

INTIEL

THE ELECTRONICS ON YOUR SIDE

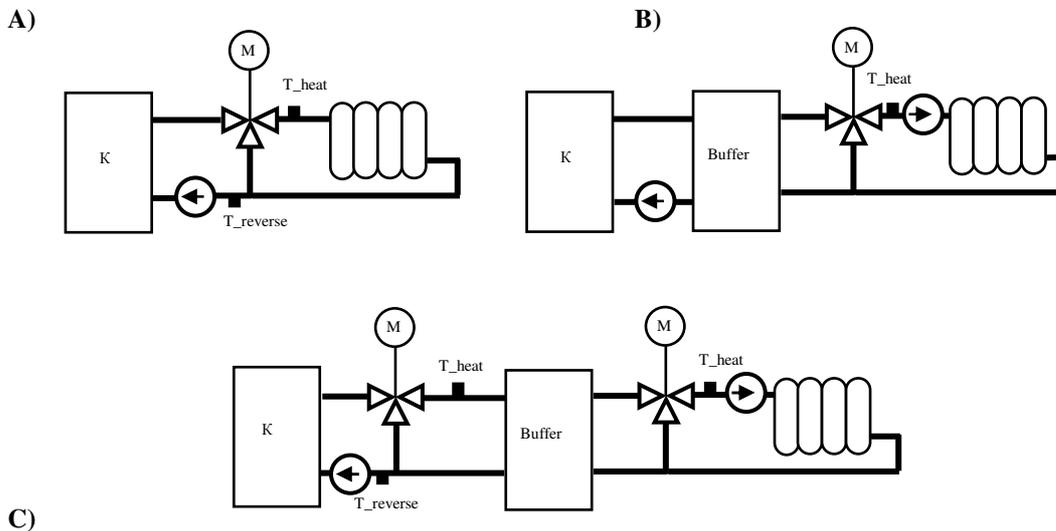
Heating circuits controller

User's Manual

1. Application

The device is designed to control motor actuators of mixed valves, in accordance with the water temperature directed to the heating system. It can be used also to keep the temperature in buffers or water tanks heated by a boiler by means of a mixed valve.

Application schemes:



A) – supply of the heating system directly from the boiler;

B) – transferring the whole boiler capacity to the buffer, and afterwards from the buffer to the heating system;

C) – using two controllers, the first one with an independent assignment for keeping buffer temperature, and the second one to manage the supply to the heating system from the buffer;

2. Operation

The assignment of the heating system temperature can be done: independently (manually from the controller), according outdoor temperature or room thermo regulator. Only one of those three options can be selected (see part “Programming”/Service settings).

The room thermostat can be a contact or analogue one, as the analogue output can be 0(4) – 20 mA or 0 – 10V.

The regulation of the heating circuits can be provided by means of impact of the motor actuator installed on the mixed valve. The motor actuators used with the Controller can be two-way or proportional ones with a control signal of 0-10V.

In relation to the difference between the assigned and measured temperature of the heating water the following control signals are being made:

Concerning two-way valves:

The room thermostat can be equipped with a contact or analogue output, as the analogue one can be 0(4) – 20 mA or 0 – 10V /see part “Programming of the room thermostat”/.

The regulation is provided by influence on the motor actuator mounted on the mixed valve, as the motor actuators can be two positional or proportional ones with a control signal of 0 – 10V.

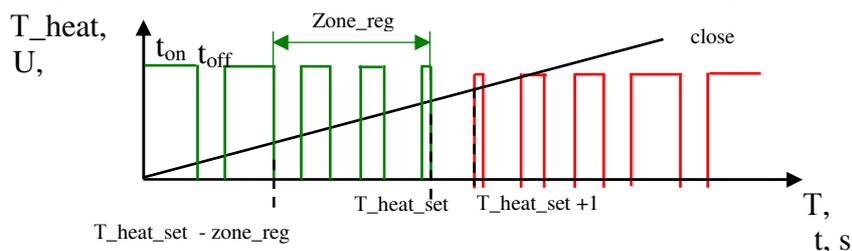
The following control signals will be made in relation to the difference between the assigned and current temperature of the heating water:

Two positional motor actuators:

In operation mode it is being sent impulses with a cycle “operation-pause”, as their relation depends on the choice for maximum pause “ t_{off} ”, zone of regulator operation “ $Zone_reg$ ” and difference between the assigned and measured temperature of the heating water “ $T_{heat_set} - T_{heat}$ (see part programming “ Service settings”).

