --:--
- back



Start

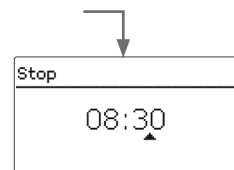
06:00

➔ In order to save the time frame, select **Save** and confirm the security enquiry with **Yes**.

➔ In order to add another time frame, repeat the previous steps.

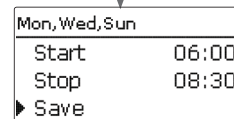
6 time frames can be adjusted per day or combination.

➔ Press the left button (←) in order to get back to the day selection.



Stop

08:30

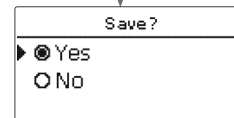


Mon, Wed, Sun

Start 06:00

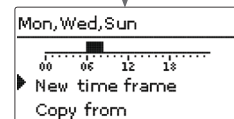
Stop 08:30

- ▶ Save



Save?

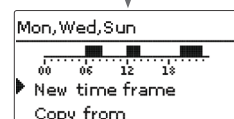
- ▶ Yes
- No



Mon, Wed, Sun

00 06 12 18

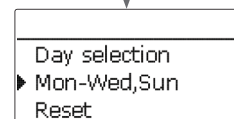
- ▶ New time frame
- Copy from



Mon, Wed, Sun

00 06 12 18

- ▶ New time frame
- Copy from



Day selection

- ▶ Mon-Wed, Sun
- Reset

Copying a time frame:

In order to copy time frames already adjusted into another day / another combination, proceed as follows:

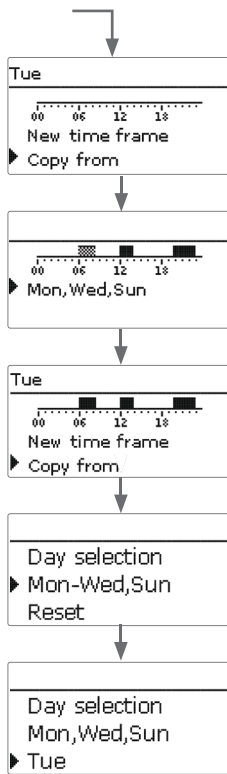
- ➔ Choose the day / the combination into which the time frames are to be copied and select **Copy from**.

A selection of days and / or combinations with time frames will appear:

- ➔ Select the day or combination from which the time frames are to be copied.

All time frames adjusted for the selected day or combination will be copied.

If the time frames copied are not changed, the day or combination will be added to the combination from which the time frames have been copied.



Changing a time frame:

In order to change a time frame, proceed as follows:

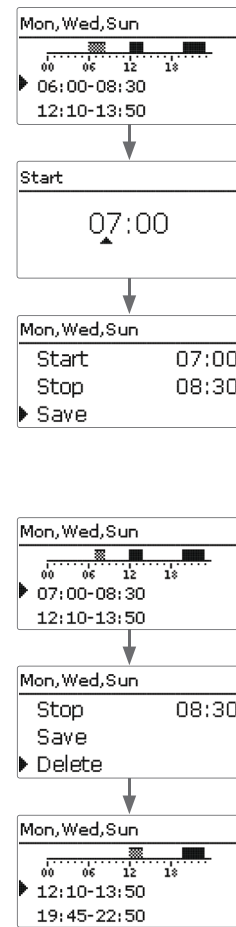
- ➔ Select the time frame to be changed.
- ➔ Make the desired change.

- ➔ In order to save the time frame, select **Save** and confirm the security enquiry with **Yes**.

Removing a time frame:

In order to delete a time frame, proceed as follows:

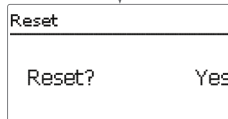
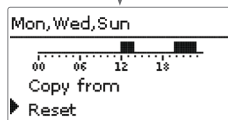
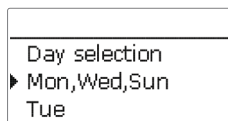
- ➔ Select the time frame that is to be deleted.
- ➔ Select the menu item **Delete** and confirm the security enquiry with **Yes**.



Resetting the timer:

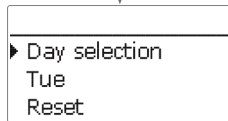
In order to reset time frames adjusted for a certain day or combination, proceed as follows

→ Select the desired day or combination.



