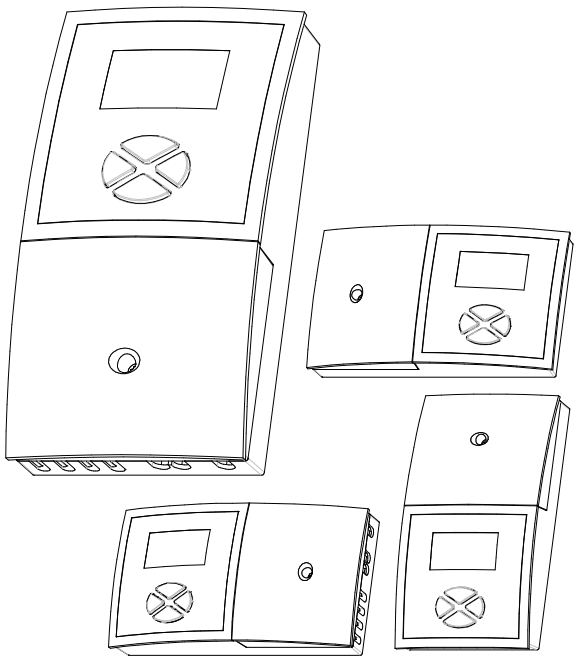
# *Elios X3*

## DIGITAL CONTROL SYSTEM FOR THE MANAGEMENT OF SOLAR HEAT PLANT



**DESCRIPTION**

Programmable digital control for thermal solar systems inclusive of solar collectors, circulation pumps and / or diverter valves, accumulation tanks and integrative heating.

Besides the fundamental function of differential regulator of temperature, it offers many options and advanced functions to manage plant schemes of various complexities and optimize the overall performance of the plant.

Thanks to the exclusive and versatile design, it is possible to install Elios X3 both in vertical and horizontal position, wall fitted and in a control system.

**GENERAL FEATURES**

- Brahma exclusive design, for installations up to four different positions
- graphic LCD, 128x64 pixels, backlit
- bicolor LED for diagnostic / signalling
- four buttons for settings
- 6 inputs for probes PT1000 o NTC (10K@25℃ β=3435)
- 3 outputs of which
  - 1 relay output N.O. (free power contact)
  - 2 triac outputs (at mains voltage)
- isolation type SELV (Safety Extra Low Voltage)
- possible wall fitted or in a control system
- possible separation of control part from power part, for system remote control (with bipolar cable, up to 50m)
- possible software updating via RS-232 with bootloader function

**TECHNICAL DATA**

| | |
|---|---|
| **Power:** | 230V-50/60Hz |
| **Operating temperature:** | -20°C +60°C |
| **Humidity:** | 95% maximum at 40°C |
| **Protection degree:** | IP 30 |
| **Weight:** | 600g |
| **Temperature Range PT1000:** | from -20℃ to 230℃ |
| **Temperature Range NTC:** | rom -20℃ to 100℃ |
| **Contact N.O.:** | max 1A 250Vac cosφ=0.4 |
| **TRIAC outputs:** | max 1A 250Vac |
| **Thermal fusible protection:** | 3,15A/250V (including loads) |
| **Dimensions:** | 210x120x45 mm |

**ACCESSORIES**

The system can be provided with:

- contact or immersion temperature probes type NTC;
- temperature probes type PT1000;
- kit for front panel remoting;
- serial cable for software updating.

**INDICATIONS FOR THE INSTALLATION**

Respect the national and european applicable normative (es.EN60335-1/prEN50165) related to electrical safety. Before to activate check the cables properly; wrong wirings can damage the devices and compromise the safety of the plant.

Connect and disconnect the control system only in absence of voltage.

The system can be mounted in every position.

Avoid exposure of the system to the fall of water drops.

Avoid laying the signals control cables along with power cables .

Before installing, refer to pictures 1 and 2 for the detection for the main parts making up Elios X3 (base, face plate, cover) and to the figure 6 for dimensions.

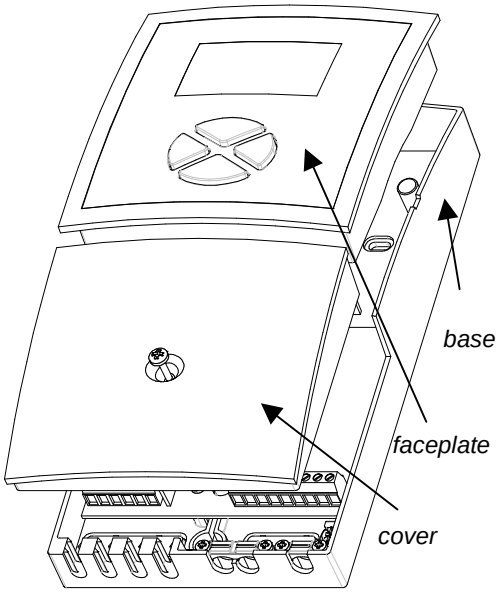



**FIGURE 1:** explosion of the main parts of the regulator: base, cover, faceplate

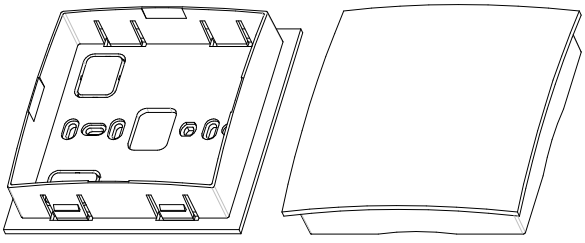


**FIGURE 2:** optional parts: bottom (left) and square plug (right)

**BASE FIXING**

To proceed to the base fixing of Elios X3 on a wall, first of all you need to remove the inferior protective cover, unscrewing the screw with a cross- tip screwdriver and unhook the square faceplate containing the control part, possibly gently, remove with a screwdriver into the loopholes.

When removing the faceplate be sure the internal connection cables: once you have separated the faceplate from the base, you have to detach the removable terminal block in order to fix freely the base of the desired support.

The base location can be either vertical or horizontal, with the control part positioned up or down, respectively, right or left.

For fixing it is possible to use many eyes provided on the bottom of the base; see, in this context, the figure 7. In case of vertical position, with the faceplate up, it is possible to use also the most common civil box wheelbase or hang the equipment through the appropriate hole.

Once the base is set it is possible to proceed to the wiring following the directions contained in the following paragraph.

**ELECTRICAL CONNECTIONS**

Connections on the electronic board contained in the base, are done all through screw terminals, to which correspond appropriate serigraphy, as shown in figure 3. In particular, we carefully distinguish two separate sections: the power part (terminal box M5 e M6) and the low tension part (terminal box M1, M2, M3 e M4).

*Before to proceed the wiring of sensors and loads, it is necessary to identify the scheme (called "system" in the menu) corresponding to the plant that Elios X3 will control.*

*Inputs and outputs, in fact, are not interchangeable: refer to the figure in Appendix A (from A.1 to A.12) where it is illustrated the position of the elements of the plant, which are associated the solar regulator connections.*

At the terminal box in the power part, must be connected the power and the loads of Elios X3 used (pumps, valves) according to the plant scheme used. Adjacent to the terminal box M6, fixed to the base, there is a clamp (isolated) T2 to realize a earth node, which connect the earth conductor of the power cable along with the earth loads conductors that provide such link. Near the terminal box M1 there is the fast-on T1, which connects the earth to the board: in this case, it is necessary to bring a conductor from fast-on to the T2 clamp, passing outside the local plant. In the extremity of the base, matching the power connections, there are the locations of cables with which it is possible to stop the voltage cables sheaths; the screws space gives opportunity to put more than one cable at the same place, as needed.

