



### **MANUAL**

*FOR ASSEMBLY AND OPERATION OF ELECTRIC FLOW-THROUGH  
BOILER/MODULE WITH THREE STAGE ELECTRONIC CONTROL*

### **PASSPORT**

*OF ELECTRIC BOILER WITH THREE STAGE ELECTRONIC CONTROL  
ECOTERMAL MRT/MODULE-T 6, 8, 10, 12, 15, 22, 30 kW*

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Dear clients! ECOTERMAL Company is thanking you for the good choice you made! Please get familiar in detail with the present manual in order to use the full scale of the advantages of the electric boilers with three stage electronic control that will secure for you comfortable, ecologic and economic heating through their quality, reliable and modern automation.

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## **1. RECOMMENDATIONS:**

- This Electrical Boiler is not intended for use by persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the Electrical Boiler by a person responsible for their safety.
- It is not allowed, to play with the electrical boiler by CHILDREN.
- It is necessary one to be familiar and to observe the safety operation and assembly manual.
- After unpacking the boiler, check delivery integrity and completeness.
- Electrical boiler has IP 20 protection degree, which applies after an installation at place where it will be used.
- Check whether the boiler type corresponds to your needs.
- It is recommendable for each assembly a project to be drafted.
- The assembly may be carried out only by an expert, authorized for such activity.
- Boiler assembly should meet the effective prescriptions, norms and to the present manual.
- Connection of the boiler to the power network (if necessary) should be harmonized with the local power supplier, which should be done by the consumer prior to the purchase of the boiler.
- Adjustment and commissioning should be carried out only by a service technician approved by the producer.
- Upon incorrect assembly, damages may occur and the producer shall not be liable thereof.
- In case of failure contact the service organization. Unprofessional intervention may damage the boiler.
- For correct functioning, safety and long-term operation secure prophylactics at least once a year.
- In case of damages incurred by unprofessional assembly, as well as upon noncompliance with the regulations and the operation manual, the producer is not liable and shall not provide guarantee service.
- The heating installation should have air bleeds at all necessary places.
- It is not allowed to make any changes whatsoever on the electrical diagram of the product, except for connection of the indoor temperature or equithermal thermoregulator.
- Hydraulic and warm tests should be carried out of each heating installation upon commissioning.
- The electric boiler may operate at open system up to temperature of 95°C max and at closed system up to 110°C at pressure of 1.8 bar in a self-contained heating circuit.
- The assembly organization is obliged to get the client familiar with the operational rules of the heating system as a whole.

## **2. INTRODUCTION**

The flow-through electric boiler ECOTERMAL is a modern ecological source of heat designated for story and central heating of small and average size houses and production facilities. The main advantages of heating with electric power are mostly cost effectiveness, high efficiency, environmental friendliness and compactness. Electric boiler can be used in every system of central or story (local) heating in a direct, accumulating or hybrid system. It

can be integrated also in existing heating systems parallel with solid fuel boiler (exemplary diagrams are shown on Fig. 1 and 2 page 10). It is recommended for safer operation the electric boilers to be mounted in systems operating with a pump securing enforced circulation of the heat medium.

### **3. TECHNICAL DESCRIPTION OF THE BOILER**

- Structure of the electric boiler/ module, see Fig. 3 page 11, Fig. 4 page 12.
- Equipment of the boilers' models is shown in Tab. 6 page 15.
- Technical datas, technical characteristics and dimensions, see Tab. 1, 2, 3, 4 page 14 and Tabl. 5 page 15.

### **4. SYSTEM CONTROL**

The three stage control performs its functions by effecting on the heaters and the water pump of the boiler. It is proportionately control of the water temperature in the water container according to the difference between the set temperature and the current temperature in the heating place.

#### **4.1. PRINCIPLE OF OPERATION**

The Boiler Control System consists of main board - pos.1, room thermo regulator - pos.2, control panel - pos.4, and other components mounted on the boiler's body. The power relays, power supply and the electrical terminals for connection with the other components are placed on the main board. The room thermo regulator measures the room temperature and sends an electrical signal to the main board which corresponds to the difference between the set and the measured temperature. This signal is in the 4 - 20 mA range. Because both the regulators (room and boiler) are interconnected in cascade system, this signal goes as a setpoint at the boiler thermo regulator's input which in turn controls the temperature of the water in the boiler, therefore the more the room temperature approaches the set point of the room thermo regulator, the less the setpoint of the boiler thermo regulator will be. In order to maintain the water temperature in the boiler a three stage proportional regulator is implemented. This provides smooth load of the electrical grid and also eliminates the possibility for temperature overshoot. The purpose of this is saving electrical energy /that is the temperature of the water in the boiler is maintained at such level that it only covers the heat loss in the premises.