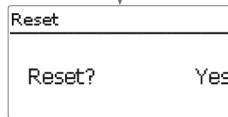
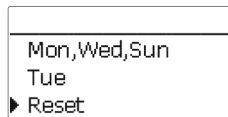
→ Select **Reset** and confirm the security enquiry with **Yes**.

The selected day or combination will disappear from the list, all its time frames will be deleted.

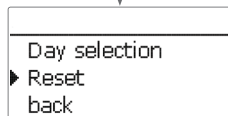


In order to reset the whole timer, proceed as follows:

→ Select **Reset** and confirm the security enquiry with **Yes**.



All adjustments made for the timer are deleted.

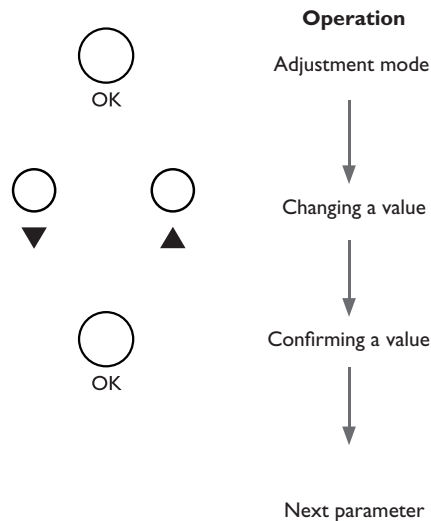
**4.2 Commissioning**

When the hydraulic system is filled and ready for operation, connect the controller to the mains.

The controller has to be connected to the measuring unit by means of the VBus®. The controller runs an initialisation phase in which the operating control LED glows red. When the controller is commissioned or when it is reset, it will run a commissioning menu after the initialisation phase. The commissioning menu leads the user through the most important adjustment channels needed for operating the system.

Commissioning menu

The commissioning menu consists of the channels described in the following. In order to make an adjustment, adjust the desired value with buttons ▼ and ▲ and confirm with the centre button (OK). The next channel will appear in the display.



1. Language:

→ Adjust the desired menu language.

Language

Deutsch

▶ English

Français

2. Daylight savings time adjustment:

→ Activate or deactivate the automatic daylight savings time adjustment.

Auto DST

▶ Yes

No

3. Date:

→ Adjust the date. First of all adjust the year, then the month and then the day.

Date

?? ?? 2016

4. Time:

→ Adjust the clock time. First of all adjust the hours, then the minutes.

Time

12:02

5. Maximum temperature:

→ Adjust the desired maximum temperature.

Maxtemp.

60 °C

35 ▲ = 60 90

6. Nominal power:

→ Adjust the nominal power of the electric immersion heater.

Nom. power

3000 W

500 ▲ = 3000 3000

7. Variant:

→ Adjust the power control variant.

The following options are available:

- Measuring unit (**Module**)
- external 0-10V power control (**10V IN**)

Variant

10V IN

▶ Module

8. Completing the commissioning menu:

Lastly, a security enquiry will appear. If the security enquiry is confirmed, the adjustments will be saved.

→ In order to confirm the security enquiry, press the centre button (OK).

→ In order to reenter the commissioning menu channels, press button ▼. If the security enquiry has been confirmed, the controller is ready for operation and should enable an optimum system operation.

Save?