Specular to the power part, there are the connectors for wiring of low voltage cables. Prepared on three rows there are different terminal box dedicated to different functions: there are two with six poles to connect the temperature probes (indicated with M1 and M2 in figure 3), one of two poles for the connection with the power faceplate (M3) and one with three poles (M4) for the connection of the flow meter.

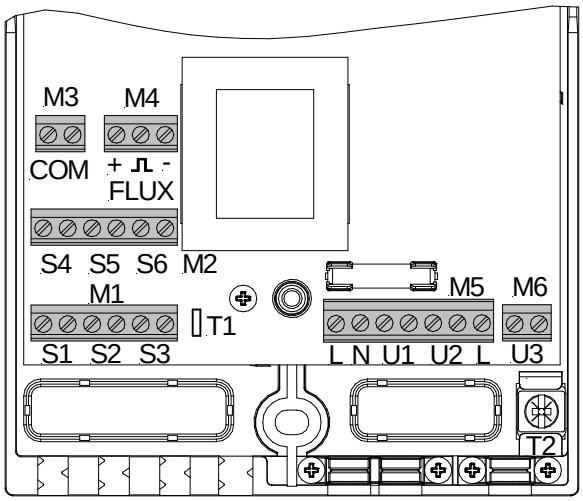
Before connecting individual probes, should be observed on the corresponding pattern scheme, the probe numbering, in order to make the connections correctly: because the inputs are specific the probes can not be exchanged between them. For example, in the scheme n°1 (refer to figure A.1) at input S1 has to be connected the probe of the solar panel, while at S2 input has to be connected the accumulation tank probe.

Later it is possible to define, using a menu, the type of probe installed for each input (PT1000 o NTC).

**FRONT PANEL REMOTE INSTALLATION**

About front panel wiring, if you want to remote it, you have to remove the internal connection cable and using the same connectors (the two poles terminal box M3 on the

base electronic board and the extractable terminal box on the front panel board) you have to make a connection with a bipolar cable (e.g. H03RR-F or H03VV-F) of section between 0,75 $mm^2$ and 2,5 $mm^2$. The cable maximum length is 50m; however the resistance of each wire cannot exceed 5Ω. If the environment is affected by heavy electromagnetic noise, it is better to use a shielded bipolar cable.
In order to install the front panel in another room or, however, on a different wall, you can use the proper bottom, provided with fixing and wiring loopholes: the bottom can be mounted in all positions.
On the base, to fill the gap left by removing the front panel, it is possible to insert the square plug on the base (see figure 2).




- L, N →Power supply (230V~)
- T1,T2 → Earth connections
- S1, S2, S3, S4, S5, S6 → inputs for temperature probes
- U1, U2 → triac outputs (230V~)
- U3 → relay output (free power contact). If you need 230V from this output, (fused) line is provided by the terminal marked with L, near U3.
- COM → faceplate connection
- FLUX → Flowmeter input (in case with 2 wires flowmeter the terminal marked with + of M4 is not connected)

**Figure 3:** Diagram of terminals (and related serigraphy) for electric connections

**USER INTERFACE AND INSTRUCTION FOR USE**
The dot matrix display provides clear and complete information to the user in various states of the operation and in the numerous setup menu, thanks to a careful management of text and icons.
In normal operation the display shows the scheme of the plant chosen by user, the output state (4 levels bars) and the temperatures detected by the probes (see, for example, figure 4).
You can input parameters and navigate menus through four multifunction buttons; in menu screens, in the lower part of the display, outlining the function of the individual keys, which change depending on the operations to be performed on the parameters and on the same menus. See, as an example, the image on figure 5.
At the center of the keys there is a bicolor LED red/ green: flashing green indicates that the system is running (and especially that the communication between base and faceplate is correct), while the red indicates an anomaly, whose details are shown on the display.
By pressing the OK button appears a screen where you can decide into which menu to enter: BASIC MENU, where the user can only view the current parameters of the system, or EXPERT MENU, where it is possible also to change the value of these parameters. To enter the menu EXPERT it is necessary to introduce a password, making inaccessible to the less experienced the most important parameters for the proper operation of the plant. Default password is 1234: we suggest to change this value the first time you enter into EXPERT menu at voice CHANGE PASSWORD. Password is protect: if you insert a wrong password for three times in a row, the control goes into lock-out position for a hour. After this time it is possible to re-enter into EXPERT menu. When the control is in lock-out position is not possible to enter into EXPERT menu.

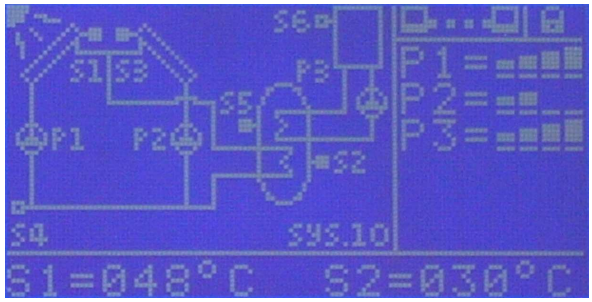



**Figure 4:** image of display in normal operation (plant scheme n.10)

When you are inside EXPERT menu and no button is pressed, after 1 minute from the moment you pressed last button, the system returns to BASIC menu. Similarly, if you are inside EXPERT menu and come back in main screen, the system remains in EXPERT menu for 1 minute: the active menu type is visualized in the display on the top right by a padlock, which is closed if you are in BASIC menu, open if you are in EXPERT one.
When you enter into one of the two menus, the main menu appears (fig. 5), which contains the following submenu:

SET SYSTEM
OPTIONS
INFORMATION

whose detailed description is given in the following paragraphs.

*For reasons of decreasing complexity and for ease of presentation, the menu will be described in the reverse order as they appear on the display; note that the format of the menu SYSTEM SET depends on the type of plant.*


**Figure 5:** image of the main menu

## Menu INFORMATION

***FW VERSION***
This item contains only technical information on the solar regulator model and firmware version.

***SYSTEM INFO***
It contains information on the plant, in particular:

**-** *LIFE Px* (x = 1, 2, 3)
Counter hours of operation of the pump Px.
Note that the counter is not reset following the procedure RESET in menu OPTIONS.
To clear the counter of each pump you have to press the OK key (in the menu EXPERT) on the corresponding menu item (e.g. if you want to clear the counter you must press OK on voice LIFE P1). At this point the words CLEAR LIFE Px flash: to reset the counter just press OK again, to cancel ESC.

**-** *SPEED Px* (x = 1, 2, 3)
Indicates the percentage points in the current speed of the pump Px.

**-** *DAY HEAT*
Indicates the thermic energy (in kWh) provided by solar plant in the last 24 hours (it is updated every hour).
To clear the counter of each pump you have to press the OK key (in the menu EXPERT) on the corresponding menu item. At this point the words CLEAR DAY HEAT flash: to reset the counter just press OK again, to cancel ESC.
The counter is not cleared with the procedure RESET of OPTIONS menu.

**-** *TOT HEAT*
Indicates the total thermic energy (in kWh) provided by solar plant. The time in which this energy was stored is reported at HEAT TIME menu item (see next paragraph).
To clear the counter of each pump you have to press the OK key (in the menu EXPERT) on the corresponding menu item. At this point the words CLEAR TOT HEAT flash: to reset the counter just press OK again, to cancel ESC. When you reset TOT HEAT, HEAT TIME is automatically cleared too.
The counter is not cleared with the procedure RESET of OPTIONS menu.

