EKTOR

HEATING SYSTEM

INSTRUCTION MANUAL
TOROIDAL ELECTRODE BOILER «EKTOR»

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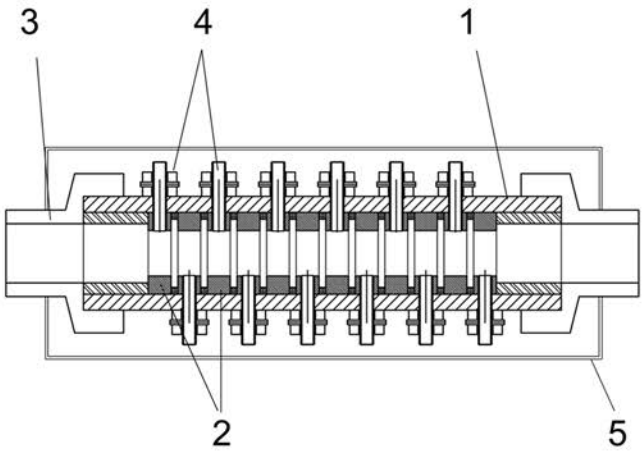
General information

1. General information

Toroidal Electrode Boiler "EKTOR" is a unique development in the field of distribution and conversion of electrical energy, which is confirmed by the patent. The boiler is a water heating element, designed for heating systems with closed contour with forced circulation of water. The power of the boiler depends on the quantity connected electrodes and line voltage. To control the temperature. It is necessary to additionally install a two-channel temperature controller (thermostat). The power of the boiler increases with the temperature of the coolant. If the temperature the coolant on the "return pipe" of the 200C –the body operates at 60% of its rated power. The boiler operates with a rated power at a coolant temperature of 50-600C on the "return flow". When installing and servicing the boiler it is necessary to follow certain rules, therefore

We ask you to carefully read the contents of this operating manual, and when working with the boiler, act according to its recommendations and instructions, as well as keep it for the entire life of the boiler.

We hope that our boiler will serve you for a long time and reliably, and also help to create at home, a pleasant atmosphere and optimum thermal comfort.



The main parts of the boiler "EKTOR":
1. Electrode housing
2. Electrode block
3. Nozzles, for input and output coolant
4. Terminals (power and ground)
5. Boiler body

The boiler complies with the requirements of standards and regulations, operating in the Republic of Uzbekistan, as evidenced by Certificate of Conformity issued by the authorized body.
At installation and operation, it is necessary to be guided by documents:
- Building regulations for heating, ventilation and air conditioning;
- Regulatory requirements for fire safety;
- Electrical Installation Rules/ Rules of Technical Operation for electrical installations of consumers;

3
Protection class

2. **Protection class:**

According to the method of protecting a person from electric shock, the device refers to class I GOST 27570.0-87. 2.2.18.
"A class I device is a device in which protection against electric shock provided with both basic insulation and additional security measures in which the available conductive parts are connected to a protective grounding fixed wiring so that the available conductive parts cannot be energized in case of damage to the main insulation."

3. **Characteristics of the heating device:**

Regulation range of heat transfer (power) - ***1-20 kW***
Heated area: ***10-300 m2*** *(with a ceiling height of 2.5 m)*
Works with voltage: ***110-220-380 V***
Efficiency (efficiency protocol) ***99,9%***
Recommended system pressure: ***1.2 to 3 bar***
Alternating current of industrial frequency: ***50 (60) Hz***
Connection to any kind of electrical network - ***1 phase, 2 phases, 3 phases***
Connection to 220 / 380V network with installed protective cutout device ***(RCD)***
Work on any coolant (except dielectrics)
Impossibility of incapacitation ("dry run", "voltage change")
Insulated casing (heat resistant polypropylene up to 152 ° C)
Tight installation (welding of polypropylene, crimping 8 bar.)
Steel electrodes (alloy) ***10 mm***
3 year *warranty*
The weight of the boiler is ***2.5 kg****, size:* ***30cm / 10cm / 10cm***
Dielectric coolant inlet and outlet.

4
The principle of operation of the boiler

4. The principle of operation of the boiler.

The design of the boiler is a group of toroidal electrodes, placed in a dielectric case at a distance from each other (Fig. 1)

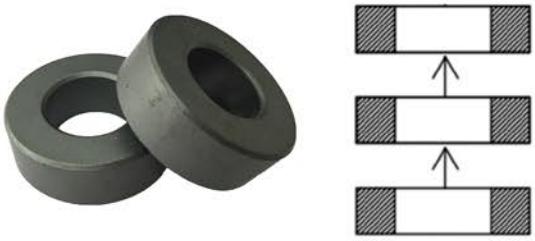


Fig. 1 Toroidal steel electrodes

Electrodes do not heat and are not heating elements, heating heat carrier is produced by direct conversion of electrical energy into heat, in the coolant.
*Electric alternating current feeds the electrodes, passes through the coolant, does work (Q = A, A = U * I * t) by changing its temperature. Science explains it by that in solutions the main charge carriers are positive and negative charged particles - ions, the movement of which leads to the release of thermal energy and, as a result, to heat carrier heating (Fig. 2).*

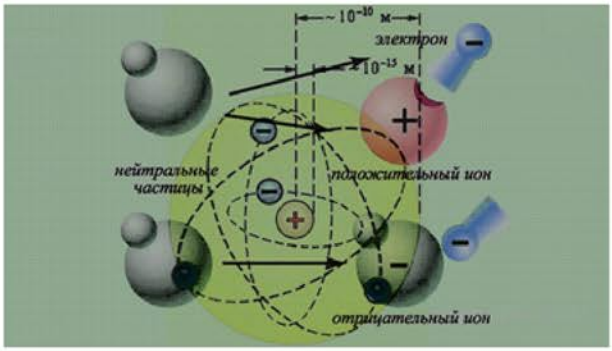


Fig. 2 The principle of operation of the heater

In the absence of coolant in the system, as a result of leakage, the air gap between the electrodes creates a gap in the electrical circuit, which leads to the disconnection boiler, ensuring the fire safety of the device.
When filling the system, the boiler works, the coolant closes the electrical circuit, being a conductor of electric current.

5
Anti-electrolysis

5. **Anti-electrolysis.**

Canadian University Electrochemical Studies
Minitoba in 1929, showed that electrolysis (gas) in steel electrodes
stops when the current density is below 2.5 A per 1 cm^2 of the electrode surface.

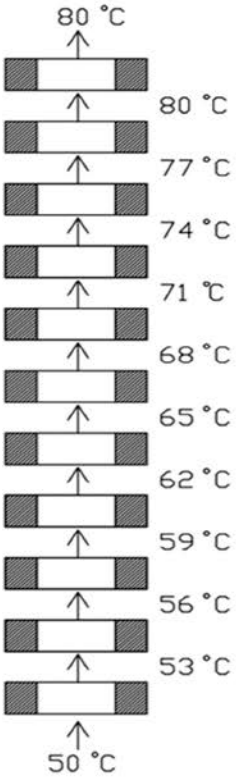
From the research article (translation): "No, even a small amount electrolytic gas will not be obtained until the current density reaches 2.5 A / cm^2 electrode. Link to the material of the research is on company website.

Compare the research data and the work of the boiler "EKTOR", on the current (I, A): connection 1 phase - 220V, power 6kW, 6000 W / 220V = current 27A, 10 mini boilers work in the case, current 27A / 10 = 2.7A, area of 1 electrode (mini boiler) = 4.83 cm2, we determine the current 1 cm2 of the electrode surface 2.7 A / 4.83 cm2 = 0.5 A, the result is that the current 0.5 A is less than the required 2.5 A by 5 times, which makes the generation of gases (electrolysis) impossible, and suggests that in the electrode boiler "EKTOR" there is no process of destruction of the coolant and electrodes.

6
The effectiveness of the principle of heating

6. **The effectiveness of the principle of heating.**
Each space between the electrodes is a separate mini "boiler",
the heated coolant moves from the "boiler" to the "boiler" increasing in temperature
*at **1-3°C**, depending on the number of connected electrodes and*
voltage (110-220-380V).

Electrodes "mini boilers"



High hysteresis (the temperature difference between the coolant inlet and outlet from the boiler) to *30°C* indicates the instantaneous heating of the entire coolant in boiler chamber. Inspection and preparation of the coolant. The boiler is designed for use on distilled water. Inspection and preparation of the coolant is performed using a two-electrode probe, supplied with the boiler.

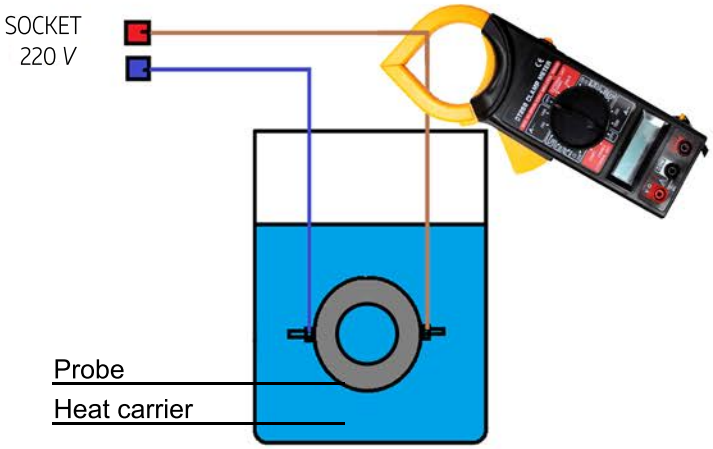
7
Method of testing and preparation of the coolant

7. **Method of testing and preparation of the coolant:**
- Drush from the system 1l of the coolant into a plastic container
- We let the probe into the coolant, turn on the outlet
- With the help of measuring ticks, we determine the current, A, (the required value is 3-3.3 A)
- The temperature of the coolant when measuring should be 30-50 ° C.
Warning: do not put your hands into the coolant during the measurement.
In case of a current reading of more than 3.3 (A), add distilled water, in the case of a current reading of less than 3.0 (A), add any low-freezing heat carrier with high electrical conductivity (the value of current consumption probe more than 3.3A)

Attention!
Corrosion of aluminum and the resulting leakage due to unsuitable coolant.
Unlike, for example, steel, gray iron or copper, the reaction of aluminum on alkaline coolant (pH value> 8.5) flows with considerable corrosion.
Ensure that the pH of the coolant in contact with aluminum is in the range of 6.5 - 8.5 pH.

