



Kharkov Electric
Industrial Company

Catalogue of equipment



Ukraine

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About company

Kharkiv electric industrial company, Ltd created in 1994.

Kharkiv electric industrial company founded in 1994 by employees scientifically – research laboratory of the electrophysical equipment and generation of heavy-duty pulse electromagnetic radiations of Institute of electrophysics and the AN radiation technologies of Ukraine (it was at that time a part Kharkiv physical – technical institute (HFTI) of AN of Ukraine).

Considering the economic situation which has developed at that time, the company concentrated the efforts on development of new electrophysical technologies and the equipment for needs housing and municipal and agriculture, food and pharmaceutical industry.

The main activities of the company became development and deployment in production of new ecologically safe energy saving technologies and the equipment for:

- ✓ for cleaning and disinfecting drinking, mine, circulating and sewage water;
- ✓ the electrophysical technologies directed on increase in periods of storage of food;
- ✓ ecologically safe technologies of electrophysical stimulation of seeds of the grain and vegetable crops directed on increase in productivity of these cultures;
- ✓ systems of microbiological purification of air.

Development of new technologies of water purification led to emergence of one more activity of our company directed on development of complete technological complexes for complex purification of drinking and reverse waters, and also household and industrial sewage. As a result of laborious work of staff of our company technological complexes were developed for water purification from iron, manganese, salts of heavy metals, phenols, oil products, synthetic is superficial – active agents (SPAV), etc.

The saved up experience in development of new technologies and the equipment for water purification allowed us to create a water treatment complex for cultivation of fish in installations with the closed cycle of water supply. Construction of a farmer complex on cultivation of klarias sheat-fish with a productivity of 100 tons per year became result of this development.

One more of the directions scientifically – research works which are carried out in our company, is development of technologies of photochemical oxidation of organic substances (technology of active oxidation). Results of the carried out works is a basis of new processing equipment for water purification in swimming pools, drinking water with the raised content of humic acids, sewage. So application of photochemical oxidation allowed to reduce considerably concentration of chlorine in swimming pools that positively affected on quality of water treatment.

Application of technology of photochemical oxidation within a state program allowed to develop a complex of purification of the highly toxic sewage containing pesticides, herbicides and other poison gases.

Further development of technologies of photochemical oxidation allowed to develop a number of installations for effective microbiological cleaning and air deodorization that allowed



to provide effective air disinfecting on constructions of local cleaning household sewage, and also to achieve elimination of accompanying unpleasant smells.

The technology of photochemical oxidation became a basis of a series of installations for receiving ozone from air. The developed photochemical ozonizers found the application in installations for cold sterilization of loose products, processing of stationary and automobile refrigerators (refrigerators) and stored in them perishable meat and dairy and fruit and vegetable production, vegetable storehouses. The main advantage of the developed photochemical ozonizers is possibility of their operation at rather low temperatures and high humidity that allows to establish them directly in refrigerators.

Development of technologies of disinfecting of air by means of ultra-violet radiation allowed to develop a series of plants with a single productivity up to several thousand m³/h which with a great success are applied at the enterprises of food and pharmaceutical industry.

One more activity of our company is development of methods of electrophysical processing of liquid environments. So as a result of the conducted researches there was a development of technology of increase in octane level of straight-run petrol without use of high temperatures and the octane corrective of additives who allowed to increase octane level of straight-run petrol by 10 – 17 units. Thus specific energy consumption on increase in octane level made 15 W h/dm³ that is much less, than at traditionally applied high-temperature methods of processing and is much cheaper, than at application of additives correcting octane level.

Today Kharkiv electric industrial company lets out the wide range of processing equipment:

- VODOGRAY® series installations for disinfecting drinking, reverse, mine and sewage ultraviolet (UV) radiation;
- the equipment for cleaning and UV of disinfecting of water in swimming pools;
- installations for UV of disinfecting of air in rooms and systems of forced and exhaust ventilation;
- installations for processing being stored in vegetable storehouses of fruit and vegetable production for the purpose of increase in periods of storage;
- equipment for electrophysical disinfection of the food equipment, capacities, container and packing;
- installations for cold sterilization of loose products (grain, grain, spices);
- installations of preseeding stimulation of seeds of grain and vegetable crops;
- filters for water purification for drinking needs;
- the filtering equipment for cleaning hozyaystvenno – household sewage;
- equipment for fight against a biofouling of decorative ponds;
- installations for increase in octane level of straight-run petrol;
- special processing equipment.

