

Controllers

User's manual
ST-402N PWM



EN

I. Safety

Before using the device for the first time the user should read the following regulations carefully. Not obeying the rules included in this manual may lead to personal injuries and device damage. The user's manual should be stored in a safe place for further reference.

In order to avoid accidents and errors it should be ensured that every person using has familiarized themselves with the principle of operation and security functions of the device. If the device is to be sold or put in a different place, make sure that the user's manual is kept with the device so that any potential user has access to essential information about the device. The manufacturer does not accept responsibility for any injuries or damage resulting from negligence; therefore, users are obliged to take the necessary safety measures listed in this manual to protect their lives and property.



WARNING

- **High voltage.** Make sure the regulator is disconnected from the mains before performing any activities involving the power supply (plugging cables, installing the device etc.).
- The device should be installed by a qualified electrician.
- Before starting the controller, the user should measure the earthing resistance of the electric motors as well as the insulation resistance of the cables.
- The regulator should not be operated by children.



NOTE

- The controller may be damaged if struck by lightning. Make sure the plug is disconnected from the power supply during storms.
- Any use other than that specified by the manufacturer is forbidden.
- Before and during the heating season, the controller should be checked for the condition of its cables. The user should also check if the controller is properly mounted and clean it if dusty or dirty.

After the editing of this manual was completed on June 29, 2015, changes in products specified in the manual may have taken place. The manufacturer reserves the right to change the information in regards to products. The illustrations may contain additional equipment. The printing technology may affect differences in shown colours.

II. Application

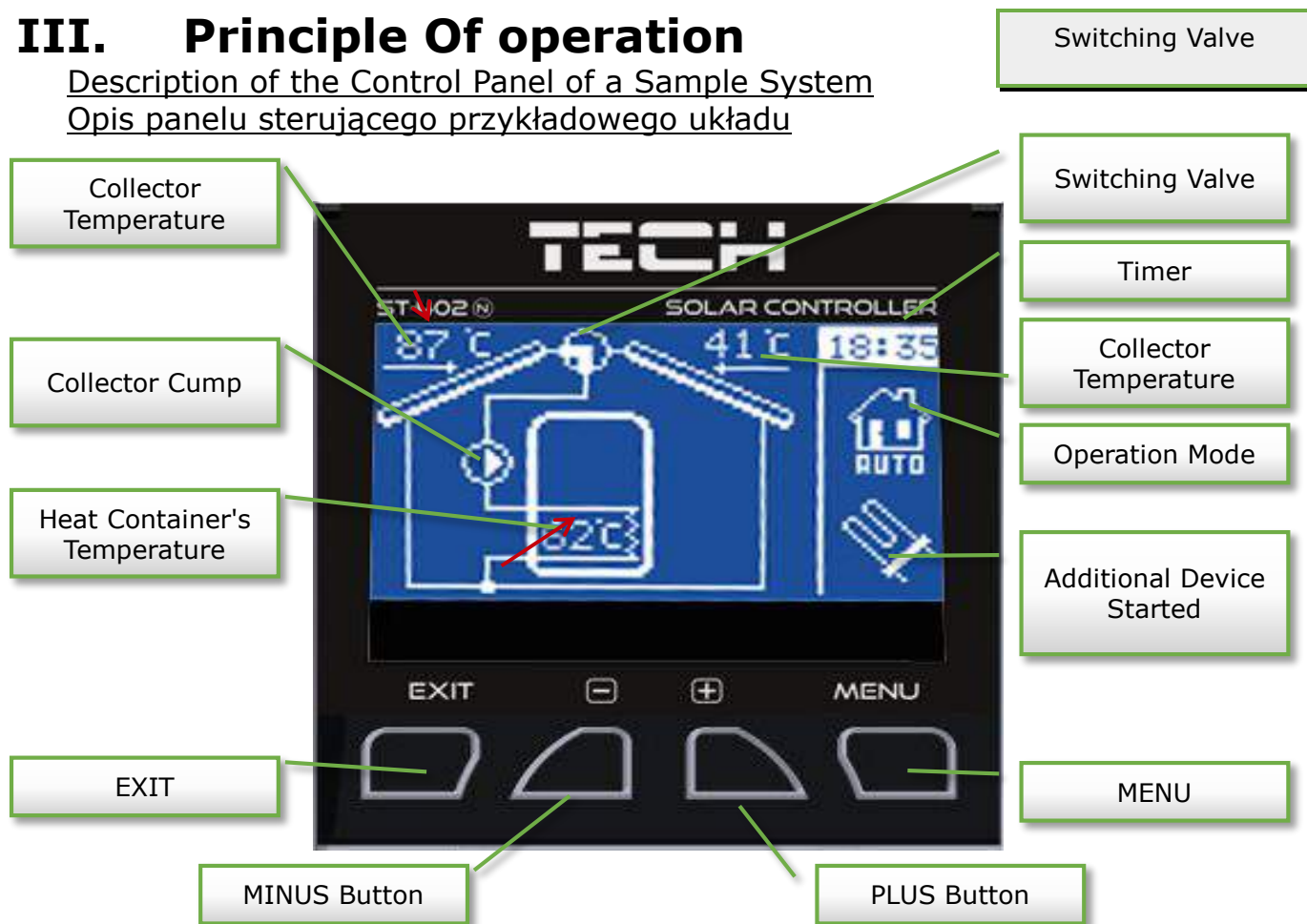
The ST-402N type temperature regulator is intended for the operation of solar collectors for various system configurations. This device controls the operation of collector pumps (or a pump and a valve) on the basis of the measurement of the solar panel temperatures and the accumulation tank (two tanks) temperature. There is an option to connect an additional device: circulation pump, electric heater or feeding the signal to the CH boiler in order to fire it up.

It is possible to control the circulation pump and feed the firing-up signal to the CH boiler directly from the controller, while an additional signal relay is necessary to control the heater.

III. Principle Of operation

Description of the Control Panel of a Sample System

Opis panelu sterującego przykładowego układu



The regulator is controlled through the use of buttons. The user may enter the menu and confirm the settings by pressing the Menu button. Using the Plus and Minus buttons, the user moves through the menu's functions. In order to accept the selected menu item, the user should press the Menu button. In order to proceed to the main screen (or the menu of a higher level), the user should use the Exit button. Any setting may be changed in a similar manner.










IV. User Menu


IV.a) Home Page

During the regulator's standard operation, **the Graphic Display** shows *the Homepage* which displays the diagram of the selected system and:

- Operation mode (or alarm type),
- Current hour,
- Collector's temperature,
- Current heat container temperature,
- The temperatures of all additional sensors, depending on the configuration.

The following graphic elements are displayed on the right hand side:

| The Symbol of Active Operation Mode: | | The Symbol of Active Additional Device (Peripherals): | |
|---|---------------------------------|---|---|
|  | Automatic Operation Mode |  | Circulation Pump |
|  | Collector Defrosting Mode |  | Firing-up the Pellet Boiler (voltage-free signal) |
|  | Holiday Mode |  | Heater |
|  | Collector Overheat (alarm mode) |  | Anti-Legionella |
|  | Sensor Damage (alarm mode) | | |

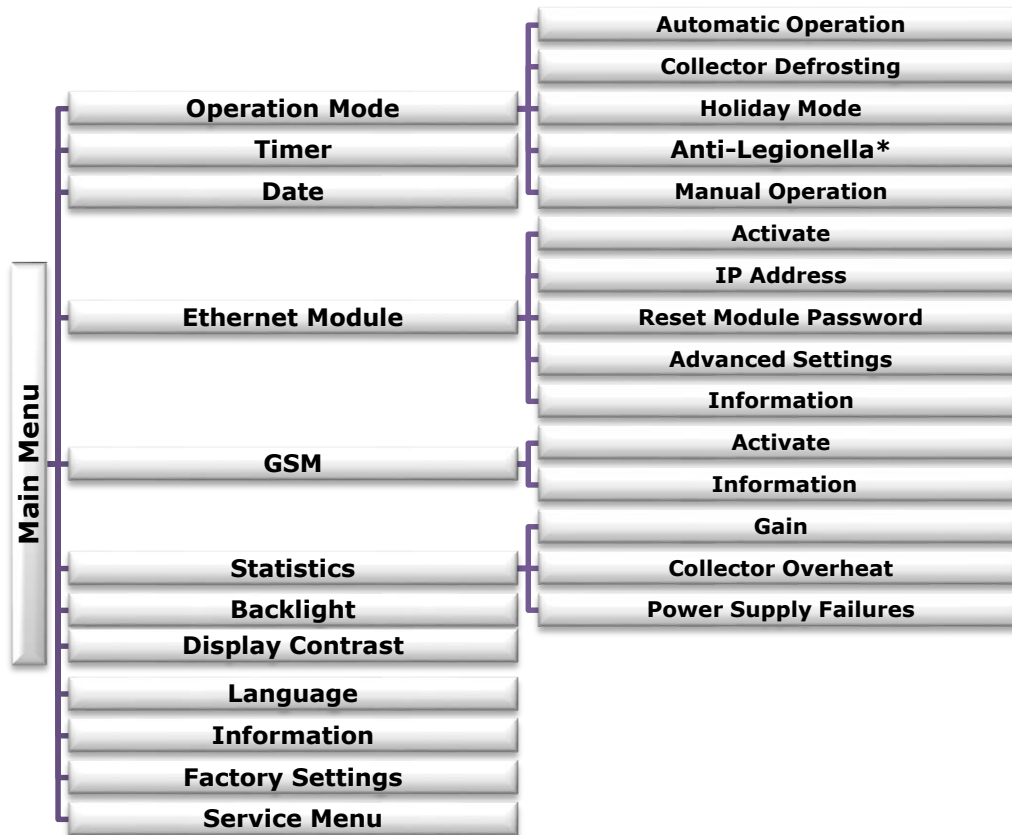
If one of the sensors is damaged, an additional icon will flash as an indicator  in the place of the displayed temperature of the damaged sensor, informing the user about the sensor that is disconnected or is damaged.

Additionally, the installation system diagram shows a pump symbol (it rotates when in operation) and/or a valve symbol (indicating the current circulation path)

IV.b) Main Menu – Flowchart

Due to its multifunctional nature, the controller's menu is divided into the Main Menu and the Service Menu.

The Main Menu is used to adjust the controller's basic options such as changing the operation modes, timer settings, date settings, changing the language etc. The layout of parameters in the Main Menu is shown by the flowchart below.



*Parameter visible if an additional device (i.e. a heater) is connected.