8
Inspection and preparation of the coolant

Example of coolant preparation



Turn on the probe in the socket, we will switch measuring pincers in current measurement mode (A-), grip pliers any of the wires (one), we write the value (A). Water from the central water supply system (1 liter) when measuring measuring ticks shows current -5 (A), we need to lower water conductivity up to consumed current probe 3 - 3.3 (A). With the help of measuring cup in portions (200 ml) pour distilled water until the required 3.3 (A) is reached, write down the amount of distilled water added. Result: 0.7 liters of distilled water was added to 1l of tap water, The resulting heat carrier volume is 1.7 l.

Calculate the composition of the coolant for the entire system:
Conventionally, the volume of the heating system - 30l
30l / 1.7l = 17.6 parts
Tap water 1l x 17.6 = 17.6 liters
Distilled water 0,7l x 17,6 = 12,3 liters

9
Reliability, durability of the device

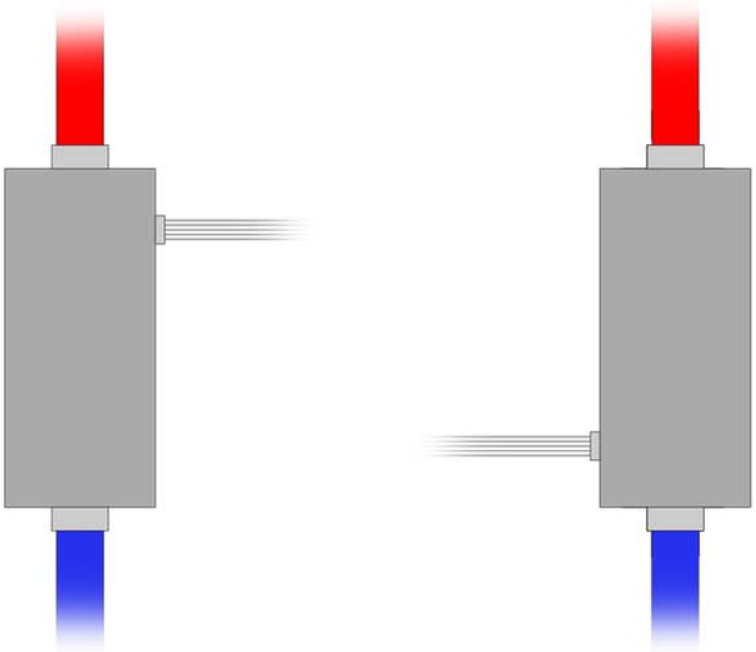
8. Reliability, durability of the device

The unique design of the Boiler "EKTOR" indicates the impossibility of output devices fail due to:

- lack of the heating elements which are heated up nodes - there is no scum
- lack of electrolysis processes (destruction of electrodes, gas formation)
- body of electrodes and connections - Polypropylene material (service life 30 years)

9. Installation of the boiler

To install the boiler on the wall it is recommended to use a self-tapping screw (d 3.5 mm) or dowel-nail 6 x40, it is possible to operate the boiler without fastening to the wall (installation in the pipe) due to its low weight.
The boiler is mounted in the system strictly vertically in any position.



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10
Connecting the boiler to the heating system

10. Connecting the boiler to the heating system.

In order to reduce heat losses of the main pipeline, the heating
The system is recommended to perform a "polypropylene" material (pipe, fittings, cranes, couplings). The connecting pipes of the boiler should not be subjected to stress from the pipes of the heating system. This condition implies strict compliance.the sizes of the ends of all connected pipes, both in height and distance from the walls and the mutual arrangement of the individual inputs and conclusions in relation to each other.

It is recommended that the design of connecting the boiler to the heating system is carried out in such a way that, if the boiler needs to be repaired, the coolant can only be drained from it.

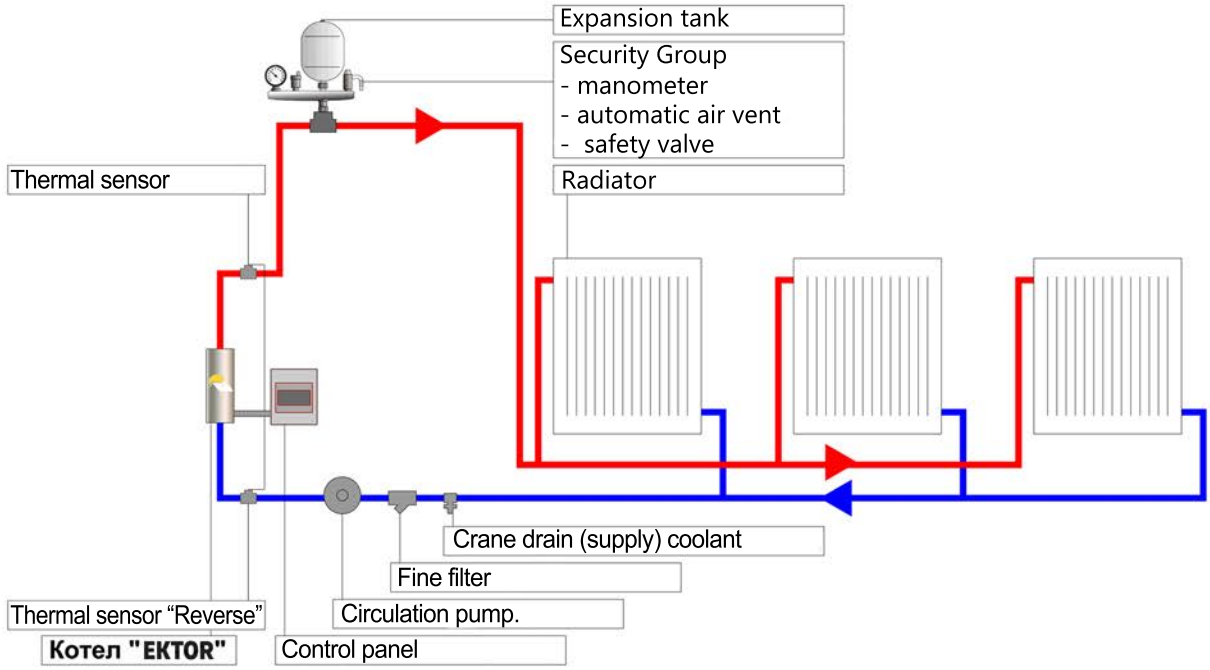
The connection with the heating system is carried out with the aid of a split PP coupling D32 using polypropylene welding.

Mandatory presence of the main elements of security of a closed heating system (security group, expansion tank, coarse filter in front of the boiler).
Efficiency of the EKTOR Boiler increases with the presence in the control system heating, two-channel thermostat, for thermostat is necessary install thermowell-holders at the "inlet" and "outlet" of the boiler.

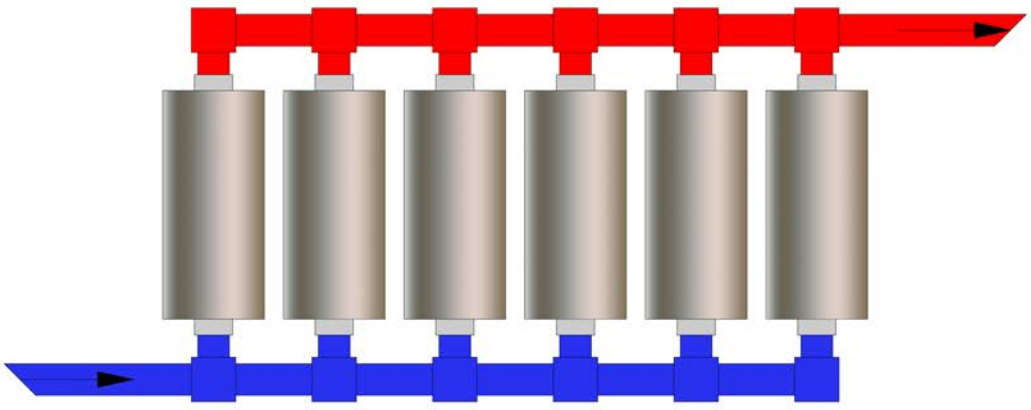
The efficiency of the water heater will also increase, provided that the volume of coolant in the heating system by 1 kW of power does not exceed 15 liters.

11
Installation of the boiler

Heating system diagram



It is also possible to install boilers (parallel) in a row manner, with the aim of increase the heating power of the coolant. Installation is performed by welding using polypropylene connecting elements, with a common entrance and a common outlet to the feed highway heating system.



12
Electrical connection of the boiler

11. Electrical connection of the boiler.

GROUNDING WIRES "EARTH" MANDATORY!

The electrical connections of the boiler to the network are made by authorized specialists. Maintain electrical installations with voltage up to 1000 V. Before installing the boiler, the user is obliged to ensure the laying of a separate power line to the boiler, including the main switch, fuses, as well as carry out the other necessary conversions in the external wiring with the project. After connecting the network wires, you need check the tightness of the screws on the power connectors and contactors.

Boiler "EKTOR"is a safe electrical device, all current is closed in the body of the electrodes and the electric potential does not spread beyond its limits when properly connected according to requirements of the EMP. Thanks to this, the boiler "EKTOR" can be connected to the electrical network with a residual current device (RCD) installed in it, in this case the grounding of the open. Conductive parts of the heating system are not required. If the boiler is connected to an electrical network without RCDs, then all exposed electrically conductive parts of the boiler and heating system must be grounded The design of the protective grounding and grounding device must comply with requirements of PUE, "Rules for the Construction and Safe Operation of Electric Boilers and electric boiler. " For energy saving purposes it is recommended to use the thermostat with temperature control "flow" and "return flow", as well as the installation of thermostats on radiators heating (thermal head).

