

KROS-110

**CONTROLLER
REGULATOR
HEATING SYSTEM
KROS-110**



without heat fluid setting

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1 Purpose

The KROS-110 controllers are designed to ensure safe automatic operation of single-phase electric heating systems and on the basis of electrode boilers and PETN boilers with installed thermal modes and electricity consumption parameters.

The KROS-110 controls **two** hot water **circulation systems** at the same time (includes a separate channel - temperature sensor and solenoid valve contact control group / second pump - all for the installation of a hot water system (in summer - no heating system) or underfloor heating) **with independent temperature setting of the systems.**

The KROS-110 units ensure safe and efficient operation of electrode boilers in heating systems made of any material, while allowing pure water to be used as a heat transfer fluid.

2. Equipment design and operating principles

The KROS-110 is a unit with microprocessor control and solid-state load commutation (boiler and pump).

The installed operational parameters of the system's functioning are displayed on the display and via an LED light.

Functionally, the KROS-110 consists of five controllers and a boiler power controller for their control, an electronic pump control key and a relay to control the three-way valve (or additional pump).

The boiler current controller limits and stabilises the current (power) to the level specified by the user with the handle on the front panel. For example, for a 3 kW boiler, they set the meaning of the maximum current at the level of 13 A. Then, the boiler current must not exceed the specified meaning under any conditions (voltage spikes in the mains, which increases the conductivity of the coolant, etc.). The adjustment is stepless, with the common meaning of the boiler current reflected on the digital display.

The second function of the controller is the short-circuit protection system (SC) of the load, the occurrence of which results in an immediate shutdown of the boiler with subsequent self-resetting after 5 seconds.

The temperature controller (1) for the coolant of the primary circuit of the system (first) disconnects the boiler when the coolant temperature (heat fluid) in the heating system reaches the significance set by the user. The temperature of the heat transfer fluid may not exceed the set value, even in cases where external control devices connected to the KROS-110 extend the "Heating" command.

Heat fluid temperature sensor - Dt1 (Fig.1) - digital, is applied to the unit.

The temperature controller (2) of the auxiliary (second) system controls the boiler and the electric valve / second pump (switches the hot fluid flow in the auxiliary (second) system (system) to reach the temperature of the hot fluid in the system, the value of which is defined by the user. Furthermore, this controller has priority over the others for maximum hot fluid / air temperature.

Heat fluid temperature sensor - DT1 (Fig.1) - digital, is applied to the unit.

When the temperature reaches the upper limit (set by the user), the temperature controller (2) switches the solenoid valve /stops the second pump for boiler operation to the main (first) system and transfers the priority of boiler control to the temperature controller (1). When the temperature drops to a lower value (set by the user), the controller (2) includes another solenoid valve /second pump for operation on the second system and switches the boiler on.

The controller for external control devices makes it possible to manage different types of heating devices: from a simple switch to a computer ("Smart Home"), while the number of control devices simultaneously connected to the KROS-110 is not limited.

The controller has two inputs for control, one of which is the "Heating" unit is to close its contacts, the other is to open it (see section 5.2.2. Connecting external control devices).

The internal temperature controller protects the KROS-110 from overheating inside and outside (heat sink) parts of the unit to prevent damage by shutting down the boiler and pump feeding. Once the unit has cooled

down, the controller automatically resumes operation of the system while maintaining the previously set parameters.

3. Basic technical parameters

- Supply voltage, V ~ 150 ...270
- Frequency, Hz 50/60
- Proprietary current consumption, no more, W 3
- Temperature setting range for warm fluid, °C +5...90
- Temperature setting range of the second system (second system), °C +30...70
- Minimum hysteresis in temperature settings, °C 1.0
- Limiting current adjustment range, A 3 ...30 ± 5%
- Power limit adjustment range, W 250...7000 ± 5%
- Current of output defence "Boiler", A 35
- Diapason of boiler switch-on delay setting (after pump), c 20 ..120
- Maximum internal heatsink temperature, °C 70
- Maximum power of "Pump" output, W 200
- Maximum switchable output power "Valve", W 1200
- Control current in external control chain, mA 0.1
- Continuous mode of operation
- Environmental temperature, °C -20 ...+35
- Splash-protected body, walls
- Overall dimensions (installed), mm 110x120x85
- Weight (without sensors), kg 0.58

4 Safety recommendations

The device uses life-threatening voltage!