IV.c) Operation Mode

Using this function, the user selects the operation mode.

IV.c.1) Automatic Operation

The pump operates during the Automatic Operation mode if the minimum difference of temperatures between the collector and the tank is reached (the difference between these temperatures when the pump is activated is determined by the function "Solar Pump Activation Delta" in: *SERVICE MENU > Pumps > Solar Pump Activation Delta*).

The pump will operate until the set temperature is reached (the set temperature is adjusted in: *SERVICE MENU > Accumulation Tank > Set Temperature*) or until the difference of temperatures between the collector and the tank reaches the deactivation delta threshold: *SERVICE MENU > Pumps > Solar Pump Deactivation Delta* (in this case, the pump will be activated again when the temperature on the collector increases above the tank's temperature by the *Solar Pump Activation Delta*). When the pump is deactivated after reaching the set temperature, it will be activated again if the temperature drops below the set value by the amount specified by the *Tank's Hysteresis* (the hysteresis value is adjusted in: *SERVICE MENU > Accumulation Tank > Tank Hysteresis*).

IV.c.2) Collector Defrosting

Using this mode, the user may manually activate the collector's pump in order to melt the snow on the solar panels. After activation, this mode is active throughout a period of time defined by the user and then the controller returns to its automatic operation (the defrosting time is set in: *SERVICE MENU > Solar Collector > Defrosting Time*). This function may be switched off manually after a shorter operation time by selecting a different operation mode.

IV.c.3) Holiday Mode

After the user activates Holiday Mode, the pump operates when one of the following conditions is met: The collector's temperature increases to the overheat temperature value (SERVICE MENU > Solar Collector > Overheat Temperature) reduced by the value of the parameter Delta Holiday (SERVICE MENU > Solar Collector > Delta Holiday). When this condition is met, the pump is activated to cool down the collector. The pump is deactivated after the temperature is reduced by 5°C.

If the collector's temperature is lower than the tank's temperature – the pump is activated to cool down the tank and will operate until the collector's and the tank's temperatures are level.

IV.c.4) Anti-Legionella

This function is only active when an additional device is connected (found under the function *Peripherals* in the Service Menu and then activated). Thermal disinfection involves increasing the temperature to the required disinfection temperature in the tank – this reading is taken from the upper sensor in the tank (in the case of using an optional sensor, the user should make sure that this sensor measures the temperature in the upper part of the tank because this is the priority sensor for this function). This is to eliminate the Legionella pneumophila bacteria that reduce the body's cell immunity. These bacteria often multiply in tanks with stagnant hot water (at an optimum temperature of 35°C). After the user activates this function, the tank heats up to the defined temperature (SERVICE MENU > Peripherals > Heater > Anti-Legionella > Anti-Legionella Temperature) and maintains such a temperature for the time of disinfection (SERVICE MENU > Peripherals > Heater > Anti-Legionella > Anti-Legionella Time) and then returns to the regular operation mode.

From the moment of activating the disinfection, the temperature of disinfection needs to be reached in no longer than the time defined by the user (SERVICE MENU > Peripherals > Heater > Anti-Legionella > Maximum Anti-Legionella Time), otherwise this function is deactivated automatically.

IV.c.5) Manual Operation

Using this function, the user may manually (by pressing the 'Menu' button) activate and deactivate the following to control the installation's equipment:

- Solar Pump,
- Second Solar Pump or Switching Valve,
- Peripherals - Additional Device (voltage-free contact e.g. for firing up the pellet boiler).

IV.d) Timer

Using this function, the user adjusts the current hour for regulator operation.

IV.e) Date

Using this function, the user adjusts the current date. The correct adjustment of date and hour is necessary to calculate energy in a proper manner.

IV.f) Ethernet Module



NOTE

Control of this type is possible after purchasing and connecting an additional ST-500 control module (which is not added to the controller as a standard).

The Ethernet Module is a device for enabling remote control over the collector's operation via the Internet or a local network. On the home computer screen, the user controls the status of all the solar installation devices and the operation of each device is presented in the form of an animation.

After activating the Internet module and selecting the DHCP option, the controller automatically downloads the following parameters from the local network: IP Address, IP Mask, Gateway Address and DNS Address. In the case of any problems with downloading the network parameters, it is possible to adjust these parameters manually. The method of obtaining the local network's parameters is described in the manual for the Internet Module.

The function Reset Module Password may be used when the user changed the factory user's password to his own password on the login page. When the new password is lost, it is possible to return to the factory password after resetting the module password.

IV.g) GSM Module



NOTE

Control of this type is possible after purchasing and connecting an additional ST-65 control module (which is not added to the controller as a standard).

The GSM module is an optional device designed to work in tandem with the collector's controller, enabling remote control over the collector operation with the use of a mobile phone. The user is notified with a text message about each alarm of the solar installation's controller and they receive a return message with information on the current temperature of all sensors by sending an appropriate text message at any time.

The ST-65 module may also operate independently of the collector. It has two inputs with temperature sensors, one contact input to be used in any configuration (detecting closing/opening of contacts) and one controlled output (e.g. possibility to connect an additional contactor to control any electrical circuit).

When any temperature sensor reaches the set maximum or minimum temperature, the module automatically sends a text message with such information. It is similar in the case of a closing or opening of the contact input which may be used e.g. for the simple protection of property.

IV.h) Statistics

The parameters in this submenu allow the user to monitor the current conditions of the controller's operation:

IV.h.1) Gain

This parameter allows the user to monitor the current values of gained energy in certain sections of time: daily, weekly, monthly, annual and temporary.



CAUTION

Statistical data displayed in the controller is approximate – it is used only to determine the approximate values of gained energy.

IV.h.2) Collector Overheat

After the user enters this submenu, the controller's display will show the list of the collector's overheats (too high temperature of the collector's sensor). The user may see:

- The date when the overheating occurred.
- The hour.
- The duration.
- The reading from the collector's sensor.

IV.h.3) Power Supply Failures

After the user enters this submenu, the controller's display will show the list of power supply failures registered by the controller. The user may see:

- Date of occurrence.
- Hour of occurrence.
- Duration of occurrence.

IV.i) Backlight

This parameter regulates the display's brightness. This change takes place after a dozen or so seconds of idleness.

IV.j) Display Contrast

This parameter regulates the display's contrast.

IV.k) Language

The user may select the controller's language version.

IV.l) Information

When the user selects this option, a screen with the controller's manufacturer logo and the current

program version appears.

IV.m) Factory Settings

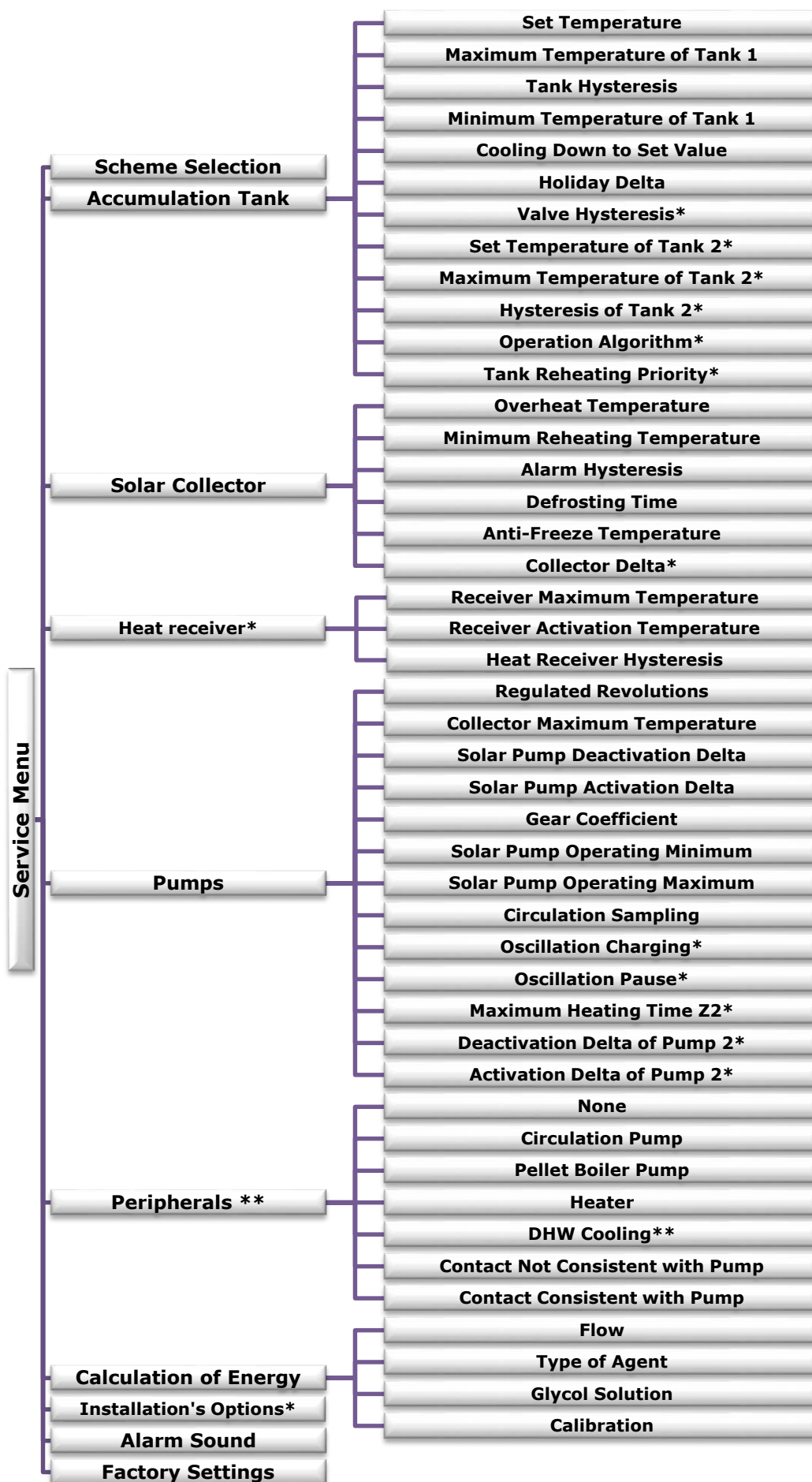
This function allows the user to load factory settings previously recorded in the service menu.

V. Service Menu

In order to enter the service settings, the user should select the SERVICE MENU option and then select code 0112 using the Plus and Minus buttons and confirm it by pressing the Menu button. In order to return to the display's main view (exit the service menu), the user should use the Exit button by pressing it several times or waiting for approx. 30 seconds (the device will then automatically leave the service mode).