With properly prepared coolant (the value of current consumed by the probe is 3-3.3 A) rated power of the boiler "EKTOR":
20 kW at connection to 3 phase mains / 380V
6 kW at connection to 1 phase network / 220V

The power of the boiler is regulated by means of circuit breakers connected to the boiler according to the electrical diagrams of this manual.

For the connection option 220V / 6 kW:
(the number of consecutive circuit breakers increases power)
N1 - 1.2 kW; N2 - 2.4 kW; N3 - 3.6 kW; N4 - 4.8 kW; N5 - 6.0 kW (scheme N1)

For connection option 380V / 20 kW:
(the number of consecutive circuit breakers increases power)
N1 - 7 kW; N2 - 14 kW; N3 - 20 kW (scheme N9)

The EKTOR boiler is able to work in loads over 50% of the nominal, which indicates the stock strength of the device, but deliberately exceeding the indicated power is not recommended (current above 3.3 A) due to the activation of the processes (gas formation) of electrolysis.

13
Connection to single-phase network 1 x 220V

	Мощность, кВт	Сечение жилы, кв. мм при напряжении в сети		Номинальный ток автомата защиты, при напряжении в сети, А	
		220В	380В	220В	380В
1фаза 220В	1,2	2,5		10	
	2,4	2,5		16	
	3,6	2,5		25	
	4,8	2,5		25	
	6	4		32	
2фазы 380В	3		2,5		10
	7		4		25
	11		6		32
	16		16		50
	18		16		50
3фазы 380В	6 - 7		2,5		16
	12 - 14		4		25
	20		10		40

Calculation table required copper conductor sections cable and circuit breaker

12. Connection to single-phase network 1 x 220V

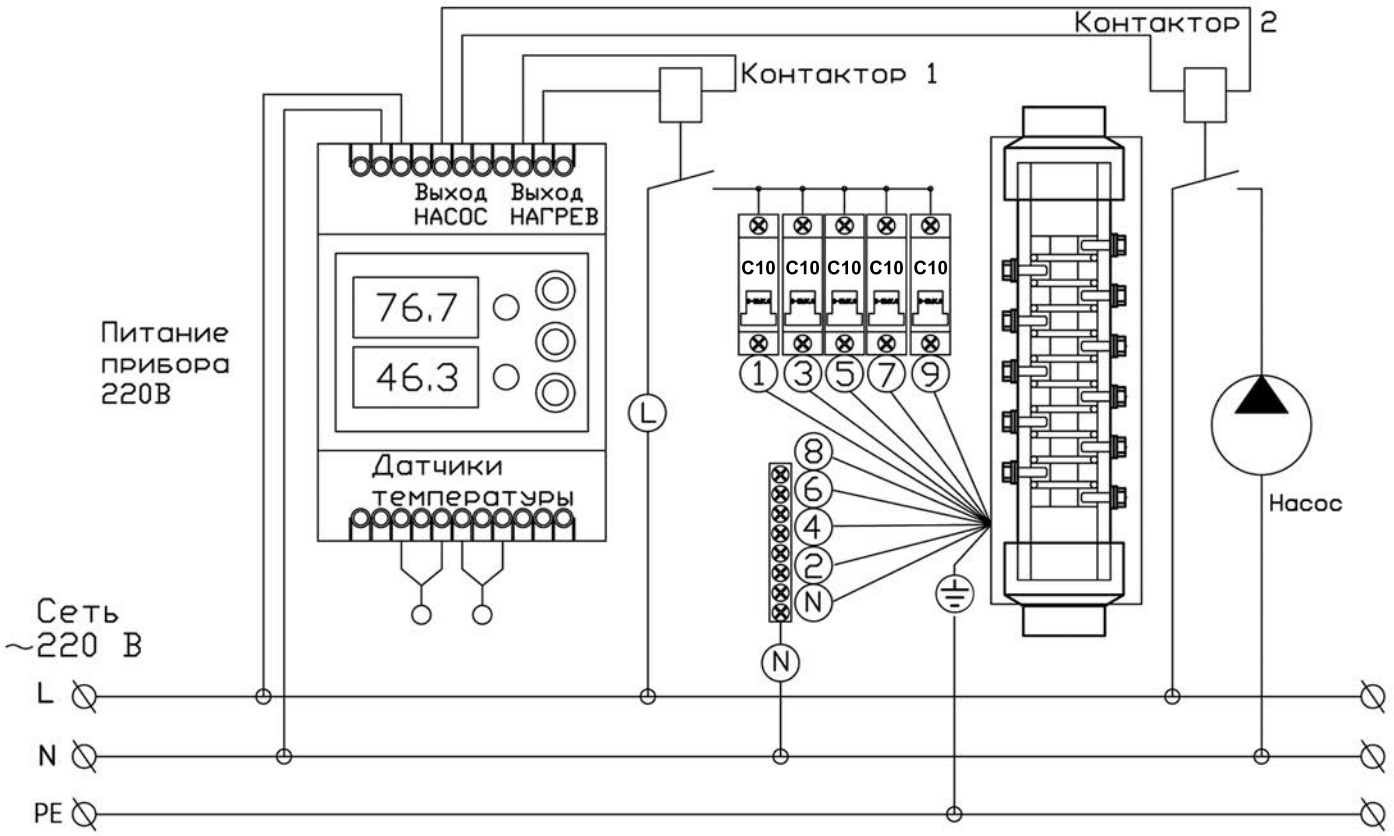
Make the electrical connection according to the scheme N1, N2 (1 phase network) or scheme N3, N4 (1 phase network with RCD)
Electrical connection must be strictly in accordance with the license plates.
the connections specified in the scheme, each wire of food of a copper has the individual Tag number, ground wire "Earth" is required.

The unit of single-pole automatic switches 10A (5 pcs.) Is intended for power on and off the electrodes, as well as automatic safety device in case of current overloads.

Switching on each single-pole circuit breaker adds 1.2 kW power, providing the power of the boiler to 6 kW.
An example of increasing power:
N1 - 1.2 kW
N2 - 2.4 kW
N3 - 3.6 kW
N4 - 4.8 kW
N5 - 6.0 kW

14
Connection to single-phase network 1 x 220B
Rated power 6 kW

Connection to single-phase network 1 x 220B



This method of connecting the boiler allows you to change the nominal heating power at its discretion and in the absence of a thermostat, to control the temperature heating system independently.

Example:
During the day, two circuit breakers -N1, N2 = 2.4 kW are on,
At night, five automatic switches -N1, N2, N3, N4, N5 = 6 kW are turned on

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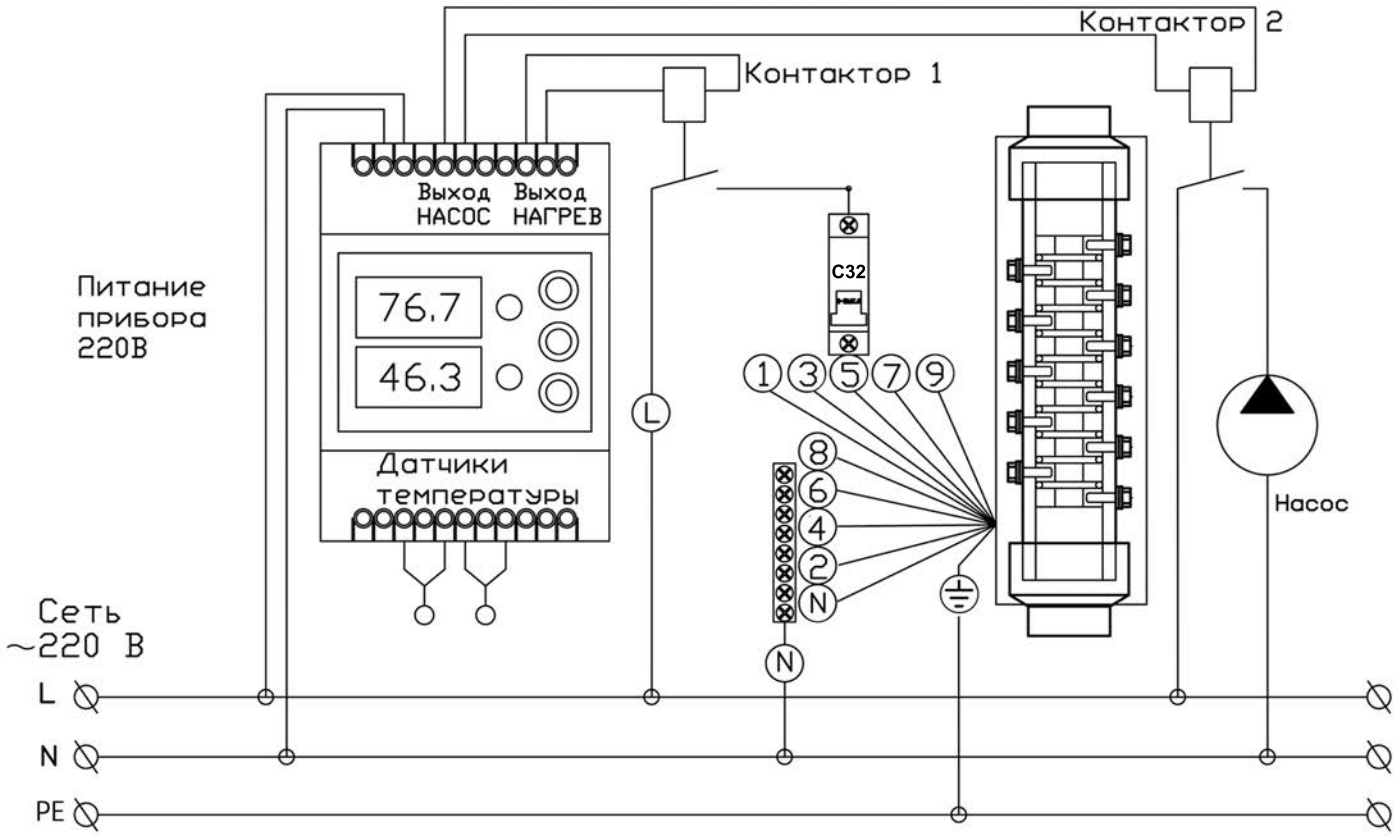
15
Connection to single-phase network 1 x 220B
Rated power 6 kW