Kharkiv electric industrial company is the winner of a national rating "Flagships of Ukraine", the winner of the All-Ukrainian project "Water Management Complex of Ukraine", the winner of the Ekoinform magazine in the nomination "Pure Technologies". For development of highly



effective technological systems and the equipment for the food industry with application of various types of electromagnetic radiation the company is awarded by the special diploma.

Ministry of Health of Ukraine, the State committee on questions housing and communal services of Ukraine, (UV sterilizers) the VODOGRAY® series are recommended to by Association of the cities of Ukraine, the International Academy of health and safety of installation of disinfecting of water for broad application on objects of municipal water supply and water disposal. Installations of the TU U 22651086.003-99 VODOGRAY® series are protected by patents No. 42314 (Ukraine), No. 2182119 (Russian Federation).

Yours faithfully,

Director, full member of Engineering Academy of Ukraine,

Academician

Shalyapin Sergey Nikolaevich

1. UV sterilizers series VODOGRAY®



UV sterilizers of VODOGRAY® series are developed for effective disinfecting drinking, technical, reverse, mine and sewage by ultraviolet (UV) radiation with a single productivity from 0,1 to 2000 m³/h. On design features of UV sterilizers of VODOGRAY® series are subdivided into sterilizers of housing-type, channel type and tray type. UV sterilizers are completed with modern energy saving UV lamps with the increased term of operation which depending on the UV type of a lamp makes from 9 to 16 hours that provides reliable operation of UV of sterilizers on an extent from one to two years without replacement of UV of a lamp. Parts UV of sterilizer contacting to disinfected water are executed from qualitative stainless steel and other materials resistant to corrosion which are allowed by Ministry of Health for contact with foodstuff. For

ensuring high stability of performance data and an exception from direct contact with disinfected UV water of a lamp are placed in quartz covers from special quartz glass with high coefficient of transparency.

Given that decontaminate water contains organic and mineral pollution, which are deposited on the outer surface of the protective quartz covers, UV sterilizers series VODOGRAI® provides for a system of cleaning them. Produces several varieties of UV sterilizers series VODOGRAY®: without system of cleaning of quartz covers, with system of chemical cleaning of quartz covers, with built-in by the mechanism of cleaning of quartz covers with a hand drive and with built-in system of electromechanical cleaning of quartz covers.

In terms of safety requirements UV sterilizers series VODOGRAI® conform the requirements of GOST 12.2.007.0 - 75, "Regulations for electrical installation (PUE), and also by the regulations of the EU and have the following characteristics:

- electrical safety class in accordance with GOST 12.2.007.0 – 75 - 1;
- extent of protection against dust and moisture hit in accordance with GOST 14254 - 96 – not below IP34;
- climatic modification and category of placement in accordance with GOST 15150 – 69 - UHL 5;
- group of service conditions on mechanical durability in accordance with GOST 17516.1 – 88 - M1.

Non-failure operation of work of UV of sterilizers is provided without continuous service and control in the conditions of ambient temperature in the range from 263 K (-10 °C) to 308 K (35 °C) and relative humidity from 90% at a temperature of 288 To (15 °C) to 98% at a temperature of 298 To (25 °C) that allows to operate UV sterilizers in rooms with the increased humidity (for example, in not heated and not ventilated underground rooms, including in



mines, cellars, wells, holds of the ships, in which probably long availability of water and frequent condensation of moisture on walls and a ceiling, etc.).

Microbiological indicators of the disinfected water conform to the most strict requirements imposed to systems of disinfecting of water. So, for example, microbiological indicators of the disinfected water conform to the most strict requirements which are imposed today to systems of disinfecting of water. So, microbiological indicators of the disinfected water of drinking appointment water drinking conforms to GOST 2874-82 requirements ". Hygienic requirements and control of quality", DSanPiN 2.2.4-171-10 "Hygienic requirements to water drinking, intended for consumption by the person", the SanPiN 2.1.4.1074-01 "Drinking water. Hygienic requirements to quality of water of the centralized systems of drinking water supply. Quality control", SanPiN 2.1.4.1116-02 "Drinking water. Hygienic requirements to quality of the water packaged in capacity. Quality control", SanPiN 10-124 RB 99 "Drinking water. Hygienic requirements to quality of water of the centralized systems of drinking water supply. Quality control", and also to normative documents of EU which regulate microbiological indicators of drinking water.