The flowchart of the Service Menu is given below.

The ST-402N controller is adapted to operate various heating installations. When the installation's scheme is changed this may lead to the appearance of additional functions in the controller's service menu - marked with an asterisk (*) in the following flowchart.



*Parameters available only in certain installation schemes.

**Parameters unavailable if certain schemes are selected.

V.a) Installation Scheme

In order for the solar installation to operate correctly, it is necessary to properly select the appropriate installation scheme (*SERVICE MENU > INSTALLATION SCHEME*), as well as to adequately configure the additional options of the selected system.

! CAUTION

During the selection of the installation scheme, the number of a given sensor is found near the values of the sensors' temperatures. Relevant sensors should be connected to the relevant sensor slot according to these numbers (in order from the left):

- (1) – Collector Sensor (PT1000), (2) – Container Sensor (PT1000),
 (3) – Additional Sensor 1 (PT1000), (4) – Additional Sensor 2 (PT1000).

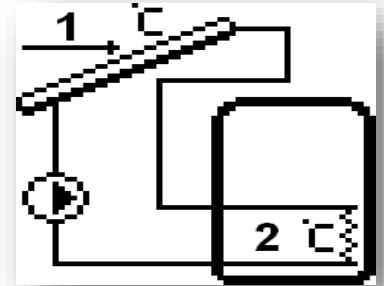
V.a.1) Scheme 1/17 - Basic

Installation 1/17 Operates:

- ⊗ The Collector Pump.
- ⊗ The Accumulation Tank.
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals.

Installation Sensors:

- ⊗ The Collector's sensor.
- ⊗ The Accumulation Tank's sensor.



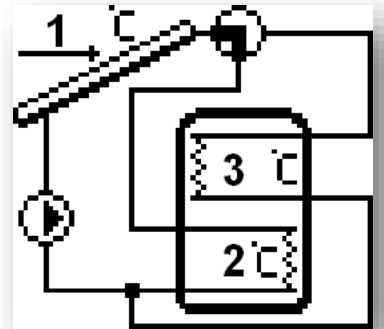
V.a.2) Scheme 2/17 – One Tank - Order

Installation 2/17 Operates:

- ⊗ The Collector Pump.
- ⊗ The Switching Valve (top-bottom).
- ⊗ The Accumulation Tank with top and bottom circulation.
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals.

Installation Sensors:

- ⊗ The collector's sensor,
- ⊗ The two sensors of the Accumulation Tank – top and bottom.



Additional Parameters to be Adjusted:

- Valve Hysteresis.
- Oscillation charging.
- The oscillation pause time.
- Maximum heating time Z2.

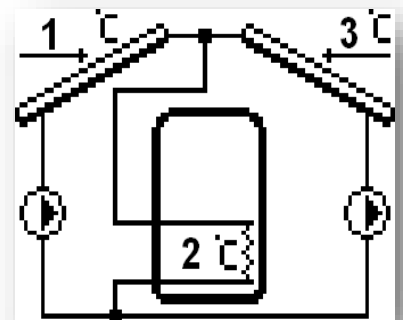
V.a.3) Scheme 3/17 – Two Collectors, Two Pumps

Installation 3/17 Operates:

- ⊗ The two Collector Pumps (the pumps operate independently, each according to its own circulation).
- ⊗ The Accumulation Tank.
- ⊗ The two directions of the collectors' location.
- ⊗ Additional peripherals.

Installation Sensors:

- ⊗ The two collector sensors.
- ⊗ The Accumulation Tank's sensor.



! Note:

Setting the Solar Collector option (*SERVICE MENU > SOLAR COLLECTOR*) applies equally to collectors situated in both directions.

Additional Parameters to be Adjusted:

- Deactivation delta of pump 2.
- Activation delta of pump 2.

V.a.4) Scheme 4/17 – Two Collectors, Valve

Installation 4/17 Operates:

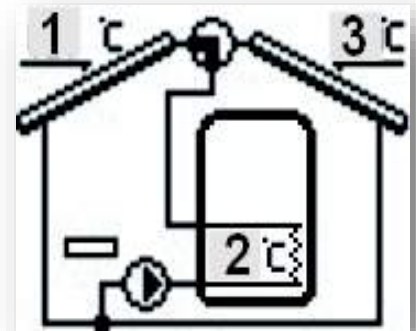
- ⊗ The Collector Pump.
- ⊗ The valve switching between the collectors
- ⊗ The Accumulation Tank.
- ⊗ The two directions of the collectors' location.
- ⊗ Additional peripherals.

Installation Sensors:

- ⊗ The two collector sensors.
- ⊗ The Accumulation Tank's sensor.

Additional Parameters to be Adjusted:

- Collector delta.



V.a.5) Scheme 5/17 – Reheating with Boiler

Installation 5/17 Operates:

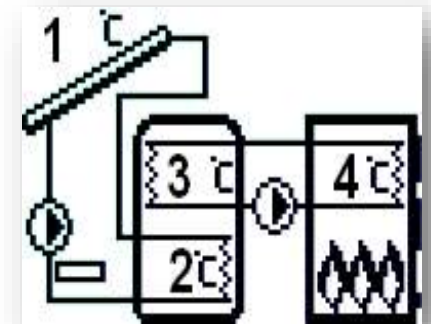
- ⊗ The Collector Pump.
- ⊗ The Auxiliary Pump – tank-boiler (*Pump 2*).
- ⊗ The Accumulation Tank with top and bottom circulation.
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals (not possible to cool down using the DHW pump).

Installation Sensors:

- ⊗ The collector's sensor.
- ⊗ The two sensors of the Accumulation Tank – top and bottom,
- ⊗ The boiler temperature sensor.

Additional Parameters to be Adjusted (additional submenu in the service menu):

- Installation's options: reheating activation delta, from hour..., to hour..., energy release, energy release threshold, release hysteresis, release solar pump.



V.a.6) Scheme 6/17 – Two Tanks, Valve

Installation 6/17 Operates:

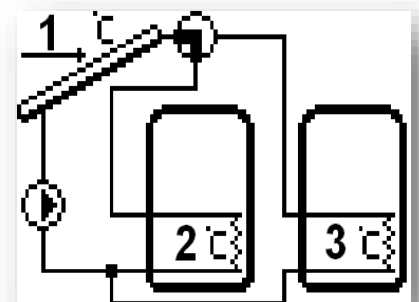
- ⊗ The Collector Pump.
- ⊗ The valve switching between the tanks.
- ⊗ The two accumulative tanks.
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals.

Installation Sensors:

- ⊗ The Collector's sensor.
- ⊗ The Accumulation Tank sensors.

Additional Parameters to be Adjusted:

- The set temperature of tank 2.
- The maximum temperature of tank 2.
- Hysteresis of tank 2.
- Oscillation charging.
- The oscillation pause time.
- Maximum heating time Z2.
- Valve Hysteresis.



V.a.7) Scheme 7/17 – Two Tanks, Two Pumps

Installation 7/17 Operates:

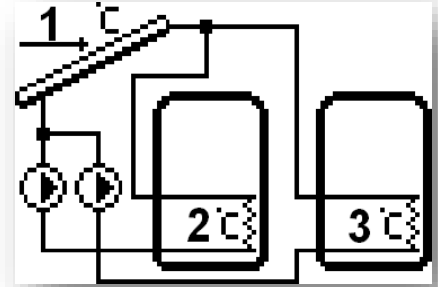
- ⊗ The two collector pumps.
- ⊗ The two accumulative tanks.
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals.

Installation Sensors:

- ⊗ The collector's sensor.
- ⊗ The Accumulation Tank sensors.

Additional Parameters to be Adjusted:

- Valve Hysteresis.
- The set temperature of tank 2.
- The maximum temperature of tank 2.
- Hysteresis of tank 2.
- Operation algorithm.
- Oscillation charging.
- The oscillation pause time.
- Maximum heating time Z2.
- Deactivation delta of pump 2.
- Activation delta of pump 2.



V.a.8) Scheme 8/17 – Two Tanks - Order

Installation 8/17 Operates:

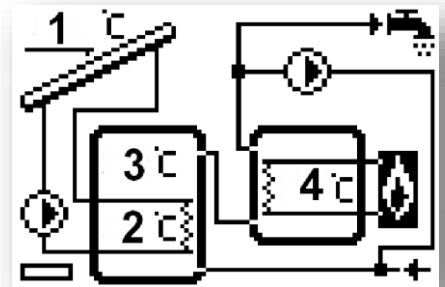
- ⊗ The Collector Pump.
- ⊗ The second tank's pump.
- ⊗ Tank 1 with top and bottom circulation.
- ⊗ Tank 2.
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals (not possible to cool down using the DHW pump).

Installation Sensors:

- ⊗ The collector's sensor.
- ⊗ The two sensors of the main accumulation tank – top and bottom.
- ⊗ The sensor of the additional accumulation tank.

Additional Parameters to be Adjusted:

- The set temperature of tank 2.
- The maximum temperature of tank 2.
- Hysteresis of tank 2.
- Operation Algorithm.
- Deactivation delta of pump 2.
- Activation delta of pump 2.



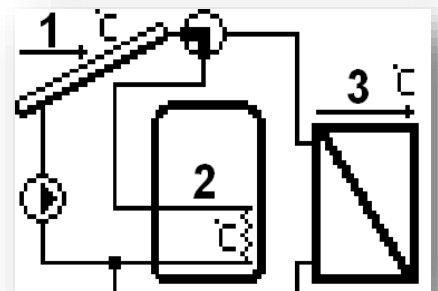
V.a.9) Scheme 9/17 – Heat Exchanger

Installation 9/17 Operates:

- ⊗ The Collector Pump.
- ⊗ The switching valve between the tank and the exchanger.
- ⊗ The Accumulation Tank.
- ⊗ The Heat Exchanger (heat Receiver).
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals.

Installation Sensors:

- ⊗ The collector's sensor.
- ⊗ The Accumulation Tank's sensor.
- ⊗ The Heat Exchanger sensor.



This installation, apart from the accumulation tank, also has a heat receiver (e.g. a swimming pool or a CH installation), the task of which is to release rather than collect thermal energy.