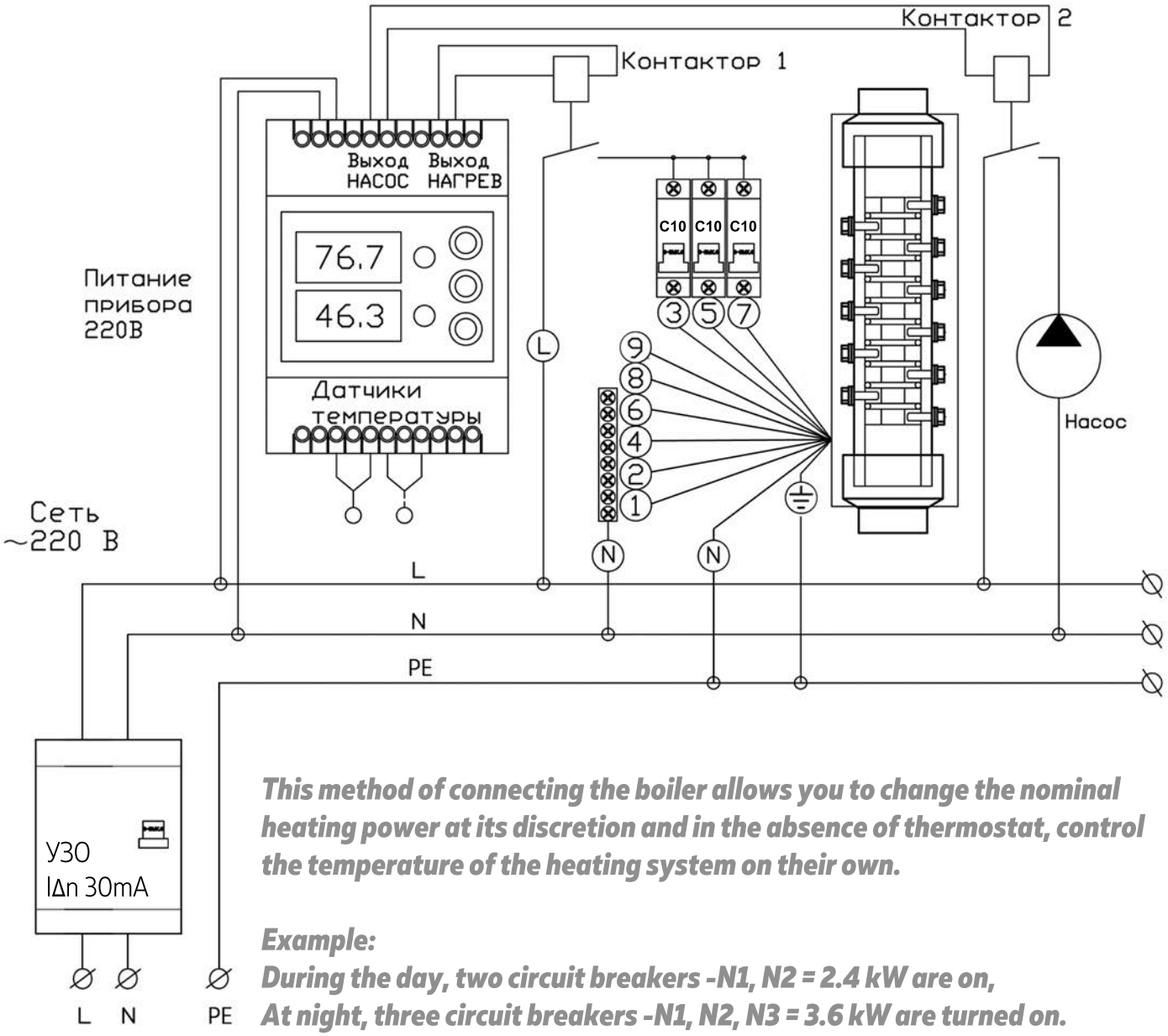
Connection to single-phase network 1 x 220B



Option of application of the 1st unipolar automatic switch 32A eliminates the change in rated power
6 kW / 220, the goal is to assemble the control of the boiler in 1 small-sized electrical panel.

Connection to the Single-phase network 1 x 220 V / s RCD Rated power 3.6kW

Connection to the Single-phase network 1 x 220 V / s RCD

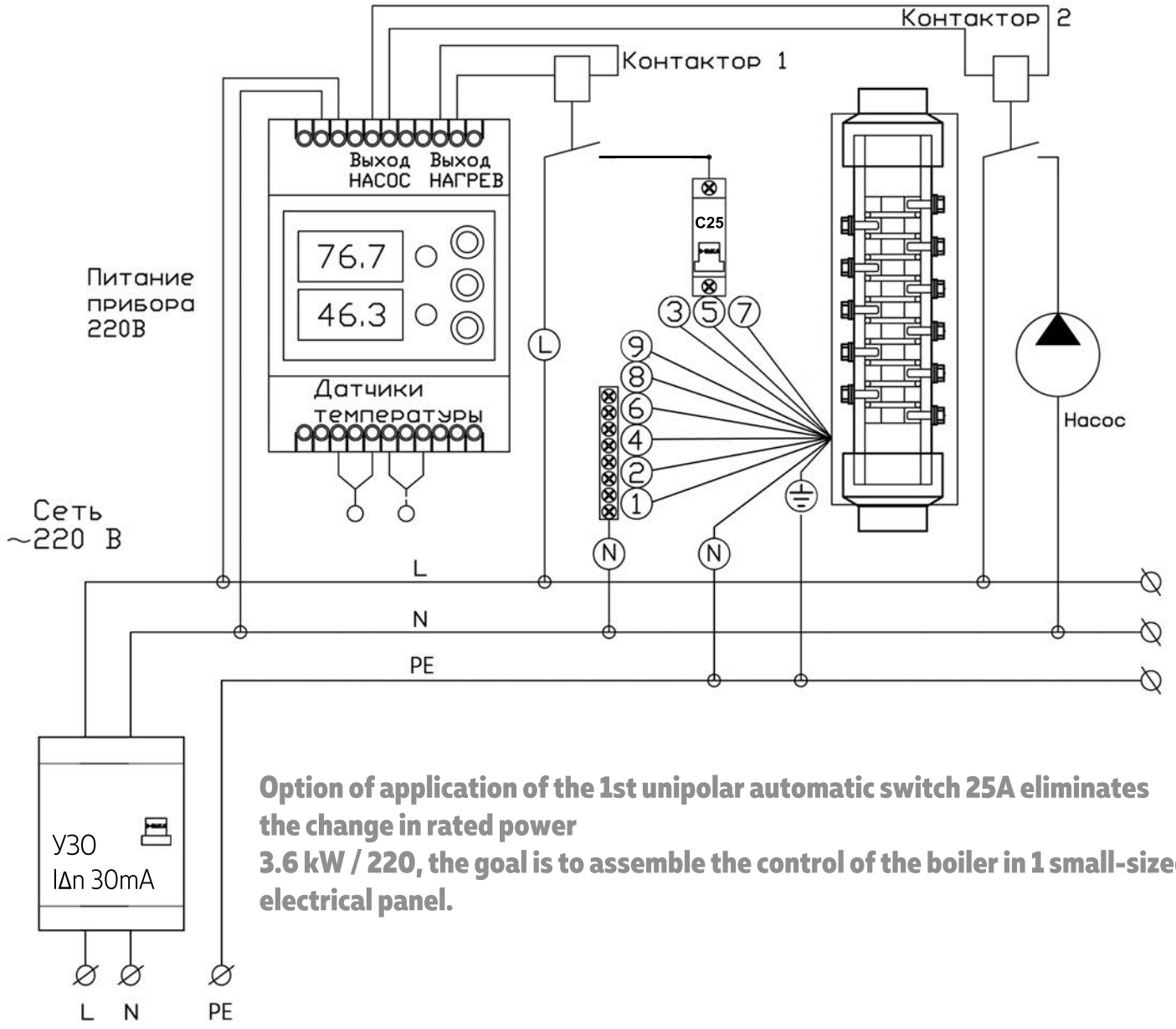


This method of connecting the boiler allows you to change the nominal heating power at its discretion and in the absence of thermostat, control the temperature of the heating system on their own.

Example:
During the day, two circuit breakers -N1, N2 = 2.4 kW are on,
At night, three circuit breakers -N1, N2, N3 = 3.6 kW are turned on.