When operating and maintaining the controllers, they must comply with the "Technical rules for the operation of electrical consumer settings" and the "Safety regulations for consumers when operating electrical settings". The controller should be used in an explosion-proof room with a relative humidity of up to 80%. The atmosphere must be free of dust, acids, alkalis and other aggressive elements.

BANNED!

Exposes the top cover of the regulator in the presence of voltage in the supply cable.

Installing the controller on wooden or other combustible shields (walls).

Apply voltages to any control inputs.

5. description

5.1 Controls and indicators (display) of the KROS-110 located on the front panel, where:

1 - Four-digit display

2 - Parameter selection button

3 - The "+" button is to increase the numerical value of the parameter

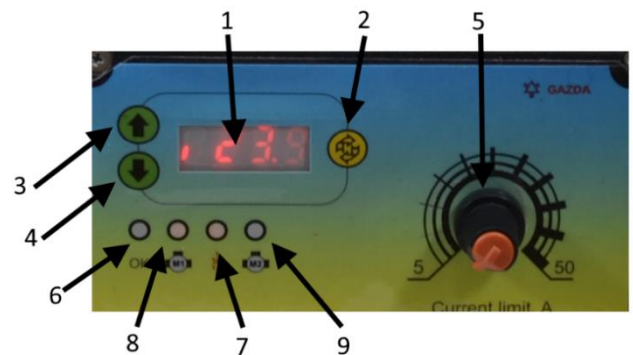
4 - "-" button to decrease the numerical value of a parameter

5 - Current limitation level setting handle (power)

6 - The "OK" LED is an indicator of the heating stop of the external control device

7 - LED - is an indicator of the "Heating" mode

8 - The LED is an indicator (indicator) of the pump



5.2 Connections to device inputs and outputs

5.2.1. Connection of power cables, loads and sensors

temperatures must be carried out in strict compliance with the terminal markings (plates inside the cover and terminal pocket on the left side panel).

Figure1. **Connection of power, load and temperature sensor during operation in a single heat circulating system** (with digital temperature sensor).