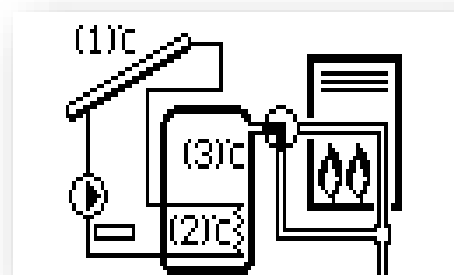
Additional Parameters to be Adjusted:

- Valve hysteresis.
- The set temperature of tank 2.
- The maximum temperature of tank 2.
- Hysteresis of tank 2.
- Oscillation charging.
- The oscillation pause time.
- The maximum heating time Z2.
- Tank reheating priority.

V.a.10) Scheme 10/17 – Double Function Furnace

Installation 10/17 Operates:

- ⊗ The Collector Pump.
- ⊗ The valve switching to the two-state reheating furnace.
- ⊗ The Accumulation Tank with top and bottom circulation.
- ⊗ The double function furnace (reheating the output from the Controller).
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals.



Installation Sensors:

- ⊗ The collector's sensor.
- ⊗ The two sensors of the Accumulation Tank – top and bottom.

This installation works with a double function furnace which reheats the circulation. If the tank's temperature is too low, the valve switches to the furnace.

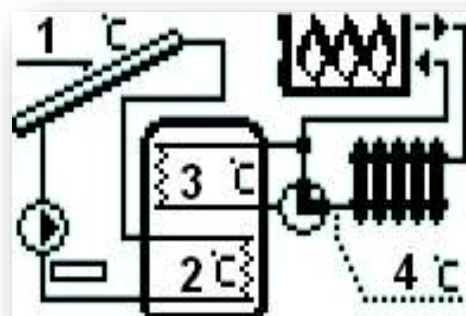
Additional Parameters to be Adjusted (additional submenu in the service menu):

- Installation's Options: reheating deactivation.

V.a.11) Scheme 11/17 – Reheating the CH Return

Installation 11/17 Operates:

- ⊗ The Collector Pump.
- ⊗ The switching valve between the direct flow to the boiler and flow through the tank.
- ⊗ The Accumulation Tank with top and bottom circulation.
- ⊗ The boiler's return circulation.
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals (not possible to cool down via use of the DHW Pump).



Installation Sensors:

- ⊗ The collector's sensor.
- ⊗ The two sensors of the Accumulation Tank - top and bottom.
- ⊗ The boiler's return sensor.

This installation is equipped with a valve which, in the case of excess hot water in the tank, switches the circulation to the boiler's return circulation in order to reheat it (as well as release the excessive heat) which will result in solid fuel savings.

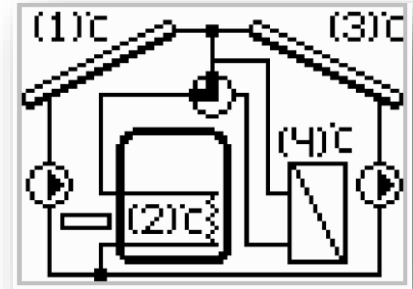
Additional Parameters to be Adjusted (additional submenu in the service menu):

- Installation's options: energy release threshold, release hysteresis, activation delta, deactivation delta.

V.a.12) Scheme 12/17 – Two Collectors, Two Pumps, Tank and Additional Heat Receiver

Installation 12/17 Operates:

- ⊗ The two Collector Pumps (the pumps operate independently, each according to its own circulation).
- ⊗ The Accumulation Tank with bottom circulation.
- ⊗ The two directions of the collectors' location.
- ⊗ The Additional Heat Receiver.
- ⊗ The Switching Valve from the main circulation to the additional receiver.



Installation Sensors:

- ⊗ The two Collector Sensors,
- ⊗ The Accumulation Tank's sensor.
- ⊗ The Additional Receiver's sensor.



Note:

It may appear that it is not possible to connect and select an additional device - the submenu Peripherals is hidden in the controller's service menu. The switching valve operating the additional receiver is connected instead of the peripherals.

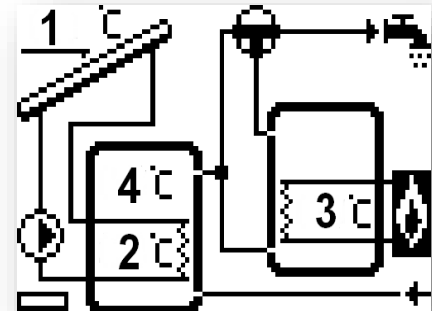
Additional Parameters to be Adjusted:

- Deactivation delta of pump 2.
- Activation delta of pump 2.

V.a.13) Scheme 13/17 – Two Collectors, Pump, Valve, Tank and Additional Tank Connected in Series

Installation 13/17 Operates:

- ⊗ The Collector Pump.
- ⊗ The Switching Valve.
- ⊗ The Accumulation Tank – solar with bottom circulation.
- ⊗ The Second Tank (heated with an additional heat source e.g. the CH Boiler).
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals (not possible to cool down using the DHW pump).



Installation Sensors:

- ⊗ The collector's sensor.
- ⊗ The two sensors of the Accumulation Tank.
- ⊗ The sensor of the second tank.

This installation allows the user to control which tank is to be used to collect hot water for the facility (the regulator selects the tank with the higher temperature). In periods of poor insulation (i.e. the winter period), water is taken from the second tank (heated with an additional heat source, e.g. the CH Boiler). On the other hand, water from the Solar Tank heated by the solar installation reaches the input of the second tank as cold water.

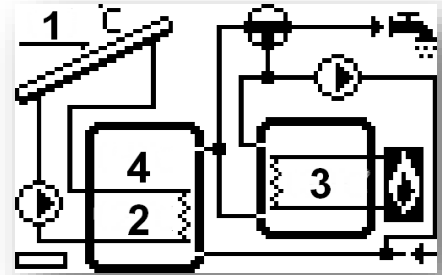
Additional Parameters to be Adjusted:

- Valve hysteresis.

V.a.14) Scheme 14/17 – Reheating the CH Return

Installation 14/17 Operates:

- ⊗ The Collector Pump.
- ⊗ The switching valve between the direct flow to the boiler and flow through the tank.
- ⊗ The Accumulation Tank – solar with top and bottom circulation.
- ⊗ The second tank (heated with an additional heat source e.g. the CH Boiler).
- ⊗ One direction of the collectors' location.
- ⊗ Pump of tank 2 – the Mixing Pump.



Installation Sensors:

- ⊗ The collector's sensor.
- ⊗ The two sensors of the Accumulation Tank.
- ⊗ Sensor of the second tank.

This installation is able to independently control from which tank it collects hot water for the facility (the regulator selects the tank with the higher temperature). In periods of large insulation, temperature in the Solar Tank may be high and it may be transferred to the second tank and thus may be used to heat more water than only that in the Solar Tank.

Note: Not possible to connect and select an additional device - the submenu Peripherals is hidden in the controller's service menu. The switching valve operating the additional receiver is connected instead of the peripherals.

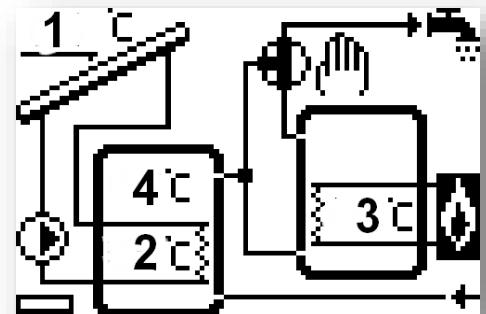
Additional parameters to be adjusted:

- Valve hysteresis.
- Operation algorithm.
- Deactivation delta of pump 2.
- Activation delta of pump 2.

V.a.15) Scheme 15/17

Installation 15/17 Operates:

- ⊗ The Collector Pump.
- ⊗ The Switching Valve.
- ⊗ The Accumulation Tank - Solar.
- ⊗ The second tank (heated with an additional heat source e.g. the CH Boiler).
- ⊗ One direction of the collectors' location.
- ⊗ Additional peripherals.



Installation Sensors:

- ⊗ The collector's sensor.
- ⊗ The two sensors of the Accumulation Tank.
- ⊗ Sensor of the second tank.

This installation is able to control which tank it collects hot water from for the facility – it allows the user to switch valve to water intake from whichever tank has the warmer water. In periods of poor insulation (i.e. the winter period), water is taken from the second tank (heated with an additional heat source, e.g. the CH Boiler). On the other hand, water from the solar tank heated by the solar installation reaches the input of the second tank as cold water.

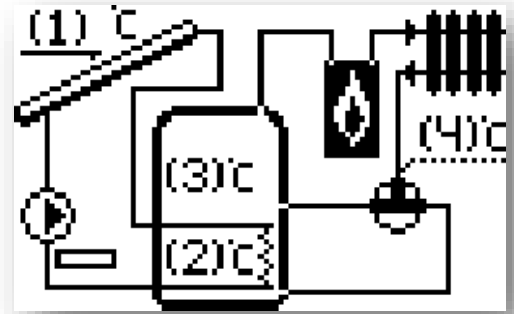
V.a.16) Scheme 16/17

Installation 15/17 Operates:

- ⑨ The Collector Pump.
- ⑨ The Switching Valve.
- ⑨ The Accumulation Tank - Solar.
- ⑨ One direction of the collectors' location.
- ⑨ Additional peripherals.

Installation Sensors:

- ⑨ The collector's sensor.
- ⑨ The two sensors of the Accumulation Tank.
- ⑨ Valve sensor.



This installation allows the user to control the valve of the CH installation return to the accumulation tank. The valve switches the circulation from the top part of the tank to the bottom part. Additional parameters to be adjusted:

- Valve delta.

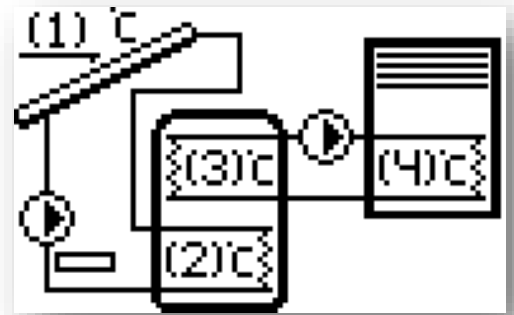
V.a.17) Scheme 17/17

Installation 17/17 Operates:

- ⑨ The Collector Pump.
- ⑨ The Pump Tank – Receiver.
- ⑨ The Accumulation Tank - Solar.
- ⑨ Heat Receiver.
- ⑨ One direction of the collectors' location.
- ⑨ Additional peripherals.

Installation Sensors:

- ⑨ The collector's sensor.
- ⑨ The two sensors of the Accumulation Tank.
- ⑨ Heat Receiver sensor.