▶ Yes

No



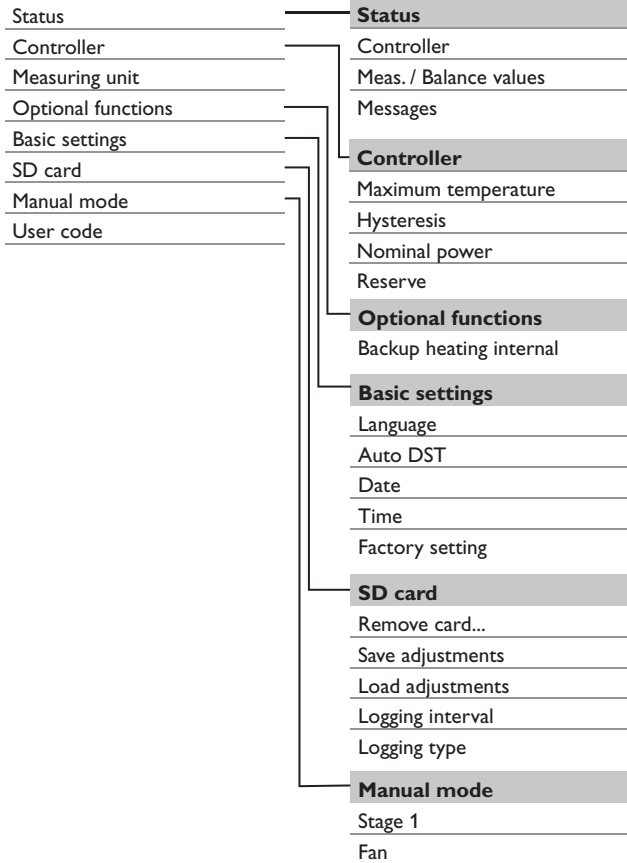
Note

The adjustments carried out during commissioning can be changed any-time in the corresponding adjustment channel.

Set the code to the customer code before handing over the controller to the customer (see page 24).

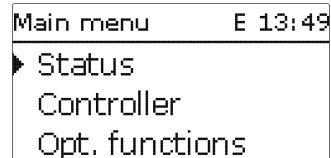
4.3 Menu structure

Main menu



The menu items and adjustment values selectable are variable depending on adjustments already made.

4.4 Main menu



In this menu, different menu areas can be selected.

The following menus are available:

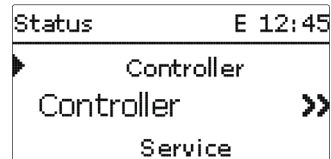
- Status
- Controller
- Measuring unit
- Optional functions
- Basic settings
- SD card
- Manual mode
- User code

➔ Select the menu area by pressing buttons ▼ and ▲.

➔ Press the centre button (OK) in order to enter the selected menu area.

If no button is pressed for 1 min, the display illumination will switch off. After 3 more minutes, the controller switches to the Status menu.

4.5 Status



In the Status menu of the controller, controller status messages as well as measurement / balance values and messages can be found.

4.5.1 Controller

Controller	E 12:45
▶ Status	Ready
Excess	0 W
Heating	0 W

In the **Status / Controller** menu, all current controller values (power values, temperatures, etc.) are indicated.

Display	Description
Status	Functional state
Booster	Functional state Booster (Backup heat.int.)
Excess	Excess power (Reserve / $P_{PV} > 3000\text{ W}$)
DCIn	Input voltage (10V IN variant)
Heating	Heating power
Store	Temperature store (S1)
Sensor 2	Temperature sensor 2 (S2)
Sensor 3	Temperature sensor 3 (S3)
RPM	Fan speed

4.5.2 Measured / Balance values

Status: Meas. ...	E 12:48
▶ S1	85.0 °C >>>
S2	55.2 °C >>>
S3	90.3 °C >>>

In the **Status/Meas./Balance values** menu, all current measurement values as well as a range of balance values are displayed.

Display	Description
S1 ... S5	Temperature S1 ... S5
PWM	Operating state power stage
Excess Wh / kWh / MWh	Excess energy in Wh / kWh / MWh
Heating Wh / kWh / MWh	Heating energy in Wh / kWh / MWh
Heating h	Operating hours of the electric heater
Backup heat.Wh / kWh / MWh	Backup heating energy in Wh / kWh / MWh
Backup heat. h	Operating hours of the internal backup heating

When a line with a measurement value is selected, another submenu will open.

S1	
▶ Minimum	20.0 °C
Maximum	85.0 °C
back	

If, for example, **S1** is selected, a submenu indicating the minimum and maximum values will open.

4.5.3 Messages

Status: Messages	
▶ Everything OK	
Version	1.00
back	

In the **Status / Messages** menu, error and warning messages are indicated. During normal operation, the message **Everything OK** is indicated. A message consists of a short text description of the fault condition.

Display	Description
!VBus Sensor unit	VBus® communication disturbed
!Sensor fault	Sensor defective
!Fan	Fan defective

In the case of an error, the control LED will start flashing red and a message will be indicated in the status display. In the case of a sensor or fan error, the system will switch off, and a message will appear on the display. If the VBus® communication is disturbed, the operating control LED will flash red. After the error has been removed, the error message will disappear.

