INTIEL

THE ELECTRONICS ON YOUR SIDE

Controller for thermosiphone solar systems INT0118

User's Manual

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I. Application
The Controller is designed to manage the recirculation with anti-freezing liquid and the operation of the electrical heating elements of the water tank in solar systems with thermosiphone circulation

II. Operation
The Controller measures the temperature in the water tank by means of sensor B, installed inside the water tank and the temperature in the pipeline by means of sensor T, installed on the inlet pipe of the water-conduit.

The switching of the electrical heating elements is managed by time in two adjustable time periods during the day and in the same time according the water tank temperature. The time periods can be adjusted for the different days in the week. In case sensor T measures a temperature lower than the assigned one within 2-90^{0}C, then a recirculation pump or a heating element placed on the pipe line is being switched on in order to prevent the water freezing inside.

III. Front panel
On the front panel are located the control and program elements. These are two row matrix LCD display, three buttons "Increment" (+), "Decrement" (-), "Program" and a light indication concerning the switching on state of the electrical heating elements of the tank. A picture of the front panel is shown at figure 1 bellow.
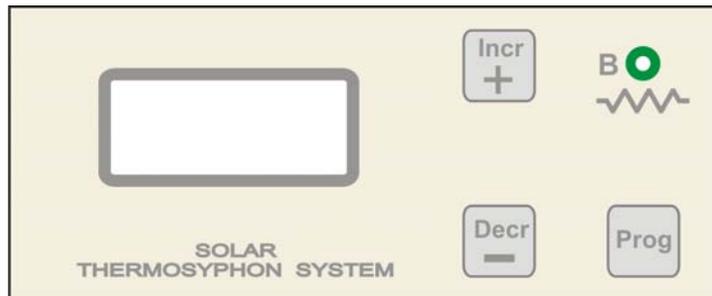

Figure.1

V. Programming
The Controller shows the indication "Start System" within a time of 8 sec. after it is being connected to the main power supply. Afterwards at the display are being shown day of the week, time (hour, minute), water tank temperature. This is a usual operation mode.
<u>1. Review of the settings</u>
From the normal Controller mode, by means of repeated pressing of buttons (+) or (-) are being shown 16 menus, as follows:
- **REL2 -** state (ON-OFF) of relay 2 for a control of recirculation pump (or an electrical heating element) against pipeline freezing. It shows temperature **t2** of sensor **T**. The menu is only for information.
- **WtB** – shows the assigned temperature in the water tank.
- **dtB** – shows the hysteresis between the temperature for switching off **WtB** and switching on **(WtB-dtB)** of the electrical heating elements of the water tank.
- **tF** – shows the temperature level at which an anti-freezing protection is being activated.
- **Wt2** – shows the assigned temperature level against anti-freezing of the pipeline.

- **dt2 -** shows the hysteresis between the temperature for switching off **Wt2** and switching on **(Wt2-dt2-1)** the recirculation (heating elements) in the pipeline.
- **Set time** – adjusting a time (an hour, minutes and day of the week)
- **Day[1 Mo/ 2 Tu/ 3 We/ 4 Th/ 5 Fr/ 6 Sa/ 7 Su] Setting,** adjusting the time periods for electrical heating operation of the water tank during every day of the week.
- **Calibr. Proced.tB,** a procedure concerning temperature sensor **B** (of the water tank) calibration.
- **Calibr. Proced.t2,** a procedure concerning temperature sensor **T** (of the pipeline) calibration.

Press button "**Prog"** in order to enter or exit each menu. The exit could be done automatically if within 5 seconds after inserting the last value no one button is being pressed. After exiting the current menu with or without **"Prog"** button, the Controller is waiting for 5 seconds for choosing another menu by means of (+) or (-), just before automatically goes into normal mode.

2. Programming of the assigned water tank temperature

From the normal Controller state by means of double pressing of button (+) it can be selected menu **WtB**. In order to enter the menu "Prog" button is to be pressed and its value starts blinking. By means of button (+) or (-) the value can be increased or decreased. If the button is being pressed and kept the value is being changed quickly and automatically in the relevant direction. The assigned temperature of the water tank can be adjusted within 30-80 C. At the same time both buttons (+) and (-) are to be pressed and kept until a sound signal is being heard and the value start blinking. Both buttons are to be released and only by means of (+) or (-) the value is to be increased or decreased. If the button is being pressed and kept the value is being changed quickly. The assigned temperature of the water tank can be adjusted within 30-80 C. After the desired value is being selected the button is to be released and it is to be waited for until it blinks five sec. afterwards the value is being saved automatically, giving a sound signal. In five seconds more the Controller is getting back by itself to its normal mode in case no other button is being pressed.