Microbiological indicators of the disinfected sewage correspond the SanPiN 4630-88 "Protection of a surface water from pollution", the SanPiN 2.1.5.980-00 "Hygienic requirements to protection of a surface water", MU 2.1.5.732-99 "Sanitary and epidemiologic supervision of disinfecting of sewage by ultra-violet radiation", MU 2.1.5.800-99 "The Gossanepidnadzor organization behind disinfecting of sewage", MU 3.2.1757-03 "Prevention of parasitic diseases. Sanitary and parasitological assessment of efficiency of disinfecting of water ultra-violet radiation", and also to normative documents of EU which regulate microbiological indicators of the sewage dumped in superficial and fish reservoirs. Thus the total coliform in the disinfected drains doesn't exceed 500 KOE/100 ml, quantity thermotolerant the coliforms of bacteria in the disinfected drains doesn't exceed 100 KOE/100 ml, the quantity coliphages in the disinfected drains doesn't exceed 10 BOE/100 ml.

1.1. UVC sterilizers series VODOGRAY of the cleared drinking water

1.1.1. UVC sterilizers of small productivity without system of cleaning of quartz covers VODOGRAY® B-02.02, VODOGRAY® B-04.02, VODOGRAY® B-05.02, VODOGRAY® B-1.02, VODOGRAY® B-3.02, VODOGRAY® B-7.02

The UV this model of sterilizers is intended for disinfecting of drinking water which passed deep cleaning on membrane filters, or pure deep-well water.

UV a sterilizer represents the cylindrical camera of disinfecting in which there is bactericidal UV lamp. For protection against direct contact with water UV lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UV of radiation. The UV case of a sterilizer and other its parts contacting to water are executed from stainless steel and other materials resistant to corrosion which are allowed by Ministry of Health for contact with foodstuff.



UV sterilizer is executed in the form of a monoblock which contains the camera of disinfecting and the built-in electronic converter. The electronic converter provides food of UV-lamp by the increased frequency that provides increase of power of bactericidal radiation and increases the resource of UV lamp. UV sterilizers are equipped with modern energy saving bactericidal UV lamps with the increased resource.

Food of UV sterilizers is carried out from a single-phase electric network of alternating current with tension 220 ± 15 V and with a frequency of 50/60 Hz.

Pressure loss in UV sterilizers doesn't exceed 0,5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 1,0 MPa (10 kgs/cm²).

The size UV of a dose is specified at transparency of water in UV range ($\lambda = 253,7$ nanometers) equal 85% (at coefficient of absorption of UV of radiation of $k = 0,15$ cm⁻¹) which corresponds to well cleared drinking water.

Table 1.1. The key technical parameters.

technical parameters	Name of UVC sterilizer VODOGRAY ® B-XX.02					
	B-02.02	B-04.02	B-05.02	B-1.02	B-3.02	B-7.02
Productivity, m ³ /h, no more	0,21	0,4	0,51	1,1	3,65	8,5
Absorbed UV a dose (A dose of UV of radiation), J/m ² , not less	550	550	550	500	500	500
UV resource of lamps, h, not less	7000	9000	9000	9000	9000	9000
Quantity of UV lamps, piece.	1	1	1	1	1	1
Power (at $\cos \phi = 0,96$), W	5,0	10,0	15,0	20,0	40,0	80,0
Conditional pass of entrance and output branch pipes	DN15	DN15	DN15	DN25	DN50	DN50
Weight (without water), kg, no more	3,5	4,5	5,0	6,5	12,5	18,0

Table 1.2. Dimensions.

UV sterilizer	L	L1	L2	L3	No figure
VODOGRAY ® B-02.02	400	360	190	-	Fig. 1
VODOGRAY ® B-04.02	475	435	265	-	Fig. 1
VODOGRAY ® B-05.02	475	435	265	-	Fig. 1
VODOGRAY ® B-1.02	560	520	350	-	Fig. 1
VODOGRAY ® B-3.02	1080	1040	800	450	Fig. 2
VODOGRAY ® B-7.02	1790	1750	1500	1000	Fig. 2

