Electrode boiler GAZDA series GM 102/104/106

1. Purpose

The "GAZDA GM-102/104/106" electric boilers are designed for:

- Installation of individual closed-type heating systems

- Construction of combined closed-loop heating systems by connecting an electrode boiler in parallel to an existing gas boiler system (solid fuel, etc.).

- Layout of underfloor heating systems

- Construction of hot water supply systems - provided the boiler operates on a heat exchanger

2. Device and principle of operation

The "GAZDA GM-102/104/106" boiler consists of a water heater and a control unit, structurally combined into a single unit.

The boiler water heater is of the electrode type, consisting of a metal body with inlet and outlet pipes and a pin electrode installed in a sealed housing via an insulator.

The boiler body, its inlet and outlet connections are reliably insulated to ensure safe and reliable operation when supplied with RCDs or residual current devices.

The principle of the electrode heater is the direct conversion of electrical energy into heat when an alternating current flows through a heat transfer fluid from one electrode to another.

The heating element in an electrode boiler is the heat transfer fluid, so the power of the boiler depends directly on its electrical conductivity (resistivity).

The boiler control unit "GAZDA GM-102(104/106)" provides automatic switching of the water heater and circulation pump to ensure the energy consumption and heat carrier temperature set by the user and, when connected to a room thermostat, to maintain the required room temperature.

The control unit consists of a digital heating medium temperature controller, a solid-state boiler current controller, a circulating pump controller with electromechanical switching (relay) and a controller for external control equipment.

The digital thermostat switches off the boiler and pump when the temperature of the heating medium in the heating system reaches the upper threshold set by the user. The heating medium temperature must not be higher than the set value, even if the external control devices (external control units) connected to the GASDY continue to issue the "Heating" command.

When the temperature of the heating medium falls below the lower threshold set by the user, the thermostat will switch on the boiler and pump.

The set and current temperature parameters are shown on the display.

The boiler current controller limits and stabilises the current at the level set by the user using the knob on the front panel. The actual boiler current will not exceed the set value under any circumstances (voltage spikes, increased heat carrier conductivity, etc.). The adjustment is stepless. Operation is indicated by the lighting of the "Heating" LED.

The circulator control ensures interdependent operation of the water heater and the pump: when the command "heat" is received, the pump starts immediately and the water heater switches on after the set time has elapsed. When the command "stop heating" is received, the water heater is first switched off and the pump is switched off after the set time has elapsed. The operation of the pump is indicated by the illumination of the "Pump" LED.

The controller for external control devices enables the heating system to be controlled by a variety of devices - from a simple switch to a computer ("Smart Home"), with no limit on the number of control devices simultaneously connected to the GAZDA.

The "heating" command consists of closing the "Control" input contacts. The indication that the heating has stopped from the unit is the "OK" indicator light.

Tab.1 **3 Main technical characteristics**

	Characteristics	Boiler model		
		GM-102	GM-104	GM-106
1	Heated area, m²	20...30	40...60	60...90
2	Cubic capacity of heated room, m³	55...80	100...160	160...250
3	Power, kW nominal	2,0	4,0	6,0
	maximum	2,2	4,4	6,6
4	Supply voltage 50/60 Hz. V	150...270	150...270	150...270
5	Current limitation adjustment range, A	2...10 ±1	2...20 ±2	2...30 ±3
6	Electrical conductivity of the heat transfer medium, uS/sm at 20°C:	350...900		
7	Maximum output power of the "Pump" output, W	300		
8	Limits for fluid temperature setting,°C	+5...90		
9	Boiler switch-on delay after pump switch-on, sec.	15±2		
10	Pump switch-off delay after boiler switch-on, sec.	30±2		
11	Circuit current of external control devices, mA	0,5		
12	Cross-section of the supply cable, (copper) mm²	2,5	4,0	6,0
13	Maximum volume of brine, litres	45	60	75
14	Diameter of connection to the system	Ø20.0mm (3/4")	Ø20.0mm (3/4")	Ø20.0mm (3/4")
15	Protection class against electric shock. current	1		
16	Degree of protection against humidity	IP34	IP34	IP34
17	Ambient temperature, °C	0...+40		
18	Overall (installation) dimensions, mm	250x90x58		
19	Weight Weight (without control box), kg	1,05	1,10	1,15

4. Indication of security measures

The boiler uses life-threatening voltages!

The installation of the boiler supply and control circuit must be carried out by electricians who are familiar with these operating instructions and are suitably qualified and authorised.

A coarse filter (mesh filter) must be installed before the boiler inlet.

When operating and maintaining the boilers, the requirements of the "Technical regulations for the operation of electrical installations for residential customers" and the "Safety regulations for the operation of electrical installations for residential customers" must be observed.

