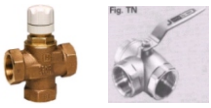
Heating, cooling and irrigation system for a house.
Control with two controllers TS-55T + 2 depending on the seasons.
option 1

R1, R2, R3, R4, R5, R6, R7 - Heat pump.
Sx - Sensors.
F1 - Thermal cutoff.
B1 - Electric heater.

Non-return valve.



V3 - Three-way manual valve.

V1 - Three-way solenoid valve

In order not to complicate the functional circuit are not shown:
- Safety valves
- Expansion tanks
- Filters
- Shut-off valves
- Cranes filling
- Cranes for emptying

Functional scheme

The coils in the pool and jacuzzi are set arbitrarily. In practice it is more efficient use of aluminum radiators.

Heating circuits:

G1. Collector - tank A9, V1, A1, R4.

G2. Collector - pool A9, V1, V3, A2, R4

Manual switching V3 for change the round.

Collector - Jacuzzi A9, V1, V3, A2, R4.

Upper heating circuits must be filled with low-freezing fluid (antifreeze). The fluid must have a freezing point suitable for the geographical area.

G3. A1 heating of tank with an electric heater. Lower circles are filled with water.

G4. Fireplace - tank A8, A1, R5, K7.

G5. Fireplace - convectors A8, K2, A5, R2, K6.

G6. Boiler - tank A7, A1, R3, K4.

G7. Boiler - convectors A7, K2, A5, R1, K3.

G8. Boiler - jacuzzi A7, R6, K5.

Cooling circuit:

G9. Draw-well - convectors A5, R7, K1.

Irrigation circle:

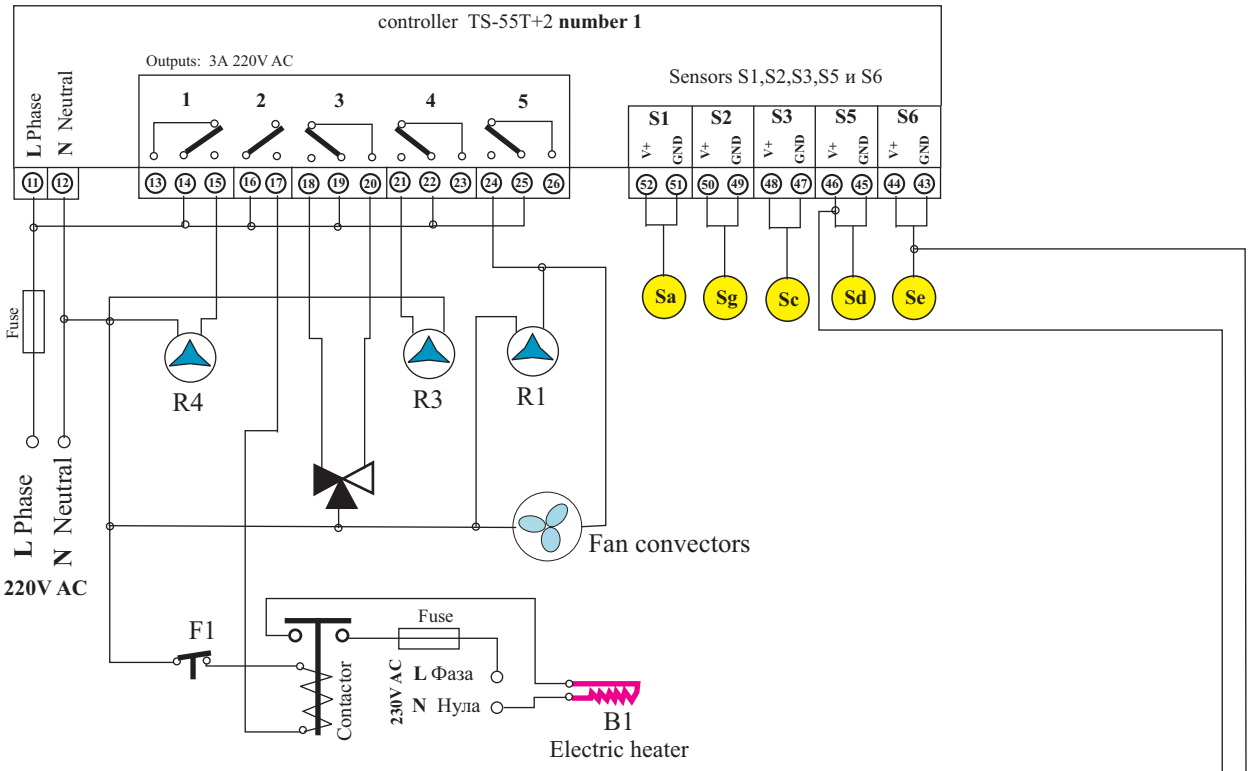
G10. Draw-well - garden pump A4, A11, A13 or Draw-well - hydrophore pump A4, A10, A12, A13.