Operation of the output concerning actuator “opening”

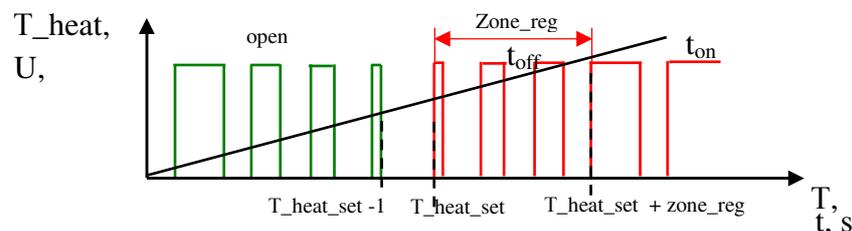
When the measured temperature of the heating water is less than the assigned one, then the operation direction is “opening”. The zone of regulation “ $Zone_reg$ ” is just before the assignation of the heating water “ T_{heat_set} ”. When the measured temperature is less than the temperature defined by the regulation zone, then the actuator works with minimal pauses of at about 3 seconds and duration of the operation impulse with a 3 seconds more than the duration for maximum pause “ t_{off} ”. When the temperature defined by the zone of operation is being reached then the operation impulses start decreasing, as the pauses start increasing. The operation impulses have their minimum value of at about 3 sec. as far as the assigned temperature “ T_{heat_set} ” is being reached and the pauses are being reached their maximum value of “ t_{off} ”. The actuator stops when the assigned and measured temperatures become equal as it remains at the same position until difference of $1^{\circ}C$ between the assigned and measured temperature appears. In case the change relates to decreasing of the heating water temperature, then the same output remains active, but if it relates to increasing of the same temperature, then the output will be switched as “closing” one will become active.



Operation of the output concerning actuator “closing”

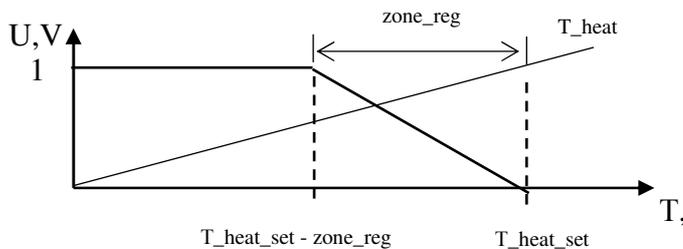
The operation direction of the actuator is “closing” when the measured temperature is greater than the assigned one. The zone of regulation “ $Zone_reg$ ” is just after the assignation of the heating water “ T_{heat_set} ”. The actuator works with minimum pauses of at about 3 sec. and duration of the operation impulses of 3 sec. greater than the period of maximum pause “ t_{off} ”, when the measured temperature of the heating water is greater than the one defined of the regulation zone. The operation impulses start decreasing and the pauses start increasing when the defined temperature in the regulation zone is being reached.

When the assigned temperature “ T_{heat_set} ” is being reached the operation impulses have minimum duration of at about 3 sec., as the pauses reach their maximum duration “ t_{off} ”. The actuator stops when the assigned and measured temperature become equal as it remains at the same position until difference of $1^{\circ}C$ between the assigned and measured temperature appears. In case the change relates to increasing of the heating water temperature, then the same output remains active, but if it relates to decreasing of the same temperature, then the output will be switched as “opening” one will become active.



Proportional actuators:

The zone of regulation "Zone_reg" is just before the assignation of the heating water "T_heat_set". The controller sends to the actuator a maximum signal of 10V when the measured temperature of the heating water is less than the one defined within the regulation zone "Zone_reg", as with reaching the regulation zone the control signal will start changing (0-10V). The signal changing is active until the temperature is within the regulation zone. It is being sent a minimum control signal of 0V, when the measured temperature of the heating water is greater than the assigned one.



Temperature limitations:

The following temperature limitations are being defined despite of the way for heating water temperature assignation is being fixed:

- Minimum temperature level of the heating water;
- Maximum temperature level of the heating water;
- Minimum temperature level of the return water.