The control panel consists of button - pos.10 (X/W), LED indicaton - pos.11 and LED indicators for the boiler condition - pos. 5,6,7

The LED indication, pos. 11 shows two temperatures. If the button, pos. 10, is pressed the set temperature "W" of the water in the water container is shown. If the button is not pressed the current temperature "X" of the water in the water container is shown. If the LED indicator, pos. 9 is switched on this means that the circulation pump is working. When the heating is over the pump switches off after 3 minutes period.

In order to even wear heaters and relays the order of inclusion mix that appears last worked relay.

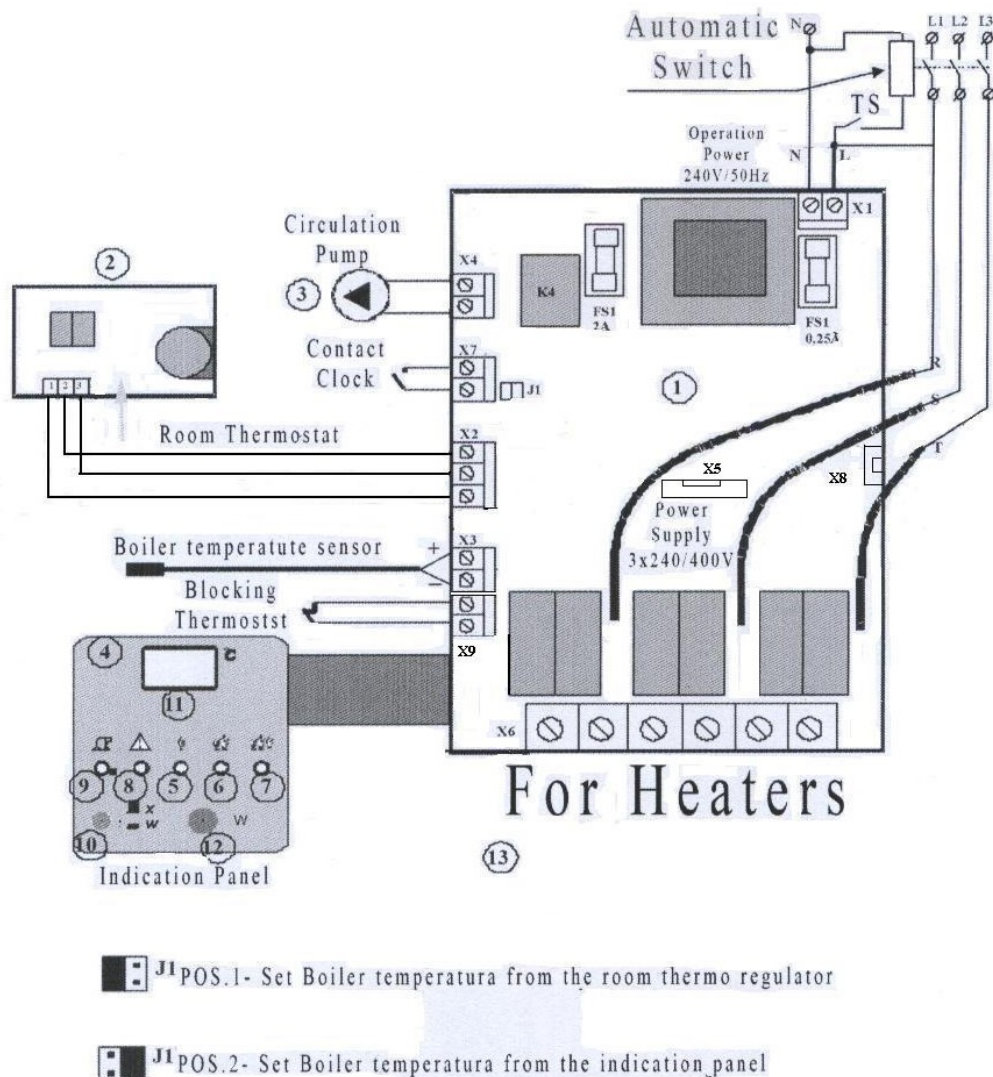
The LED indicator, pos 8, shows that blocking thermostat is switched on. When the cause is eliminated, the block system is recovered manually. The control panel connects to the main board by a 20 wire cable through the coupling X5.