3. Programming of the hysteresis between the temperatures of switching of water tank electrical heating elements

After triple pressing of the (+) button the Controller from its normal mode enters into **dtB** menu. "Prog" button is to be pressed and the value starts blinking. By means of (+) or (-) buttons the value is being increased or decreased. The value can be adjusted within 2-5 C. After the desired value is being selected the button is to be released and it is to be waited for until it blinks five sec. afterwards the value is being stored automatically, giving a sound signal. In five seconds more the Controller is getting back to its normal mode if no other buttons is being pressed.

4. Programming the antifreeze temperature

After four times pressing of (+) button the Controller enters into **tF** menu from its normal mode. **"Prog"** button is to be pressed and the value starts blinking. By means of (+) or (-) buttons the value is being increased or decreased. The value can be adjusted within 2-10 C or OFF. Adjusting OFF means this function is deactivated. After the desired value is being selected the button is to be released and it is to be waited for until it blinks five sec. afterwards the value is being stored automatically, giving a sound signal. In five seconds more the Controller is getting back to its normal mode if no other buttons is being pressed.

5. Programming of the assigned temperature level of the pipeline.

After five times pressing (+) button the Controller from its normal mode enters into **Wt2** menu. **"Prog"** button is to be pressed and the value starts blinking. By means of (+) or (-) buttons the value is being increased or decreased. The value can be adjusted within 2-90 C. After the desired value is being selected the button is to be released and it is to be waited for until it blinks five sec. afterwards the value is being stored automatically, giving a sound

signal. In five seconds more the Controller is getting back to its normal mode if no other buttons is being pressed.

6. Programming of the hysteresis between the temperatures of switching of pipeline electrical heating elements

After six pressing of the (+) button the Controller from its normal mode enters into **dt2** menu. **"Prog"** button is to be pressed and the value starts blinking. By means of (+) or (-) buttons the value is being increased or decreased. The value can be adjusted within 2-10 C. After the desired value is being selected the button is to be released and it is to be waited for until it blinks five sec. afterwards the value is being stored automatically, giving a sound signal. In five seconds more the Controller is getting back to its normal mode if no other buttons is being pressed.

7. Fixing time (hour and day of the week).

After six pressing of the (+) button the Controller from its normal mode enters into **Set time** menu. "Prog" button is to be pressed and the value for the day of the week starts blinking. By means of (+) or (-) buttons the value is being increased or decreased. It can be adjusted every day of the week. After the desired value is being selected the button is to be released and it is to be waited for until it blinks five sec. afterwards the value is being saved and the hour position starts blinking. If the button is being pressed and kept continuously the value is being changed quickly and automatically. After the desired value is being selected the button is to be released and it is to be waited for until it blinks five sec. afterwards the value is being saved the minute position starts blinking. After the minute value is being selected by means of (+) or (-) button it is to be waited for until it blinks for 5 seconds or **"Prog"** button is to be pressed in case to exit the menu. In five seconds more the Controller is getting back to its normal mode if no other buttons is being pressed.

8. Programming the operation time of water tank heating elements

During the day it can be fixed 0, 1 or 2 operation time periods (intervals) for switching on the electrical heating elements.

After eight to fourteen pressing of the (+) button the Controller from its normal mode enters into **Day No: Settings** menu for adjusting the time periods concerning the relevant day of the week. By means of **"Prog"** button it is to be entered in a submenu for choosing I interval, II interval or Exit Menu. The interval number can be changed by means of (+) or (-) buttons. One bellow other is being shown the periods for switching on and switching off concerning the relevant interval. By means of **"Prog"** button it can be entered in a submenu for an hour programming. It starts to blink the value which is to be changed. After fixing the desired value by means (+) or (-) buttons it is to be waited for until it blinks for 5 seconds or it is to be confirmed by means of **"Prog"** button, and afterwards the next value starts blinking. Consecutively are being changed the four values. Afterwards it is to be waited for an automatic exit of the menu concerning the chosen interval or by means of pressing **"Prog"** button. By means of (+) or (-) button it is to be selected a menu for programming the other interval which is to be programmed in the same way. At the end it is to be selected Exit Menu and to exit by means of pressing **"Prog"** button.

Time adjusting (hour and minutes) can be fixed within 00:00 and 23:59. Instead of 24:00 it is being indicated --:--. In case any value for interval beginning or end is --:-- it means the previous mentioned interval is going to be ignored.

9. Calibration of temperature senor B (of the water tank) and sensor T (of the pipeline).

The Controller goes into **Calibr.Proced**.**tB** menu after pressing (+) button 15 times or by pressing (-) button twice. In the same way after pressing (+) button 16 times or (-) button once a menu **Calibr.Proced.t2** is being selected. During that procedure the output of the controller is being automatically switched off. **"Prog"** button is to be pressed until indication **CONNECT Re 0 ºC** is being shown. It means to temperature sensor Pt1000 terminals to be

connected a resistor with a value of 1000Ω or the real sensor to be placed at 0 C. By means of (+) or (-) it is to be confirmed that this is fulfilled. Then the following message is being shown "**please wait…**", afterwards another message is being shown **CONNECT Re 100 ºC.** It means to temperature sensor Pt1000 terminals to be connected a resistor with a value of 1385Ω or the real sensor to be placed at 100 C. By means of (+) or (-) it is to be confirmed that this is fulfilled. Then the following message is being shown "**please wait…**" When the process completes a message **Calibr.COMPLETE** is being shown. The Controller automatically goes into normal mode if no one button is being pressed.