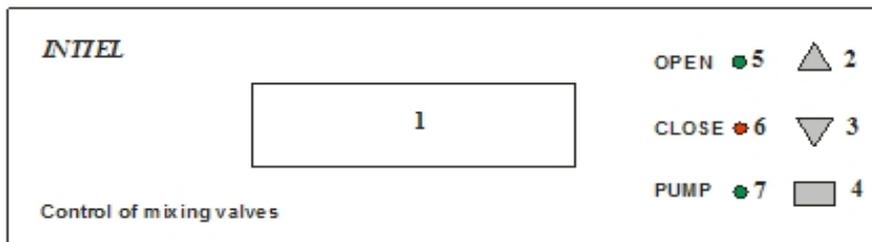
Minimum and maximum temperature of the heating water defines the temperature range within which the heating water is being sent to the heating system (see part programming "Service settings").

The minimum temperature level of the return water protects the heat-exchanger source of condensation. It is not being sent the complete capacity of the source to the heating systems until the temperature of the return water it is not being increased above the assigned one. In this case a caution message occurs on the display (see part programming "Service settings").

Operation of the pump output:

- normal operation when the temperature of the heating water is within the range of its minimum and maximum levels.
- operation by force when the water temperature is less than 10 °C.
- stops the pump operation by force in case the temperature of the heating water exceeds its maximum level with 10 °C, thus protecting the heating circuit against overheating. The same state is being kept until it occurs a necessity for more capacity in the heating circuit.
- stops in case of no need of sending heated water to the circuit. The pump stops also if the mixed valve is closed for more than 1 hour. The same state is being kept until it occurs a necessity for more capacity in the heating circuit.
- stops in case of no heated water at the heating circuit inlet. The pump output is being switched off in case the measured temperature of the heating water is lower than the assigned minimum one in 1 hour. Then, the controller goes into test mode as every 15 minutes the pump is being switched on for 5 minutes. The previous mentioned state goes on until the heating water exceeds the assignation for the minimum water temperature level.

3. Front panel



- 1 – display;
- 2 – Button „forward”;
- 3 – Button „backward”;
- 4 – Button for entering/escaping programming mode;
- 5 – indication “opening” direction about two positional actuators;
- 6 – indication “closing” direction about two positional actuators;
- 7 – indication about circulation pump operation;

4. Programming

4.1 Manual adjustment of the heated water temperature. Press buttons „↑” or „↓” until it is being shown on the indication the assigned and measured values:

T_heat_set ...°C
T_heat °C

Press button „✓” in order to enter into programming mode, as after that the value assignation starts blinking. By means of buttons „↑” or „↓” can be made changes within the range of „T_heat_min” to „T_heat_max”. (see part programming “Service settings”).

In order to confirm the changes „✓” button is to be pressed again or it is to be waited for at about 10 seconds for automatic saving.

In case of not allowed manual assignation after pressing button „✓” the following message appears for at about 10 sec.

Ch. T_heat_set
Disable Wait

4.2 Heating water temperature assignation by means of outdoor temperature (equi-thermal regulation).

Temporary it can be switched to manual assignation of the heating water in the aim of faster heating of the building. It could be suitable during initial starting of the system or after its long stop. (see part programming “Service settings”). Once the comfort temperature is being reached it can be switched to a control by means of outdoor temperature.

Press buttons „↑” or „↓” until select the message about the equi-thermal regulation and measured value of the outdoor temperature:

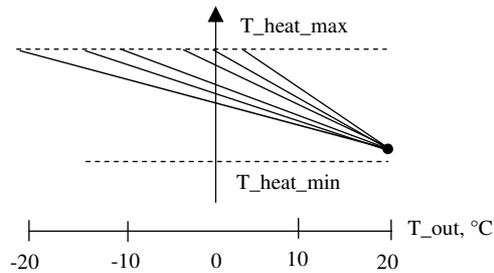
Equitherm Reg
T_out °C

4.2.1 Selection of a temperature region

Press button „✓” in order to enter programming mode, as a message about selection of temperature region is being shown:

Equitherm Reg
Region +20

The value next to the message is blinking as by means of buttons „↑” or „↓” can be made changes from (+5)°C up to (-20) °C, as in this case it is being adjusted an outdoor temperature which correspond to a maximum assignation of the heating water. The temperature region selection fix the curve according which the assignation of the heating water will be changed in relation to the changes of the outdoor temperature. All curves have a common point at +20°C, which corresponds to minimum assignation of the heating water.