**-** *HEAT TIME*
Indicates the time (in hours) in which total thermic energy was stored. This counter is cleared after resetting TOT HEAT.

***VIEW GRAPH TEMP.***
It allows seeing the graph of the six temperature probes, selectable by pressing the keys UP and DOWN (Figure 6). The graphs contain the values of temperatures of the last 24 hours.

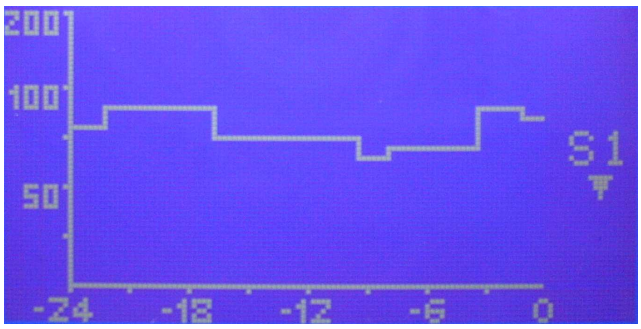



**Figure 6:** image of the diagram

## Menu OPTIONS

It allows the user to set some preferences relating to the generic user interface or basic functions of the plant.
Below there is a description of the individual menu items, which is also reported the range of variation (range) and the "factory" value (default).

***CONTRAST***
It allows the fine contrast of the LCD, for optimum readability depending on the light conditions of the environment in which it is placed the solar regulator.
Range: -9 ÷ +9
Default: 0

***LIGHT MIN***
It corresponds to the brightness of the display in resting conditions (i.e. after twenty seconds after the action on the keys). Acting on this switch, you can turn off the display when not needed, or at opposite, turn on.
Range: 0÷100%
Default: 10%

***SYSTEM ON/OFF***
General switch-on and switch-off of the plant.
In fact it is a "stand-by" as the function anti-lock of the pump, SAFE PUMP (recently described below) in the SYSTEM OFF state, remains active.
Range: ON / OFF
Default: ON

***SAFE PUMP***
This option protects pumps from blockage due to a prolonged inactivity, activating them regularly 24 hours after the last activation, also if the system is in state of SYSTEM OFF.
Further, the option takes effect for the pump Px also if the operating option of the pump OPM Px is OFF (see menu SYSTEM).
Range: ON/ OFF
Default: ON

***RESET***
The reset procedure (pressing contemporary the buttons "up" and "down" for ten seconds) restores the default values.
For the parameters of the menu SET SYSTEM, leaving intact the preferences set in the menu OPTIONS.

***CHANGE PASSWORD***
Change of the current password.

## Menu SET SYSTEM

This is the most complex and most important menu of Elios X3, because it contains all the configuration parameters of the plant.
The menu depends on the type of plant selected (i.e. the value of the parameter SYSTEM), as evident from the figures from A.1 to A.12.
In Appendix every plant configuration includes various probes inputs and various loads, as well as different functions and options.
The number of menu items depends also by the BASIC / EXPERT menu OPTIONS: please refer to the paragraph above for a description of this option.

In Table 1 are shown schematically information regarding the menu SYSTEM parameters, including the range of variation, the value of default and the association between visibility parameter in the menu and layout of plant chosen.
Here is thorough presentation of the contents of the menu with a detailed description of the individual parameters and, where applicable, of the algorithms associated with them.

***SYSTEM***
First setting to be made during installation: the configuration of inputs and outputs, and active parameters and logic operation of the solar controller depend on the number of the SYSTEM .
Refer to figures from A1 to A.12 in Appendix to detect the scheme, and the relative number, referring to the plant to control.

***DTx ON*** (x = 1, 2, 3)
Tank x temperature differential (ΔT) to activate the pump.
See next parameter for further information.

***DTx OFF*** (x = 1, 2, 3)
Tank x temperature differential (ΔT) to deactivate the pump.
See next parameter for further information.

***DTx MOD*** (x = 1, 2, 3)
Tank x temperature differential (ΔT) to start the pump modulation.
See next parameter for further information.

***DTx+5%*** (x = 1, 2, 3)
Tank x temperature rising differential.

As the main function of Elios X3 is that of temperature differential controller, it is necessary to specify temperature differentials of regulation algorithm, which works as follows.
When the temperature difference between collector and tank is almost equal to parameter DTx ON, pump Px is activated and, after a 1 second impulse at maximum speed, works at minimum speed (for output U1 and U2 only).
Minimum speed can be set with MIN S P1 and MIN S P2 parameters.
Then, if the temperature difference is equal to DTx MOD, the pump start to modulate. Beyond DTx MOD, every time temperature difference rises of DTx+5% parameter (tank rising), the pump speed rises of another step (5%) until the maximum speed is reached.
The pump Px is deactivated, instead, when the temperature difference between collector and tank is less than parameter DTx OFF.

***HEAT MODE***
Option for the normal charge of a tank.
1) Option NORM: the tank is charged up to STx MAX value;
2) Option NORM: the tank is charged up to STx LIM value.

***STx MAX*** (x = 1, 2, 3)
Maximum set-point of tank x.
When the tank temperature goes beyond this value, the solar charge is stopped and the display shows symbol  (option NORM).
The tank temperature could exceed the set-point in the case that system cooling option is active. See on the subject parameters COOL Cx and T MAX Cx.
If you set the option HIGH, the considered set-point is STxLIM (see next paragraph), so this value is always exceeded during tank x charge.

***STx LIM*** (x = 1, 2, 3)
Maximum temperature of the tank x.
Maximum temperature of the tank x, that may in no case be exceeded. With the operating option HIGH is the effective set- point of the tank x.

***MAX ON / MAX OFF***
They are the parameters for the limitation of maximum temperature, used to set the additional differential temperature and present only in plants with heating boiler with solid fuel (plant n° 3 – 9 – 12) to drive the output U3 or heat exchange (plant n°2) to drive the output U 2.
If the temperature to adjust, which depends from the plant, becomes more than MAX ON, the relay opens; when falls below MAX OFF, the relay closes.

***MIN ON / MIN OFF***
These parameters are for restricting minimum temperature. These parameters are for restricting minimum temperature. Like the previous ones, they are used to regulate the temperature differential additional used only in plants with heating boiler with solid fuel (plant n° 3 – 9 – 12) to drive the output U3 or heat exchange (plant n°2) to drive the output U2.
If the temperature to adjust, which depends from the plant, it becomes lower than the MIN ON, the relay opens; when the value exceeds MIN OFF, the relay closes.
In plants with heating boiler with solid fuel (plant n°3 – 9 – 12), it is better to set MIN ON=50℃ and MIN OFF=55 ℃.

***LOCK PROT***
If this function is active, when the collector temperature is greater than LIMIT Cx parameter (see next paragraph), the solar pump is activated for 1s every minute. If this function is deactivated, in this condition the pump remains off.

***LIMIT Cx***
It is the temperature limit for the collector Cx for the emergency arrest.
If the probe panel detects a temperature higher than this, the corresponding solar pump is stopped to avoid the overheating of the solar circuit.
If this value is exceeded the function NO STOP is activated, the pump is activated for 1 second every minute.

At this stage of the emergency, the display shows  flashing.

***COOL Cx (T MAX Cx)***
Option cooling collector Cx.
If the option COOL Cx is enabled, when the temperature of the collector Cx exceeds the value T MAX Cx (security maximum temperature), then the pump is activated to provide solar collector cooling, even if the temperature is higher than the accumulation set –point (STx MAX).