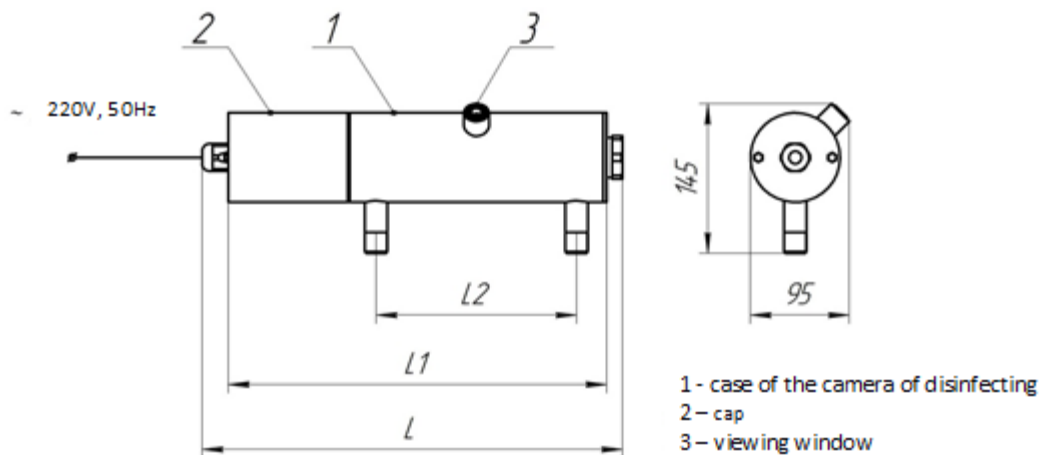


Fig. 1.1. UVC sterilizer VODOGRAY® B-XX.02.

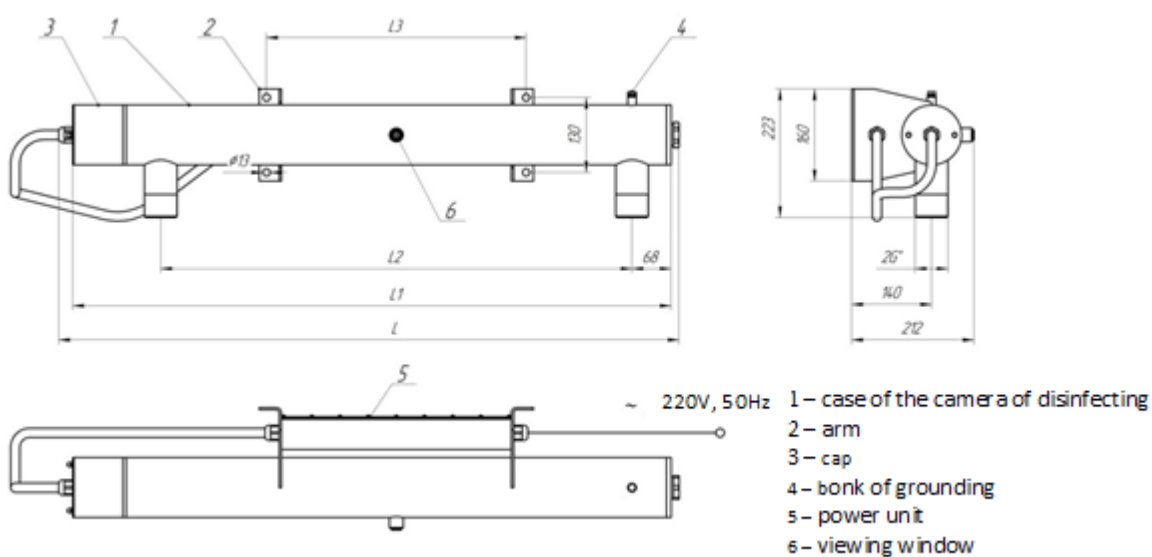


Fig. 1.2. UVC sterilizer VODOGRAY® B-XX.02.

1.1.2. UVC sterilizers of middle productivity with system of chemical cleaning of quartz covers VODOGRAY® B-10.02, VODOGRAY® B-20.02, VODOGRAY® B-25.02, VODOGRAY® B-30.02, VODOGRAY® B-50.02, VODOGRAY® B-75.02

The UV this model of sterilizers is intended for disinfecting of drinking water which passed deep cleaning on membrane filters, or pure deep-well water.

UV a sterilizer consists of the camera of disinfecting, a case of management and the block of chemical cleaning. The camera of disinfecting represents the cylindrical camera in which some bactericidal UV of lamps are located. For protection against direct contact with water each UV the lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UV of radiation. The case of the camera of disinfecting and other, its parts contacting to water are executed from stainless steel and other materials resistant to corrosion which are allowed by Ministry of Health for contact with foodstuff.