In order to confirm the changes „✓”button is to be pressed again or it is to be waited for at about 10 seconds for automatic saving.

4.2.2 Time selection for a room delay

The message about “Room delay” is being shown on the display, as just next to it the value blinks:

Equitherm Reg
Room delay

By means of buttons „↑” or „↓” it can be selected changes within the range of 0 up to 30 hours. In this case it is being defined the period of time after which the changes of the heating water temperature calculated by means of the outdoor temperature will be proceeded. In this case it is being obtained an average value of the heating water assignation by means of the outdoor temperature for the selected period of time.

For example: the selected curve is(-10+20°C), room delay is 5 hours, outdoor temperature is 10°C and we have current assignation of the heating water 40°C. The outdoor temperature is being changed as it goes to 7°C, as the temperature of the heating water is to become 46°C. Due to selected room delay, the heating water assignation will start increasing as the difference of 6°C will be reached at the end of the 5th hour.

Recommended values for the Room delay:

0 – 3 hours for light constructions and halls;

4 – 10 hours for solid built houses;

11 – 30 hours for solid built houses with a good insulation;

In order to confirm the changes „✓”button is to be pressed or it is to be waited for at about 10 seconds for automatic saving.

After pressing „✓” button the following message for 10 sec. appears when the equi-thermal regulation is not allowed:

Equitherm Reg
Disable Wait

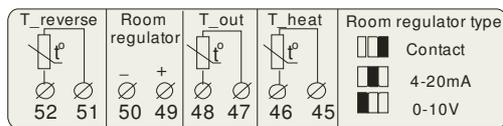
4.3 Adjusting the heating water assignment by room thermostat. Turn buttons „↑” or „↓” until on the display is being appeared message about room thermo regulator and its current status:

Room Reg
Status

4.3.1 Select the type of the room thermostat.

The room thermostat can be contact or analogue one as the analogue types can be equipped with an output 0(4) – 20 mA or 0 – 10 V.

It is necessary to be mentioned the used type thermostat, as well in the program and with the jumper concerning the type of the signal at room thermostat terminals.



Press button „✓” in order to enter into programming mode, as a message about room thermostat type is being shown:

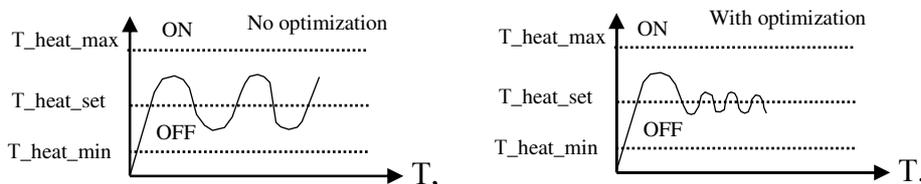
Room Reg
Type

By means of buttons „↑” or „↓” can be selected „Contact” or „Analog” types. In order to confirm the changes „✓” button is to be pressed or it is to be waited for at about 10 seconds for automatic saving as the next setting will be turned.

4.3.2 Optimization time of contact type regulator. A message about an optimization time appears as just next to it the value blinks:

Room Reg - Contact
Opt time min

By means of buttons „↑” or „↓” can be made changes from 0 up to 60 min., with a step of 5 minutes. Using the optimization time provides decreasing of variations in heating water assignment, which provides better regulation of the heating water.



In terms of not using an optimization (0) the room thermostat switches on or switches off, as the assignment of the heating water become:

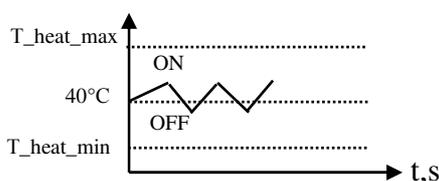
- maximum, when it is switched on;
- minimum, when it is switched off.