However, for security reasons, the pump will stop when the temperature reaches the accumulation STx LIM.
At the stage of cooling collectors the display shows the symbol  .

***L MIN Cx (T MIN Cx)***
The option minimum temperature of the collector Cx: avoids unnecessary activations of the solar pump.
If the option L MIN Cx is ON, the solar pump is activated only for the collector temperatures higher than T MIN Cx (minimum temperature of the collector Cx).
If the collector temperature is lower than T MIN Cx, the display shows the symbol  .

***NFR Cx (T NFR Cx)***
Option antifreeze for the collector.
If the option NFR Cx is ON when the temperature of the collector Cx falls below the value of T NFR Cx (temperature antifreeze collector Cx), the solar pump is activated by heat transfer to the accumulation collector and avoids that the thermal fluid frosts inside.
The pump turns off when the temperature of the collector exceeds 1 degree the value of T NFR Cx.
Note that the antifreeze is effective only if the accumulation stocked sufficient heat to counteract the action of frost.
When the system comes into antifreeze the display shows  flashing.

***PRIORITY***
The priority for the charge of the tank in multi-tank plants, is to allow to select the order in which you loaded the different tanks (or "layers" of the tank, see diagram n.4), as plants that use this very different parameter; refer to the following scheme to make a correct approach.
The symbol ">" is used to indicate the highest priority: ST1 > ST2 means that the tank ST1 has priority over ST2.

System 4
*Single tank with two layers*

| | |
|---|---|
| Priority = 1 | ST-inferior > ST2-superior |
| Priority = 2 | ST2-superior > ST-inferior |

System 5
*Two tanks (with diverter valve)*

| | |
|---|---|
| Priority = 1 | ST1 > ST2 |
| Priority = 2 | ST2 > ST1 |

System 6
*Two tanks (with two pumps)*

| | |
|---|---|
| Priority = 1 | ST1 > ST2 |
| Priority = 2 | ST2 > ST1 |

System 10
*Three tanks (with three pumps)*

| | |
|---|---|
| Priority = 1 | ST1 > ST2 > ST3 |
| Priority = 2 | ST1 > ST3 > ST2 |
| Priority = 3 | ST2 > ST1 > ST3 |
| Priority = 4 | ST2 > ST3 > ST1 |
| Priority = 5 | ST3 > ST1 > ST2 |
| Priority = 6 | ST3 > ST2 > ST1 |

System 11
*Three tanks (with diverter valves)*

| | |
|---|---|
| Priority = 1 | ST1 > ST2 > ST3 |
| Priority = 2 | ST1 > ST3 > ST2 |
| Priority = 3 | ST2 > ST1 > ST3 |
| Priority = 4 | ST2 > ST3 > ST1 |
| Priority = 5 | ST3 > ST1 > ST2 |
| Priority = 6 | ST3 > ST2 > ST1 |

System 12
*Two tanks (with diverter valve)*

| | |
|---|---|
| Priority = 1 | ST1 > ST2 |
| Priority = 2 | ST2 > ST1 |

***TIME STOP / TIME RUN (commuter charge)***
Charging and stopping time for the alternating management of more tanks plants (value in minutes).
In accordance with the priorities specified by the previous parameter, the regulator verifies the conditions for the charge of the prior tank; otherwise it passes to load the next in order of priority and only if it is necessary the solar charge for a number of minutes equal to the TIME RUN, then it stops for TIME STOP. If during the charging and stopping time of a secondary tank, for example after taking a sample, it is required the charge of a more prior one, the regulator passes to load that one.
The tanks are initially loaded up to STx MAX; when everyone has reached this temperature and if you choose the option HIGH, then are loaded up to STx LIM.

***RE COOL***
If cooling tank option is enabled, it allows to lower the accumulation temperature when this is higher than the one set by the user, because of the cooling function of the collectors.
In particular, with this option turned on, if the accumulation temperature is higher than STx MAX and if the collector temperature is lower than 5 degree compared to the accumulation, then the corresponding pump is activated to bring the accumulation temperature under the value of STxMAX.
In cooling tank stage the display shows the flashing symbol  .

***HP TUBE C***
Special option for collectors with vacuum tube (for *heat-pipe* type only).
If the collector temperature is higher than the tank temperature and lower than the increased tank temperature of DTx ON, then the pump is activated for 30 seconds at the maximum speed. At the end of the 30 seconds one of the following cases can happen:

1) if the collector temperature is higher than the temperature tank of DTx ON then you can proceed to the normal charge of tank;
2) if the collector temperature is lower than the tank temperature the pump is stopped;
3) if the collector temperature is higher than the temperature tank, but lower than the increased tank temperature of DTx ON, then the pump is stopped for 2 minutes, after this time the collector temperature is monitored again and the cycle resumes.

***T TH ON / T TH OFF***
Switch on and off temperature of the thermostat.
The regulator makes available for some planting schemes, a thermostat function independent of the differential regulation of the solar accumulation temperature.
This function can be used in two different ways depending

on the plant:

- if T TH ON < T TH OFF is used to activate an additional heating from an external source, for example gas boiler or biomass;
- if T TH ON > T TH OFF is used to exploit the excess heat of the accumulation, for example for rising temperatures return of the heating circuit or to activate the transfer of excess heat on a secondary system.

***SPH***
Indicates specific heat (in J/g°C or in kJ/kg°C) of thermovector fluid.

***SPW***
Indicates specific heat (in kg/l or in kg/$dm^3$ or in g/$cm^3$) of thermovector fluid.

***L PULSE***
Indicates the liters per pulse counted by flowmeter.

***MIN S Px***
Minimum speed of the pump Px, expressed in percentage points and set by step of 5%. Where at Ux output is not connected a pump, but a diverter valve (or in anyway is not a load which modulates), it should be set MIN SP Px = 100%.

***OPM Px*** (x = 1, 2, 3)
Operation option of the pump Px: in mode AUTO the pump control depends on the logic of operation of the regulator, but, during maintenance, it is possible to deactivate it, turning OFF, or forcing the activation at 100% of the speed, in state ON.
The antifreeze function is active also when the pump is OFF.

***TYPE Sx*** (x = 1, 2, 3, 4, 5, 6)
For each probe can be specified the sensor type, so NTC or PT1000.
If the probe is not connected, because is optional in the plant scheme used, it is possible to set the parameter as "N.C.".
In the plants with supplementary heating (schemes n°3, 9 and 12) is possible to use also a solid fuel boiler: in this case the relative probe has to be connected (Sx TYPE must be set differently from N.C.).
If the probe is not connected, because is optional in the plant scheme used, it is possible to set the parameter as "N.C.".