- 1 - Boiler
- 2 - Pump
- 3 - Temperature sensor

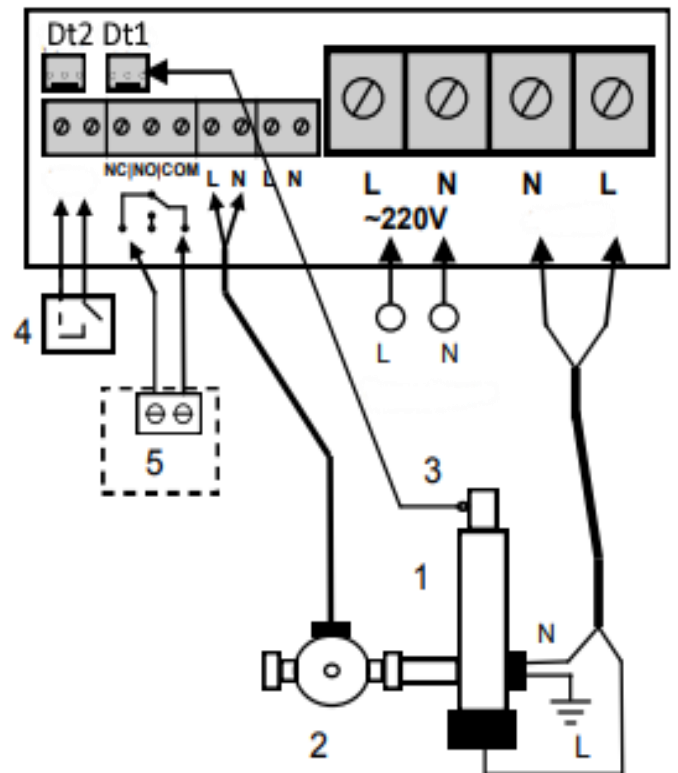
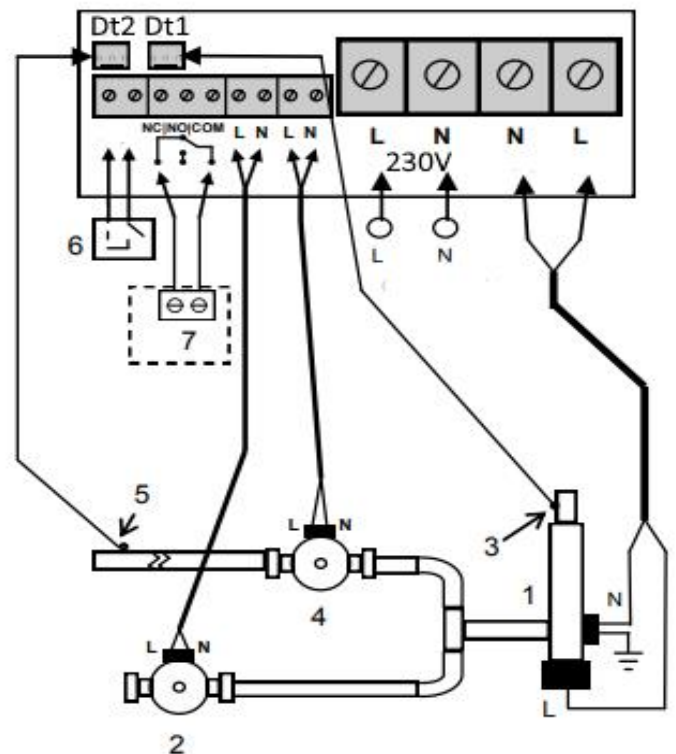


Figure2. **Connection of power cables, load and temperature sensors when operating on two heat fluid circulation systems**(with two digital temperature sensors).

- 1 - Boiler
- 2 - First pump (main) systems
- 3 - First (main) temperature sensor of the system
- 4 - Valve* or second pump (optional) of the system
- 5 - Second temperature sensor (optional) of the system

* *The valve can be two / three / four-way, at the same time it can be installed as "on return" as well as "on supply". - depending on the functional structure of the system*



5.2.2. Connecting external control devices

To control the heating system with external devices (ED), the KROS-110 has two inputs "Control 1" and "Control 2" (see Figures 1 and 2) with opposite logic, which allows any number of external devices (ED) to be used simultaneously.

Namely, for the input "**Control1**" the assembly "Heating" is to **short-circuit** its contacts. This way of control is the most frequently used, the contacts "COM-NO" are used external devices (ED) .

For the "**Control 2**" input, the "Heating" unit is the **opening of** its contacts, the "COM-NC" contacts are used with external devices (ED).

If an external device (ED) is not connected to the KROS-110, jumpers must be placed in the contacts of both inputs.

If only the "Control1"-input is used, a jumper must be inserted in the "Control2"-input contacts.

If only the "Control2"-input is used, there should be no jumper in the "Control1"-input contacts.

The command to stop heating from external devices (ED) is displayed by the glow of the "OK" indicator (see section 5.1) on the front panel of the KROS-110.

5.3 Parameter setting

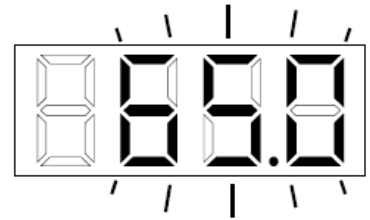
All user-accessible parameters of the system operation, except for the current boiler limit (output) level, happen by means of the functional buttons on the front panel of the KROS-110 (see section 5.1) with the reflection of the numerical value on the four-digit display. The first character - to display the parameter code and the rest - its numerical value.