Each of the circles G1 to G10 is managed independently and can be turned on or off by management.
This allows sequential construction and inclusion of the rounds in operation.
Disabling it by establishing the numbers of sensors from that round to zero. The inclusion of a circle becomes, by establishing the real numbers of the sensors. The time required for inclusion or exclusion is not more than 60 seconds.

Attachment of the circles to the controller's output is indicated in the following table:

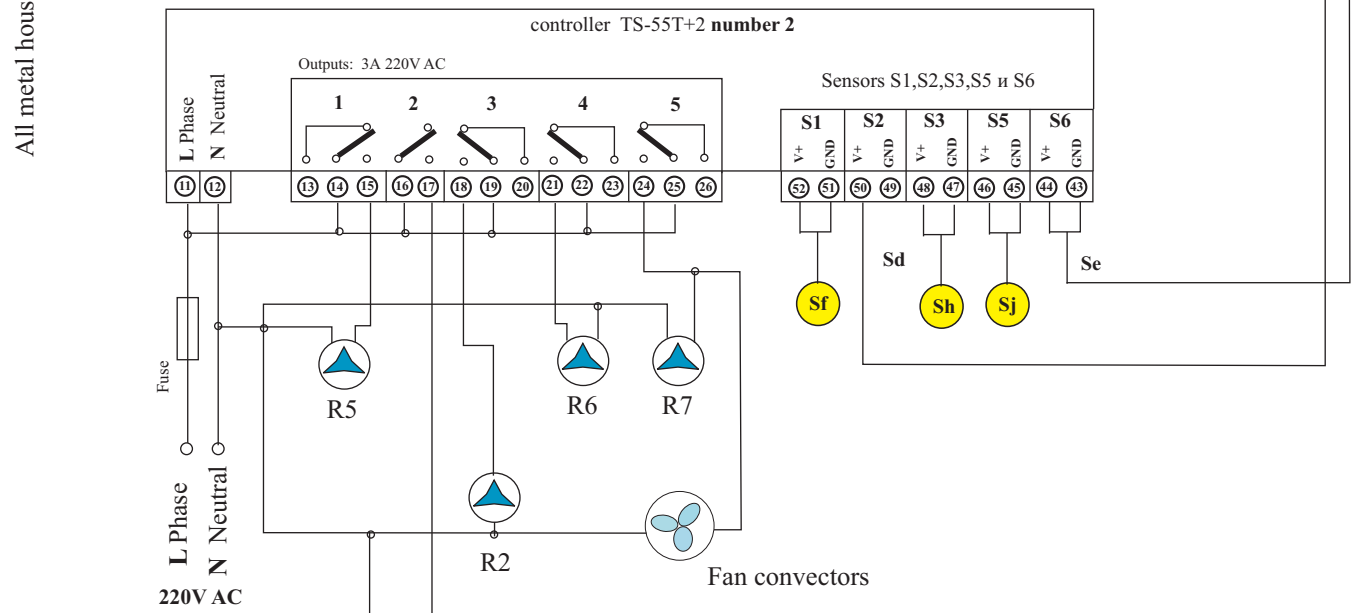
Controller TS-55T+2 number:	Output number:	Round number:
1	1	G1
1	2	G3
1	3	G2
1	4	G6
1	5	G7
2	1	G4
2	2	G10
2	3	G5
2	4	G8
2	5	G9

Electric scheme



Output 2 of the controller number 1 is used as a weekly temperature timer.