Additional Parameters to be Adjusted (additional submenu in the service menu):

- Heat Receiver: receiver maximum temperature, receiver activation temperature, heat receiver hysteresis.

V.b) Accumulation Tank

This menu allows the user to adjust all parameters related to the tank (heat container).

V.b.1) Set Temperature

This function is used to adjust the set temperature in the container which leads to the deactivation of the Collector Pump.

V.b.2) Maximum Temperature of Tank 1

Using this option, the user may declare the maximum acceptable safe temperature value to which the tank is allowed to heat in the case of *Collector Overheat*.

If the collector reaches its alarm temperature (*Overheat*), the pump is activated automatically in order to cool down the heated collector, regardless of the set temperature. The pump operates until reaching *the Tank's Maximum Temperature* or until the collector's temperature drops by the value of *the Alarm Hysteresis* (see: *SERVICE MENU > Solar Collector > Alarm Hysteresis*)

V.b.3) Minimum Temperature of Tank 1

Using this parameter, the user may declare the minimum acceptable temperature value to which the tank is allowed to cool. Below this temperature, the pump does not activate in the Collector Defrosting mode.

V.b.4) Tank Hysteresis

Using this function, the user declares the tank hysteresis value. If the tank reaches the set temperature and the pump is deactivated, it will be activated again after the tank's temperature drops below the set value by the value of this hysteresis.

V.b.5) Cooling Down to Set Value

When the collector reaches the overheat temperature, the pump is activated in emergency mode to cool it down. In this case, the tank receives heating until exceeding the set temperature (up to the maximum temperature). To prevent the accumulation of water which is too hot in the container, the *Cooling Down to Set Value* function should be started. After activating this option, when the collector's temperature drops below that of the container, the pump is activated in order to cool down the tank until it reaches the set temperature.

V.b.6) Delta Holiday

This function is active only in the Holiday Operating mode. This parameter determines how many °C before reaching the collector overheat temperature the pump is activated in order to cool it down. The pump is deactivated after the collector's temperature is reduced by at least 5°C.

V.b.7) Valve Hysteresis

Option active only in the case of setting the installation scheme number: 2, 6, 9, 13 and 14.

This function determines the value by which the temperature needs to change so that the valve is switched again.

In the case of scheme 2: the tank first reheats in the top part of the tank (where the inlet of hot utility water is located). After this part of the tank is reheated, the valve switches the circulation to the second part of the tank. The valve is activated again after the priority part of the tank is cooled down by the value of valve hysteresis (this is the difference in temperatures of both parts of the tank).

In the case of scheme 6: the setting relates to valve control when cooling the Collector down in the Summer Mode or Alarm Mode, as well as when defrosting. The valve hysteresis determines the difference in temperatures between the tanks when the valve switches to the opposite tank.

In the case of scheme 9: when the set temperature of the first tank is reached, the valve switches the power supply to the Heat Receiver's circulation. The valve is activated again after the first tank is cooled down by the value of valve hysteresis (this is the difference in temperatures of both tanks).

In the case of schemes 13 and 14: the regulator controls the switching valve in the installation's model – water from the warmer tank is directed to the facility. The difference in temperatures on tanks is detected automatically, and if this difference reaches the value of the valve's delta, then the valve switches to water intake from the warmer tank.

V.b.8) Set Temperature of Tank 2

Option active only in the case of setting the installation scheme number: 6, 7, 8 and 9.

This function determines the set temperature of tank 2 which leads to the deactivation of the Collector Pump (schemes 6 and 9) or the pump of tank 2 (schemes 7 and 8).

V.b.9) Maximum Temperature of Tank 2

Option active only in the case of setting the installation scheme number: 6, 7, 8 and 9.

Using this option, the user may declare the maximum acceptable safe temperature value to which the second tank is allowed to heat in the case of Collector Overheating.

V.b.10) Hysteresis of Tank 2

Option active only in the case of setting the installation scheme number: 6, 7, 8 and 9.

The pump is deactivated after reaching its set temperature. The pump is activated again after the tank's temperature drops below the set value by the value of hysteresis of tank 2.

V.b.11) Operation Algorithm

Option active only in the case of setting the installation scheme number: 7, 8 and 14.

Using this option, the user selects the pump operation mode. The pumps may operate in the

following modes:

a) *Priority of Tank 1* – first, tank 1 is heated (only pump 1 operates), after the set temperature is reached, pump 2 is activated and reheats tank 2.

b) *Parallel Operation* – the pumps operate independently of one another, each within its own range (according to the settings) and both tanks are heated at the same time.

V.b.12) Tank Reheating Priority

Option active only in the case of setting the installation scheme number: 9.

After the user marks this function, the tank's set temperature is treated as a priority – the valve does not switch to the circulation with the heat receiver until the tank's set temperature is reached. The function of oscillation loading is not taken into account in this situation.

V.c) Solar Collector

This menu allows the user to adjust all parameters related to the Solar Collector.

V.c.1) Overheat Temperature

This is the Solar Collector's acceptable alarm temperature at which the pump is forced to activate in order to cool down the solar panels. The discharge of warm water will take place regardless of the tank's set temperature. The pump will operate until its temperature drops below the alarm temperature by the *Alarm Hysteresis Value* (*Service Settings > Solar Collector > Alarm Hysteresis*) or until the tank reaches the maximum acceptable temperature (*Service Settings > Accumulation Tank > Maximum Temperature*)

V.c.2) Minimum Reheating Temperature

This is the collector's threshold temperature. If the temperature within the collector is higher and is dropping after reaching the minimum reheating temperature, the pump is deactivated. On the other hand, when the temperature on the collector is below this limit and is increasing - the pump is activated after reaching the minimum reheating temperature plus hysteresis - 3°C. The threshold reheating temperature is not active in the emergency mode, manual operation or collector defrosting.

V.c.3) Anti-Freeze Temperature

Due to the different freezing temperatures of the liquid in the solar installation, the *Anti-Freeze Temperature* was introduced. This parameter determines the minimum safe temperature when the glycol liquid does not freeze (temperature measured on the collector). In the case of a significant drop in the collector's temperature (to the value of this parameter), the pump is activated and operates continuously until the collector is heated to a safe temperature. The settings range of this coefficient is within -50: +10°C.

V.c.4) Alarm Hysteresis

Using this function, the user declares the value of the collector's alarm hysteresis. If the tank reaches the alarm temperature (*Overheat Temperature*) and the pump is activated, it will deactivate again when the collector's temperature drops below *the maximum temperature* by the value of this hysteresis.

V.c.5) Defrosting Time

Using this function, the user determines for how long the pump is activated after the activation of the function *Collector Defrosting*.

V.c.6) Collector Delta

Option active only in the case of setting the installation scheme number: 4.

Only one heating circulation is always active in this system. The switching valve is to switch the circulation to the collector that currently has temperature higher at least by the value of collector delta (this is the difference in temperatures of both Collectors).

V.d) Heat Receiver

This submenu is visible only in the case of activating the installation scheme number: 17.

V.d.1) Receiver Maximum Temperature

This parameter determines the maximum value of the receiver's temperature – as long as the receiver fails to reach this value, the Pump Tank – Receiver operates (provided that the temperature of the top tank's sensor is higher than the temperature of the receiver).

After reaching this temperature, the pump tank – receiver is deactivated. The pump is activated again after the receiver's temperature drops the receiver's hysteresis value (provided that the temperature of the top tank's sensor is higher than the temperature of the receiver).

V.d.2) Receiver Activation Temperature

This parameter applies to the activation of the Pump Tank – Receiver; this pump is activated after the tank's top sensor reaches this value (provided that the temperature of the receiver is lower than the temperature of the tank's top sensor).

If the temperature of the top tank's sensor drops below the activation temperature reduced by the heat receiver hysteresis, the pump is deactivated until the tank's temperature increases.

V.d.3) Heat Receiver Hysteresis

This parameter applies both to the receiver's maximum temperature and the receiver's activation temperature, and the operation of this parameter was described above.

V.e) Pumps

V.e.1) Pump's Revolutions, Adjusted or Constant

Using this function, the user defines the mode of the pump's operation. The user may select constant revolutions when the pump operates at all times with full power (always when its operation is active) or adjusted revolutions. In the case of adjusted revolutions, the user should adjust several additional parameters (see below).

V.e.2) Collector's Maximum Temperature

Using this setting, the user declares the value of the collector's maximum alarm temperature when the pump may be damaged. This temperature should be adjusted according to the collector's technical data. Due to the phenomenon of glycol "gelation" at high temperatures and the risk of damaging the Solar Pump, the pump will be deactivated after reaching the maximum alarm temperature (the regulator proceeds to the *Collector Overheat* mode).

V.e.3) Solar Pump Deactivation Delta

This function determines the difference between the collector temperature and the tank temperature when the pump is deactivated (so as to avoid cooling down the tank).

V.e.4) Solar Pump Activation Delta

This function determines the difference between the Collector Temperature and the Tank Temperature when the pump begins to operate (this is the pump activation threshold value).

V.e.5) Gear Coefficient

This parameter is active only if the pump's revolutions are set as adjusted. When the conditions for the pump's activation are met, it is initially activated at minimum speed (*Solar Pump's Operating Minimum*). Then, the pump increases its revolutions according to the setting of this coefficient, which determines at how many °C of difference between the collector temperature and the tank temperature the pump increases its operation revolutions by 10%. The gear coefficient applies only to the pump's operating revolutions, namely the value of revolutions within the limits of the Solar Pump's operating minimum (0% for the gear coefficient) as well as the solar pump operating maximum (100% for the gear coefficient). The greater the difference in temperatures between the collector and the tank, the greater the number of revolutions conducted by the pump.

Example:

If the gear coefficient value is 3, a change in the difference in temperatures between the collector and the tank by each 3 degrees will lead to a change in the value of the pump's revolutions by 10%.

The table below contains examples of the coefficient's values depicting the operation of the gear

coefficient.

| | Gear Coeff. 3 | Gear Coeff. 4 | Gear Coeff. 5 | Gear Coeff. 6 | Pump's Operation Revolutions |
|-------------------|---------------|---------------|---------------|---------------|---------------------------------|
| Value of Δ | $\Delta 3$ | $\Delta 4$ | $\Delta 5$ | $\Delta 6$ | 10% |
| (Collector's | $\Delta 6$ | $\Delta 8$ | $\Delta 10$ | $\Delta 12$ | 20% |
| Temperature - | $\Delta 9$ | $\Delta 12$ | $\Delta 15$ | $\Delta 18$ | 30% |
| Tank's | $\Delta 12$ | $\Delta 16$ | $\Delta 20$ | $\Delta 24$ | 40% |
| Temperature) | $\Delta 15$ | $\Delta 20$ | $\Delta 25$ | $\Delta 30$ | 50% |

V.e.6) Solar Pump Operating Minimum

This parameter is active only if the pump's revolutions are set as adjusted. Using this setting, the user should define the pump's minimum initial revolutions.

