OZONE SYNTHESIZER A-s-GOKSf-5-05-“OZON”

Service manual

This service manual is destined to get acquainted with operating principles, structure and specifications of ozone synthesizer A-s-GOKSf-5-05 “OZON” (further synthesizer) for its proper running.

Caution **Read this service manual carefully before using the device**

1 Synthesizer description and operation

1.1 Purpose

Synthesizer A-s-GOKSf -5-05-«OZON» (Figure 1) is used for production of ozone-oxygen mixture from oxygen medical gas (GOST 5583) by electro synthesis. Ozone-oxygen mixture is used for medical application for ozone therapeutic treatment.
Apparatus functionality made it fit for carrying out of research engineering of ozone use in ecology, biology and medicine for the purpose of development of science-based methods of ozone application.

1.2 Specifications

1.2.1 Synthesizer produces ozone-oxygen mixture with ozone outlet concentration up to 50.0 mg/l. Oxygen flow rate changes from 0.2 up to 1.0 l/min.

1.2.2 Ozone synthesizer overall dimensions, mm:

- length……..230
- width……...225
- height……..85

1.2.3 Ozone synthesizer mass, maximum, 3.5 kg.
1.2.4 Power consumption, maximum, 70 WA.
1.2.5 Supply voltage 220 V, frequency 50 Hz.
1.2.6 Time of continuous running, minimum, 8 h.
1.2.7 Duration of treatment from 1 up to 50 min.
1.2.8 Average service life of synthesizer is 5 years.
1.2.9 Inlet oxygen pressure, maximum, 0.5MPa (0.5 kg/cm^2).

1.3 Synthesizer structure

1.3.1 Ozone synthesizer A-s-GOKSf-5-05-“OZON” is a programmable automated device of continuous operation. It is made as one block that contains:

- electro-gas reactor (ozonizer);
- high-voltage high-frequency power supply;
- electric valve for auto trip of oxygen supply at ozonator inlet;
- back valve to prevent ingress of ozonized fluid into ozonator;
- timer of treatment preset time and auto trip of synthesizer when preset time is over;
- ozone concentration measuring unit;

- two-line LCD to display running regime, oxygen consumption, preset time of treatment and ozone concentration in ozone-oxygen mixture at synthesizer outlet.
In addition synthesizer has a destructor for residual ozone decomposition.
1.3.2 Operation conditions:
- ambient temperature, 10-35 ºC;
- relative humidity at tº 25ºC from 30 up to 95%.

1.4 Delivery set

Delivery set contains:

Ozone synthesizer, МАЮИ. 941714.008 ТУ	1 piece
Power cable	1 piece
PVC pipe	3 m
Device of ozone intake to syringe	1 piece
Destructor	1 piece
Service manual	1 piece

At consumer will the set may has the following:
- Analyzer of ozone in liquid mediums “ИКОЖ-5”……..…1 piece
- Oxygen vessel with 2 liters capacity and reducer ……...1 piece

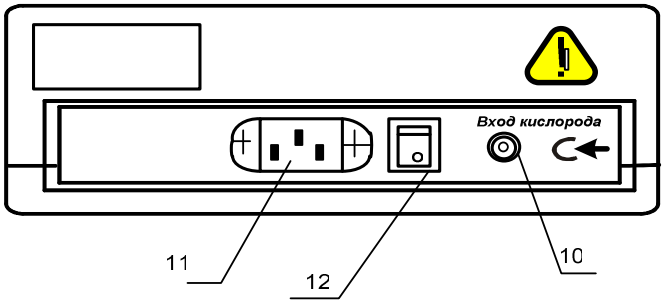
1.5 Structure and operation

1.5.1 Ozone forms at supply of increased frequency high voltage (6-8kV) to ozonator. Under this voltage in inter-electrode gap appears silent discharge. Ionizing effect of high potential electric field to oxygen, blown between ozonator electrodes, that covered by quartz glass, leads to ozone formation. Ozone concentration in ozone-oxygen mixture may be adjusted by variation of voltage frequency that feed the ozonator, and also by variation of oxygen consumption, blown through the ozonator.

