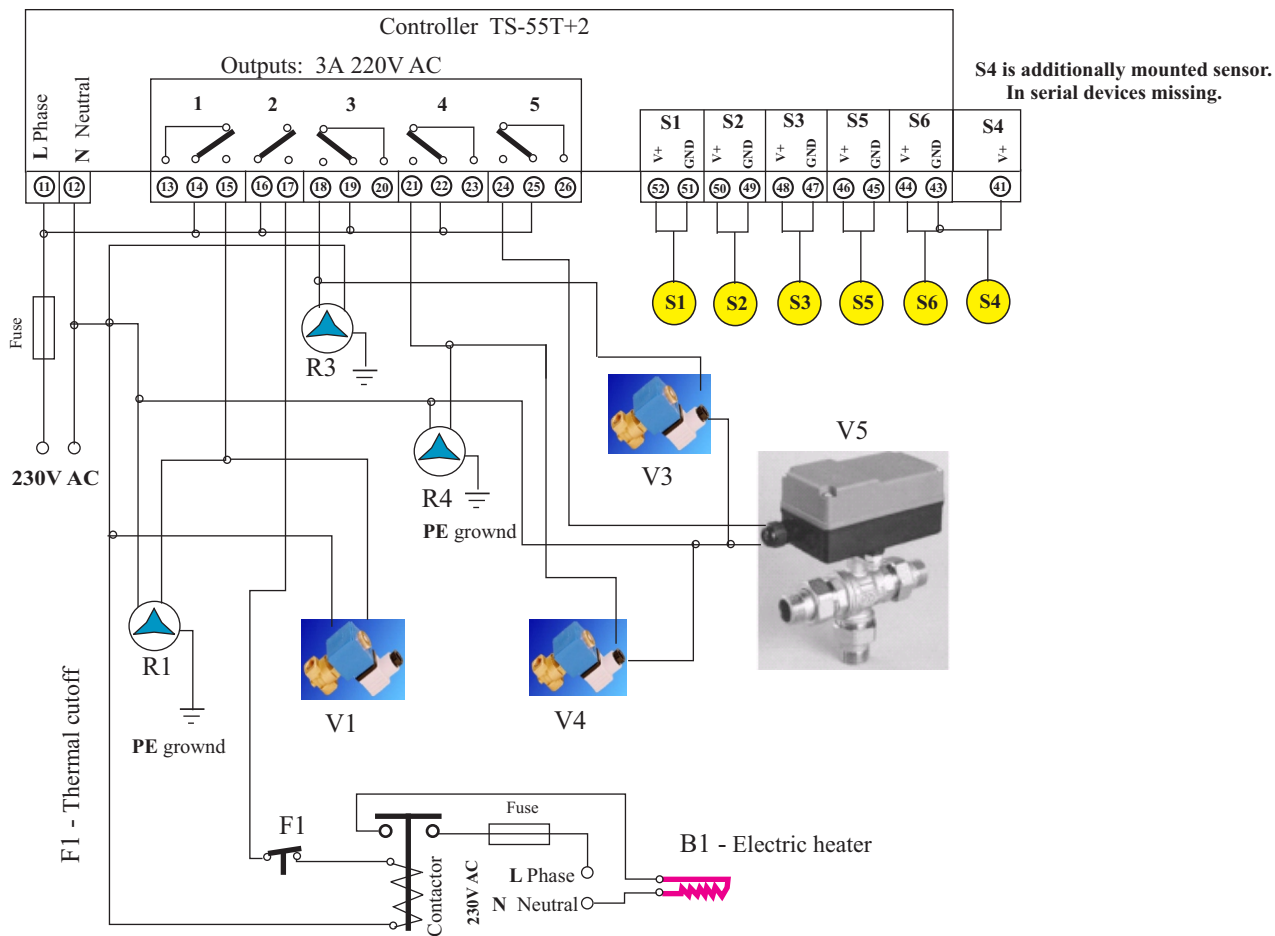
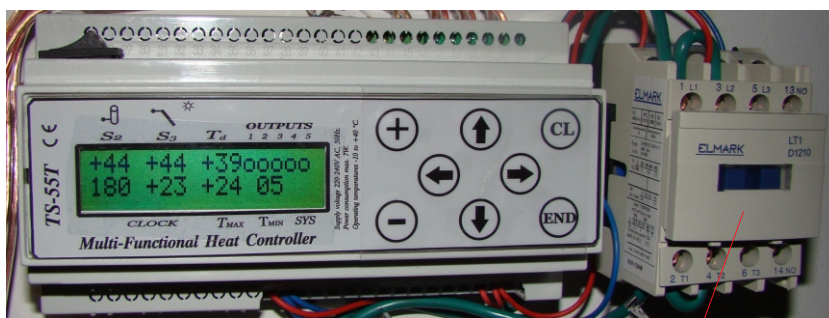


Use weekly temperature timer to control temperature in the water heater.
Additional heating from two alternative heat sources - solar collector
local / central water heating, boiler or fireplace.
Maintain the set temperature in the pipe for recirculation.
Bypass by long pipes to the collector.
Protection against normally circulation of hot water.