17
Connection to the Single-phase network 1 x 220 V / s RCD Rated power 3.6kW

Connection to the Single-phase network 1 x 220 V / s RCD



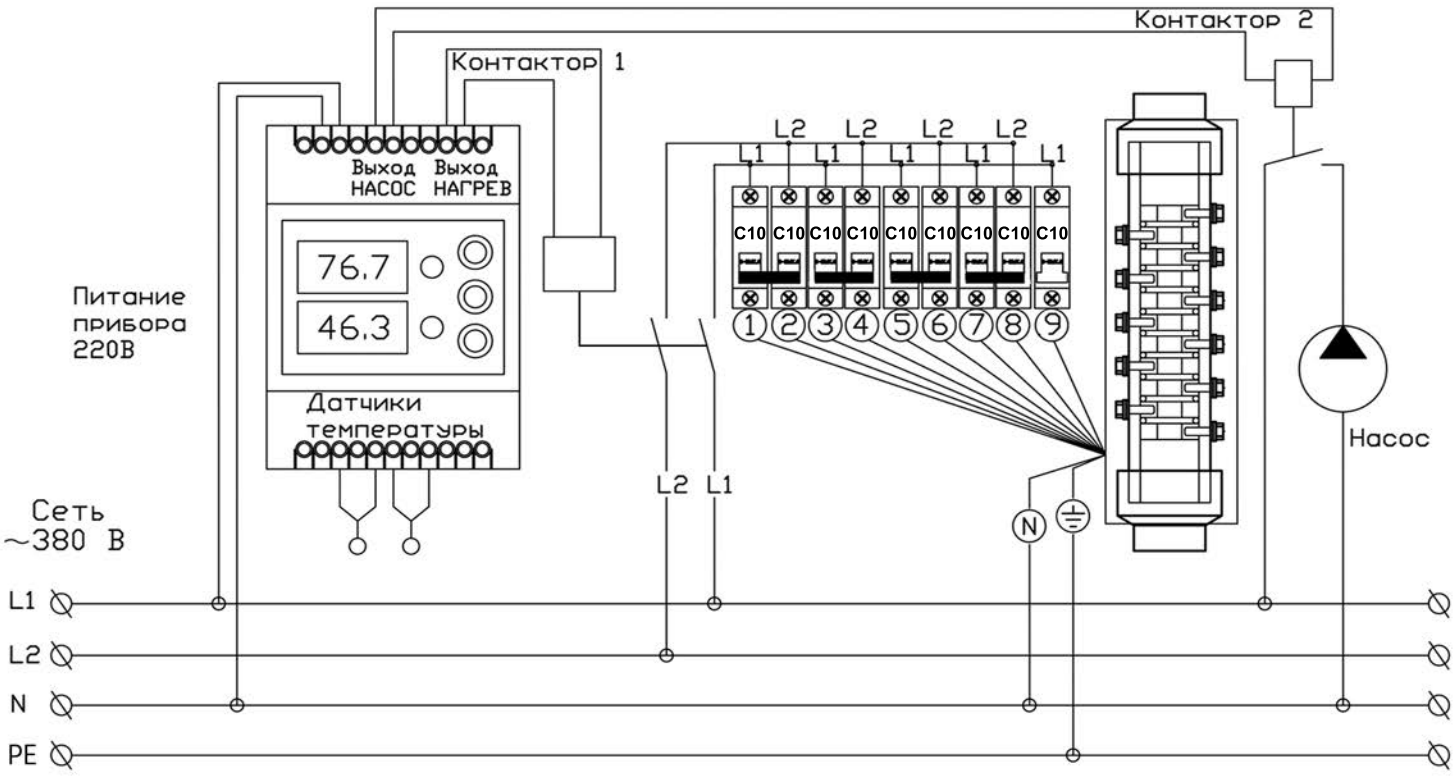
Option of application of the 1st unipolar automatic switch 25A eliminates the change in rated power 3.6 kW / 220, the goal is to assemble the control of the boiler in 1 small-sized electrical panel.

18
Connection to a two-phase network 2 x 380 V
Rated power 18 kW

13. Connection to a two-phase network 2 x 380V

Perform electrical connection according to scheme N5, N6 (2 phase mains) either N7, N8 (2 phase network with RCD)

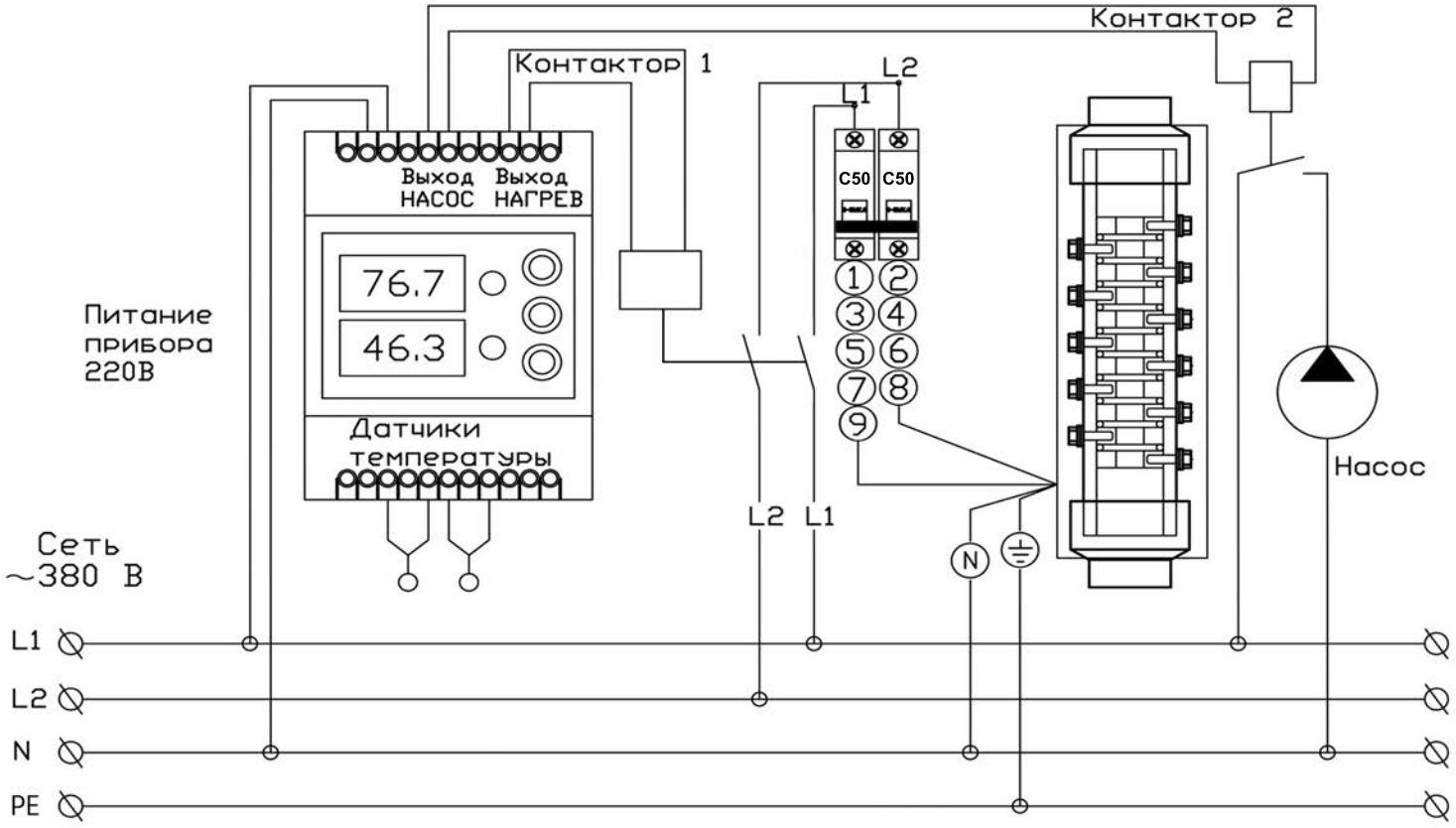
Connection to two-phase network 2 x 380 V



Turning on each bipolar circuit breaker adds 4 -5 kW of heating power, providing the power of the boiler to 18 kW.
Example of increasing power: N1 - 3 kW, N2 - 7 kW, N3 - 12 kW, N4 - 16 kW, N5 - 18 kW

19
Connection to two-phase network 2 x 380 V
Rated power 18 kW

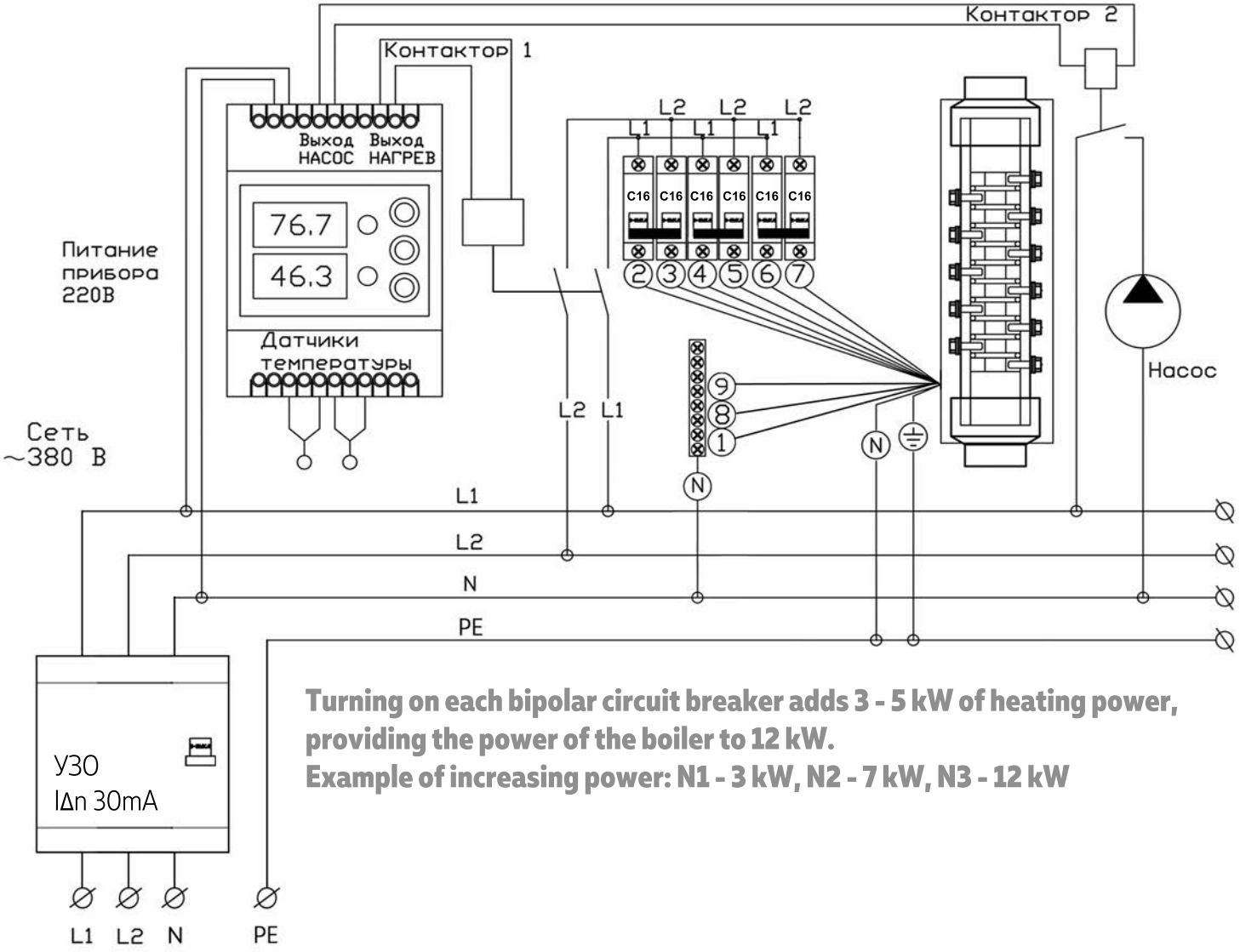
Connection to two-phase network 2 x 380 V