The mainboard is joined by the individual elements shown in respective power wires arrangement. When replacing the boiler sensor or mainboard, but not replace the sensor, it is possible to obtain the temperature difference. In case that the management is used for example for electric boiler, then it is not required to be mounted room thermo regulator. In this case jumper J1, which placed on the main board is switched to pos 2 and by trimmer potentiometer W pos 12 the temperature is set. In all other cases jumper J1 is placed in pos. 1

#### 4.2. TECHNICAL CHARACTERISTICS

- Power Supply 240V/AC
- Maximum permissible operating current of the power relays 16A / 250V
- The outlet electricity of the room thermo regulator corresponding to the set temperature of the water in the boiler 20 to 90 C 4 до 20mA
- Protection against overheating. Digital indicators for the set and the current temperature. Smooth loading of the power supply network.
- Temperature measurement accuracy  $\pm 3^{\circ}\text{C}$

### 4.3. WIRING DIAGRAM



To power wire X1 is getting operational power 240V/50Hz. It is secured by built-in breaker FS1 – 0.25 A. The room thermostat is connected to X2.

The three cables labeled R, S and T, must be submitted three phases of the contactors for power - pos.13. Relays are connected to six power wires X6 in scheme with a total zero. H7 is connected to contact external clock for timing of operation of the boiler in a closed contact. In case that clock is not used, these power wires are short-circuit with a bridge. X3 is connected to the boiler temperature sensor. The sensor is polar, you must follow the indicated polarity when connected. In a reverse connection does not fail, but the temperature is unreal. To connect x8 to advanced management another six relays they involve together relay motherboard.

The blocking (emergency) thermostat is connected to X9.

TS - thermal switch, temperature switch.

#### 4.4. DIFFERENT OPTIONS AND SPECIFIC RULES TO BE FOLLOWED DURING INSTALLATION AND USE.

##### **- By Boiler Thermo regulator**

The set point of the controller is set by the potentiometer for manual adjustment located on the front control panel and it is permanent. In this case an installation of thermostatic valves at each radiator will make it possible to control the temperature in each room individually. The water temperature in the boiler is set manually by the user and doesn't depend on the ambient temperature, whereas the thermostatic valves affect the boiler controller and electrical power by dosing the consumed heat power. In operating mode the boiler is in steady state and maintains constant water temperature while the power varies.

**It is a shortcoming that because of the manual adjustment the water temperature may be lower or higher than what is really necessary to maintain the set points of the thermostatic valves in the different rooms.**

##### **- By the external weekly programmable thermo regulator**

It should be mounted in the heated rooms. It determines the duration of operation and rest of the boiler, depending on the program entered and the temperature in the premises. In operating mode the set point of the thermo regulator is determined by the manual adjustment unit located on the front panel and is constant. In this case thermostatic valves can be installed at the radiators in all the heated rooms except the room where the programmable controller is placed. If a thermostatic valve is installed in the same room, it should be fully open in order not to prevent the normal operation of the programmable thermo regulator. The water temperature in the boiler is adjusted manually by the user and doesn't depend on the ambient temperature. The thermostatic valves influence the boiler regulator by dosing the consumed heat power and the room temperature influences the duration of the boiler operating time. An advantage of this method is the convenient control of the boiler directly from the room, disadvantage is the frequent switching between on and off state, in order to maintain the room temperature. **The boiler/module doesn't work in steady state mode and there are large temperature oscillations. (The boiler is worked in ON/OFF mode according the room temperature).**