Using an optimization of 5-60 min., in case of room thermostat switching on or switching off, then the assignation of the heating water is being changed in the following way:

- switching on – start increasing as the maximum assignation is being reached at the end off the optimization time period and it happens only if during that time switching off does not appear;

- switching off – start decreasing as the minimum assignation is being reached at the end off the optimization time period and it happens only if during that time switching on does not appear;

For example: a contact type thermostat is being chosen, optimization time 15 min., state of the regulator is switched off. The current value of the heating water is 40°C, which means the regulator will be switched on. Due to entered optimization time the assignation will start increasing. At the 5th minute the desired temperature is being reached as the regulator is being switched off. The assignation of the heating water will be increased with $1/3(T_{heat_max}-40)$ and it will start decreasing, as the decreasing will go on until the regulator will be switched on again.



The choice of the optimization time depends on the heating water speed (pipeline, radiators), the system for a room control, the capacity of the heating source (boiler) and the building insulation.

Recommendations:

1. Room contact thermostats are to be with hysteresis of 0.5 – 1 °C
2. The optimization time is to be with 5-10 min. grater of the time between two switching of the room thermostat in the fixed mode. Practically the times can be adjusted according heating system inertness:
 - low inertness systems – (5 – 20) min.
 - middle inertness systems – (25 – 40) min.
 - high inertness systems – (45 – 60) min.

In order to confirm the changes „✓”button is to be pressed or it is to be waited for at about 10 seconds for automatic saving as the initial position will be turned.

In case of not allowed regulation by means of room temperature after pressing „✓” button the following message is being shown for 10 sec.:

Room Reg
Disable Wiat

4.4 Information about the return water. Turn buttons „↑” or „↓” until the assigned and measured values are being indicated:

T_rev_set ... °C
T_rev ... °C

In case the measured temperature of the return water is less than the assigned one then a warning message appears as the motor actuator start closing the valve, thus imitating the capacity sent to the building:

ATTENTION!
<Very low

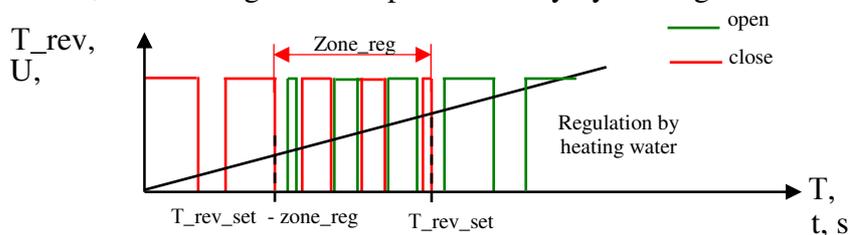
By means of pressing „✓” button it can be switched between warning message and the information about the return water, where by means of buttons „↑” or „↓” again to have access to “Programming”. The assignation of the return water can be changed from “Service settings”.

Special features of the actuator operation during activation of the return water temperature limitation:

The actuator operates in the same way like it is described the operation way, but the regulation is done by means of the return water. The zone of regulation is just before the assignation of the return water.

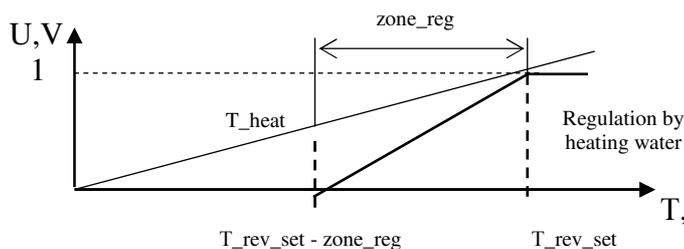
- Two positional actuators:

A typical feature in this case is that when the return water temperature reaches to the regulation zone, then it is being started switching between the outputs ‘closing” and “opening” and part of the capacity is being sent to the heating. In the beginning of the regulation zone the “opening” impulses are short, as with reaching the assignation of the return water they are being increased. When the assignation of the return water is being exceeded, then the regulation is provided only by heating water.



- Proportional actuators:

When the return water temperature reaches the zone of regulation then the control signal is being changed from 0 up to 10V, as the size depends of the difference between the assigned and measured temperature of the return water. When the assignation is exceeded then the regulation is provided by the heating water.