The boiler must be operated in an explosion-proof room with a relative humidity of up to 80%.

The atmosphere should be free of acids, bases and other aggressive elements.

The wires feeding the boiler must have a cross-section smaller than that specified in item 12 of Table 1.

The heat transfer medium (water or low-fluid) must have an electrical conductivity not exceeding the value given in item 6 of Table 1.

This is prohibited:

- Open the control unit covers when the terminal strip is connected to the power supply;

- apply any voltage to the control input contacts ("Control").

5. Heat transfer medium

The main and **defining parameter of an** electrode boiler heat transfer fluid is its **electrical conductivity**. Electrical conductivity is a numerical expression of a solution's ability to conduct electricity. The unit of measure for electrical conductivity is S/sm (S - Siemens). The higher the numerical value of the electrical conductivity of the heat transfer fluid, the higher the current and therefore the boiler output. The unit for measuring the electrical conductivity of solutions is the conductivity meter.
The numerical expression of electrical conductivity is inversely proportional to the numerical expression of the resistivity of the heat transfer medium, measured in ohms/degree, i.e. the lower the numerical value of resistivity, the higher the current (and power) of the boiler.
The most efficient operation of all electrode boilers is achieved when the electrical conductivity of the heat transfer medium is **300...500µS/sm** (resistivity of **1600...1300 Ohm/cm**) **at 20°C** (this value also varies with the temperature of the heat transfer medium). A more precise value for a particular brand of boiler depends on the design of that boiler - namely the working area of the electrodes.
Therefore, either a specialised liquid with a low freezing point (for the construction of non-freezing heating systems) or a water-based solution with a certain level of electrical conductivity can be used as the heat transfer fluid for the electrode boiler.

For self-preparation of heat exchange fluid, it is recommended to use water purified from all impurities (distilled, rain, snow) in which baking soda (sodium bicarbonate) has been dissolved at a rate of 30 g per 100 litres of water. In this case, the amount of 'basic' heat transfer fluid prepared should exceed the capacity of the system by 20...30%. Excess heat exchange fluid should be drained into a convenient container and stored - it will be needed in case of leaks or to top up the system with an open expansion tank.

When operating the GAZDA GM-102/104/106 boilers at maximum output, the electrical conductivity of the heat carrier should be 350/450 µs/sm.

If a boiler is selected with a clearly inflated capacity, the system will operate correctly on tap water (or other water) with an electrical conductivity of 350...1200 μs/sm (item 6 of Table 1).

6. Installation in a heating system

Before installing the boiler, remove the protective covers and inspect the boiler for visible damage and foreign bodies inside the boiler after transport and storage.

The boiler can be installed vertically or horizontally on a non-combustible wall (brick, concrete, foam concrete, etc.).

The boiler must be fixed to the wall using the clamps supplied with the boiler. The use of clamps is not necessary if the boiler is connected to securely fixed metal pipes.

It is recommended to connect the boiler using taps with folding connections for easy disassembly without draining the heat transfer fluid.

In a system without a circulating pump, the boiler must be installed vertically only! The height of the riser pipe above the boiler must be in accordance with the design.

The heating system must be equipped with a coarse filter (mesh filter) installed before the boiler inlet.

The closed type heating system must include a safety group (safety valve, pressure gauge and automatic air vent) and an expansion tank.

The section of the heating system from the boiler outlet to the safety group must be made of metal pipes and fittings.

The installation location must be selected in such a way as to exclude the entry of liquid or water into the electronic control unit of the boiler (for example, in the event of the operation of a safety valve).

7. Connecting electrical circuits

GAZDA GM-102/104/106 boilers do not have exposed metal surfaces, so they **do not need to be earthed** to connect the boilers to the mains it is necessary to use a separate line with an automatic circuit breaker the rated current of the circuit breaker must correspond to the maximum current of the boiler the connection of the wires supplying the pump and external control equipment must be made strictly in accordance with the markings on the boiler terminals (plate on the left side panel of the control unit).

for connection of boilers to the mains it is necessary to use flexible copper cable. the cable cross-section must comply with the requirements of point 12 of Table 1 for the connection of external control devices it is necessary to remove the jumper in advance from the corresponding terminal block of the boiler control unit sufficient cable conductor cross-section 0.35 mm2.