Electric scheme

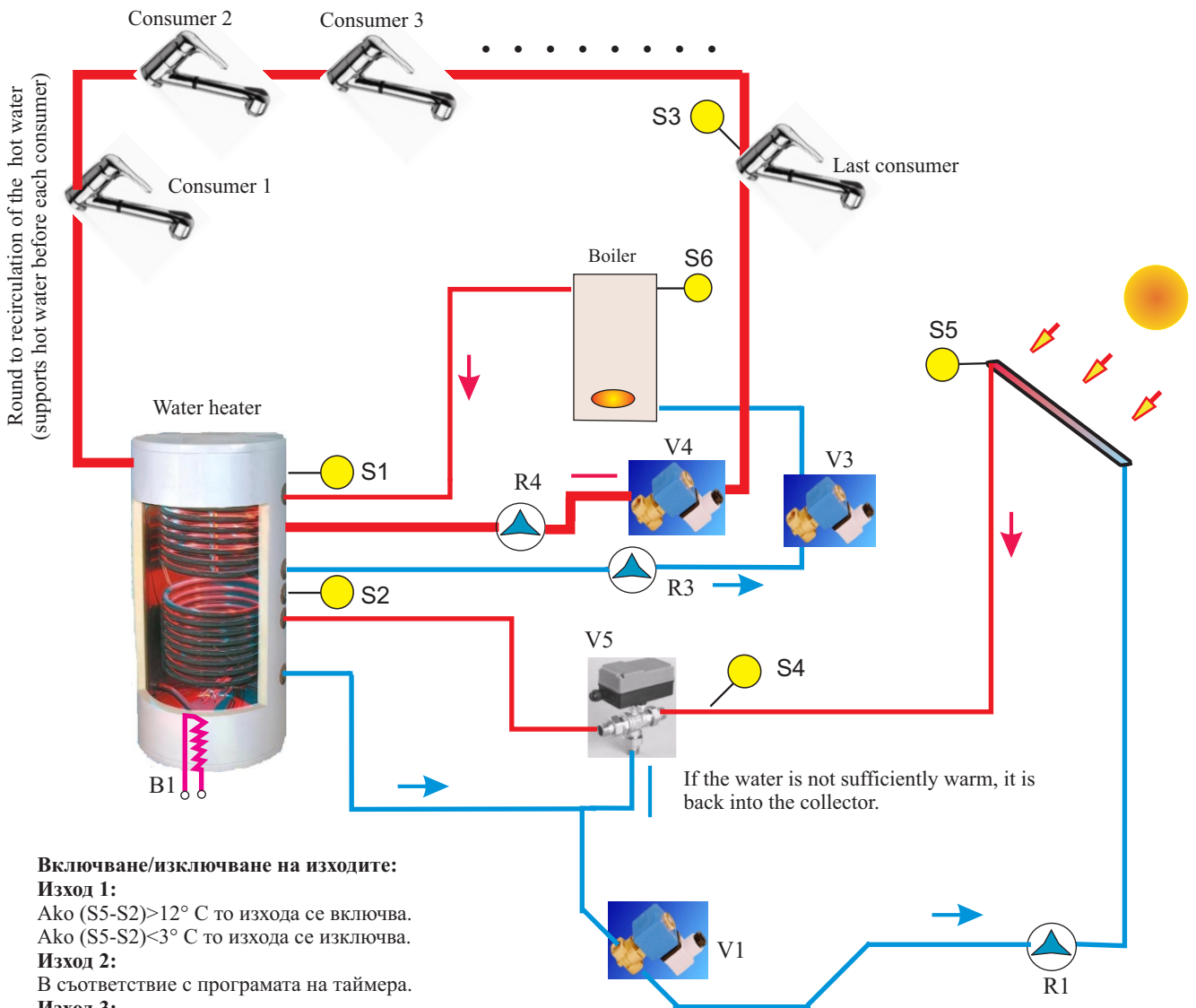


Controller TS-55T+2



Controller

Функционална схема



Включване/изключване на изходите:

Изход 1:

Ако $(S5-S2) > 12^{\circ}\text{C}$ то изхода се включва.