4.6 Controller menu

Controller	E 12:31
▶ Maxtemp.	60 °C
Hysteresis	5.0 K
Nom. po...	3000 W

In this menu, all adjustments for the *DeltaTherm*® PV can be made. The maximum temperature and the nominal power have already been adjusted during commissioning.

Adjustment channel	Description	Adjustment range / selection	Factory setting
Maxtemp.	Maximum temperature	35 ... 90 °C	60 °C
Hysteresis	Hysteresis maximum temperature	1 ... 10K	5K
Nom. power	Nominal power	500 ... 3000W	3000W
Reserve	Reserve that will not be used for heating	0 ... 9000 W	10W

If the temperature at the store sensor S1 falls below the value [Maxtemp. - Hysteresis], the electric heater can be used for heating. If the store temperature reaches the adjusted maximum temperature, the store will no longer be loaded in order to avoid damage caused by overheating.

The **Reserve** is an adjustable excess power which will be fed into the grid and not used for heating. The reserve can be used, e.g. in large PV systems, in order to start the heating at a later point in time. This will reduce power peaks at noon.

4.7 Measuring unit

Measuring unit	E 13:49
▶ Variant	10V IN
Meas. value	2.5 V
Heat. pow.	250 W

In the **Measuring unit** menu, the curve of power control can be adjusted. The source of the immersion heater power control has already been defined in the commissioning menu.



Note

The **Measuring unit** menu is only available, if the **10V IN** variant has been selected in the commissioning menu.

Adjustment channel / Indication	Description	Adjustment range / Indication range / Selection	Factory setting
Variant	Indication of power control source	-	10V IN
Meas. value	Signal indication	0.0 ... 10.0V	-
Heat. pow.	Heat energy indication	1 ... 3000W	-
Curve	Curve submenu		
Volt 0kW	Lower voltage	0.0 ... 9.0V	1.0V
Volt 3kW	Upper voltage	1.0 ... 10.0V	10.0V

10V IN

With the **10V IN** variant, the power control takes place via an external 0-10 V signal. The signal is issued at the terminals 17 and 19.

Measuring unit	E 13:31
Curve	
Volt 0kW	1.0 V
▶ Volt 3kW	10.0 V

The parameters **Volt 0kW** and **Volt 3kW** can be used for adjusting the power control curve.



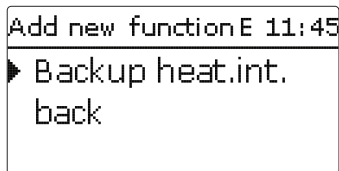
Note

Since there is no communication with the measuring unit in this variant, no excess is measured and balanced.

4.8 Optional functions

Opt. functions	E 11:45
▶ Add new function	
back	

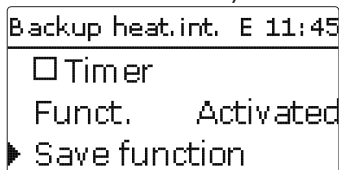
In this menu, optional functions can be selected and adjusted for the arrangement. By selecting **Add new function**, different pre-programmed functions can be selected.



When a function is selected, a submenu will open in which all adjustments required can be made.

When a function has been adjusted and saved, it will appear in the **Opt. functions** menu above the menu item **Add new function**.

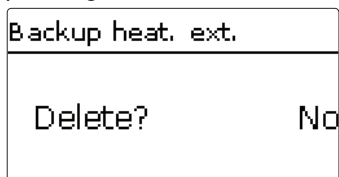
This allows an easy overview of functions already activated.



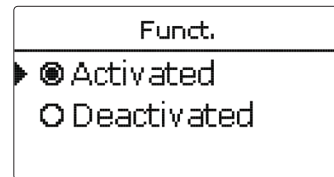
At the end of each optional function submenu, the menu items **Function** and **Save function** are available.

In order to save a function, select **Save function** and confirm the security enquiry by selecting **Yes**. In functions already saved, the menu item **Delete function** will appear instead.

In order to delete a function already saved, select **Delete function** and confirm the security enquiry by selecting **Yes**.