**Table 1:** SET SYSTEM menu parameters.

| PARAMETER | DESCRIPTION | DEFAULT | RANGE* | PLANT N. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| **SYSTEM** | PLANT NUMBER - ON/OFF | 1 | 1 / 12 | x | x | x | x | x | x | x | x | x | x | x | x |
| **DT1 ON** | DELTA T ACTIVATION TANK 1 | +6 °K | +1 / +20 | x | x | x | x | x | x | x | x | x | x | x | x |
| **DT2 ON** | DELTA T ACTIVATION TANK 2 | +6 °K | +1 / +20 | | x | | | x | x | | | | x | x | x |
| **DT3 ON** | DELTA T ACTIVATION TANK 3 | +6 °K | +1 / +20 | | | | | | | | | | x | x | |
| **DT1 OFF** | DELTA T DEACTIV. TANK 1 | +4 °K | +1 / +20 | x | x | x | x | x | x | x | x | x | x | x | x |
| **DT2 OFF** | DELTA T DEACTIV. TANK 2 | +4 °K | +1 / +20 | | x | | | x | x | | | | x | x | x |
| **DT3 OFF** | DELTA T DEACTIV. TANK 3 | +4 °K | +1 / +20 | | | | | | | | | | x | x | |
| **DT1 MOD** | DELTA T MODULATION TANK 1 | +10 °K | +1 / +30 | x | x | x | x | x | x | x | x | x | x | x | x |
| **DT2 MOD** | DELTA T MODULATION TANK 2 | +10 °K | +1 / +30 | | x | | | x | x | | | | x | x | x |
| **DT3 MOD** | DELTA T MODULATION TANK 3 | +10 °K | +1 / +30 | | | | | | | | | | x | x | |
| **DT1+5%** | RISING TANK 1 | +2 °K | +1 / +20 | x | x | x | x | x | x | x | x | x | x | x | x |
| **DT2+5%** | RISING TANK 2 | +2 °K | +1 / +20 | | x | | | x | x | | | | x | x | x |
| **DT3+5%** | RISING TANK 3 | +2 °K | +1 / +20 | | | | | | | | | | x | x | |
| **HEAT MODE** | OPTION TANK CHARGE | NORM | NORM / HIGH | x | x | x | x | x | x | x | x | x | x | x | x |
| **ST1 MAX** | SET-POINT MAXIMUM TANK 1 | +60°C | +2 / +95 | x | x | x | x | x | x | x | x | x | x | x | x |
| **ST2 MAX** | SET-POINT MAXIMUM TANK 2 | +60°C | +2 / +95 | | x | | | x | x | | | | x | x | x |
| **ST3 MAX** | SET-POINT MAXIMUM TANK 3 | +60°C | +2 / +95 | | | | | | | | | | x | x | |
| **ST1 LIM** | SET-POINT LIMIT TANK 1 | +85°C | +2 / +95 | x | x | x | x | x | x | x | x | x | x | x | x |
| **ST2 LIM** | SET-POINT LIMIT TANK 2 | +85°C | +2 / +95 | | x | | | x | x | | | | x | x | x |
| **ST3 LIM** | SET-POINT LIMIT TANK 3 | +85°C | +2 / +95 | | | | | | | | | | x | x | |
| **MAX ON** | MAX LIMIT TEMPE. (ACTIVATION) | +60°C | 0 / +95 | | x | x | | | | | | x | | | x |
| **MAX OFF** | MAX LIMIT TEMP. (DEACTIV.) | +58°C | 0 / +95 | | x | x | | | | | | x | | | x |
| **MIN ON** | MIN LIMIT TEMP. (ACTIVATION) | +5°C | 0 / +90 | | x | x | | | | | | x | | | x |
| **MIN OFF** | MIN LIMIT TEMP. (DEACTIV.)) | +10°C | 0 / +90 | | x | x | | | | | | x | | | x |
| **LOCK PROT** | FUNZIONE ANTISTALLO | ON | ON / OFF | x | x | x | x | x | x | x | x | x | x | x | x |
| **LIMIT C1** | LIMIT TEMP. COLLECTOR 1 | +140°C | +110 / +200 | x | x | x | x | x | x | x | x | x | x | x | x |
| **LIMIT C2** | LIMIT TEMP. COLLECTOR 2 | +140°C | +110 / +200 | | | | | | | x | | x | | | |
| **COOL C1** | OPTIONAL COOLING SYST. COLL. 1 | OFF | ON / OFF | x | x | x | x | x | x | x | x | x | x | x | x |
| **T MAX C1** | MAXIMUM TEMPERATURE COLL. 1 | +120°C | +100 / +190 | x | x | x | x | x | x | x | x | x | x | x | x |
| **COOL C2** | OPTIONAL COOLING SYST. COLL. 2 | OFF | ON / OFF | | | | | | | x | | x | | | |
| **T MAX C2** | MAXIMUM TEMPERATURE COLL. 2 | +120°C | +100 / +190 | | | | | | | x | | x | | | |
| **L MIN C1** | MINIMUM LIMITATION COLL. 1 | OFF | ON / OFF | x | x | x | x | x | x | x | x | x | x | x | x |
| **T MIN C1** | MIN COLL. TEMPERATURE 1 | +10°C | +10 / +90 | x | x | x | x | x | x | x | x | x | x | x | x |
| **L MIN C2** | MINIMUM LIMITATION COLL. 2 | OFF | ON / OFF | | | | | | | x | | x | | | |
| **T MIN C2** | MIN COLL. TEMPERATURE 2 | +10°C | +10 / +90 | | | | | | | x | | x | | | |
| **NFR C1** | ANTIFREEZER PROTECT COLL. 1 | OFF | ON / OFF | x | x | x | x | x | x | x | x | x | x | x | x |
| **T NFR C1** | ANTIFREEZER TEMP. COLL.. 1 | +4°C | -10 / +10 | x | x | x | x | x | x | x | x | x | x | x | x |
| **NFR C2** | ANTIFREEZER PROTECT COLL. 2 | OFF | ON / OFF | | | | | | | x | | x | | | |
| **T NFR C2** | ANTIFREEZER TEMP. COLL. 2 | +4°C | -10 / +10 | | | | | | | x | | x | | | |
| **PRIORITY** | PRIORITY | 1 | 1 / 7 | | | | | x | x | | | | x | x | x |
| **TIME STOP** | STOP COMMUTER TIME | 2 min. | 1 / 30 | | | | | x | x | | | | x | x | x |
| **TIME RUN** | CHARGE COMMUTER TIME | 15 min. | 1 / 30 | | | | | x | x | | | | x | x | x |
| **RE COOL** | TANK COOLING | ON | ON / OFF | x | x | x | x | x | x | x | x | x | x | x | x |
| **HP TUBE C** | TUBULAR COLLECTOR (HEATPIPE) | OFF | ON / OFF | x | x | x | x | x | x | x | x | x | x | x | x |
| **T TH ON** | THERMOSTAT ACTIV. TEMP. | +40°C | 0 / +95 | | | x | | | | | x | x | | | x |
| **T TH OFF** | THERMOSTAT DEACTIV. TEMP. | +45°C | 0 / +95 | | | x | | | | | x | x | | | x |
| **SPH** | SPECIFIC HEAT | 1 J/g°C | 0 / 9.9 | x | x | x | x | x | x | x | x | x | x | x | x |
| **SPW** | SPECIFIC WEIGHT | 1 kg/l | 0 / 2.55 | x | x | x | x | x | x | x | x | x | x | x | x |
| **L PULSE** | LITERS PER PULSE | 0.5 l | 0 / 10 | x | x | x | x | x | x | x | x | x | x | x | x |
| **MIN S P1** | REGULATION PUMP MIN SPEED 1 | 30% | +30 / +100 | x | x | x | x | x | x | x | x | x | x | x | x |
| **MIN S P2** | REGULATION PUMP MIN SPEED 2 | 30% | +30 / +100 | | x | x | | | x | x | | x | x | | |
| **OPM P1** | OPERATING METHOD PUMP 1 | AUTO | OFF/AUTO/ON | x | x | x | x | x | x | x | x | x | x | x | x |
| **OPM P2** | OPERATING METHOD PUMP 2 | AUTO | OFF/AUTO/ON | | x | x | x | x | x | x | x | x | x | x | x |
| **OPM P3** | OPERATING METHOD PUMP 3 | AUTO | OFF/AUTO/ON | | | | | | | | x | x | x | x | x |
| **TYPE S1** | PROBE TYPE 1 | see plant | N.C./NTC/PT1000 | x | x | x | x | x | x | x | x | x | x | x | x |
| **TYPE S2** | PROBE TYPE 2 | see plant | N.C./NTC/PT1000 | x | x | x | x | x | x | x | x | x | x | x | x |
| **TYPE S3** | PROBE TYPE 3 | see plant | N.C./NTC/PT1000 | x | x | x | x | x | x | x | x | x | x | x | x |
| **TYPE S4** | PROBE TYPE 4 | see plant | N.C./NTC/PT1000 | x | x | x | x | x | x | x | x | x | x | x | x |
| **TYPE S5** | PROBE TYPE 5 | see plant | N.C./NTC/PT1000 | | x | | | x | x | x | x | x | x | x | x |
| **TYPE S6** | PROBE TYPE 6 | see plant | N.C./NTC/PT1000 | | | | | x | x | | | x | | | x |

- In case the user set a parameter to a value that is not compatible with the plant configuration, an asterisk (*) will be visualized next to the same parameter value.