Option of application of the 1st Bipolar automatic switch 50A eliminates the change in nominal power 18 kW / 380, the goal - to collect control of the boiler in 1 small electrical switchboard.

20
Connection to two-phase network 2 x 380 V / s RCD
Rated power 18 kW

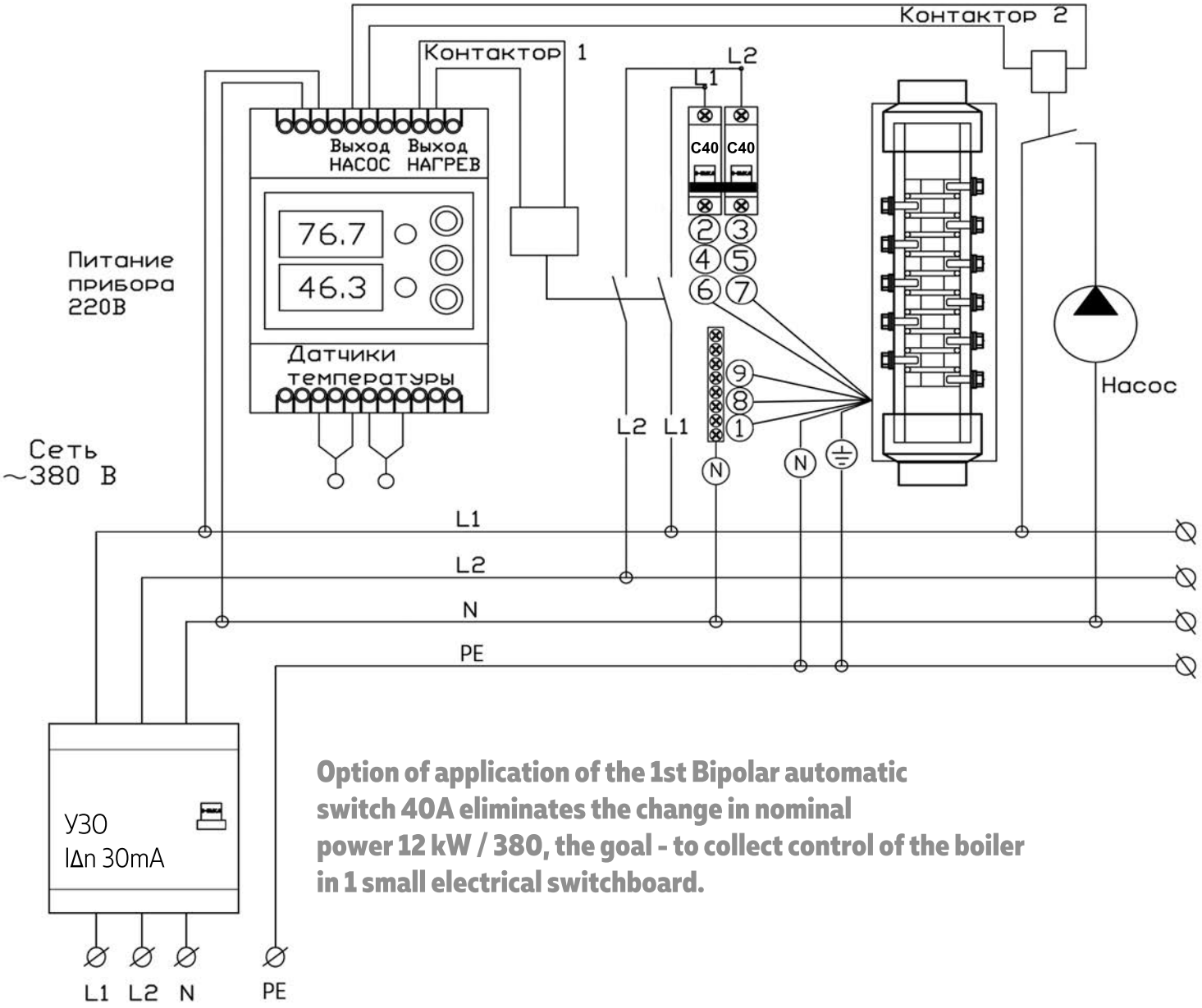
Connection to two-phase network 2 x 380 V / s RCD



Turning on each bipolar circuit breaker adds 3 - 5 kW of heating power, providing the power of the boiler to 12 kW.
Example of increasing power: N1 - 3 kW, N2 - 7 kW, N3 - 12 kW

21
Connection to two-phase network 2 x 380 V / s RCD
Rated power 12 kW

Connection to two-phase network 2 x 380 V / s RCD



Option of application of the 1st Bipolar automatic switch 40A eliminates the change in nominal power 12 kW / 380, the goal - to collect control of the boiler in 1 small electrical switchboard.

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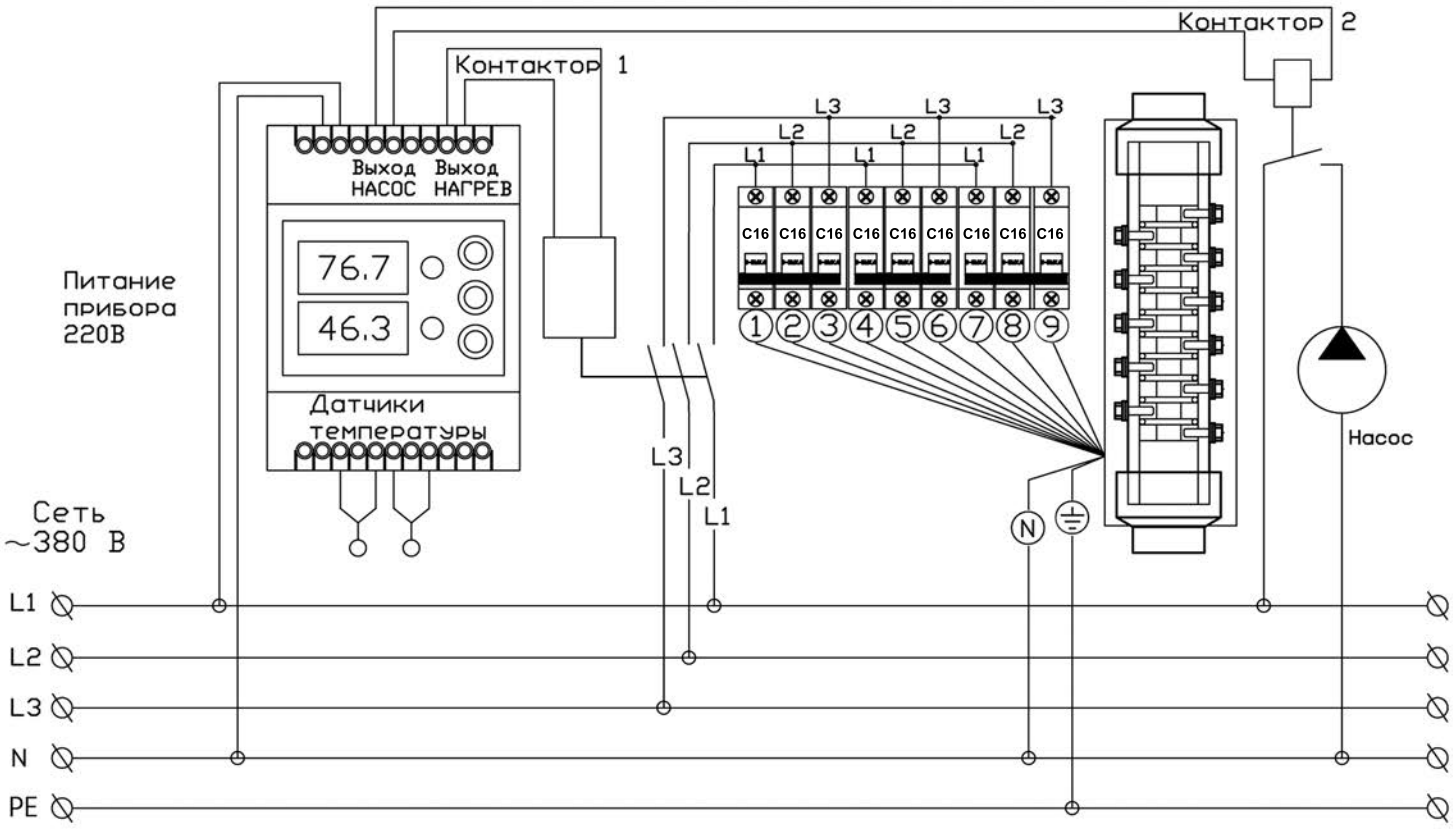
Connection to the Three-phase network 3 x 380 V
Rated power 20 kW