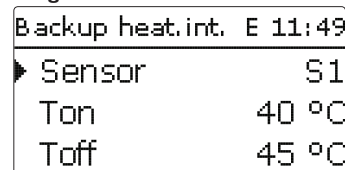


If the menu item **Delete function** is confirmed by pressing the right button (✓), a security enquiry appears. The setting can be changed between **Yes** and **No** by pressing the left or the right button. If **Yes** has been selected and confirmed by pressing the right button (✓), the function is deleted and available under **Add new function** again.



With the menu item **Function**, an optional function already saved can be temporarily deactivated or re-activated respectively. In this case, all adjustments remain stored, the allocated relays remain occupied and cannot be allocated to another function.

Internal backup heating



Opt. functions /Add new function/Backup heat.int.

Adjustment channel	Description	Adjustment range / selection	Factory setting
Sensor	Reference sensor	S1 ... S3	S1
Ton	Switch-on temperature	20 ... 74 °C	40 °C
Toff	Switch-off temperature	21 ... 75 °C	45 °C
Timer	Timer option	Yes, No	No
Funct.	Activation / Deactivation	Activated, Deactivated	Activated
Save function / Delete function	Save / Delete function	-	-

The **internal backup heating** function is used for operating the electric heating for backup heating with current from the mains. For this purpose, the power stage is switched on. The switch-on and switch-off temperatures **Ton** and **Toff** are used as reference parameters.

If the temperature falls below the adjusted threshold **Ton**, the power stage and the relay switch on. They switch off, if the temperature exceeds **Toff**.

The reference sensor is selectable. If the maximum temperature is exceeded at S1, the backup heating is interrupted. Upon saving the function, the note **Use of mains current possible!** appears.

```
Backup heating
Activated.
Use of mains
current possible!
```

The note also appears, when the booster is active.

In the status menu, the menu item **Booster** is available which can be used for heating to **Toff** outside the time frames.

```
Status: Control...E 11:52
▶ St...Backup heating
Booster      Off >>
DCIn        0.0 V
```

The internal backup heating is balanced separately.



Note:

For information on timer adjustment see page 16.

4.9 Basic settings

```
Basic settings  E 12:40
▶ Language     English
☒ Auto DST
Date          01.01.2017
```

In the Basic settings menu, all basic parameters for the controller can be adjusted. Normally, these settings have been made during commissioning. They can be subsequently changed in this menu.

Adjustment channel	Description	Adjustment range / selection	Factory setting
Language	Selection of the menu language	Deutsch, English, Français, Español, Italiano	Deutsch
Auto DST	Daylight savings time selection	Yes, No	Yes

Adjustment channel	Description	Adjustment range / selection	Factory setting
Date	Adjustment of the date	01.01.2001 ... 31.12.2099	01.01.2017
Time	Adjustment of the current time	00:00 ... 23:59	-
Factory setting	back to factory setting	Yes, No	No

4.10 MicroSD card

```
SD card
▶ Rem. time    75 d
Options
Remove card...
```

SD card

Adjustment channel	Description	Adjustment range / selection	Factory setting
Rem. time	Remaining logging time	-	-
Options			
Remove card...	Safely remove card	-	-
Save adjustments	Save adjustments	-	-
Load adjustments	Load adjustments	-	-
Logging interval	Interval for data logging	00:01 ... 20:00 (mm:ss)	01:00
Logging type	Logging type	Cyclic, Linear	Linear
Update	Firmware update	Yes, No	No

The controller is equipped with a MicroSD card slot for MicroSD memory cards. With a MicroSD card, the following functions can be carried out:

- Logging measurement and balance values. After the transfer to a computer, the values can be opened and visualised, e. g. in a spreadsheet.
- Store adjustments and parameterisations on the MicroSD card and, if necessary, retrieve them from there.
- Running firmware updates on the controller.

➔ To safely remove the MicroSD card, always select the menu item **Remove card...** before removing the card.

➔ Wait until **Remove card** is displayed.

WARNING! Electric shock!

Upon opening the housing, live parts are exposed!
 → **Always disconnect the device from power supply before opening the housing!**

ATTENTION! ESD damage!

Electrostatic discharge can lead to damage to electronic components!
 → **Take care to discharge properly before touching the inside of the device! To do so, touch a grounded surface such as a radiator or tap!**

**Note:**

The MicroSD card slot will only be accessible after the housing is opened.