**FIXING AND DIMENSIONS**

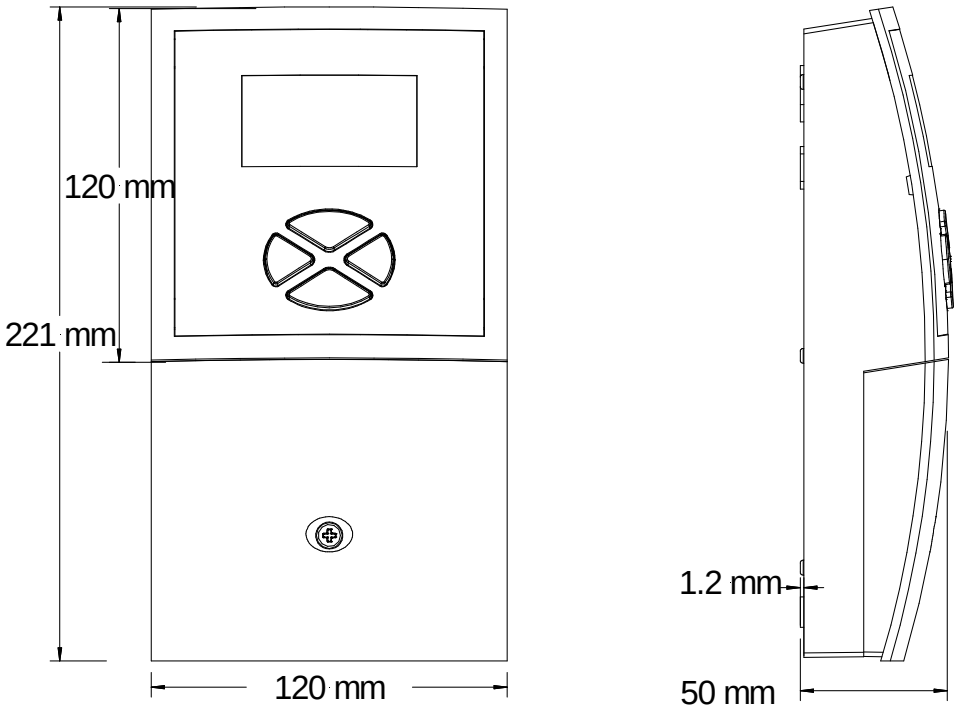



**Figure 7:** dimensions

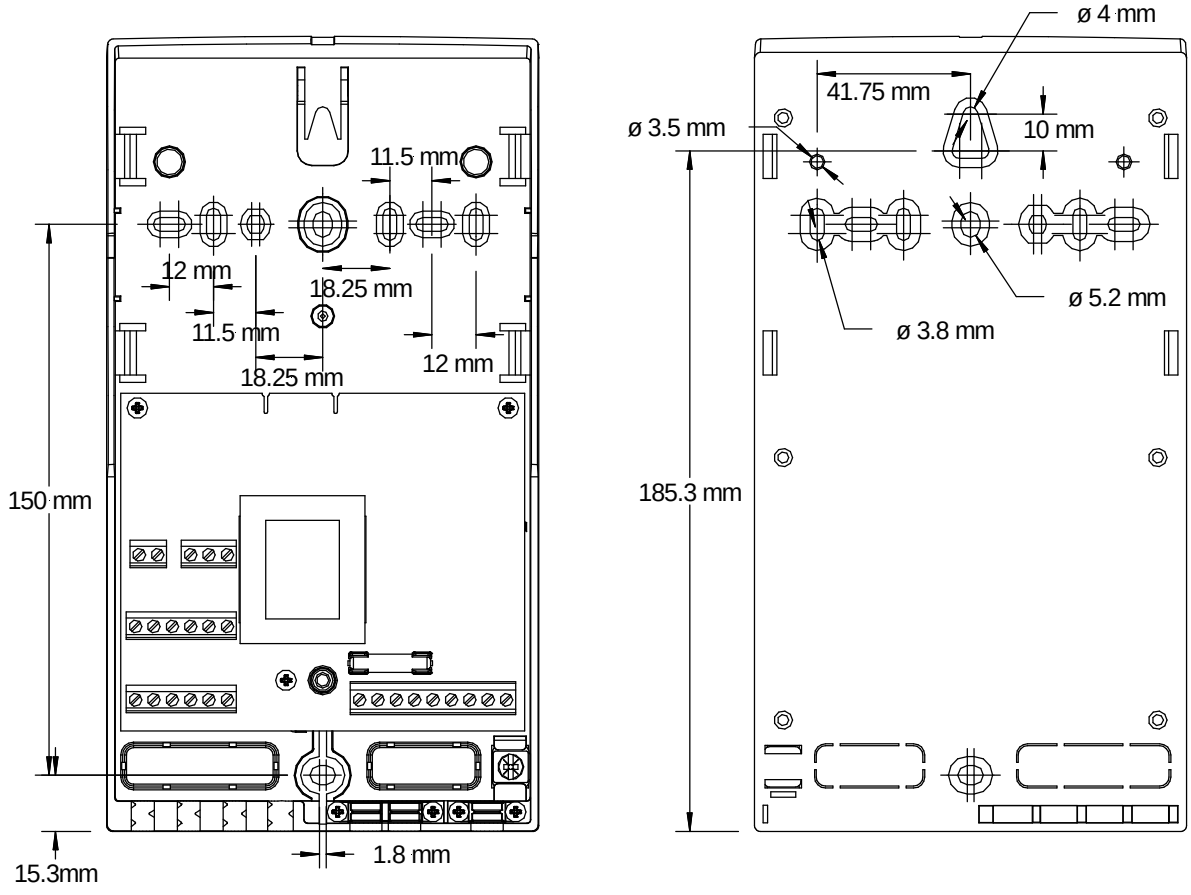
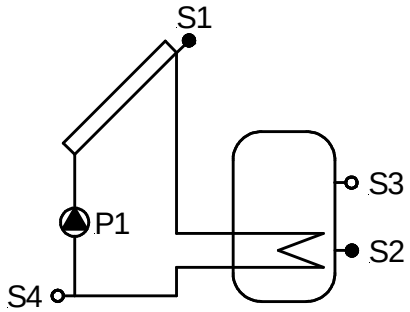