1.5.2 Appearance of the front and back panels that contain controls are shown in Figure 1:
1- choke OZONE OUT;
2,3- buttons OZONE CONCENTRATION to vary ozone concentration at synthesizer outlet;
4 – switch OPERATION;
5 – LED OPERATION;
6 – button CALIBRATION;
7 – button TREATMENT PERIOD;
8 – LCD;
9 – control knob OXYGEN CONSUMPTION;
10 – choke OXYGEN IN;
11 - PLUG for cable to connect the synthesizer to a circuit; Fusible insertion ВП-1В 1, 0А 250V;
12 – SWITCH of synthesizer on/off;
13 – connector to computer for device adjustment at the Manufacturer

Front panel.

1- choke OZONE OUT; 2,3- buttons OZONE CONCENTRATION to vary ozone concentration at synthesizer outlet; 4 – switch OPERATION; 5 – LED OPERATION; 6 – button CALIBRATION; 7 – button TREATMENT PERIOD; 8 – LCD; 9 – control knob OXYGEN CONSUMPTION; 13 – connector to computer for device adjustment at the Manufacturer.



Back panel

10 – choke OXYGEN IN; 11 - PLUG for cable to connect the synthesizer to a circuit; 12 – SWITCH of synthesizer on/off;

Fig.1

2 Proper use

2.1 Operating limits

2.1.1 Synthesizer mounting and maintenance must be held by skilled technician.

2.1.2 Room where synthesizer is running must have exhausted ventilation and warning signs.

2.1.3 All joints of oxygen and ozone hoses must be hermetic.
2.1.4 Synthesizer must be safely grounded through the ground contact of the power cord plug and earth conductor of power socket.

2.1.5 Only personnel acquainted with this service maintenance, trained to work with ozone and to operate vessels under pressure is permitted to service the synthesizer.

Caution

Ozone is the colourless gas with specific odour. High ozone concentration can negatively affect human body. All joints of hosepipes, in which ozone-oxygen mixture flows, must be hermetic.
By appearance of ozone odour it is necessary to switch off the synthesizer and ventilate the room. For human nose the threshold of sensitivity of ozone orour is in 10 times less then maximum permissible concentration – 0.01 mg/m^3.
Don't close vent holes of synthesizer.
Don't switch on the synthesizer with opened cover.
Don't operate the synthesizer without destructor.
Don't smoke in the room, where the synthesizer was placed.
Don't expose the synthesizer to vibration, when it is running.
Don't place the synthesizer and also oxygen vessel at the distance less than 1 m from the heaters and less than 10m from heat sources with open flame.
Don't leave running synthesizer without personnel control.

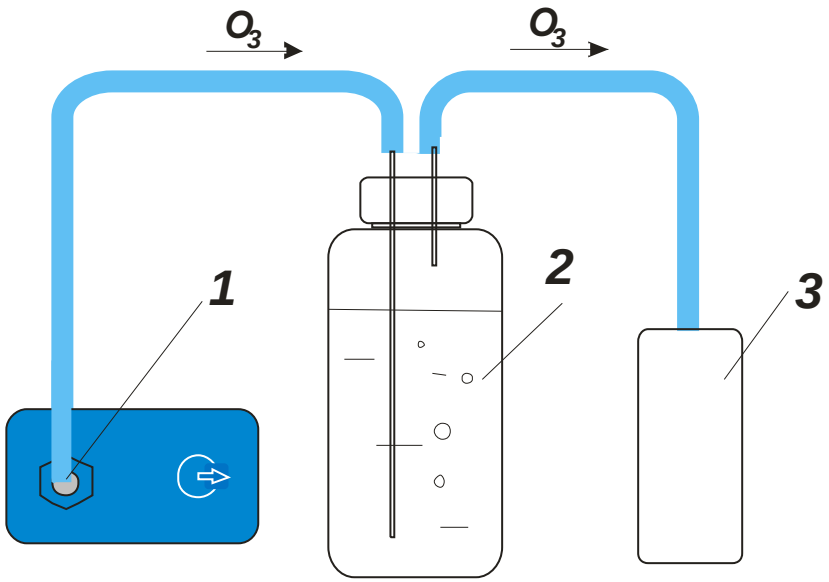
2.2 Preparation and operation of the synthesizer

2.2.1 Place synthesizer on the horizontal surface.

2.2.2 Make sure that the power cord are in good order. Connect the power cord to the plug of synthesizer (pos.11, Fig. 1) and plug it in.