##### **- By room thermo regulator (proportional)**

The proportional thermo regulator is mounted in any of the heated rooms. While in operation the set point of the boiler temperature controller varies, it is determined by the signal from the room temperature controller and depends on the difference between the set and the measured temperature value. The thermostatic valves can be installed at the radiators in each room, except the room where the room temperature controller is installed. If the thermo regulator and a thermostatic valve are installed in the same room the valve must be fully open. During the operation the boiler is in steady state mode having the water temperature optimally adapted for maintaining the temperature set at the room thermo regulator. When the room temperature changes the set point for the boiler controller will also change correspondingly. **Over-consumption of energy is eliminated and this method is also economical in terms of protection of the electrical installation. (Ideal option for heating one premise).**

## **5. OPERATION MANUAL**

- The customer has to provide water supply and electricity to the installation.
- The customer monitors for leaks and controls the operating pressure in the system.
- Adjust the boiler or room temperature depending on the operating principle of the installation and personal preferences.
- Upon departure from the parameters calls to authorized service.
- The service is performed by specialists familiar with the structure, management and operation of the device.
- When the electric power stops and restores again, the electric boiler automatically starts again.

## **6. CONNECTING TO THE ELECTRIC NETWORK**

- Connecting the electric switchboard to the power supply network and the boiler electric installation assembly should be carried out only by an expert with the necessary qualification. The power supply is connected through not severable joint according to the connection diagram. The cross-section of the power supply cable should be selected in accordance with the boiler power (see Table 4, page 14).

## **7. COMMISSIONING**

- Boiler startup is possible after performed control on the good working order of the connections to the heating system, checkup of the electrical connections and the external line.
- Check up whether the valves and taps of the heating circuit are open, check up also the water pressure in the system. Switch on the automatic fuse of the electric boiler and preset the desired temperature of the boiler and the indoor temperature controller or programmer. Servicing of the indoor temperature controller is done according to the instructions thereto. The heating systems may be filled in only by water or mixture of water and antifreeze. Oil should not be used.

## **8. CONDITIONS OF COMMISSIONING AND UNDERTAKING GUARANTEE MAINTENANCE – GENERAL TERMS:**

**The electric boiler/module is mounted by consoles only on a wall that can bear its weight. The boiler location should be selected in a manner to secure access – technological tolerance from its all four sides is shown on Fig. 6 page 13, the distances being different for the various rated powers.**

1. Boiler should be mounted at a place suitable for servicing (free access thereto) and possibility of opening the front lid.
2. Boiler should be mounted suspended on the wall at minimum height of 1 m off the floor.



3. Water filter should be mounted at the cold water intake before the pump by observing the direction marked on the filter itself (boiler fixture), in accordance with the attached manufacturer's instructions.
4. The boiler should not be contaminated with building materials.
5. Banjo fitting connections should be mounted on the boiler intake and the outlet.
6. Hydraulic test should be carried out at an index of 1.25 above the operating pressure.
7. Upon assembly, it is necessary the adjustments of the boiler and the blocking thermostats to be checked up. The actual control is done during the warm test.
8. The guarantee shall be effective as from the commissioning date, but not later than six months as from the date of the purchase.

### Method of connecting the system to a solid fuel boiler

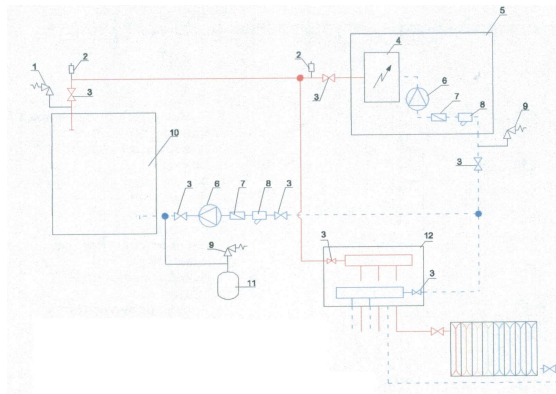


Fig. 1

- |                                |                             |
|--------------------------------|-----------------------------|
| 1. Safety valve by temperature | 7. Return valve             |
| 2. Air bleeder                 | 8. Water filter             |
| 3. Shut off valve              | 9. Safety valve by pressure |
| 4. Electric heater             | 10. Solid fuel boiler       |
| 5. Electric boiler             | 11. Expansion vessel        |
| 6. Circulation pump            | 12. Manifold Box            |