**Figure 8:** base fixing

**APPENDIX:** SELECTABLE PLANT DIAGRAM (PARAMETER SYSTEM)

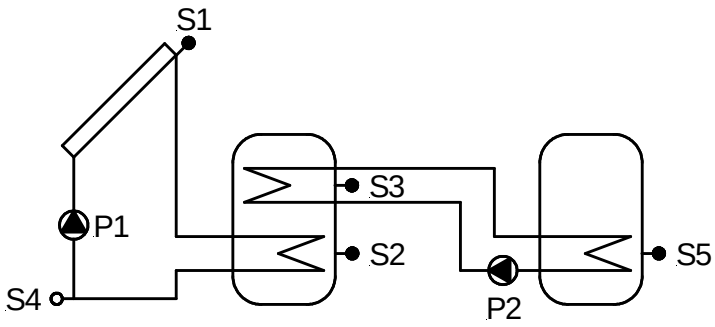
**FIG. A.1 - SYSTEM 1 - SCHEME 1**
standard




1 tank
1 pump
2 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | inferior probe of tank |
| S3 | (optional) superior probe of tank |
| S4 | (optional) return probe |
| P1 | solar pump (output U1) |

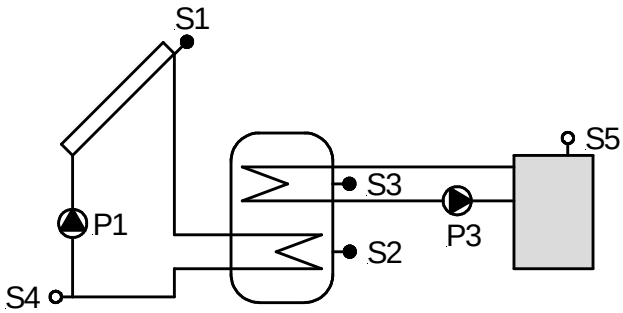
**FIG. A.2 - SYSTEM 2 - SCHEME 2**
Heat exchange between two tanks




2 tanks
2 pumps
4 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | inferior probe of tank 1 |
| S3 | superior probe of tank 1 |
| S4 | (optional) return probe |
| S5 | inferior probe of tank 2 |
| P1 | solar probe (output U1) |
| P2 | Heat exchange pump (output U2) |

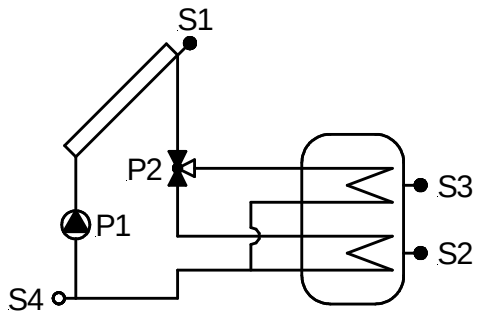
**FIG. A.3 - SYSTEM 3 - SCHEME 3**
With supplementary heating (possibly solid fuel)




1 tank
2 pumps
3 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | inferior probe of tank |
| S3 | superior probe of tank |
| S4 | (optional) return probe |
| S5 | (optional) heating probe |
| P1 | solar pump (output U1) |
| P3 | supplementary heating pump (output U3) |

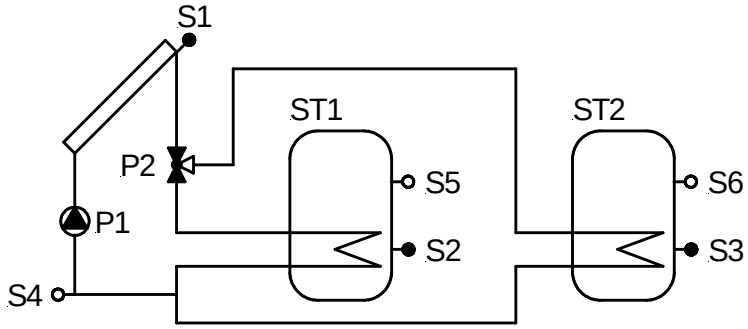
**FIG. A.4 - SYSTEM 4 - SCHEME 4**
Layers charging tank




1 tank
1 pump
1 diverter valve
3 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | inferior probe of tank |
| S3 | superior probe of tank |
| S4 | (optional) return probe |
| P1 | solar pump (output U1) |
| P2 | diverter valve (output U2) |

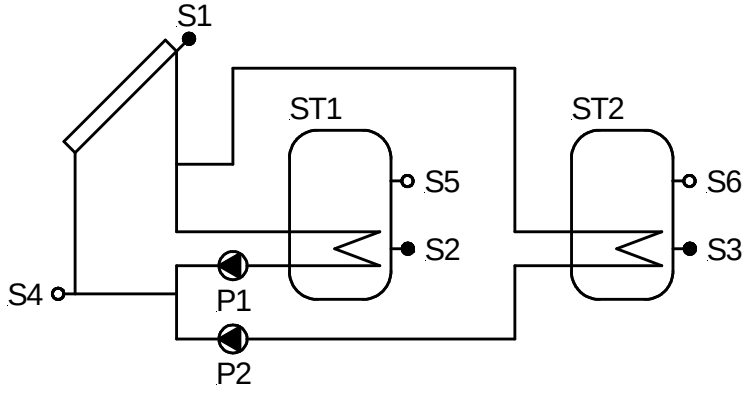
**FIG. A.5 - SYSTEM 5 - SCHEME 5**
Double tank and diverter valve




2 tanks
1 pump
1 diverter valve
3 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | inferior probe of tank 1 |
| S3 | inferior probe of tank 2 |
| S4 | (optional.) return probe |
| S5 | (opz.) sonda sup. serb. 1 |
| S6 | (opz.) sonda sup. serb. 2 |
| P1 | solar pump (output U1) |
| P2 | diverter valve (output U2) |

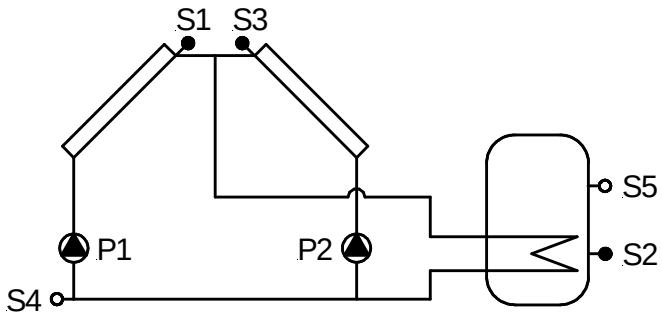
**FIG. A.6 - SYSTEM 6 - SCHEME 6**
Double tank and double pump




2 tanks
2 pumps
3 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | inferior probe of tank 1 |
| S3 | inferior probe of tank 2 |
| S4 | (optional) return probe |
| S5 | (optional) superior probe of tank 1 |
| S6 | (optional) superior probe of tank 2 |
| P1 | solar pump 1 (output U1) |
| P2 | solar pump 2 (output U2) |

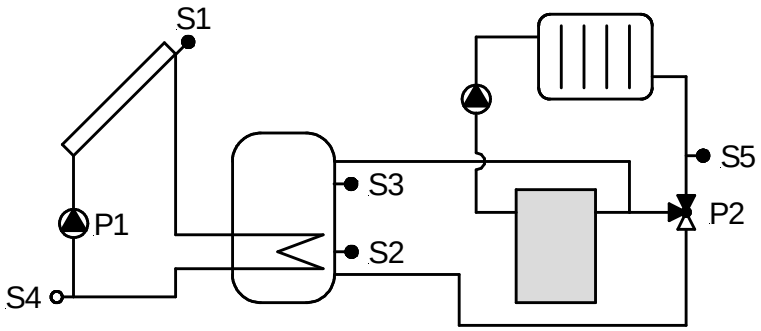
**FIG. A.7 - SYSTEM 7 - SCHEME 7**
System east/west