In order to insert or remove the SD card, proceed as follows:

- Disconnect the device from the power supply.
- Unscrew the screw from the cover and remove it along with the cover from the housing.
- Insert the MicroSD card into the slot or remove the MicroSD card from the slot, respectively.
- Put the cover on the housing.
- Attach with the fastening screw.
- Establish the power supply.

Firmware updates

When a MicroSD card with a firmware update is in the card slot, the menu item **Update** will appear.

- In order to run an update, select **Yes** and confirm with the centre button (OK). The update will run automatically. The indication **Please wait...** and a progress bar will appear on the display. When the update has been completed, the controller will automatically reboot and run a short initialisation phase.

- To skip the update, select **No**.

**Note:**

The controller will only recognise a firmware update file if it is stored in a folder named **PVE** on the first level of the MicroSD card.

- Create a folder named **PVE** on the SD card and extract the downloaded ZIP file into this folder.

Starting the logging

- Adjust the desired logging type and interval. Logging will start immediately.

Completing the logging process

- In order to stop the logging, remove the MicroSD card from the device. To do so, follow the instructions described above.

When **Linear** is adjusted in the **logging type** adjustment channel, data logging will stop if the capacity limit is reached. The message **Memory capacity** will be displayed.

If **Cyclic** is adjusted, the oldest data logged onto the SD card will be overwritten as soon as the capacity limit is reached.

**Note:**

Because of the increasing size of the data packets, the remaining logging time does not decrease linearly. The data packet size can increase, e.g. with the increasing operating hours value.

Storing controller adjustments

- To store the controller adjustments on the MicroSD card, select the menu item **Save adjustments**.

While the adjustments are being stored, first **Please wait...**, then **Done!** will be indicated on the display. The controller adjustments are stored as a .SET file on the MicroSD card.

Loading controller adjustments

- To load controller adjustments from a MicroSD card, select the menu item **Load adjustments**.

The File selection window will appear.

- Select the desired .SET file.

While the adjustments are being loaded, first **Please wait...**, then **Done!** will be indicated on the display.

4.11 Manual mode

```
Manual mode   E 12:44
▶ Stage 1     Auto
  Fan         Auto
  back
```

Manual mode

Adjustment channel	Description	Adjustment range / selection	Factory setting
Stage 1	Manual mode selection for the power unit, modulating	Auto, 0 ... 100% (in steps of 10%)	Auto
Fan	Manual mode selection for the fan	On, Auto, Off	Auto

In the **Manual mode** menu, the operating mode of the power unit can be adjusted.

```
Stage 1
Auto
Auto ▲ = Auto 100
```

ATTENTION! Damage through overheating!



The manual mode > 0 % of the power stage in a system electrically connected, but not hydraulically filled can lead to damage caused by overheating!

→ **Make sure the hydraulic system is filled and ready for operation.**

An operating mode can be selected for the power unit. The following options are available:

Auto = Stage is in automatic mode

0% = Stage is switched off

100% = Stage is switched on at 100 %

The power of the modulating stage can be set to the manual mode in steps of 10 %.



Note:

After service and maintenance work, the relay mode must be set back to **Auto**. Normal operation is not possible in manual mode.

4.12 User code

```
User code:
0000
▲
```

The access to some adjustment values can be restricted via a user code (customer).

1. Installer **0262** (Factory setting)

All menus and adjustment values are shown and all values can be altered.

If the installer user code is active, an **E** will be displayed next to the clock time.

2. Customer **0000**

The installer level is not shown, adjustment values can be changed partly.

For safety reasons, the user code should generally be set to the customer code before the controller is handed to the customer!

→ In order to restrict the access, enter 0000 in the **User code** menu item.

5 Troubleshooting

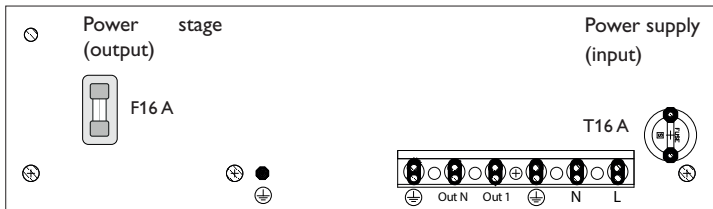
If a malfunction occurs, a message will appear on the display of the controller (see 4.5.3 on page 19).