### Method of connecting of story (local) heating

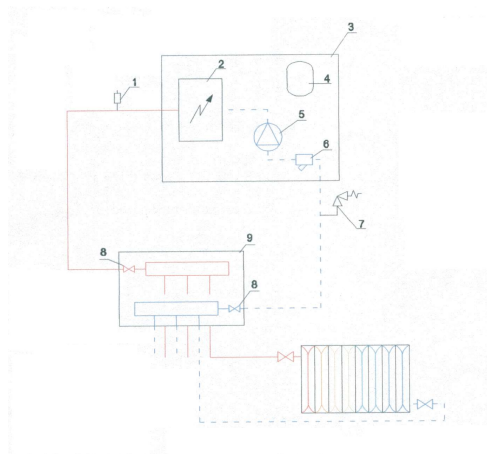


Fig. 2

- |                     |                   |
|---------------------|-------------------|
| 1. Air bleeder      | 7. Safety valve   |
| 2. Electric heater  | 8. Shut off valve |
| 3. Electric boiler  | 9. Manifold Box   |
| 4. Expansion vessel |                   |
| 5. Circulation pump |                   |
| 6. Water filter     |                   |

## ELECTRICAL BOILER MRT 6 - 30 kW

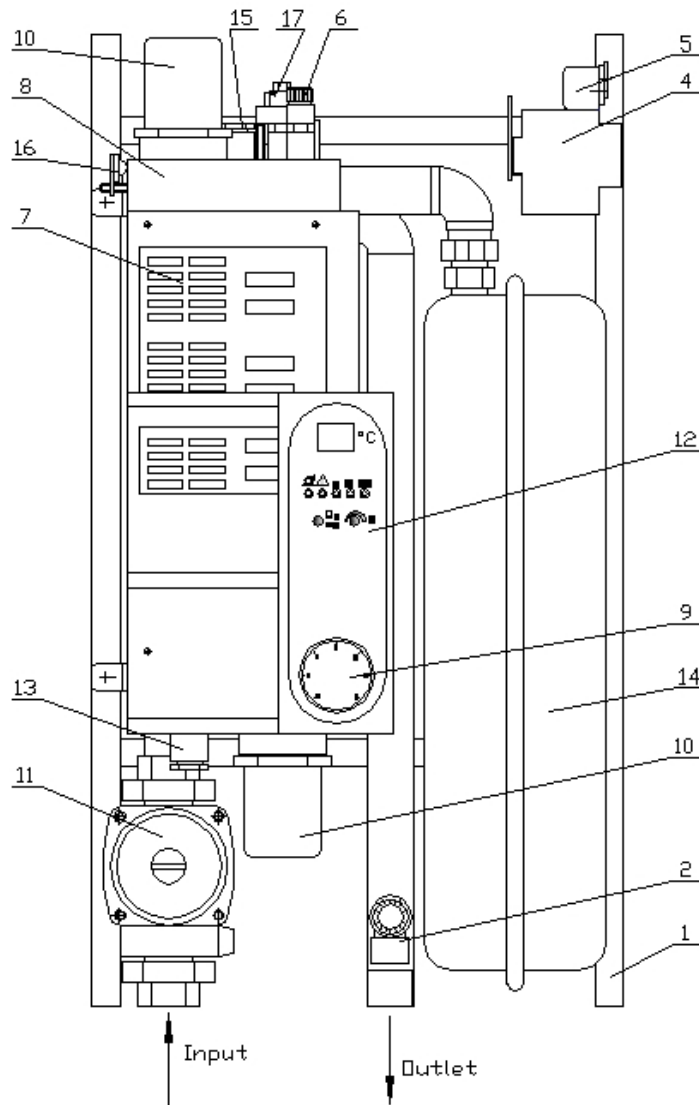


Fig.3

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1. Frame</li> <li>2. Safety Valve 2.5 bar</li> <li>4. Automatic Breaker<br/>with additional protection</li> <li>5. Emergency (blocking) Thermostat</li> <li>6. Air Bleeder</li> <li>7. System control</li> <li>8. Water Container</li> <li>9. Pressure-gauge</li> </ul> | <ul style="list-style-type: none"> <li>10. Heaters</li> <li>11. Circulation Pump</li> <li>12. Control Panel</li> <li>13. Pressure-gauge valve</li> <li>14. Expansion Tank</li> <li>15. Thermostat Pocket</li> <li>16. Thermostat –bimetallic</li> <li>17. Pressure switch</li> </ul> |
|--|--|