2.2.3 By ozone-resisting hose connect choke **OXYGEN IN (**pos.10, Fig. 1**)** with reducer of the oxygen vessel or oxygen main.

2.2.4 By ozone-resisting hose connect choke **OZONE OUT** (pos.1, Fig. 2) with ozonizer (bottle with physical solution, plastic bag, etc.), (pos.2, Fig. 2) and ozonizer with destructor choke (pos. 3, Fig. 2).



1. Choke "Ozone out"; 2. Ozonizer; 3. Destructor

Fig. 2

2.2.5 If it is necessary to take ozone-oxygen mixture in syringe, connect choke "OZONE OUT" (pos.1, Fig. 3) to choke "DESTRUCTOR" (pos.2, Fig. 3) of intake device to syringe, and set the syringe in inlet "INTAKE TO SYRINGE" (pos.3, Fig. 3) and push it firmly. During it the inlet "INTAKE TO SYRINGE" is opening and syringe piston come up under pressure.

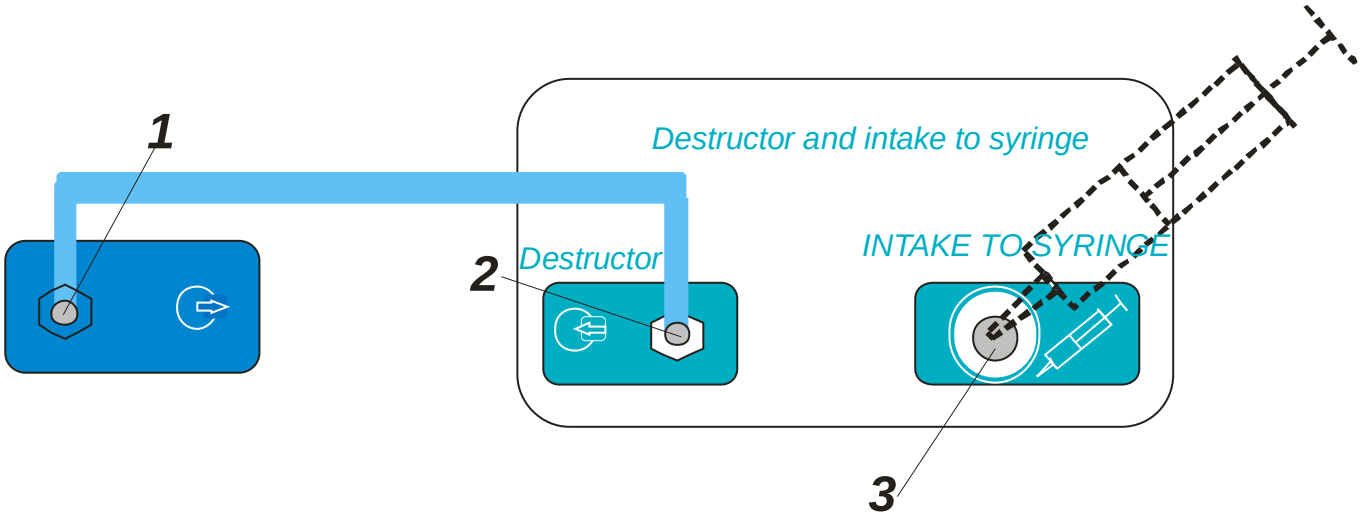


Fig. 3

2.2.6 Turn on the power switch (pos.12, Fig. 1).
As result the inscription "**Ozone synthesizer"** appears on the screen of **LCD** (pos.8, Fig. 1) during 3 sec.

If inscription doesn't appear on the screen, it is necessary to turn off the power switch (pos.12, Fig. 1) and turn it on again.

2.2.7 Warm-up mode automatically go on in 3 sec. and will be lasting 60 sec. As result inscription "**WARM-UP**" and number of seconds to the warming finish appear on the display screen (pos.8, Fig. 1).