1 tank
2 pumps
3 probes

| | |
|---|---|
| S1 | collector probe 1 |
| S2 | inferior probe of tank |
| S3 | collector probe 2 |
| S4 | (optional) return probe |
| S5 | (optional) superior probe of tank |
| P1 | solar pump 1 (output U1) |
| P2 | solar pump 2 (output U2) |

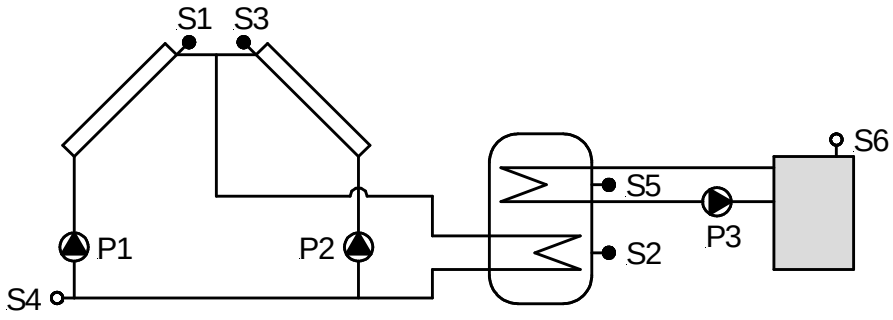
**FIG. A.8 - SYSTEM 8 - SCHEME 8**
Raising of the return temperature of the heating circuit




1 tank
1 pump
1 diverter valve
4 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | inferior probe of tank |
| S3 | superior probe of tank |
| S4 | (optional) return probe solare |
| S5 | heating return probe |
| P1 | solar pump (output U1) |
| P2 | diverter valve (output U2) |

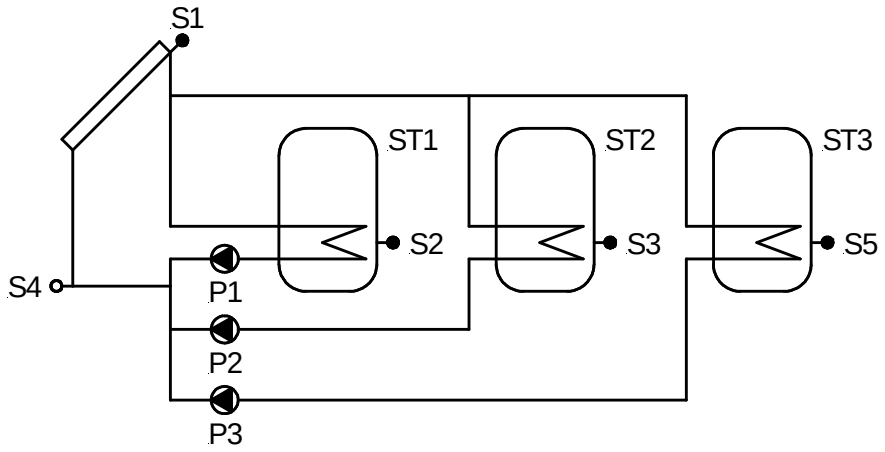
**FIG. A.9 - SYSTEM 9 - SCHEME 9**
System east / west with supplementary heating
(Probably solid fuel)




1 tank
3 pumps
4 probes

| | |
|---|---|
| S1 | collector probe 1 |
| S2 | inferior probe of tank |
| S3 | collector probe 2 |
| S4 | (optional) return probe |
| S5 | superior probe of tank |
| S6 | (optional) heating probe |
| P1 | solar pump 1 (output U1) |
| P2 | solar pump 2 (output U2) |
| P3 | supplementary heating pump (output U3) |

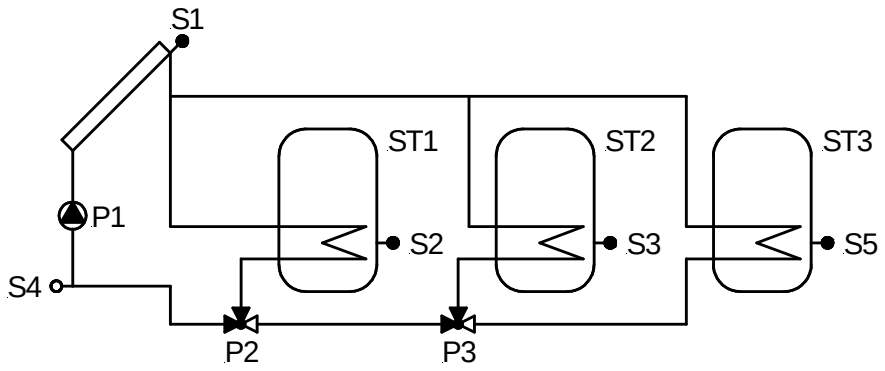
**FIG. A.10 - SYSTEM 10 - SCHEME 10**
Triple tank and triple pumps




3 tanks
3 pumps
4 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | probe tank 1 |
| S3 | probe tank 2 |
| S4 | (optional) return probe |
| S5 | probe tank 3 |
| P1 | solar pump 1 (output U1) |
| P2 | solar pump 2 (output U2) |
| P3 | solar pump 3 (output U3) |

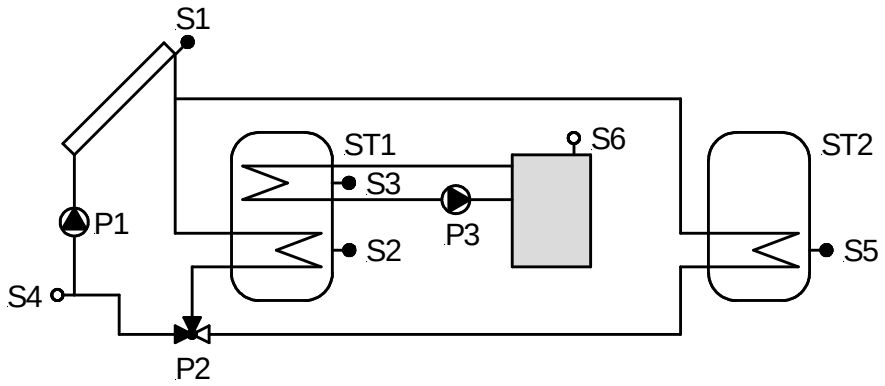
**FIG. A.11 - SYSTEM 11 - SCHEME 11**
triple tank with one pump and diverter valves




3 tanks
1 pump
2 diverter valves
4 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | probe tank 1 |
| S3 | probe tank 2 |
| S4 | (optional) return probe |
| S5 | probe tank 3 |
| P1 | solar pump (output U1) |
| P2 | diverter valve 1 (output U2) |
| P3 | diverter valve 2 (output U3) |

**FIG. A.12 - SYSTEM 12 - SCHEME 12**
Double tank with supplementary heating on the main tank (Probably solid fuel)




2 tanks
2 pumps
1 diverter valve
5 probes

| | |
|---|---|
| S1 | collector probe |
| S2 | inferior probe of tank 1 |
| S3 | superior probe of tank 1 |
| S4 | (optional) return probe |
| S5 | inferior probe of tank 2 |
| S6 | (optional) heating probe |
| P1 | solar pump (output U1) |
| P2 | diverter valve (output U2) |
| P3 | supplementary heating pump (output U3) |

**ATTENTION -> Brahma S.p.A. accepts no responsibility for any damage resulting from customer's tampering with the product.**

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