5.3.1 Setting the temperature of the primary (first) circuit heat fluid of the system (system). When the heating is switched on, the current value of this parameter is displayed by default.



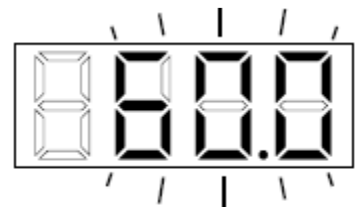
The code for this option is not available, so the display will show, for example - as in the image, which corresponds to 26.3 °C.

Overview and setting of the upper limit. To view the pre-set upper temperature limit (the value at which the heating will be turned off), press the "+" (up arrow) button - the display will change in flashing mode (edit mode), with the upper limit number reflected. Example - in the figure - 65°C.



If you want to change it and the display flashes (5 seconds), press and hold one of the "+" (increase) or "-" (decrease) buttons to the desired value. To store the newly selected limit (boundary), press the button to select the option (on the right-hand side of the screen), or wait (approximately 5 seconds), regardless of the microcontroller output editing mode, which will be confirmed by the display stopping flashing and going to the current temperature value display.

Review and set lower limit. To view the previously set lower limit temperature (the value at lowering to which the heating will be renewed), press the "-" button (down arrow) - the display will change to flashing mode (edit mode) to display the lower limit number. Example - in the figure - 60°C.



If you want to change it and the display flashes (5 seconds), press and hold one of the "+" (increase) or "-" (decrease) buttons to the desired value. To store the newly selected limit (boundary), press the button to select the option (on the right-hand side of the screen), or wait (approximately 5 seconds), regardless of the microcontroller output editing mode, which will be confirmed by the display stopping flashing and going to the current temperature value display.

5.3.2. Setting the current (power) limitation level of the boiler

The KROS-110 incorporates a unique current counter-controller for the boiler (see point 2), the operation of which consists in presenting to the boiler only that part of the mains voltage which is necessary for stable support of the current level selected by the user, irrespective of voltage fluctuations and the level of electric conductivity of the heat fluid. In other words, the KROS-110

"passes" the entire mains voltage to the boiler until the level of the rising current approaches the significance level set by the handle on the front panel - from this moment, heating continues, but already with an unchanging (stabilised) level of boiler current.



The setting of the boiler current (output) limitation level should be done at a boiler outlet temperature close to the upper limit (point 5.3.1) with the boiler running - the display reflects the current meaning.

For this, press the parameter selection button to be reflected in the benefit display with the code (first character) "**c**" (**current**). In the example in the figure - 15.0 A (amperes).

Continue to determine with the handle the necessary level of current limitation according to the benefits of the display, enduring a pause of 2...5 seconds between turns of the handle (to record the inertia of the stabiliser).

Until the parameter selection button is pressed, the display will remain in current display mode (or whatever parameter the user stops at - permanently displaying the current value of the selected parameter).

5.3.3. Selecting the circulation system configuration

The KROS-110 can operate in either one circulation system or two. Configuration selection takes place using the function keys.



General parameter code for the second system - two vertical segments at the bottom of the first character.

First parameter - Switching **on/off the second system**. Press the parameter selection button to select for display "II OFF" (or "II On" - depending on the predetermined task). Switching on the second system - by pressing the "+" button - on the display "II On" . Switching off - pressing "-" - on the "II Off" display.

Caution: configuration with two systems (systems) cannot be selected if the temperature sensor of the second system is not

connected to the KROS-110! In such a variant, operation of the entire system will be stopped and blocked, with error codes "E01" and "E04" illuminated successively on the display. Unblocking is done by pressing the "+" and "-" buttons simultaneously.

5.3.4. Setting the temperature of the second system (second system)

Review and setting of the upper limit. To review the previously set upper temperature limit (meaning, reaching which the heating of the second system will be switched off) press the "+" button (up arrow) - the display will switch to flashing mode (edit mode), reflecting the upper limit number. Example - in the figure - 65°C.