Ако $(S5-S2) < 3^{\circ}\text{C}$ то изхода се изключва.

Изход 2:

В съответствие с програмата на таймера.

Изход 3:

Ако $(S6-S1) > 8^{\circ}\text{C}$ то изхода се включва.

Ако $(S6-S1) < 4^{\circ}\text{C}$ то изхода се изключва.

Изход 4:

Ако $S3 < 40^{\circ}\text{C}$ и $(S1-S3) > 10^{\circ}\text{C}$ то изхода се включва.

Ако $S3 > 42^{\circ}\text{C}$ или $(S1-S3) < 3^{\circ}\text{C}$ то изхода се изключва.

Изход 5:

Ако $(S4-S2) > 6^{\circ}\text{C}$ то изхода се включва.

Ако $(S4-S2) < 3^{\circ}\text{C}$ то изхода се изключва.

V1, V3, V4 - Solenoid valves (can be replaced with non-return valve - the liquid permeable only in one direction).

V5 - Three-way solenoid (performed bypass).

S1, S2, S3, S5, S6 - Sensors

B1 - Electric heater

R1, R3, R4 - Water pump

Advantages of management with recirculation circle of hot water, than constantly working of the water pump R4:

1. Lower cost of electricity from the pump. The pump will be included only if necessary under the terms of the output 4. The placement of the valve V4, targets consumers to receive hot water only in the direction of the pump R4. this creates an end consumer and by maintaining the temperature of hot water in front of him and former consumers will have a warm water ahead. It would be better if the final consumer is the most frequently used hot water. Any use of hot water it will provide hot water to all consumers. This reduces the necessity of starting the pump.
2. Reduce the heat loss is the constant rotation along the entire length of the pipe recirculation hottest water from the boiler. In the section of the pipe after the final consumer to the suction port of the pump will be inserted only water lower than 40°C when TURN ON the pump R4.

We will use:

- The conditional differential output of channel 1.
- Logical function "OR" for channel 1.
- The conditional output of channel 2 for control with weekly temperature timers 1, 2 and 3.
- Logical function "OR" for channel 2.
- Conditions differential output channel 3.
- Logical "OR" function for channel 3.
- Thermostat including at lower levels of channel 4.
- The conditional differential output channel 4.
- Logical function "AND" for channel 4.
- The conditional differential output channel 5.
- Logical "OR" function for channel 5.

Programming:

1. Set the time and date.
2. Set the timer program if necessary.
3. Write the below two table in the controller.
4. Perform calibration of the sensors.
5. Select "Automatic mode".

The below 2 rows of functional table must be set as follows:

(You only need to enroll only numbers with circle - the other is established by RESET.)

	1	2	3	4	5	6	7	8
Td1-8: Td1,Td2,Td3 Td4,Td5,Td6,Td7,Td8	60	40	75	05	05	05	05	05
U1-8: u1 u2 u3 u4 u5 u6 u7 u8	0	0	0	0	0	0	0	0

u1-u8 are the numbers of outputs, used into timers 1 to 8. If the output is different from '0' then the corresponding row is used by the clock time, for set indication output. Ux must be from 0 to 5.

This table should be write into the controller as using functional table (see TS-plus2).

You only need to enroll only numbers with circles (the other is established by RESET).

Table setup of the differential regulators, logical functions and thermostats						
Row from the table for programming	Output number:					Note
	1	2	3	4	5	
Top Level - °C Top level thermostats XX=2 до 90°C	90	90	90	90	90	Temperature to TURN ON the conditional output of the thermostat
Top Level-Sensor S Sensor for thermostat top level S=0-6	0	0	0	0	0	
Low Level - °C Low level thermostats XX=2 до 90°C	05	05	05	40	05	Temperature to TURN ON the conditional output of the thermostat
Low Level-Sensor Sensor for thermostat top level S=0-6	0	2	0	3	0	
Differential regulator ON TEMPERATURE 2 - 90°C	12	05	08	10	06	Temperature difference ST-SP to TURN ON the conditional output of the regulator
Differential regulator OFF TEMPERATURE 2 - 90°C	03	02	04	03	03	Temperature difference ST-SP to TURN OFF the conditional output of the regulator
Differential regulator sensor ST 0 - 6	5	0	6	1	4	Sensor heat source *
Differential regulator sensor SP 0 - 6	2	0	1	3	2	Sensory hot-receiver *
Used logical function AND, OR	0	0	0	A	0	A(AND) / O(OR)

* - Do not put ST = SP !