V.e.7) Solar Pump Operating Maximum

This parameter is active only if the pump's revolutions are set as adjusted. Using this setting, the user should define the pump's maximum percentage operation revolutions.

V.e.6) Circulation Sampling

This function allows the user to activate or deactivate circulation sampling aimed at updating the temperature reading consisting in a short activation of the collector's pump (when normal conditions for the pump's activation are not met). Sampling requires a short activation of the pump after growth in the collector's temperature by at least 3°C.

V.e.9) Oscillation Charging

Option active only in the case of setting the installation scheme number: 2, 6, 7 and 9.

Oscillation Charging is a function applied in the case of using a valve switching the circulation from the collector in the installation. The first circulation is always the priority circulation and the valve is switched to circulation 1 until reaching the set temperature in this circulation. When the temperature on the collector is too low to reheat circulation 1, oscillation charging of circulation 2 is activated – the valve switches to circulation 2 and the pump operates in operation cycles (parameter: Maximum Heating Time of Tank 2) as well as pause (Parameter Oscillation Pause Time). When the collector reaches a high enough temperature to reheat circulation 1, oscillation charging of the second circulation is no longer necessary – the valve switches to circulation 1. The function oscillation charging is aimed at optimizing the use of available solar energy.

When the user deactivates oscillation charging, reheating of the first circulation has absolute priority, and switching the controller to reheating of the second circulation is possible only after the set temperature in the first circulation is reached.

In the case of scheme 2 – the first circulation is the circulation collector – tank's top part, while the second circulation is the circulation collector – tank's bottom part.

In the case of schemes 6, 7 and 9 – the first circulation is the circulation collector – tank 1, while the second circulation is the circulation collector – tank 2.

V.e.10) Oscillation Pause

Option active only in the case of setting the installation scheme number: 2, 6, 7 and 9.

After the maximum heating time Z2, an oscillation pause takes place (the pump is deactivated) ensuring the stabilization of temperature. When the collector's temperature increases sufficiently during such pause, the valve switches to the first circulation. Otherwise, the maximum heating time cycle Z2 and the oscillation pause are repeated.

V.e.11) Maximum Heating Time Z2

Option active only in the case of setting the installation scheme number: 2, 6, 7 and 9.

After switching the valve to the second circulation, (when the collector's temperature is too low to reheat the first circulation to its set temperature), this parameter determines how long it will be

reheated (if the conditions for switching to the first circulation are still not met).

V.e.12) Deactivation Delta of Pump 2

Option active only in the case of setting the installation scheme number: 3, 7, 8, 12 and 14.

This function determines the difference between the collector temperature and tank 2 temperature when the pump is deactivated (so as to avoid cooling down the tank).

V.e.13) Activation Delta of Pump 2

Option active only in the case of setting the installation scheme number: 3, 7, 8, 12 and 14.

This function determines the difference between the collector temperature and tank 2 temperature when the pump begins to operate (this is the pump's activation threshold value).

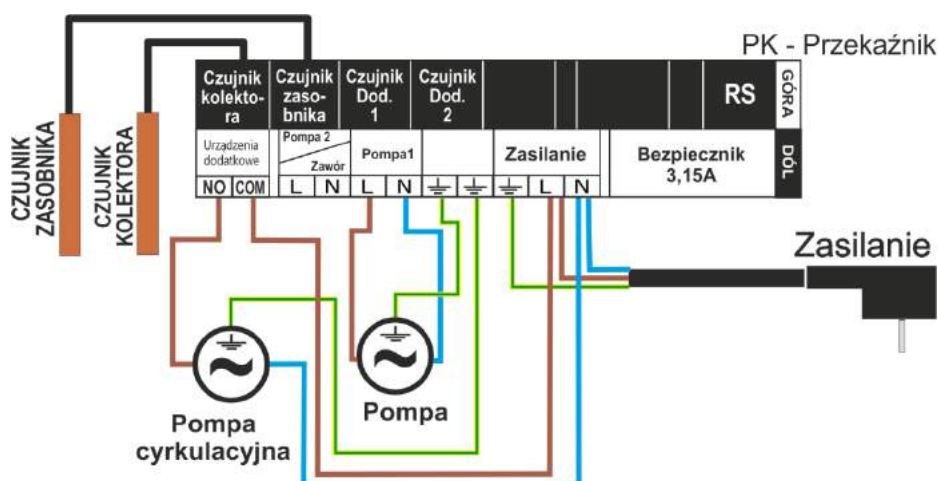
V.f) Peripherals

The user may connect and configure the settings of an additional device. If there is no additional device, the user should select the position *NO* (deactivate). Additional available devices and examples of connections supporting all available installation schemes are presented below.

In the case of using schemes 12 or 14, it is not possible to connect an additional device – the function is inactive.

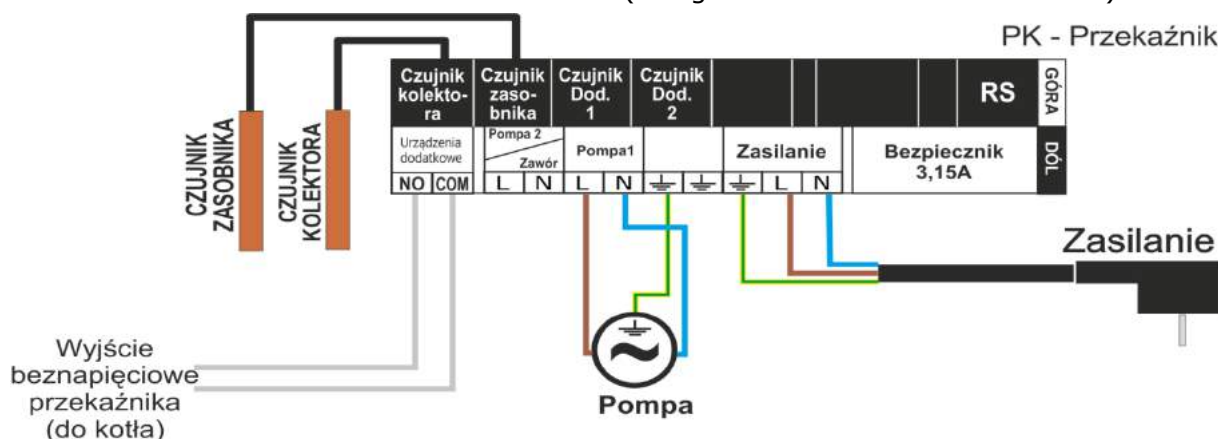
V.f.1) Circulation Pump

After selecting this device, the user should adjust the pump's periodical *Operation Time* and *Stoppage Time* during its activity. Then, the user should define in which hours the pump will be active, with the use of the "From" and "To" functions. Entering the same times ("From - To") will result in the device being active throughout the whole day.



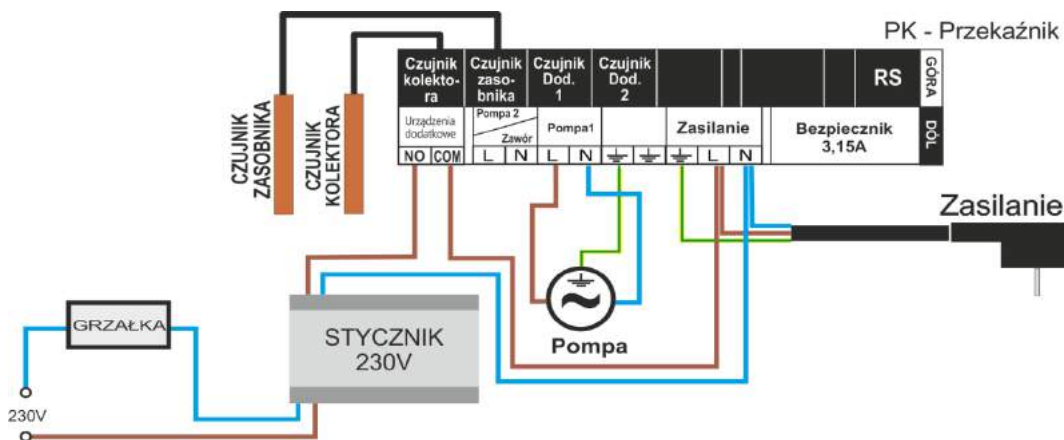
V.f.2) Firing up the PLT Boiler (pellet)

This option is used to adjust the voltage-free signal to fire up the pellet boiler. The user sets the *Activation Delta*, namely the difference between the tank's set temperature and the tank's current temperature which leads to the controller sending a signal to fire up the boiler. Then, the user selects the time interval in which this function will be active (using the function "From" and "To")



V.f.3) Heater

The heater is used to electrically heat the tank. The principle of operation is similar to that in the previous case but the heater should be connected by means of an additional contactor. The user sets the activation delta (the difference between the tank's set temperature and the tank's current temperature), below which the controller will activate the heater. Then, the user selects the time interval in which the electric heating function will be active (by means of the "From" and "To" functions).



V.f.4) Contact (not) Consistent with Pump

This setting determines the operation of the voltage-free contact. If the icon "Contact Consistent with Pump" is marked, then the voltage-free contact will close always when the pump operates (the additional device will activate). Otherwise (when the icon is unmarked), the contact will open at each activation of the solar pump.

V.f.5) Cooling with DHW Pump

Option inactive in the case of setting the installation scheme number: 5, 8, 11, 13 and 15.

This is a function which operates beyond a time interval, namely all the time. Sensor 4 is required for it to operate (installed in the external DHW Tank). This function may not operate when a scheme using all sensors is selected. Furthermore, a tank sensor is needed for it to operate (in the case of two sensors in the tank - the top sensor)

If the criteria referred to above are met, the peripheral will be activated (contact closing) when:

- ☉ The tank's temperature during its growth exceeds its maximum temperature reduced by the "Cooling Activation Delta" and operates until the temperature drops below the tank's maximum temperature reduced by the "Cooling Deactivation Delta" (both parameters are adjusted in the menu).
- ☉ The temperature in the tank is higher than the DHW Temperature. A constant hysteresis of 3 degrees is used here.

V.g) Calculation of Energy

Entering the following values correctly will make it possible for measure the gained energy in a more precise manner.