14. **Connection to a three-phase network 3 x 380V.**
Make the electrical connection according to the scheme N9, N10 (3 phase network) either N11, N12 (3 phase network with RCD)

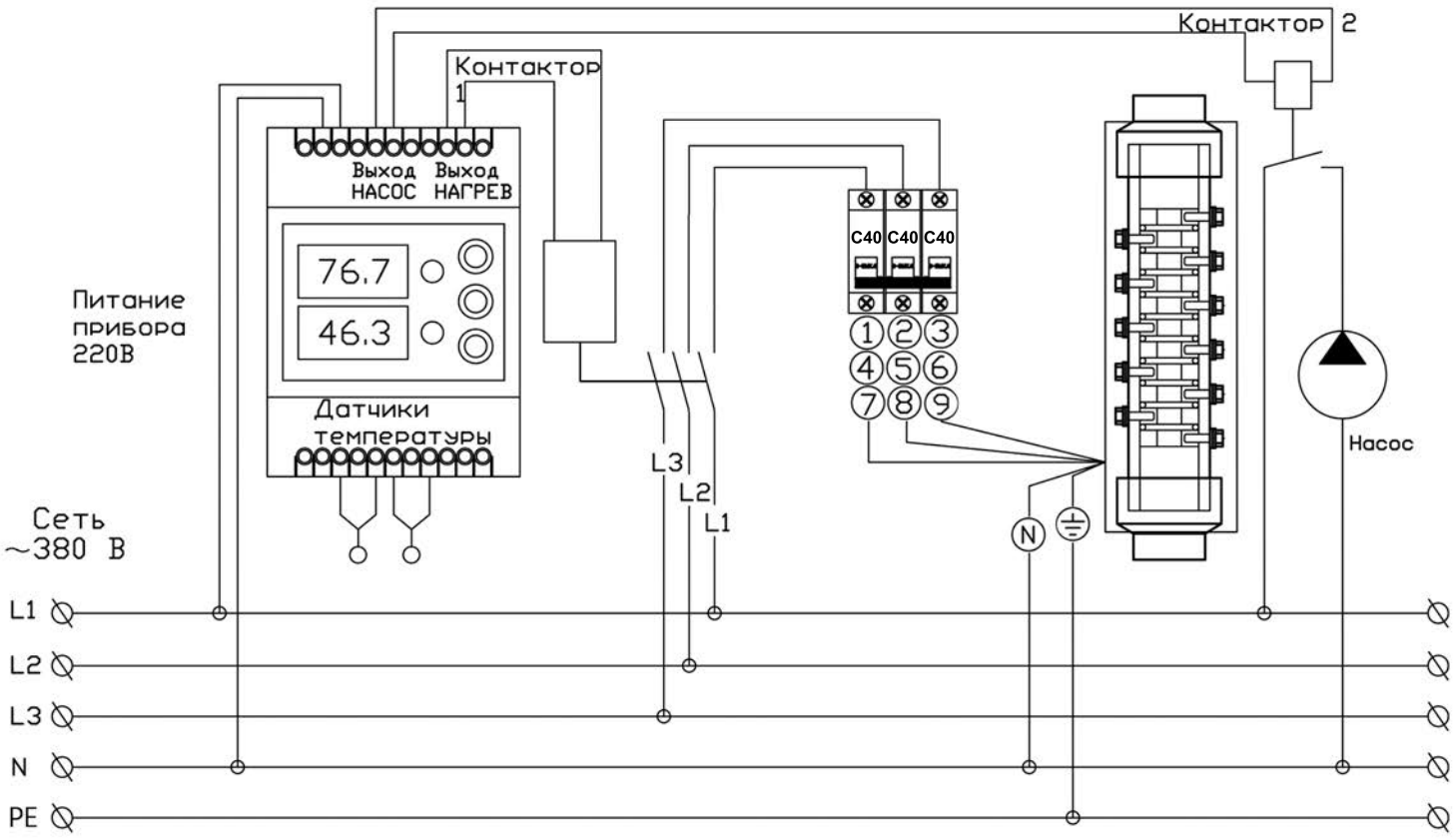
Connection to the Three-phase network 3 x 380 V



Turn on each three-pole circuit breaker
adds 6-7 kW of power, providing the power of the boiler up to 20 kW.
Example of increasing power: N1 - 7 kW, N2 –14 kW, N3 - 20 kW

23
Connection to the Three-phase network 3 x 380 V
Rated power 20 kW

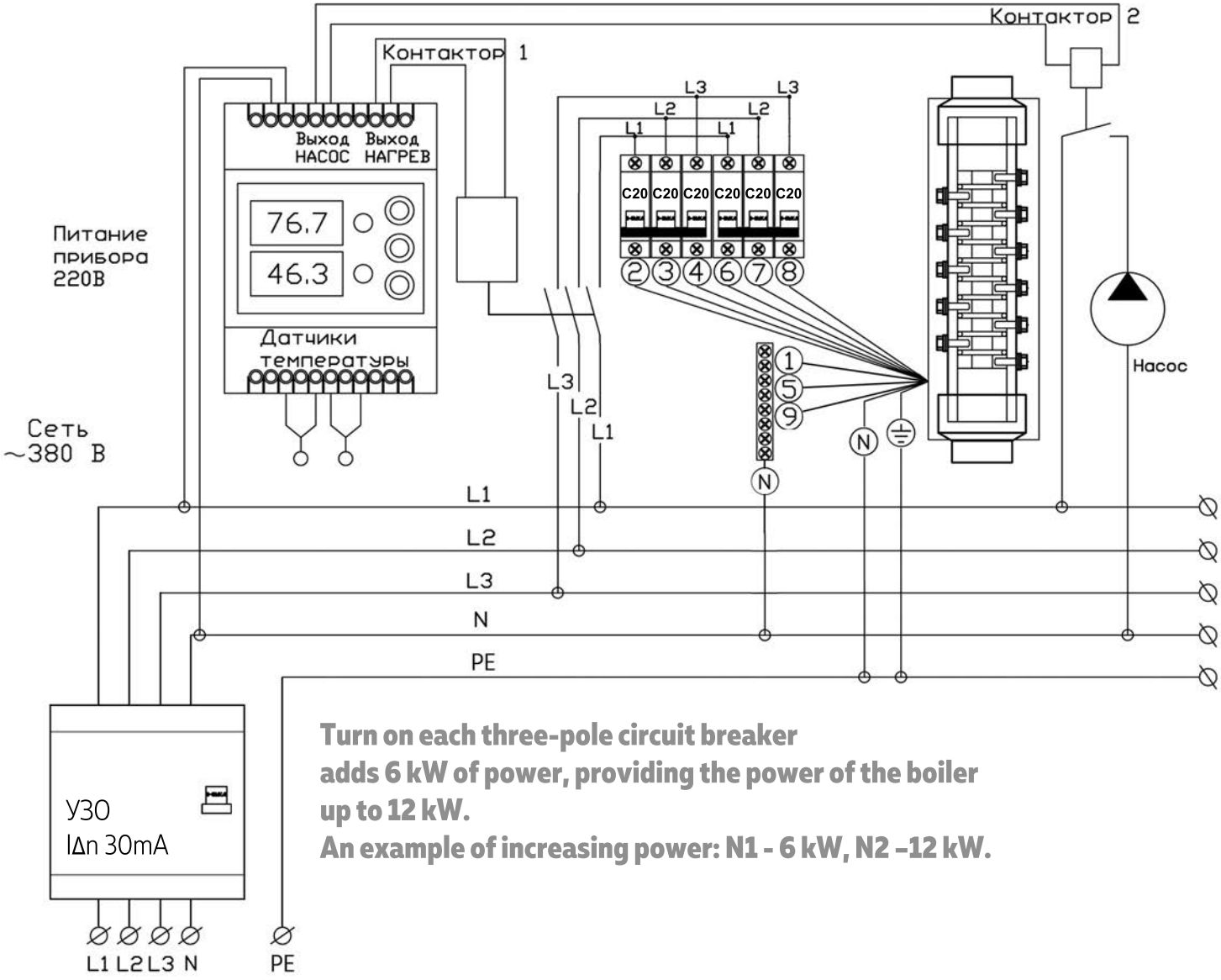
Connection to the Three-phase network 3 x 380 V



Application variant of the 1st Tripolar Circuit Breaker 40A eliminates the change of the rated power of 20 kW / 380, the goal is to collect boiler control in 1 small electric switchboard.