Log in the row from functional table "SET TIMER" and program the timers 1.2 and 3:

Timer 1	Td1 ON/OFF1 DAY 12345 Choice of day (s) of the week
	Td1 ON1 HR MN Hour and minutes for the establishment Td=Td1. 03 00
	Td1 OFF1 HR MN Hour and minutes for the establishment Td=05. 05 55
Timer 2	Td2 ON/OFF2 DAY 1234567 Choice of day (s) of the week
	Td2 ON2 HR MN Hour and minutes for the establishment Td=Td2. 11 00
	Td2 OFF2 HR MN Hour and minutes for the establishment Td=05. 19 00
Timer 3	Td3 ON/OFF3 DAY 6 Choice of day (s) of the week
	Td3 ON3 HR MN Hour and minutes for the establishment Td=Td3. 02 00
	Td3 OFF3 HR MN Hour and minutes for the establishment Td=05. 05 55
Timer 4	Td4 ON/OFF4 DAY 6 Choice of day (s) of the week
	Td4 ON4 HR MN Hour and minutes for the establishment Td=Td3. ?? ?? Not used.
	Td4 OFF4 HR MN Hour and minutes to TURN OFF of the output. ?? ?? Not used.
Timer 5	Td5 ON/OFF5 DAY 6 Choice of day (s) of the week
	Td5 ON5 HR MN Hour and minutes for the establishment Td=Td3. ?? ?? Not used..
	Td5 OFF5 HR MN Hour and minutes to TURN OFF of the output. ?? ?? Not used.
Timer 6	Td6 ON/OFF6 DAY 6 Choice of day (s) of the week
	Td6 ON6 HR MN Hour and minutes for the establishment Td=Td3. ?? ?? Not used.
	Td6 OFF6 HR MN Hour and minutes to TURN OFF of the output. ?? ?? Not used.
Timer 7	Td7 ON/OFF7 DAY 6 Choice of day (s) of the week
	Td7 ON7 HR MN Hour and minutes for the establishment Td=Td3. ?? ?? Not used.
	Td7 OFF7 HR MN Hour and minutes to TURN OFF of the output. ?? ?? Not used.
Timer 8	Td8 ON/OFF8 DAY 6 Choice of day (s) of the week
	Td8 ON8 HR MN Hour and minutes for the establishment Td=Td3. ?? ?? Not used.
	Td8 OFF8 HR MN Hour and minutes to TURN OFF of the output. ?? ?? Not used.

In the days Monday to Friday the Timer 1 will set in 3.00 hours Td = 60 ° C (desired temperature in the water heater).
If sensor 3 measuring the temperature less than 60 ° C in the range of 3.00 to 5.55 hours then output 2 will be set in 1.
If sensor 3 measuring the temperature greater than 60 ° C in the range from 3.00 to 5.55 hours then conditioned output 2 will be set to 0.
At 5.55 hours timer 1 will establish Td = 05 ° C (desired temperature in the water heater). Surely sensor 3 will show higher temperature and output 2 will be set to 0.

In the days Monday to Sunday the timer 2 will establish at 11.00 hours Td = 40 ° C (desired temperature in the water heater).
If sensor 3 measuring the temperature less than 40 ° C in the range of 11.00 to 19.00 hours then output 2 will be set in 1.
If sensor 3 measuring the temperature greater than 40 ° C in the range from 11.00 to 19.00 hours then conditioned output 2 will be set to 0.
At 19.00 hours timer 1 will establish Td = 05 ° C (desired temperature in the water heater). Surely sensor 3 will show higher temperature and output 2 will be set to 0.

In the days Saturday the timer 3 will set in 02.00 hours Td = 75 ° C (desired temperature in the water heater).
If sensor 3 measuring the temperature less than 75 ° C in the range of 02.00 to 05.55 hours then output 2 will be set in 1.
If sensor 3 measuring the temperature greater than 75 ° C in the range from 02.00 to 05.55 hours then conditioned output 2 will be set to 0.
At 05.55 hours timer 3 will establish Td = 05 ° C (desired temperature in the water heater). Surely sensor 3 will show higher temperature and output 2 will be set to 0.

To maintain water temperature in the pipe recirculation only desirable times of the day we can use free clock timer, to example four. Bottom line of functional table must be set as follows:

	1	2	3	4	5	6	7	8
U1-8: u1 u2 u3 u4 u5 u6 u7 u8	0	0	0	4	0	0	0	0

Log in terms of functional table "SET TIMER" and programming the timer 4, with the hours necessary to inclusion and exclusion:

Тимер 4	Td4 ON/OFF4	
	DAY 6	Choice of day (s) of the week
	Td4 ON4 HR MN	Hour and minutes for the establishment Td=Td3. 07 30
	Td4 OFF4 HR MN	Hour and minutes to TURN OFF of the output. 21 00