V.g.1) Flow

At this point, the user should specify the quantity of glycol that flows through the pump in one minute.

V.g.2) Type of Agent

This function allows the user to identify the agent used: ethylene glycol, propylene glycol or water.

V.g.3) Glycol Solution

At this point, the user should specify the percentage concentration of glycol in water.

V.g.4) Calibration

This function allows the user to calibrate the difference in temperatures between the sensors. The temperature measurement takes place in the temperature sensor's installation place. There is a possibility of deviations in the flow and temperature measurement at the return from the container. The manufacturer does not recommend changing this setting.

V.h) Installation Options

This submenu is visible only in the case of activating the installation scheme number: 5, 10 or 11.

V.h.1) Reheating Activation Delta

This option is only active in the case of setting the installation scheme number: 5.

This installation model has an additional circulation reheating the tank using the CH Boiler. If the tank's temperature is lower than the tank's set temperature, at least by the value of the set activation delta (this is the difference between the tank's set temperature and the tank's current temperature), the auxiliary pump (from the boiler) is activated to reheat the Accumulation Tank (provided that the boiler's temperature is higher than the tank's temperature). This setting is active only in hours defined by the user ("From/To").

V.h.2) From Hour... to Hour...

This option is only active in the case of setting the installation scheme number: 5.

These settings define in which hours ("From/To") the circulation from the CH Boiler reheating the Accumulation Tank is active (see the previous point).

V.h.3) Energy Release

This option is only active in the case of setting the installation scheme number: 5.

Activating scheme 5 enables the energy release (e.g. to the CH installation) above the tank's set threshold temperature.

V.h.4) Energy Release Threshold

This option is only active in the case of setting the installation scheme number: 5 and 11.

This parameter is used to adjust the threshold tank temperature at which the valve will switch to reheating the boiler's return.

V.h.5) Release Hysteresis

This option is only active in the case of setting the installation scheme number: 5 and 11.

When the release threshold temperature is reached, the valve switches the power supply to the boiler's return circulation. The valve is switched again after the tank cools down by the value of the release hysteresis.

V.h.6) Solar Pump Release

This option is only active in the case of setting the installation scheme number: 5, 11.

After activating schemes 5 or 11, this installation makes it possible to deactivate the Solar Pump's operation, e.g. to cool down the tank using the Auxiliary Pump.

V.h.7) Reheating Deactivation

This option is only active in the case of setting the installation scheme number: 10.

The tank in scheme 10 is reheated with a double function furnace. The function reheating deactivation applies to the threshold temperature to which the tank is to be reheated – if the tank's temperature exceeds this value, reheating with the double function furnace is deactivated (valve switched).

V.h.8) Activation Delta (return)

This option is only active in the case of setting the installation scheme number: 11.

This parameter determines the maximum difference between the tank temperature and the boiler return circulation temperature at which the valve switches to reheating the boiler's return.

V.h.9) Deactivation Delta (return)

This option is only active in the case of setting the installation scheme number: 11.

This parameter determines the minimum difference between the tank temperature and the boiler return circulation temperature at which the valve switches to the traditional boiler circulation (without reheating)

V.h.10) Valve Delta

The regulator in this installation model controls the switching valve – if the temperature on the tank's top sensor is higher than the valve's temperature plus the value of the valve's delta - the valve will switch the circulation to the bottom part of the tank. The circulation will be switched to the tank's top part again after these temperatures are level.

V.i) Alarm Sound

This function allows the user to activate or deactivate the acoustic signal after an alarm.


V.j) Factory Settings

The regulator is pre-configured for operation. However, it should be adjusted for own needs. Return to the factory settings is possible at any moment. Activating the factory settings option cancels all the user's settings of the Solar Installation Controller (saved in the user's menu) and replaces them with the settings saved by the boiler's manufacturer. From that moment, the user may once again adjust their own parameters. Restoring factory settings will result in setting the default installation scheme as current.

V. Protections


In order to ensure safe and failure-free operation, the regulator has been equipped with a range of safeguards.

1. Installation Sensor Protection.

If one of the sensors is damaged, an acoustic signal is activated and the following symbol will appear on the right hand side of the display:  An additional icon informing the user about the sensor

that is disconnected or is damaged will flash in the place of the displayed temperature of the damaged sensor. In order to deactivate the alarm signal in the sensor's error mode, the user should press **the Exit** button.

2. Protection against Collector Overheat.

If the maximum temperature (alarm) is reached, the regulator proceeds to the so-called collector *overheat* mode and the display will show the following symbol:  . The pump begins to

operate in order to cool down the collector until *the Tank's Maximum Temperature* is reached or until the collector's temperature drops by the value of the *Alarm Hysteresis* (see: *SERVICE MENU > Solar Collector > Alarm Hysteresis*) In the case of two tanks, both of them are used to cool down the overheated collector (at the same time or successively, depending on the operation algorithm setting).

3. Heat Container Protection.

In the case of collector overheat, each tank may be heated to no more than the set value of the maximum safe temperature. After reaching this temperature, the pump of a given tank is stopped (in the system with two tanks with a valve, the circulation is switched to the second tank).

4. Fuse.

The regulator is equipped with a WT 3,15A tube fuse-link protecting the network,



Higher amperage should not be used. Higher amperage fuse should not be used as it may damage the controller.

V. Updating Software



NOTE

New software may be uploaded to the controller only by a qualified fitter. After the software is changed, it is not possible to restore the previous settings.

In order to upload new software, the controller should be disconnected from the power supply. A USB flash drive with new software should be inserted to the USB port. Then, the controller should be connected to the power supply while holding the MENU button all the time. The MENU button should be held until a single sound signal is heard – this means that the new software is being uploaded.

VI. Maintenance

Before and during the heating season, the **ST-402N** controller should be checked for the condition of its cables. The user should also check if the controller is properly mounted and clean it if dusty or dirty.

| Technical Data of ST-402N Controller | |
|---|------------------|
| Power Supply Voltage | 230V/50Hz +/-10% |
| Temperature Adjustment Range | 8°C: 90°C |
| Power Consumption | max. 4W |
| Temperature Strength of PT 1000 Sensors | -30°C: 200°C |
| Measurement Accuracy | 1°C |
| Ambient Temperature | 5°C: 50°C |
| Load at Each Outlet | 1A |
| Fuse Insert | 3,15A |

VII. Assembly



NOTE:

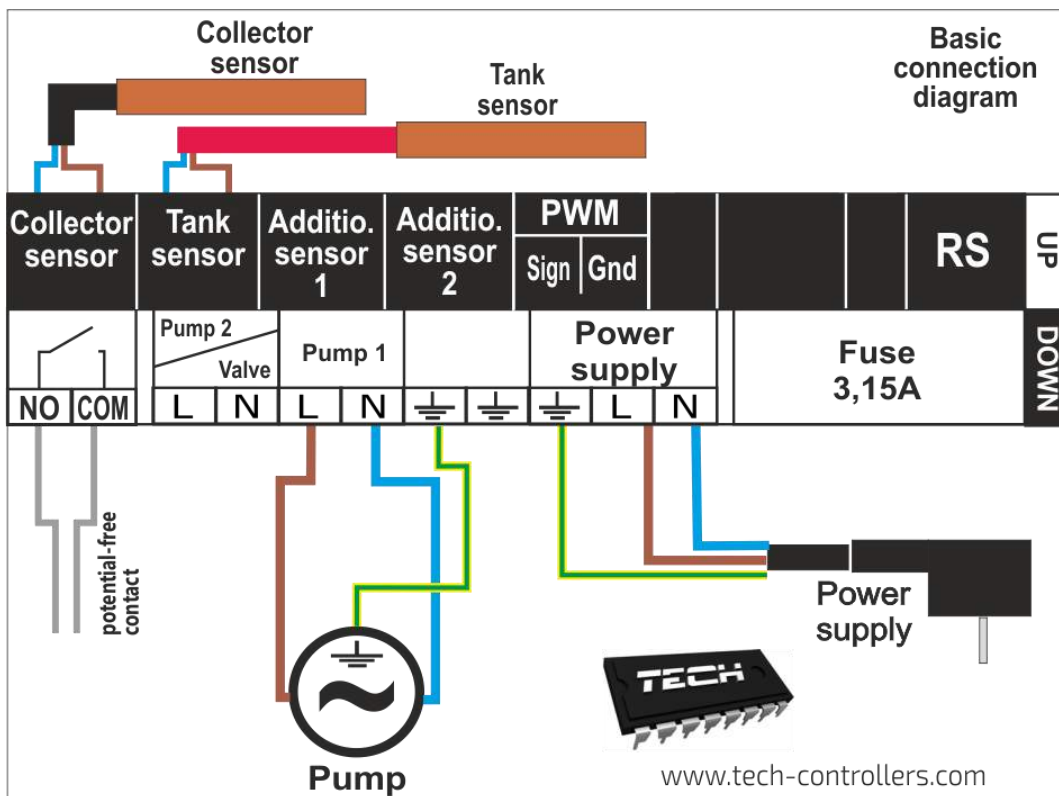
The device should be installed by a qualified electrician. Make sure that the plug is disconnected from the power supply at that time.



CAUTION

The cable to the temperature sensor should be led in a shield and should be protected against weather factors. The cable for connection to the solar controller should be permanent, made under a roof and well insulated. Metal elements of the sensor and the collector installation should be earthed.

Schematic Diagram of the Collector Installation



*Schematic Diagram – the scheme does not replace the design of the CH installation. It is aimed at demonstrating the possibility for expanding the controller. The presented scheme of the heating installation does not contain cut-off and protecting elements for the execution of its specialist installation.