After warming the inscription **"CALIBRATION IS NECESSARY"** appears on the screen of **LCD** (pos.8, Fig. 1).

2.2.8 Open oxygen vessel valve or oxygen main and set inlet pressure 15 kg/cm^2 to synthesizer.

2.2.9 Press the button CALIBRATION (pos.6, Fig. 1). As result electric valve of oxygen supply is uncovered and ozone concentration measuring unit is blown off by pure oxygen. The inscription **IT IS CALIBRATING** appears on the screen of **LCD** (pos.8, Fig. 1) and also value of oxygen consumption, which appears under the inscription ***"Oxygen consumption, l/min"***

During calibration the required consumption of oxygen can be set by control knob OXYGEN CONSUMPTION (pos.9, Fig. 1). Its value is displayed on screen of **LCD** (pos.8, Fig. 1) under inscription ***"Oxygen consumption, l/min".***

Caution

Feature of oxygen consumption controller of Italian firm "KAMOCCI" is that for variation of oxygen consumption it is required to pull upward knob of oxygen consumption controller (pos.9, Fig. 1) (until click). Set required oxygen consumption on the screen of LCD by smooth-running of the control knob to the right (to increase consumption) and to the left (to decrease consumption).
After setting of oxygen consumption press the control knob OXYGEN CONSUMPTION downward (until click). As result the control knob is fixing and blocks random variation of oxygen consumption.

After calibration zero value of ozone concentration must pop up under inscription ***"Outlet ozone concentration, mg/l".***

If there is need of some more calibration time to set oxygen consumption or if data of ozone concentration are not equal to zero value after calibration end, it is necessary to repeat calibration mode by pressing the button CALIBRATION (pos.6, Fig. 1) again.

When time of calibration (20 sec.) is over, the inscription **READY TO OPERATION** appears on screen of LCD (pos.8, Fig. 1).

2.2.10 Before pressing the button OPERATION (pos.4, Fig. 1), it is necessary to set required time of treatment by button TREATMENT PERIOD (pos.7, Fig. 1). Value of this time appears on screen of LCD (pos.8, Fig. 1) in minutes under inscription ***"Treatment period, min".***

Treatment time, min

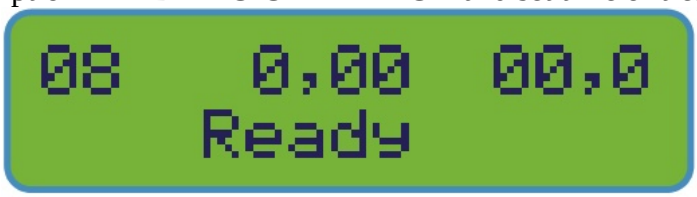
2.2.11 Press the button OPERATION (pos.4, Fig. 1). As result ozone generator starts and LED OPERATION is lightning (pos.5, Fig. 1). The inscription **OZONE AT OUTPUT** and digit of set oxygen consumption in l/min appear on the screen of LCD (pos.8, Fig. 1), and digit of set time of treatment will change, shown time to the treatment finish.

2.2.12 Set required for treatment value of ozone concentration by buttons OZONE CONCENTRATION (pos.2, 3, Fig. 1). This value appears in mg/l on the screen of LCD (pos.8, Fig. 1) under inscription ***"Outlet ozone concentration, mg/l".***

To increase ozone concentration, it is required to press the button (pos. 2) and hold it in pushed position, and to decrease ozone concentration – the button with position 3. During process the value of ozone concentration changes slowly. For quicker change of ozone concentration it is required to release the button for short time (max. 5 sec.) and press it again.

2.2.13 When set time of treatment is over, supply of oxygen stopped and also the ozone generator switches off automatically. On the screen of LCD (pos.8, Fig. 1) appears inscription **TIME IS OVER and sound signal**, LED (pos.5, Fig. 1) will go out.

2.2.14 After that is required to press the button **OPERATION** (pos.4, Fig. 1). The sound signal is stopping and synthesizer switches over to standby mode. On the screen of LCD (pos.8, Fig. 1) appear again the inscription **READY TO OPERATION** and set time of treatment.