If you want to change it and the display flashes (5 seconds), press and hold one of the "+" (increase) or "-" (decrease) buttons to the desired value. To store the newly selected limit (boundary), press the button to select the option (on the right-hand side of the screen), or wait (approximately 5 seconds), regardless of the microcontroller output editing mode, which will be confirmed by the display stopping flashing and going to the current temperature value display.

Review and set lower limit. To view the previously set lower limit temperature (the value at lowering to which the heating will be renewed), press the "-" button (down arrow) - the display will change to flashing mode (edit mode) to display the lower limit number. Example - in the figure - 60°C.



If you want to change this and the display is flashing (5 seconds), press and hold one of the "+" (increase) or "-" (decrease) buttons to the desired value. To store the newly selected limit (boundary), press the button to select the option (on the right-hand side of the screen), or wait (approximately 5 seconds), regardless of the microcontroller output editing mode, which will be confirmed by the display stopping flashing and going to the current temperature value display.

5.3.5. Setting the boiler switch-on delay

Whenever the system is stopped (power failure, edit settings, control by external devices (ED), the KROS-110 first activates the pump and, after a predetermined delay time (the display reflects the countdown in seconds), reconnects the boiler. This delay time - is a parameter, also available for user conversion.



Parameter code for editing - "d". To review a predetermined limit press the parameter selection button and select the screen display with this code. Example - in the figure - d030 - a delay of 30 seconds is set.

If you wish to change this setting - press and hold one of the "+" (increase) or "-" (decrease) buttons to the desired value. To store the newly selected limit (boundary), press the button to select the option (on the right-hand side of the screen), or wait (approximately 5 seconds) for the microcontroller to exit edit mode on its own, which will be confirmed by the display stopping flashing and moving to the current temperature value display of the first system.

5.3.6. Internal temperature of the KROS-110

Code for this parameter - one vertical segment at the bottom of the first character. This option is not available for editing.

To review the colloquial meaning of the internal temperature and the KROS-110 heat sink, press the parameter selection button to select the display with this code. Example - in the figure - I 40.5 - the temperature consists of 40.5 °C.



The maximum value of this parameter - 70 °C. When this level is reached, the KROS-110 will switch off the load, with the error code "E09" reflected on the display.

Once the temperature has been reduced to 69 °C, the KROS-110 will automatically resume operation of the system while maintaining all previously set parameters.

5.3.7 "Winter" / "Summer" mode

This mode is more often used when operating two circulation systems, the first, the heating system, the second, usually the hot water system (see point 1, point 2).

During "Winter" operation, the KROS-110 controls the heating of both systems simultaneously



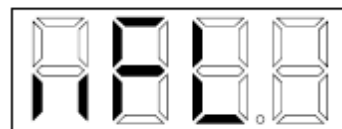
(see point 2). **In the "Summer" triple mode, the heating system locks up***, the boiler only works on the hot water system.

To set the desired mode, press the parameter keys to select the screen to display "**HEA**" (Heating - Heating) or "**SA**" (Summer - Summer) - displays the previously set task). Parameter transformation - press the "+" or "-" button.

The *Heat fluid temperature is roughly set at 10°C. In winter, it is recommended to use this function in "Anti-freeze" mode.

5.3.8. Valve or pump for second circulation system

Depending on whether the executing mechanism (valve or pump) is connected to the "Valve" output (on the left side panel of the KROS-7) for securing the circulation of heat fluid in the second system (system) - it is necessary to select the appropriate value when setting the parameters.



Pressing the parameter keys to select the screen for displaying "**II FL**" (Flap - Valve) or "**II PU**" (Pump) - displays the previously set task). Parameter transformation - pressing the "+" or "-" key.

6 Installation and initial start-up

Caution! Assembly and connection must be carried out by qualified specialists who have studied this User Manual.

When assembling, strict attention must be paid to the supply cable connections and the position of the consumer information board near the contact connectors.

The surface temperature sensors to be applied must be protected with thermal conductive paste KPT-8 (or equivalent) with subsequent thermal insulation from the natural environment.