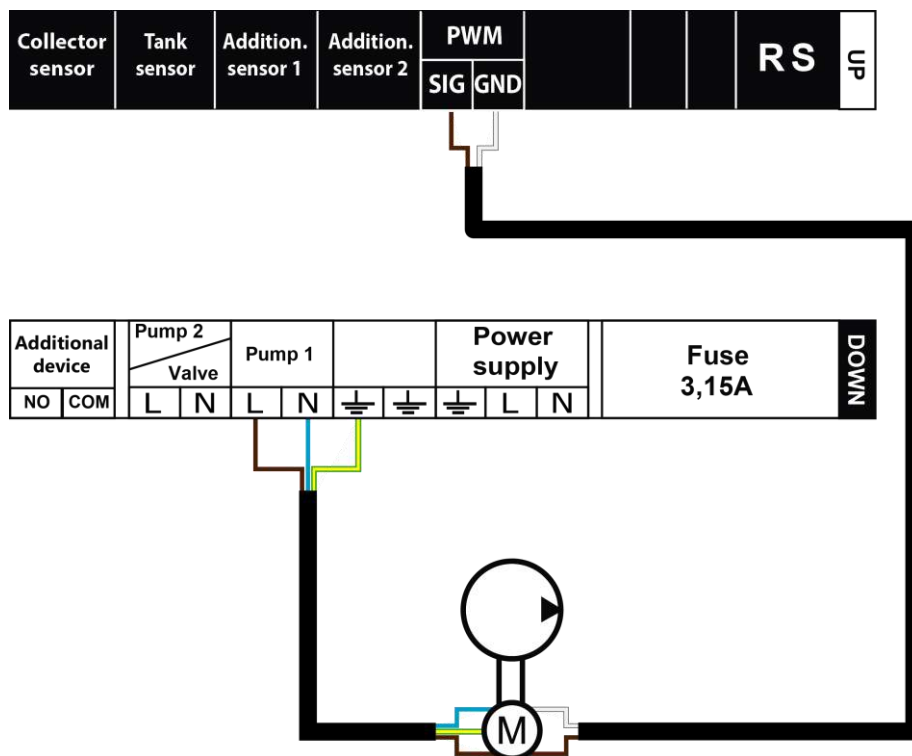


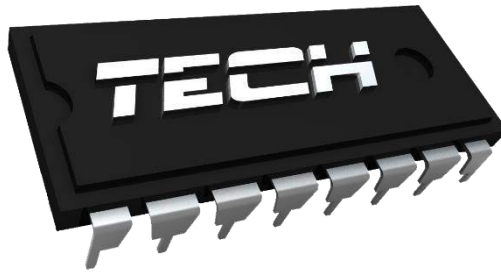
Table of contents

| | | |
|------|--|----|
| I. | Safety | 2 |
| II. | Application | 3 |
| III. | Principle Of operation | 3 |
| IV. | User Menu | 4 |
| | IV.a) Home Page | 4 |
| | IV.b) Main Menu – Flowchart..... | 5 |
| | IV.c) Operation Mode | 5 |
| | IV.c.1) Automatic Operation | 5 |
| | IV.c.2) Collector Defrosting | 5 |
| | IV.c.3) Holiday Mode | 6 |
| | IV.c.4) Anti-Legionella | 6 |
| | IV.c.5) Manual Operation | 6 |
| | IV.d) Timer | 6 |
| | IV.e) Date | 6 |
| | IV.f) Ethernet Module..... | 6 |
| | IV.g) GSM Module..... | 7 |
| | IV.h) Statistics | 7 |
| | IV.h.1) Gain | 7 |
| | IV.h.2) Collector Overheat | 7 |
| | IV.h.3) Power Supply Failures..... | 7 |
| | IV.i) Backlight | 7 |
| | IV.j) Display Contrast..... | 7 |
| | IV.k) Language | 7 |
| | IV.l) Information | 7 |
| | IV.m) Factory Settings | 8 |
| V. | Service Menu | 8 |
| | V.a) Installation Scheme | 10 |
| | V.a.1) Scheme 1/17 - Basic..... | 10 |
| | V.a.2) Scheme 2/17 – One Tank - Order | 10 |
| | V.a.3) Scheme 3/17 – Two Collectors, Two Pumps | 10 |
| | V.a.4) Scheme 4/17 – Two Collectors, Valve | 11 |
| | V.a.5) Scheme 5/17 – Reheating with Boiler | 11 |
| | V.a.6) Scheme 6/17 – Two Tanks, Valve | 11 |
| | V.a.7) Scheme 7/17 – Two Tanks, Two Pumps..... | 12 |
| | V.a.8) Scheme 8/17 – Two Tanks - Order | 12 |
| | V.a.9) Scheme 9/17 – Heat Exchanger..... | 12 |
| | V.a.10) Scheme 10/17 – Double Function Furnace | 13 |
| | V.a.11) Scheme 11/17 – Reheating the CH Return | 13 |

ST-402N User's Manual v 1.0.3

| | | |
|---------|--|----|
| V.a.12) | Scheme 12/17 – Two Collectors, Two Pumps, Tank and Additional Heat Receiver | 14 |
| V.a.13) | Scheme 13/17 – Two Collectors, Pump, Valve, Tank and Additional Tank Connected in Series | 14 |
| V.a.14) | Scheme 14/17 – Reheating the CH Return | 15 |
| V.a.15) | Scheme 15/17 | 15 |
| V.a.16) | Scheme 16/17 | 16 |
| V.a.17) | Scheme 17/17 | 16 |
| V.b) | Accumulation Tank | 16 |
| V.b.1) | Set Temperature | 16 |
| V.b.2) | Maximum Temperature of Tank 1 | 16 |
| V.b.3) | Minimum Temperature of Tank 1 | 16 |
| V.b.4) | Tank Hysteresis..... | 17 |
| V.b.5) | Cooling Down to Set Value | 17 |
| V.b.6) | Delta Holiday | 17 |
| V.b.7) | Valve Hysteresis..... | 17 |
| V.b.8) | Set Temperature of Tank 2 | 17 |
| V.b.9) | Maximum Temperature of Tank 2 | 17 |
| V.b.10) | Hysteresis of Tank 2 | 17 |
| V.b.11) | Operation Algorithm | 17 |
| V.b.12) | Tank Reheating Priority..... | 18 |
| V.c) | Solar Collector..... | 18 |
| V.c.1) | Overheat Temperature | 18 |
| V.c.2) | Minimum Reheating Temperature | 18 |
| V.c.3) | Anti-Freeze Temperature | 18 |
| V.c.4) | Alarm Hysteresis | 18 |
| V.c.5) | Defrosting Time | 18 |
| V.c.6) | Collector Delta | 18 |
| V.d) | Heat Receiver..... | 19 |
| V.d.1) | Receiver Maximum Temperature | 19 |
| V.d.2) | Receiver Activation Temperature | 19 |
| V.d.3) | Heat Receiver Hysteresis..... | 19 |
| V.e) | Pumps..... | 19 |
| V.e.1) | Pump's Revolutions, Adjusted or Constant | 19 |
| V.e.2) | Collector's Maximum Temperature | 19 |
| V.e.3) | Solar Pump Deactivation Delta | 19 |
| V.e.4) | Solar Pump Activation Delta | 19 |
| V.e.5) | Gear Coefficient..... | 19 |
| V.e.6) | Solar Pump Operating Minimum | 20 |
| V.e.7) | Solar Pump Operating Maximum..... | 20 |
| V.e.6) | Circulation Sampling | 20 |
| V.e.9) | Oscillation Charging | 20 |
| V.e.10) | Oscillation Pause | 20 |
| V.e.11) | Maximum Heating Time Z2 | 20 |

| | | |
|---------|--|----|
| V.e.12) | Deactivation Delta of Pump 2 | 21 |
| V.e.13) | Activation Delta of Pump 2..... | 21 |
| V.f) | Peripherals..... | 21 |
| V.f.1) | Circulation Pump | 21 |
| V.f.2) | Firing up the PLT Boiler (pellet) | 21 |
| V.f.3) | Heater..... | 22 |
| V.f.4) | Contact (not) Consistent with Pump | 22 |
| V.f.5) | Cooling with DHW Pump | 22 |
| V.g) | Calculation of Energy | 22 |
| V.g.1) | Flow..... | 22 |
| V.g.2) | Type of Agent..... | 22 |
| V.g.3) | Glycol Solution | 22 |
| V.g.4) | Calibration | 22 |
| V.h) | Installation Options..... | 23 |
| V.h.1) | Reheating Activation Delta | 23 |
| V.h.2) | From Hour... to Hour.. | 23 |
| V.h.3) | Energy Release..... | 23 |
| V.h.4) | Energy Release Threshold | 23 |
| V.h.5) | Release Hysteresis | 23 |
| V.h.6) | Solar Pump Release | 23 |
| V.h.7) | Reheating Deactivation..... | 23 |
| V.h.8) | Activation Delta (return)..... | 23 |
| V.h.9) | Deactivation Delta (return) | 24 |
| V.h.10) | Valve Delta | 24 |
| V.i) | Alarm Sound | 24 |
| V.j) | Factory Settings | 24 |
| V. | Protections | 24 |
| V. | Updating Software | 25 |
| VI. | Maintenance..... | 25 |
| VII. | Assembly..... | 25 |



Declaration of conformity no 62/2012

The company TECH, based in Wieprz 1047A, 34-122 Wieprz, declares with complete liability that our temperature regulator **ST-402N** 230V, 50Hz meets the requirements of the Regulation of the Minister of Economy, Labor and Social Policy (Journal of Laws No 155, item 1,089) dated August 21st, 2007 implementing the provisions of the Low Voltage Directive **(LVD) 2006/95/EC**,, the Act dated April 13th, 2007 on electromagnetic compatibility (Journal of Laws 07.82.556) implementing the provisions of Directive **(EMC) 2004/108/EC**, as well as the Regulation of the Minister of Economy dated May 8th, 2013 "on basic requirements on the restriction of the use of certain hazardous substances in electrical and electronic equipment" implementing the provisions of Directive **ROHS 2011/65/EC**.

Harmonized standards were used to assess the conformity **PN-EN 60730-2-9:2011, PN-EN 60730-1:2012**.

The product was marked with CE : 12-05-2014

| | |
|---|--|
|  PAWEŁ JURA |  JANUSZ MASTER |
| WŁAŚCICIELE TECH SP.J. | |

Wieprz, April 14th, 2015



Care for the natural environment is our priority. Being aware of the fact that we manufacture electronic devices obligates us dispose of used elements and electronic equipment in a manner which is safe for nature. As a result, the company has received a registry number assigned by the Main Inspector of Environmental Protection. The symbol of a crossed out rubbish bin on a product means that the product must not be thrown out to ordinary waste bins. By segregating waste intended for recycling, we help protect the natural environment. It is the user's responsibility to transfer waste electrical and electronic equipment to the selected collection point for recycling of waste generated from electronic and electrical equipment.



Controllers

TECH Sp.j.

Wieprz 1047A

34-122 Wieprz

SERWIS

32-652 Bulowice,

Skotnica 120

Tel. +48 33 8759380, +48 33 3300018

+48 33 8751920, +48 33 8704700

Fax. +48 33 8454547

serwis@techsterowniki.pl

Monday - Friday

7:00 - 16:00

Saturday

9:00 - 12:00

WWW.TECH-CONTROLLERS.COM