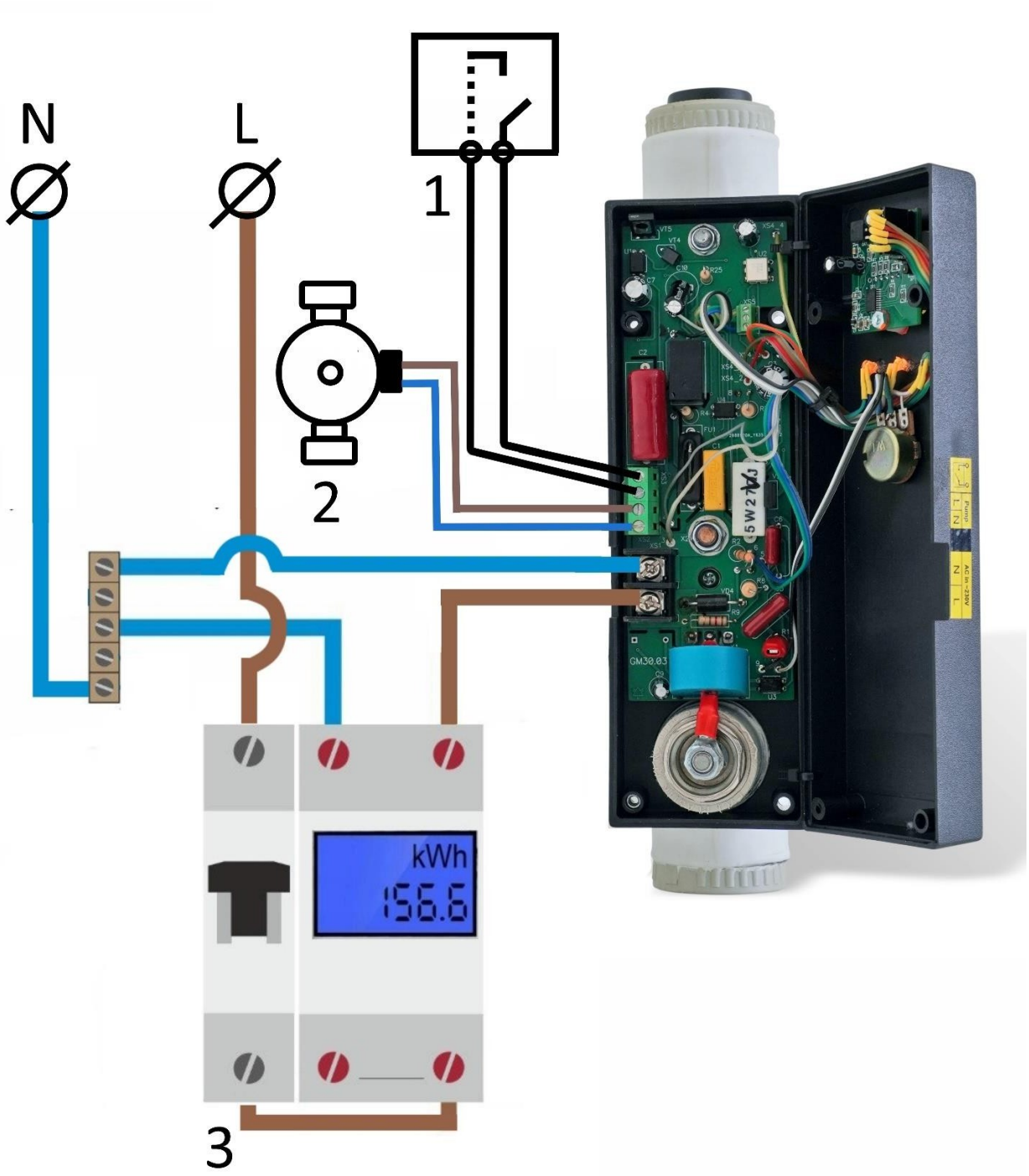


Fig. 1

Connecting the power, pump and external control unit cables.

1-External control device (room thermostat, WI-FI relay with potential-free contacts, etc.).

2-Circulation pump

3-Control box (overcurrent circuit breaker, meter indicating current, voltage and current power consumption)

8. Controls and indications

The controls and indications of the GAZDA GM-102/104/106 boilers are located on the front panel of the control unit, where:

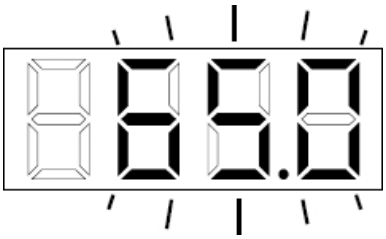
1 - three-digit display
2 - +" button - increase in temperature numerical value
3 - "-" button - reducing the temperature numerical value
4 - LED "OK" - indication of heater deactivation by external control device
5 - LED - pump operating indicator
6 - LED - water heater operation indicator
7 - knob for setting the level of current limitation

9. Parameter setting

9.1. Setting the brine temperature

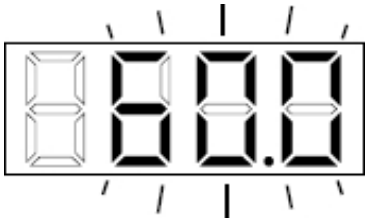
When the boiler is switched on, the display shows the current temperature value, for example as shown in the figure, which corresponds to 26.3 °C.