The installation location of the KROS-110 must ensure free cooling of its heat sink (prohibited in the installation of wall cabinets, shelves, etc.).

The cross-section of the supply cables and the loads should ensure the passage of the corresponding currents without heating.

Conductors connected to the control input terminals "Control 1" and "Control 2 " - not more than 1.0 mm² stripping for connection to terminals - at least 8 mm.

Set the current limitation handle to the minimum setting before starting the system for the first time.

If the heating system is fully prepared for operation, switch on the automatic switch by connecting the power supply to the KROS controller. If electrical power is present, the system will start operating according to the manufacturer's settings:

- The display will show the current temperature value of the first system (system) for 3 seconds.
- After this, the pump will be switched on - the "Pump" LED is confirmed to be lit.
- The display will show a countdown of the 30 second boiler switch-on delay, after which the boiler will be switched on (confirmed by the "Heating" LED glowing), the display will again show the current temperature value of the first system.

In addition, the system is ready for the user to install parameters (see section 5.3).

7 Maintenance

Maintenance of the KROS controller should be carried out before the heating season and afterwards:

- Remove dust from the housing and radiator.

- Check the fixing of the wires in the connectors, ensure that there is no damage to the insulation of the connection wires.

8 Troubleshooting malfunctions and ways of eliminating them

The main potential problems and their solutions are listed in the Tables.

L. p.	Problem (damage), situation	Cause (of failure)	Elimination method (method)
1	Boiler does not work, on the display - flashing words: E01	Absence of temperature sensor Dt2	See para. 5.3.3 on page 9
2	E02	Absence of temperature sensor Dt1	Connect sensor / Check for damage
3	E03	Failure of the internal temperature sensor	Repair in the Service Centre
4	E04	Temperature sensor Dt2 defective	See para. 5.3.3 on page 9 / Check the connected sensor for damage
5	E05	Temperature sensor Dt1 defective	Check the sensor for damage or replace it
6	E06	Failure of the internal temperature sensor	Repair in the Service Centre
7	E08	Temperature of the first (main) system (system) used to over 95 °C	Tune the operation of the pump and the entire second system (lower the temperature / correctly select the location of the temperature sensor). Operation resumes automatically
8	E09	Internal temperature more 70 °C	Reinstall the KROS-110 to a location with better ventilation. Work resumes automatically after cooling down
9	E11	Temperature of the second (optional) system more than 95 °C	Check connected sensor for damage / Replace sensor
10	The boiler switches off periodically (5 ...10 seconds), on the display - "c Hi"	1. the circuit current in the boiler system will exceed the limit value due to a mains voltage surge. 2. short circuit in the boiler system	1. reduce current with the handle on the front panel until the voltage surge is terminated 2. replace wires or repair the boiler
11	Boiler current lower passport meaning even with the handle (grip) position at "30A"	1. low level of thermal fluid conductivity 2. boiler damage (failure)	Make adjustments or replace the heat fluid (see Repair of electrical equipment (boiler control components). Boiler repair (replacement of electrodes)

11	When electrical power is present, the KROS-110 does not function (display does not light up)	Fuse has blown due to a short circuit in the pump system	Replace the fuse. Check cable and pump for short circuit
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In the event of a malfunction, not listed in the table, contact a specialist at the Service Centre or behind the place of purchase of the regulator (controller).

12 Guarantee

Warranty period - 24 months from date of sale.

During the guarantee period, the manufacturer will repair the controller free of charge, provided that the user complies with the connection regulations and the operating instructions (operating manual).

In the event of a warranty repair, this Passport is a must!

The KROS controller is not eligible for warranty repair (servicing) in the following cases:

1. broken case seals.
2. end of the guarantee period.
3. the operating conditions do not comply with the requirements of the User (Operating) Manual.
4. the controller is not used as intended or is not complete in accordance with the User Manual.
5. the controller housing or temperature sensors have the following mechanical damage, corrosion marks with aggressive substances.
6. Presence of dirt and insects inside the unit.
- 7 Lightning strike, fire, flooding.