Electric scheme



Output 2 of the controller number 2 is used as a weekly temperature timer.

All metal housings to be connected to earth!

Connect only one A11 (A12).

A12 - Електромагнитен вентил

A11 - Градинска помпа

Tables for programming the controllers 1 and 2:

Table setup of the differential regulators, logical functions and thermostats.
controller number 1

Row from the table for programming	Output number controlled round					Note
	G1 1	G3 2	G2 3	G6 4	G7 5	
Top Level - °C Top level thermostats XX=2 до 90°C	90	90	60	65	50	Temperature to TURN ON the conditional output of the thermostat
Top Level-Sensor Sensor for thermostat top level S=0-6	0	0	Sc 3	Se 6	Se 6	
Low Level - °C Low level thermostats XX=2 до 90°C	05	05	05	05	05	Temperature to TURN ON the conditional output of the thermostat
Low Level-Sensor Sensor for thermostat top level S=0-6	0	Sc 3	0	0	0	
Differential regulator ON TEMPERATURE 2 - 90°C	14	05	05	08	05	Temperature difference ST-SP to TURN ON the conditional output of the regulator
Differential regulator OFF TEMPERATURE 2 - 90°C	4	02	02	03	02	Temperature difference ST-SP to TURN OFF the conditional output of the regulator
Differential regulator sensor ST 0 - 6	Sa 1	0	0	Se 6	0	Sensor heat source *
Differential regulator sensor SP 0 - 6	Sc 3	0	0	Sd 5	0	Sensory hot-receiver *
Used logical function AND, OR	O	O	O	A	O	A(AND) / O(OR)

In the summer should be set - 0
to prohibit the filing of heat
from the boiler to the convectors.

*** - Do not put ST = SP !**

Programming:
1. Set the time and date.
2. Set the timer program if necessary.
3. Program the top table in the controller.
4. Perform calibration of the sensors.
5. Select "Automatic mode".

TURN ON / TURN OFF outputs of TS-55T+2 (controller number 1):

Output 1:
If Sc-Sa>14°C then the output is TURN ON. The water heater is heated by the Solar collector.
If Sc-Sa)<4°C then the output is TURN OFF.

Output 2:
TURN ON and TURN OFF at depending on the programming of the weekly temperature timer (or manual setting of Td buttons '+' '-' in the automatic mode of the controller).
If Sc<Td°C then the output is TURN ON. The water heater is heated by electric heater.
Td е желаната температура в бойлера (задава се с таймера).
If S5<65°C или (ST_5-SP_2)<3°C then the output is TURN OFF.

Output 3:
If Sc>60°C then the output is TURN ON. Guide a warm to the water pool or the jacuzzi.
If Sc<60°C then the output is TURN OFF. Guide a warm to the water pool or the water heater.

Output 4:
If Se>65°C и (Se-Sd)>8°C then the output is TURN ON. The water heater warm from boiler.
If Se<65°C или (Se-Sd)<3°C then the output is TURN OFF.

Output 5:
If Se>50°C then the output is TURN ON. Sending hot water from the boiler to the convectors.
If Se<50°C then the output is TURN OFF.

In the table above for the circle G6 (boiler-water heater) is allowed to operate only if the boiler temperature is exceeded by **65**°C.
Round G7 (boiler-convectors) be permitted upon reaching the temperature in the boiler **50**°C.
It provides an advantage for convectors at withdrawal of heat from the boiler. The water heater will be heated only if remaining excess heat in the boiler. By changing the digits we can reduce, enhance or turn advantage. The advantage can be excluded temporarily or permanently into the row "Top Level-Sensor" for rounds G6 set number sensor '0'.