## MODULE T 6 – 30 KW

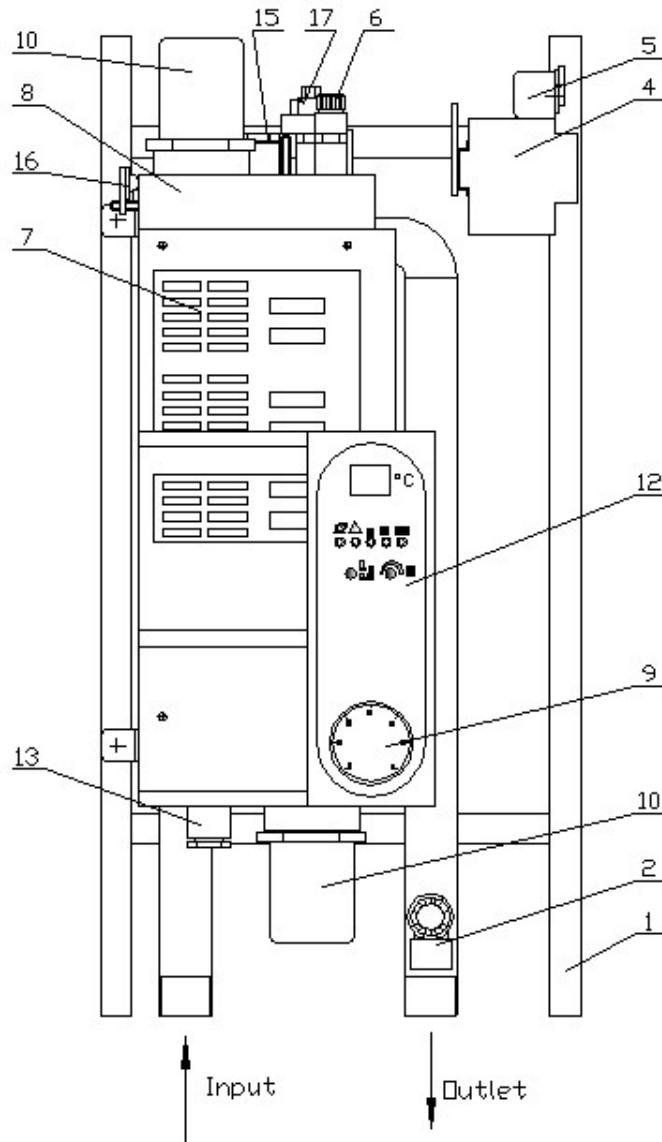


Fig.4

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1. Frame</li> <li>2. Safety Valve 2.5 bar</li> <li>4. Automatic Breaker<br/>with additional protection</li> <li>5. Emergency (blocking) Thermostat</li> <li>6. Air Bleeder</li> <li>7. System control</li> <li>8. Water Container</li> </ul> | <ul style="list-style-type: none"> <li>9. Pressure-gauge</li> <li>10. Heaters</li> <li>12. Control Panel</li> <li>13. Pressure-gauge Valve</li> <li>15. Thermostat Pocket</li> <li>16. Thermostat –bimetallic</li> <li>17. Pressure switch</li> </ul> |
|---|---|

## CONTROL PANEL

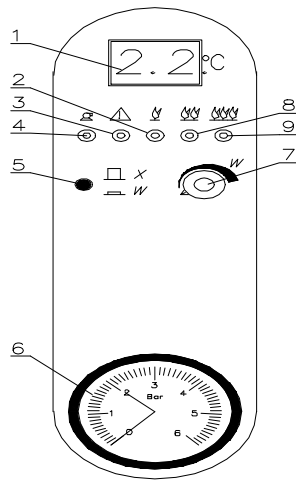


Fig. 5

1. Digital Display
2. LED Indication– First Stage ON
3. LED Indication of activated emergency thermostat
4. LED Indication of circulation pump condition
5. Button – set/current temperature
6. Pressure-gauge
7. Potentiometer of boiler’s temperature
8. LED Indication– Second Stage ON
9. LED Indication– Third Stage ON