WARNING! Electric shock!



Upon opening the housing, live parts are exposed!

→ **Always disconnect the device from power supply before opening the housing!**



Controller with power unit

The controller with power unit is protected by two fuses (16 A). The fuse holders become accessible after the cover is removed. To replace the fuse (T16A), unfasten the fuse holder using a screw driver and pull it from the base.

To replace the fuse (F16A), pull the fuse holder from the base.

The operating control LED flashes red and an error is indicated in the status menu.

Is the message **!Sensor fault** indicated in the **Status/Messages** menu?

no

yes

Is the message **!Fan** indicated in the **Status/Messages** menu?

yes

Check fan (connection); replace it, if necessary.

Sensor fault. An error code instead of a temperature is shown on the sensor display channel.

Short circuit or line break. Disconnected temperature sensors can be checked with an ohmmeter. Please check if the resistance values correspond with the table.

°C	Ω Pt1000	°C	Ω Pt1000
-10	961	55	1213
-5	980	60	1232
0	1000	65	1252
5	1019	70	1271
10	1039	75	1290
15	1058	80	1309
20	1078	85	1328
25	1097	90	1347
30	1117	95	1366
35	1136	100	1385
40	1155	105	1404
45	1175	110	1423
50	1194	115	1442

Operating control LED is permanently red.

Is the message **!VBus Sensor unit** indicated in the **Status/Messages** menu?

yes

The **error** LED of the measuring unit is flashing red?

no

yes

The **operating** LED of the measuring unit is flashing red?

no

yes

o.k.

Check the VBus® cable from the controller to the measuring unit / establish the connection.

Check / establish power supply of the measuring unit.

Status display **Excess** fluctuates quickly between positive and negative values.

The 16 A fuse of the power stage (left) is defective. The fuse holder (which holds the spare fuse) becomes accessible when the cover is removed. The fuse can then be replaced.

The display is permanently off.

Press any button. Display illuminated?

no

yes

Check the power supply of the controller. Is it disconnected?

yes

no

Controller has been in standby, everything OK

Establish the power supply.

The 16 A fuse of the power supply (right) is defective. The fuse holder (which holds the spare fuse) becomes accessible when the cover is removed. The fuse can then be replaced.

Heating power too low or no heating power available.

Is **Max. temp.** indicated in the status menu?

no

yes

Is **Power red.** indicated in the status menu?

yes

Is the store maximum temperature exceeded?

no

Is a fan speed < 2800 indicated in the **Controller** status menu?

no

yes

A temperature threshold has been exceeded in the controller / cooling element. As soon as the device has cooled down, it will heat with the heating power available.

Check / clean fan.

A temperature threshold has been exceeded in the controller / cooling element. As soon as the device has cooled down, it will heat with the heating power available.

6 Accessories



Electric immersion heater

For installation into the store.



DL3 Datalogger

For visualisation via VBus.net, incl. SD card, mains adapter, network and VBus® cable.



DL2 Datalogger

For visualisation via VBus.net, incl. SD card and network cable, mains adapter and VBus® cable pre-connected.



KM2 Communication module

Communication module incl. service CD, network cable and mains adapter, VBus® cable pre-connected.



VBus.net

The www.VBus.net visualisation portal – your system data displayed as live data, diagrams and tables.

7 List of spare parts

Designation	Spare part number
Sensor module <i>DeltaTherm</i> ® E sensor incl. current sensors	11209960
Spare fuses <i>DeltaTherm</i> ® PV	29003080

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Distributed by:

RESOL–Elektronische Regelungen GmbH

Heiskampstraße 10

45527 Hattingen / Germany

Tel.: +49 (0) 23 24/96 48 - 0

Fax: +49 (0) 23 24/96 48 - 755

www.resol.com

info@resol.com

Important note

The texts and drawings in this manual are correct to the best of our knowledge. As faults can never be excluded, please note:

Your own calculations and plans, under consideration of the current standards and directions should only be basis for your projects. We do not offer a guarantee for the completeness of the drawings and texts of this manual - they only represent some examples. They can only be used at your own risk. No liability is assumed for incorrect, incomplete or false information and / or the resulting damages.

Note

The design and the specifications can be changed without notice.

The illustrations may differ from the original product.

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