The device does not require to turn it off and can be in standby mode until next treatment with minimum energy consumption.

2.2.14 Before treatment will be repeated, it is necessary to check data of LCD. If ozone concentration value is not equal to zero or there is symbol "- - - -" on the screen, then before next treatment it is necessary to calibrate device by pressing the button CALIBRATION (pos.6, Fig. 1).

2.2.15 If it is not required to change time of treatment, oxygen consumption or value of ozone concentration at synthesizer outlet, then press the button OPERATION (pos.4, Fig. 1) and synthesizer begins to operate in the same mode again (treatment repeats).

When it is required, change oxygen consumption or outlet ozone concentration in mode "OPERATION", during treatment.
2.2.15 When operation is over, turn the synthesizer off by switch (pos.12, Fig. 1) and shut oxygen vessel off.

if inscription appears on the display, it is required to turn the synthesizer off and turn it on again only in 3-5sec. if the inscription appears again, it is required to apply to the manufacturer.

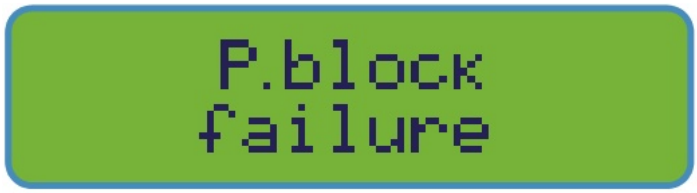
Caution

1. If during operation process oxygen supply stops, the synthesizer sounds the signal and on screen of LCD (pos.8, Fig. 1) appears inscription EMERGENCY! NO OXYGEN!

In this case it is necessary to check presence of oxygen at synthesizer inlet and set of oxygen consumption.
2. By increase of oxygen consumption more then 1.2 l/min, synthesizer is turned off automatically, sounds a signal and on screen of LCD (pos.8, Fig. 1) appears inscription EMERGENCY! OXYGEN OVERRUN!

In this case it is necessary to switch synthesizer over to standby mode (item 2.2.13) and check pressure at synthesizer inlet. Press the button "CALIBRATION" (pos.6, Fig. 1) and set required oxygen consumption by control knob (pos.9, Fig. 1) of oxygen consumption.

3. By **malfunction of ozone generator, synthesizer sounds a signal and on screen of LCD (pos.8, Fig. 1) appears inscription POWER BLOCK FAILURE!**



In this case the device is subject to test and repair at the Manufacturer.

3. Maintenance

3.1 It is required to do reactivation of contained in destructor catalyst. Catalyst is reactivated by means of heating at t 200°C during 3-4 hours.

4 Transportation and storage

4.1 Synthesizers are transported to any distance in covered wagons and motor vehicles, pressurized modules of airplanes and cargo containers in compliance with goods transportation regulations effective for this kind of transport.

5 Utilization

5.1 It is recommended to utilize synthesizers with expired service life on the Manufacturer:

CERTIFICATE
OZONE SYNTHESIZER A-s-GOKSf-5-05-«OZON»
Serial number № _____

Ozone synthesizer A-s-GOKSf -5-05-«OZON» is used for production of ozone-oxygen mixture from oxygen medical gas by electro synthesis.

1. Specifications

Overall dimensions, mm:
- length…….230
- width……..225
- height……...…85

Synthesizer mass, kg……..3.5
Power consumption, VA…….70.
Supply voltage 220 V, frequency 50 Hz.
Time of continuous running, 8 h.

2 Delivery set
Delivery set contains:

Ozone synthesizer	1 piece
Power cable	1 piece
PVC pipe	3 m
Device of ozone intake to syringe	1 piece
Destructor	1 piece
Service manual	1 piece

3 Acceptance statement

Ozone synthesizer A-s-GOKSf -5-05-«OZON»
Product name

№_____has been manufactured and accepted in compliance with
Serial number
the mandatory requirements of state standards, the effective technical documentation and found fit for service.

4 Warranty
Service life is 12 months from the date of purchase, if seals of Manufacturer are not broken.