Table setup of the differential regulators, logical functions and thermostats.
controller number 2

Row from the table for programming	Output number controlled round					
	G4 1	G10 2	G5 3	G8 4	G9 5	Note
Top Level - °C Top level thermostats XX=2 до 90°C	65	90	50	68	30	Temperature to TURN ON the conditional output of the thermostat
Top Level-Sensor Sensor for thermostat top level S=0-6	Sf 1	0	Sf 1	Se 6	Sj 5	
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	Sd 2	0	Sh 3	0	
Differential regulator ON TEMPERATURE 2 - 90°C	08	05	05	05	05	Temperature difference ST-SP to TURN ON the conditional output of the regulator
Differential regulator OFF TEMPERATURE 2 - 90°C	03	02	02	02	02	Temperature difference ST-SP to TURN OFF the conditional output of the regulator
Differential regulator sensor ST 0 - 6	Sf 1	0	0	0	0	Sensor heat source *
Differential regulator sensor SP 0 - 6	Sd 2	0	0	0	0	Sensory hot-receiver *
Used logical function AND, OR	A	O	O	A	O	A(AND) / O(OR)

In the summer should be set - 0
to prohibit the supply of heat
from the fireplace to the convectors.

In winter, must be set - 0
to prohibit cooling
by convectors.

If you do not want heating jacuzzi from boiler must all the numbers of sensors in the column is set to 0.

Programming:
1. Set the time and date.
2. Set the timer program if necessary.
3. Program the top table in the controller.
4. Perform calibration of the sensors.
5. Select "Automatic mode".

TURN ON / TURN OFF outputs of TS-55T+2 (controller number 2):

Output 1:
If Sf>65°C and (Sf-Sd)>8°C then the output is TURN ON. The water heater is heated by the fireplace.
If Sf<65°C or (Sf-Sd)<3°C then the output is TURN OFF.

Изход 2:
TURN ON or TURN OFF depending on the programming of the weekly temperature timer.
If Sd<Td°C then the output is TURN ON. Perform watering.
Td is the desired temperature in the tank (set from timer).
If Sd>Td°C тthen the output is TURN OFF.

Изход 3:
If Sf>50°C then the output is TURN ON. Sending warm water from the fireplace to the convectors.
If Sf<50°C then the output is TURN OFF.

Изход 4:
If Se>68°C and Sh<40°C then the output is TURN ON. Jacuzzi is heated by the boiler.
If Se<68°C or Sh>40°C then the output is TURN OFF.

Изход 5:
If Sj>30°C then the output is TURN ON. Sending cold water from well to convectors.
If Sj<30°C then the output is TURN OFF.

In the table above for the circle G4 (fireplace-tank) is allowed to operate only if the boiler temperature is exceeded by **65**°C.
Round G5 (fire-convectors) be permitted upon reaching the temperature in the fireplace **50**°C.
It provides an advantage for convectors withdrawal of heat from the fireplace. The water heater will be heated only if have remaining excess heat in the fireplace. By changing the numbers we can reduce, enhance or turn advantage. The advantage can be excluded temporarily or permanently if into row "Top Level-Sensor" for rounds G4 is assigned a number of sensor '0'.

Opportunities provided by the software "TS-plus2" the controller gives the user great opportunities for selecting and changing the manner of control of the functional circuit.
Probably many options are available for managing specific functional scheme, but will show just one more:
Place the sensor 'Sj' (measured temperature of the air) in the largest room of the house. In winter heating indoor air will have prevail.
Setting maintained temperature in other rooms will be done by setting flow and local opportunities for adjustment of convectors.
If the sensor 'Sj' display a temperature below the desired then heat from the fireplace will be directed only to the convectors.