24
Connection to the Three-phase network 3 x 380 V / s RCD
Rated power 12 kW

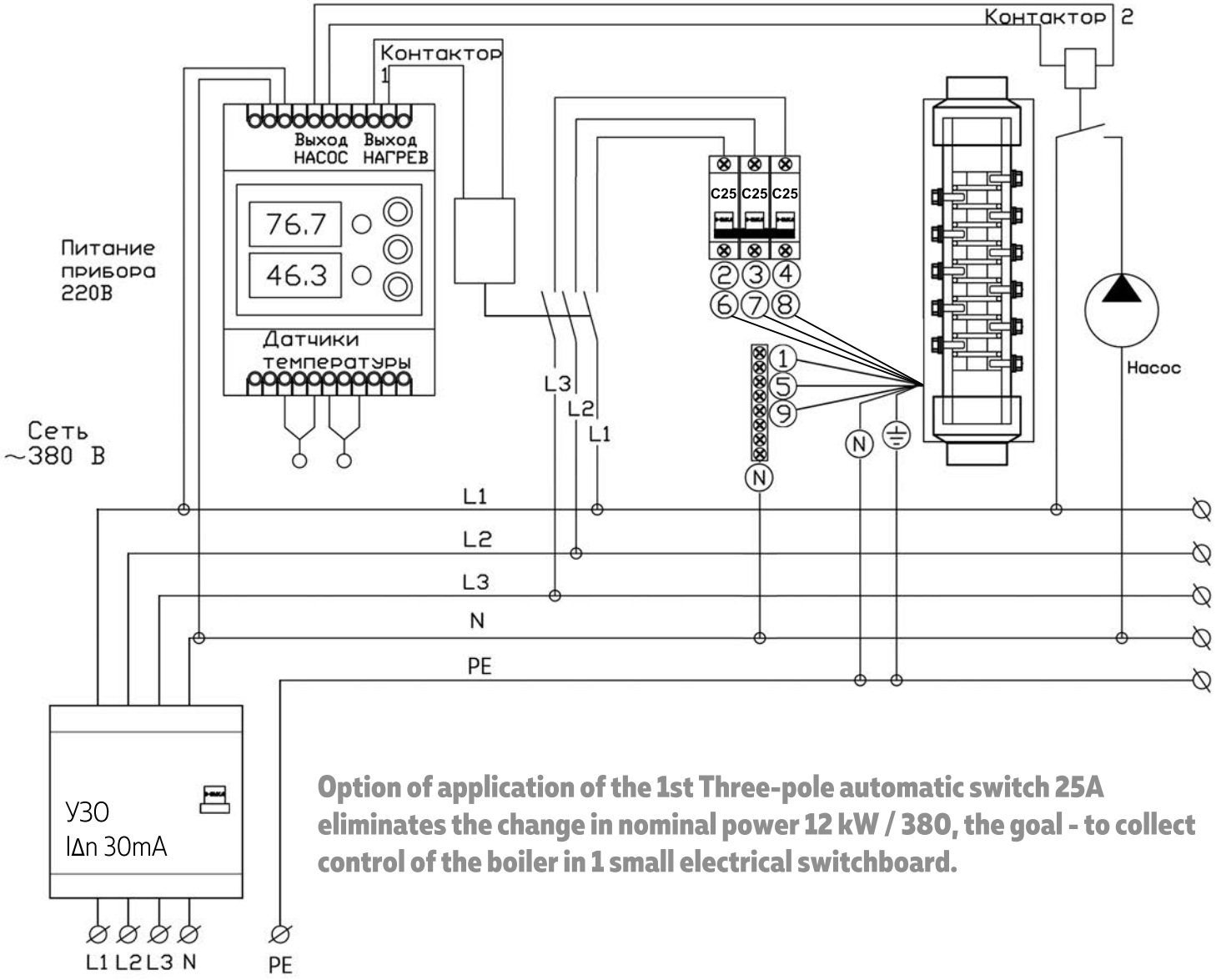
Connection to the Three-phase network 3 x 380 V / s RCD



Turn on each three-pole circuit breaker adds 6 kW of power, providing the power of the boiler up to 12 kW.
An example of increasing power: N1 - 6 kW, N2 –12 kW.

25
Connection to the Three-phase network 3 x 380 V / s RCD
Rated power 12 kW

Connection to the Three-phase network 3 x 380 V / s RCD



Option of application of the 1st Three-pole automatic switch 25A eliminates the change in nominal power 12 kW / 380, the goal - to collect control of the boiler in 1 small electrical switchboard.

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15. Identification and troubleshooting

Electrode Boiler «EKTOR» cannot be disabled. The short circuit of the electrodes is impossible, the electrodes are separated by a dielectric. Steel electrodes, no electrolysis. Tightness of terminal connections, crimping 8 bars, elimination - tighten the nut.
The polypropylene case is not subject to corrosion.
Возможные причины нарушения работы:
Possible causes of disruption:
1. Turn off the circuit breaker - check the current A (point 7 "Check and heat carrier preparation")
2. The boiler does not turn on - check the mains voltage, check the connections of the electrical circuit, check the serviceability of the magnetic starter (point "Electrical boiler connection ")

16. Safety requirements

In the design, installation and operation must be guided.
following documents:
- Regulatory requirements for fire safety;
- Electrical Installation Rules/ Rules of Technical Operation for electrical installations of consumers;

In addition to compliance with the requirements contained in the above documents, when operating the boiler, it is also necessary to follow the requirements and recommendations, listed in this guide.
At the same time, it is necessary to exclude any interference with the operation of the boiler for minors.persons as well as persons who are intoxicated under the influence of narcotic, psychotropic substances, etc.
In practice, there may be situations in which measures need to be taken:
-to prevent the launch (albeit random) of the boiler during technical inspection or performance of work in the water supply network by disconnecting boiler from the source of electrical current,
- if necessary, it is necessary to drain water from the boiler or the heating system ensure that the water is not hot enough to cause burns
- in case of coolant leakage or freezing, do not try to turn it on boiler until normal conditions for boiler operation are restored.

27
Maintenance
Rules of storage and transportation
Contents of delivery

17. Maintenance.

The system of maintenance of the heating system consists of preventive inspections before and after the heating season. Everything maintenance work on the maintenance of the heating system is necessary carry out when the device is disconnected from the electrical network.

Recommendation: Check the health of the grounding line and performance circuit breakers. If necessary, troubleshoot or replace. Verify that there are no leaks from the heating system piping.

18. Rules of storage and transportation.

It is recommended to transport and store boilers "EKTOR" in the original original packaging - it is necessary to limit the force on the packaging, to avoid shock, rain and snow. Must be stored in the appropriate standard conditions, non-aggressive environment, air humidity up to 75%, restriction biological effects, shock and vibration. Packages with products should be placed on racks in the amount of not more than 5 sets in vertical rows.

19. Contents of delivery.

1. Toroidal Electrode Boiler "EKTOR"
2. Operation manual
3. Probe to determine the flow conductivity
4. Packing

Свидетельство о приемке и продаже

Дата выпуска *Серийный номер*

Штамп ОТК

Дата продажи *Подпись продавца*

Наименование предприятия торговли

Талон на установку котла

Котел установлен в
_____

По улице _____ д. №_____ кв. _____,

Запущен механиком (Ф.И.О.)
_____

Организация проводившая установку
_____

Механик _____(подпись)_____

Владелец котла_____(подпись)_____

Warranty

21. Warranty.

1. The warranty period is 3 years from the date of sale through a retail network.
2. The manufacturer guarantees the reliable operation of the boiler, subject to the storage conditions of correctness installation, proper use, compliance with the rules of operation and maintenance, specified in the instruction manual.
3. Warranty obligations apply only to a device installed by a specialized organization engaged in the installation of heating systems and boiler equipment, with mandatory filling in the attached installation certificate and warranty certificate.
4. Warranty service is carried out only if there is an issued warranty card. Buyer's signatures in the warranty card. In the absence of marks in the "Acceptance Certificate and sale ", as well as with an empty warranty card, warranty repair is not performed and product quality claims are not accepted. Warranty does not apply for components.
5. Completeness of products is checked by the Buyer upon receipt of the goods in the presence of supplier representative. After sales claims for completeness are not accepted.
Warranty does not apply to:
- absence of an issued warranty certificate (original) or the Buyer's signature in it. In the coupon there are traces of corrections and blots.
- incompleteness of the product, the absence or impossibility of reading (damage, painting, delete) the serial number on the product.
- modernization or change of the product configuration by the Buyer, carried out without participation Seller's Specialist.
- the presence of mechanical and thermal damage (faults, chips, dents, scratches, bulges, traces burning and soot, broken or burnt conductors and other elements) or traces unauthorized repair (i.e., carried out without the participation of a Seller's specialist), violation of Buyer original seals of the manufacturer and warranty labels.
- presence of traces of animals, birds, insects.
6. The manufacturer is not responsible for the operation of the device, if its wiring diagrams and operating rules do not comply with the requirements of these operating instructions.

I am familiar with the rules of operation and conditions of warranty.
Complaints to the configuration and appearance do not have.
BUYER'S SIGNATURE: _____
You can find the addresses of service centers on the company's website, or specify by phone.
+998 (71) 200-0272

Гарантийный талон

КОРЕШОК №1
На гарантийный ремонт тороидального электродного котла «EKTOR»

Гарантийный талон изъят «…….»……..….20…..года

Ремонт произвел……/……../

……линия отреза……

ГАРАНТИЙНЫЙ ТАЛОН
ЧП «EKTOR»
г. Ташкент, Алмазарский р-н, массив Себзор, 4 1/2

Т А Л О Н №1
На гарантийный ремонт тороидального электродного котла «EKTOR»

Зав. №……...

Изготовлен «…..»……../……./ М. П.

Продан _____
(наименование торга или штамп)

Дата «…..»……..20…..г. _____
(подпись продавца)

Владелец: адрес, телефон ……
……
……
……

Выполнены работы ……
……
……
……
……

КОРЕШОК №2
На гарантийный ремонт тороидального электродного котла «EKTOR»

Гарантийный талон изъят «…….»……..….20…..года

Ремонт произвел……/……../

……линия отреза……

ГАРАНТИЙНЫЙ ТАЛОН
ЧП «EKTOR»
г. Ташкент, Алмазарский р-н, массив Себзор, 4 1/2

Т А Л О Н №2
На гарантийный ремонт тороидального электродного котла «EKTOR»

Зав. №……...

Изготовлен «…..»……../……./ М. П.

Продан _____
(наименование торга или штамп)

Дата «…..»……..20…..г. _____
(подпись продавца)

Владелец: адрес, телефон ……
……
……
……

Выполнены работы ……
……
……
……
……

EKTOR
HEATING SYSTEM

EKTOR
СИСТЕМА ОТОПЛЕНИЯ

Manufacturer: PE "EKTOR"
Address: Tashkent, Almazar district, Sebzor massif, 4 1/2
Tel: +998 (71) 200-0272

www.ektor.uz

The manufacturer reserves the right to make changes in the design and design of the product, equipment and technological support without notice to third parties.

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EKTOR
HEATING SYSTEM