Now, if during one of the programmed time periods the water tank temperature goes down with the value of **dtB** bellow the assigned one **WtB** the electrical heating elements are being switched on and light indication **B** appears. After subsequent increasing of the temperature in the tank up to assigned one **WtB** the electrical heating elements are being switched off and the light indication **B** stops.

VI. Signalization of abnormal sates

If during Controller normal mode the temperature sensor is being cut off or its terminals be connected each other on the display is being shown Err C.
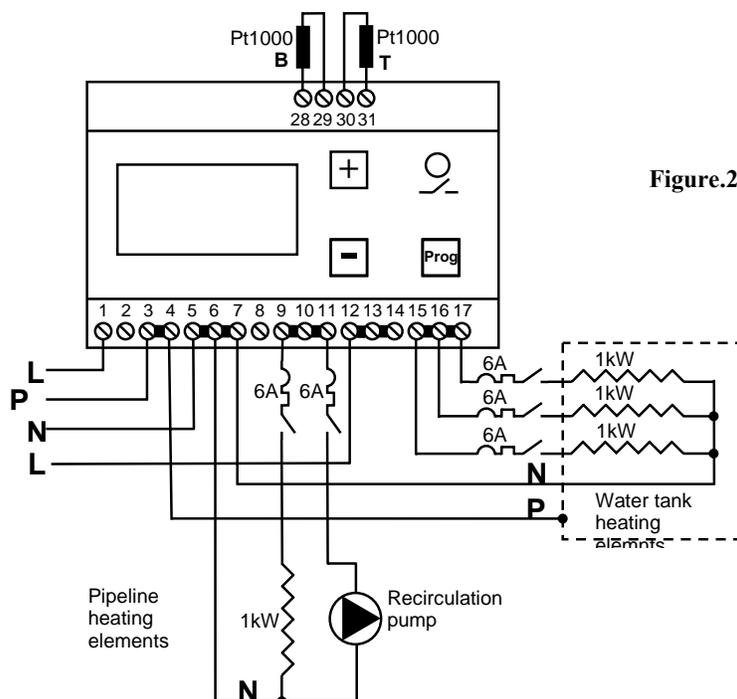
VII. Electrical connections (figure 2)

Figure.2

To terminals 28 and 29 is to be connected temperature sensor **B** (Pt1000) concerning water tank temperature measurement. To terminals 30 and 31 is to be connected temperature sensor **T** (Pt1000) concerning pipeline temperature measurement.

To terminals 1, 3 and 5 are to be connected the power supply ~220/230V, 50 Hz to the controller as to terminal 1 the phase (L), to terminal 3 – protection earth (PE), to terminal 5 – neutral (N).

Between terminal 6 and 9, 10, 11 trough outer fuse are to be connected heating elements concerning the pipeline or recirculation pump. The maximum current through the contacts is 16A. Between terminals 7 and 15, 16, 17 by means of outer fuse are to be connected the water

tank heating elements. The maximum current through the contacts is 16A. The water tank body is to be connected to terminal 4 protection earth (PE).

To terminals 12, 13, 14 is to be connected a phase concerning pipeline heating elements and the recirculation pump.

IV. Technical data

Supply woltage	230V AC 50-60Hz
Maximal rated current	16A/ AC 250V / 50-60Hz
Number of outputs	two, switching relays
Sensor	Pt 1000 (-50 up to +250C)
Rated current through the sensor	0.8mA
Measurement range	$(-30\ ^0C) - (+125\ ^0C)$
Indication	Matrix display
Measurement unit	$1\ ^0C$
Humidity	0 – 80%
Protection	IP 20

VIII. Warranty

The warranty period is 24 months following the purchase date of the unit or its installation by an authorized Engineering Company, but not exceeding 28 months after the production date. The warranty is extended to the malfunctions that occur during the warranty period and are result of the production reasons or defective used parts.

The warranty does not relate to malfunctions corresponding to not-qualified installation, activities directed to the product body interference, not regular storage or transport.

The repairs during the warranty period can be done after correct filling of the manufacturer warranty card

Warranty Card

Manufacturer: *INTIEL*	
Product type	Controller for thermosiphone systems INT0118
Production number	
Production date	
Dealer confirmation	
Purchase date	
Invoice number	
Dealer's name, address and stamp	
Seller's name and signature	