Displaying and setting the upper limit (cut-off threshold). To display a pre-set upper temperature limit (the value at which the heating will switch off), press the "+" (up arrow) button - the display will go into flashing mode (edit mode), showing the height of the upper limit. The example in the figure is 65°C.



If it is necessary to change this parameter, press and hold one of the "+" (increase) or "-" (decrease) buttons to the desired value while the display flashes (5 seconds). To store the newly selected limit, wait (5 seconds) for the microcontroller to exit edit mode, which will be confirmed by the display stopping flashing and going to the current temperature value.

Displaying and setting the lower limit. To display a pre-set lower temperature limit (the value below which heating will resume), press the "-" button (down arrow) - the display will switch to flashing mode (edit mode) with the lower limit value displayed. The example in the figure is 60°C.



If it is necessary to change this parameter, press and hold one of the "+" (increase) or "-" (decrease) buttons to the desired value while the display flashes (5 seconds). To store the newly selected limit, wait (5 seconds) until the microcontroller exits the

edit mode, which will be confirmed by the display stopping flashing and going to the current temperature value.

9.2. Setting the boiler current limitation level

GAZDA GM-102/104/106 boilers are equipped with a unique current consumption regulator (see section 2), whose task is to supply the heating system with only that part of the mains voltage required to maintain a stable current level selected by the user.
This level will be maintained automatically, irrespective of fluctuations in line voltage and the level of electrical conductivity of the heat carrier

The boiler current limitation level is set using the knob on the front panel in accordance with the controller scale.

10. Commissioning, operation and maintenance of the system

Regardless of the condition of the piping and radiators of the heating system (new or used), the entire system must be thoroughly flushed before pumping the prepared fluid, for this purpose clean water must be pumped into the system, the circulation pump must be connected for 3...6 hours. If the system is old, flushing should be carried out with a corrosion inhibitor - according to the instructions for its use. At the same time as flushing, leaks in the system should be removed.

Then drain the flushing water completely and clean the strainer. Pump the

prepared fluid into the system.

Before commissioning the system for the first time, ensure that the electrical and hydraulic parts of the system are complete, check the wiring and equipment for correctness and reliability.

Start the system - switch on the boiler power supply and select the desired operating parameters.

When starting a heating system in a large cooled room when the water temperature in the system rises for a long time, it is advisable to switch off 30-50% of the radiators during boiler operation. This will reduce the heating time of the water in the 'shortened' heating system and reduce the total adjustment time for the electrical conductivity of the heat transfer fluid, if necessary.

Further operation of the boiler does not require any user intervention, except for adjusting the settings of the automation parameters in order to

to achieve the most comfortable and economical space heating.
It should be understood that the efficiency of a heating system is primarily a function of good thermal insulation of the heated space.

If the system is working properly, the boiler does not require any maintenance, except for checking the tightness of the cable terminals once a year, before the start of the heating season.

The heating system should be cleaned at the end of each heating season.

When operating the system with the expansion tank open, fill it to the normal level:

- distilled water (rain, snow) - if the level is reduced due to evaporation;
- "basic" (see section 5) fluid if the level is reduced due to leakage

11. Possible faults and how to rectify them

Situation	Possible cause	Solution
1.When connected voltage breaker automatic becomes liberated	Failure of the safety switch. Short circuit in the supply cable. Incorrect connection of the boiler.	Replace the circuit breaker. Check that there are no short circuits in the cable and that the phase and neutral wires are connected correctly
2.Current level no reaches the value indicated on the rating plate. System does not reach the set temperature level.	Low conductivity of the heat transfer medium.	Activate the heat transfer fluid. See section 5 "Heat transfer fluid".
3 The current level corresponds to the nameplate value, but the system does not achieve the set level temperatures.	Actual volume heat carrier exceeds the requirements item 13 of Table 1.	Please use the method system reduction (switch off some heaters/circuits in order to heating of the system)
	The output of the heaters/circuits exceeds the output of the boiler	Disconnect some radiators/circuits or install a boiler with a higher capacity
	Conductivity level transfer factor heat significantly exceeds the requirements item 6 of table 1	Change the heat transfer fluid or reduce its conductivity by adding distilled water.
4. the boiler is slowly losing power adjustment conductivity/exchange heating medium does not change the situation.	On the surface of the electrode and housing has formed insulation deposit	Dismantle and clean the boiler electrode and housing inside boiler
	Corrosion ("wear") of the electrode due to aggressive particles in heat transfer fluid	Replace the electrode and carrier warm