Table setup of the differential regulators, logical functions and thermostats.
controller number 2

Row from the table for programming	Output number controlled round					Note
	G4 1	G10 2	G5 3	G8 4	G9 5	
Top Level - °C Top level thermostats XX=2 до 90°C	25	90	50	68	30	Temperature to TURN ON the conditional output of the thermostat
Top Level-Sensor Sensor for thermostat top level S=0-6	Sj 5	0	Sf 1	Se 6	Sj 5	
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	Sd 2	0	Sh 3	0	
Differential regulator ON TEMPERATURE 2 - 90°C	08	05	05	05	05	Temperature difference ST-SP to TURN ON the conditional output of the regulator
Differential regulator OFF TEMPERATURE 2 - 90°C	03	02	02	02	02	Temperature difference ST-SP to TURN OFF the conditional output of the regulator
Differential regulator sensor ST 0 - 6	Sf 1	0	0	0	0	Sensor heat source *
Differential regulator sensor SP 0 - 6	Sd 2	0	0	0	0	Sensory hot-receiver *
Used logical function AND, OR	A	O	O	A	O	A(AND) / O(OR)

In the summer should be set - 0 to prohibit the supply of heat from the fireplace to the convectors.

In winter, must be set - 0 to prohibit cooling by convectors.

If you do not want heating jacuzzi from boiler must all the numbers of sensors in the column is set to 0.

Programming:
1. Set the time and date.
2. Set the timer program if necessary.
3. Program the top table in the controller.
4. Perform calibration of the sensors.
5. Select "Automatic mode".

TURN ON / TURN OFF outputs of TS-55T+2 (controller number 2):
Output 1:
If Sj>25°C and (Sf-Sd)>8°C then the output is TURN ON. The water heater is heated by the fireplace.
If Sj<25°C или (Sf-Sd)<3°C then the output is TURN OFF.
Изход 2:
TURN ON or TURN OFF depending on the programming of the weekly temperature timer.
If Sd<Td°C then the output is TURN ON. Perform watering.
Td is the desired temperature in the tank (set from timer).
If Sd>Td°C then the output is TURN OFF.
Изход 3:
If Sf>50°C then the output is TURN ON. Sending warm water from the fireplace to the convectors.
If Sf<50°C then the output is TURN OFF.
Изход 4:
If Se>68°C и Sh<40°C then the output is TURN ON. Jacuzzi is heated by the boiler.
If Se<68°C или Sh>40°C then the output is TURN OFF.
Изход 5:
If Sj>30°C then the output is TURN ON. Sending cold water from well to convectors.
If Sj<30°C then the output is TURN OFF.

In the table above for the circle G4 (fireplace-tank) is allowed to operate only if the boiler temperature is exceeded by **25**°C.
Round G5 (fire-convectors) be permitted upon reaching the temperature in the fireplace **50**°C.
It provides an advantage for convectors withdrawal of heat from the fireplace. The water heater will be heated only if have remaining excess heat in the fireplace. By changing the numbers we can reduce, enhance or turn advantage. The advantage can be excluded temporarily or permanently if into row "Top Level-Sensor" for rounds G4 is assigned a number of sensor '0'.

Option 2 - Instead pump R7 used solenoid valve.
After cooling water is moving to a tank for drip irrigation.

Besides settings from version 1 to switch from winter to summer mode of governance must be made:
1. Rotate the manual three-way valve V2 for the movement of cooling water to the tank for drip irrigation.
2. Set the flow of cooling water through the valve V4.
Everything else remains the same as in option 1.

R1, R2, R3, R4, R5, R6 - Heat pump.
Sx - Sensors.
F1 - Thermal cutoff.
B1 - Electric heater.
Non-return valve.



V3 - Three-way manual valve.


V1 - Three-way solenoid valve

V4 - Two-way manual valve.

Sj - Sensor for measuring air temperature

Функционална схема

The coils in the pool and jacuzzi are set arbitrarily. In practice it is more efficient use of aluminum radiators.