4.5 Service settings. Pres buttons „↑” or „↓” until on the indication appears the following message:

Service Set
for technicians

Then press „✓” button, as on the display will appear a message for a password and value after which it blinks:

Service Set
Password

Press buttons „↑” or „↓” turning until **123** is being shown on the display, as after that press button „✓”. In case of wrong password the following message is being indicated for 10 sec.:

Service Set Disable Wait

4.5.1 Maximum temperature of the heating water.

In case of correct entered password it is being shown on the display a message about maximum temperature as the value next to it blinks:

Service Set T _{heat_max}

By means of buttons „↑” or „↓” can be adjusted the changes within 50 up to 90 °C. In order to confirm the changes „✓” button is to be pressed again or it is to be waited for 10 sec. for automatic saving, turning to the next setting.

4.5.2 Minimum temperature of the heating water.

A message for a minimum temperature is being indicated on the display and the value next to it blinks:

Service Set T _{heat_min}

By means of buttons „↑” or „↓” can be adjusted the changes within 5 up to 40 °C. In order to confirm the changes „✓” button is to be pressed again or it is to be waited for 10 sec. for automatic saving, turning to the next setting.

4.5.3 Assignment of the return water temperature.

A message for assignment of the return water temperature and the value next to it blinks:

Service Set T _{rev_set} °C
--

By means of buttons „↑” or „↓” can be adjusted changes from 30 up to 60°C (see “Operation” – limitations and “Programming” – information about the return water).

In order to confirm the changes „✓” button is to be pressed again or it is to be waited for 10 sec. for automatic saving, turning to the next setting.

4.5.3 Maximum pause between two operation impulses – only concerning two positional actuators.

A message appears at the display concerning the off time and the value next to it blinks:

Service Set t _{off_s}

By means of buttons „↑” or „↓” can be adjusted the changes within 15 up to 180 sec.

It is of any meaning only in the regulation zone, as it allows making the actuator “slower” than its operation speed. Out of the regulation mode despite of the selected value, the pauses between the operation impulses are at about 3 sec.

In order to confirm the changes „✓” button is to be pressed again or it is to be waited for 10 sec. for automatic saving, turning to the next setting.

4.5.4 Zone of regulation. A message appears at the display concerning the zone of regulation and the value next to it blinks:

Service Set
Zone_reg °C

By means of buttons „↑” or „↓” can be adjusted the changes from 2 up to 10 °C. In this way it is being selected with how many degrees just before reaching the temperature assignation to start decreasing of the operation impulses and in the same time increasing the pauses between them (it concerns about two positional actuators) and changing the control signal 0-10V (concerning proportional actuators).

In order to confirm the changes „✓” button is to be pressed again or it is to be waited for 10 sec. for automatic saving, turning to the next setting.

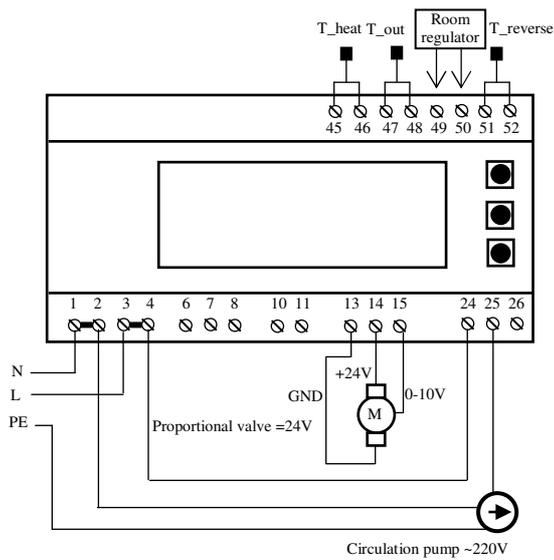
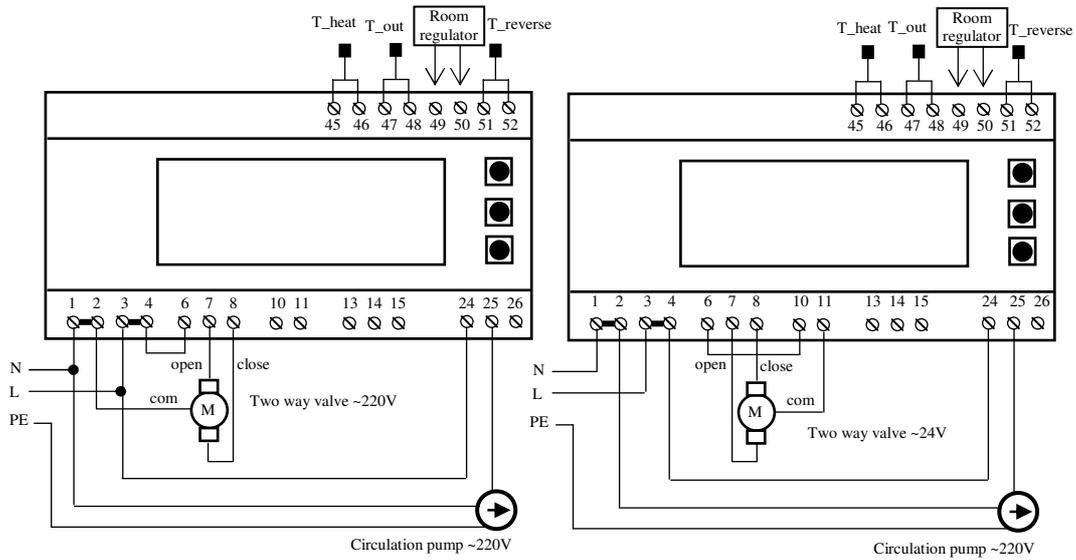
4.5.5 Choice of the regulation way(regime). Here it can be selected the criteria according which the assignation about the heating water will be formed. On the indication is being shown a message about the regulation regime and next to it the current state blinks:

Service Set
Regime

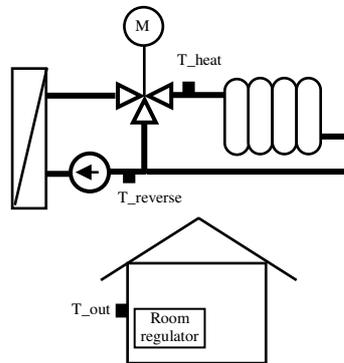
By means of buttons „↑” or „↓” it can be selected between: manual (Manual), an outdoor temperature (T_out) or a room thermo regulator (Room_reg).

In order to confirm the changes „✓” button is to be pressed again or it is to be waited for 10 sec. for automatic saving, turning to the initial position.

6. Electrical connections and technical data



Location of the elements of the heating systems



Recommendation with the installation::

- sensor for heating water T_{heat} - it is to be mounted on the outlet pipe after the mixed valve.
- return water sensor $T_{reverse}$ – it is to be mounted on the inlet pipe of the heat exchanger (boiler). The sensor is not to be connected to the controller in case there is no necessity of observing the return water temperature.
- outdoor temperature sensor T_{out} – it is to be mounted on the north outer wall of the building protected by direct sun shine and wind. It is not recommended to be installed close to heating sources (chimney, windows, doors, etc.), as well under eaves and balconies.
- room thermo regulator – it is to be installed at the most occupied room at a place protected of direct sunshine and internal heating sources (stoves, other electrical appliances, etc.)
- Synchronization of the motor actuator with the valve. Separate the valve and the actuator and disconnect the heating water sensor T_{heat} . Turn the valve manually in close direction to complete closed position. Check the actuator out if it moves in the same direction in which the valve was tuned, as it has to be corrected in case of not matching the same direction. It has to be waited for until the actuator fulfills its complete move, as afterwards it is to be mounted on the valve and connected heating water sensor T_{heat} .

Technical data:

Power supply	~230V/50Hz
Temperature sensors	Pt 1000 (-50 до +250 °C)
Room thermostat input	0 – 10V,(4 – 20mA), contact
Two way actuator output	~220V/50W / ~24V/2,5W
Proportional actuator output	=24V/2,5W
Circulation pump output	switching contact ~220V/3A
Control signal	0 – 10V/max.20mA
Measurement range	-30 +130 °C
Unit of measurement	1 °C
Humidity	up to 80%
Protection	IP20

7. Warranty

The warranty period is 24 months following the purchase date of the unit or its installation by a qualified staff, 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: <i>INTIEL</i>	
<i>Product type</i>	
<i>Production number</i>	
<i>Production date</i>	
Dealer's confirmation	
<i>Purchase date</i>	
<i>Invoice number</i>	
<i>Dealer's name, address and stamp</i>	
<i>Seller's name and signature</i>	
Installation date	
<i>Date</i>	
<i>Company (address, stamp)</i>	
<i>Installer's name and signature</i>	