## MRT /MODULE T 6÷30 KW

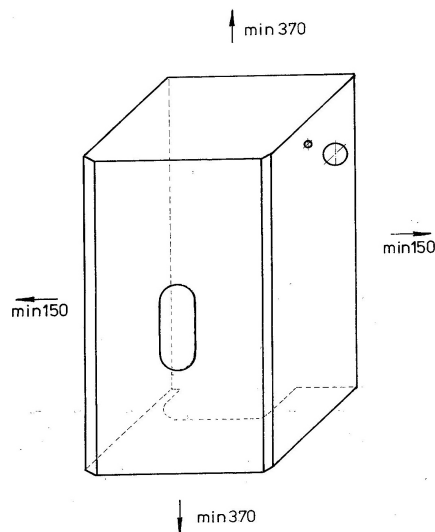


Fig. 6

### Dimensions of electric boilers/module with three stage control

<b>MRT 6 - 30</b>		<b>kW</b>	<b>6 - 30</b>
height		<b>mm</b>	700
length		<b>mm</b>	385
width		<b>mm</b>	260
<b>Module-T 6 – 30</b>		<b>kW</b>	<b>6 - 30</b>
height		<b>mm</b>	645
length		<b>mm</b>	315
width		<b>mm</b>	270

Tab. 1

### Technical characteristics of electric boilers/Module with three stage control

Maximum power	<b>kW</b>	<b>6, 8</b>	<b>10,12</b>	<b>15</b>	<b>22</b>	<b>30</b>
Commutations level	<b>pcs</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
Boiler body volume	<b>dm<sup>3</sup></b>	<b>8,9</b>	<b>8,9</b>	<b>8,9</b>	<b>8,9</b>	<b>8,9</b>
Supply voltage	<b>V</b>	<b>240/400</b>	<b>240/400</b>	<b>400</b>	<b>400</b>	<b>400</b>

Tab. 2

### Technical data

Maximum operating pressure	<b>Bar</b>	<b>2,5</b>
Test pressure	<b>Bar</b>	<b>4,0</b>
Regulation of heat medium temperature	<b>°C</b>	<b>30–90</b>
Room temperature control	<b>°C</b>	<b>5–30</b>
Connection pipes dimensions	<b>G</b>	<b>1”</b>
Efficiency index	<b>%</b>	<b>99,30</b>

Tab. 3

### Cross-section of power supply cables to electric network

<b>P [ kW]</b>	<b>I<sub>heater</sub> [A]</b>	<b>Cross-section [mm<sup>2</sup>]</b>	<b>I<sub>fuse</sub> [A]</b>
<b>6</b>	<b>8,7</b>	<b>5 x 2,5</b>	<b>10</b>
<b>8</b>	<b>11,11</b>	<b>5 x 2,5</b>	<b>16</b>
<b>10</b>	<b>13.89</b>	<b>( 3 x 2,5 + 1,5 ) + 1 x 4</b>	<b>20</b>
<b>12</b>	<b>16.67</b>	<b>( 3 x 4 + 2,5 ) + 1 x 4</b>	<b>25</b>
<b>15</b>	<b>20.83</b>	<b>( 3 x 4 + 2,5 ) + 1 x 6</b>	<b>32</b>
<b>22</b>	<b>31.25</b>	<b>( 3 x 6 + 4 ) + 1 x 10</b>	<b>50</b>
<b>30</b>	<b>41.67</b>	<b>( 3 x 10 + 6 ) + 1 x 10</b>	<b>63</b>

Tab. 4

### WEIGHT OF THE BOILERS MODELS

Electrical boilers			Electrical modules		
Model	Power, kW	Weight, kg	Model	Power, kW	Weight, kg
6 MRT	6	29.0	6 T	6	22.0
8 MRT	8		8 T	8	
10 MRT	10		10 T	10	
12 MRT	12		12 T	12	
15 MRT	15	29.5	15 T	15	22.5
22 MRT	22	31.0	22 T	22	24.0
30 MRT	30	33.0	30 T	30	26.0

Tab. 5

### Equipment of the boilers' models

EQUIPMENT	MODEL	
	MRT	Module T
Expansion tank	√	—
Circulation pump	√	—
Water filter	√	—
Safety valve	√	√
Blocking (emergency) Thermostat	√	√
Air bleeder	√	√
Mounting brackets	√	√

Tab. 6

**Note: The manufacturer reserves the right to make construction changing of the product.**