Cleaning of quartz covers of organic and mineral deposits is made with a method of washing of internal part of the camera of disinfecting by special washing solution or 1,5 – 2% solution of oxalic or hydrochloric acid. Washing of the camera of disinfecting is carried out by means of the washing block.

UV control of a sterilizer is exercised by means of a management case which provides inclusion and switching off of UV of lamps, inclusion and switching off of the block of washing, and also light indication of work of UV of lamps, the accounting of operating time of UV of a sterilizer, control of intensity of UV of radiation, control of availability of water in the disinfecting camera, and also indication of operation of the block of washing.

UV sterilizers are equipped with system of automatic inclusion/shutdown of UV of lamps depending on availability of water in the disinfecting camera, the monitoring system of operability of UV of lamps, the counter of the UV resource of lamps, system of protective shutdown of a power supply system of installation at a casual touch of the service personnel to current carrying parts of UV of a sterilizer.

The block of washing consists of the pump and the capacity attached to it in which flushing solution is filled in. For washing of the camera of disinfecting it is necessary to block a stream passing through the camera of disinfecting of water, to switch off lamp UV, to connect to located on entrance and output branch pipes of the camera of disinfecting to branches hoses of the block of washing, to fill the block of washing with washing solution, to turn on the block of washing and to make chemical cleaning of internal part of the camera of disinfecting. Duration of a cycle of chemical cleaning makes 30 – 45 minutes. Then it is necessary to carry out neutralization of washing solution and to merge it in the sewerage and to make washing of the camera of disinfecting with clear water.

Table 1.3. The key technical parameters.

technical parameters	Name of UVC sterilizer VODOGRAY® B-XX.02					
	B-10.02	B-20.02	B-25.02	B-30.02	B-50.02	B-75.02
Productivity, m ³ /h, no more	12,7	19,2	25	34	50	75
Absorbed UV a dose (A dose of UV of radiation), J/m ² , not less	325	350	325	325	325	325
UV resource of lamps, h, not less	9000	9000	9000	9000	9000	9000
Quantity of UV lamps, piece.	3	5	3	4	6	9
Power (at cos φ = 0,96), W	0,15	0,2	0,25	0,35	0,5	0,7
Conditional pass of entrance and output branch pipes	DN50	DN50	DN50	DN50	DN100	DN100
Weight (without water), kg, no more	50	58	60	63	70	75

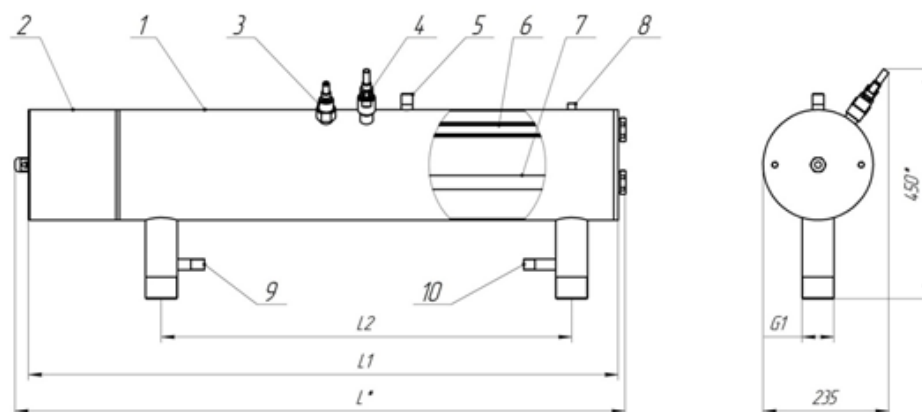
Power supply of UV of sterilizers is carried out from a single-phase electric network of alternating current with tension 220 ± 15 V and with a frequency of 50/60 Hz.

Pressure loss in UV sterilizers doesn't exceed 0,5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 1,0 MPa (10 kgfs/cm²).

The size UV of a dose is specified at transparency of water in UV range ($\lambda = 253,7$ nanometers) equal 75% (at coefficient of absorption of UV of radiation of $k = 0,25 \text{ cm}^{-1}$) which corresponds to the cleared drinking water.

Table 1.4. Dimensions.

UV sterilizer	L	L1	L2	DN	No figure
VODOGRAY ® B-10.02	1130	1090	760	50	Fig. 1
VODOGRAY ® B-20.02	1130	1090	760	50	Fig. 1
VODOGRAY ® B-25.02	1850	1810	760	50	Fig. 1
VODOGRAY ® B-30.02	1850	1810	760	50	Fig. 1
VODOGRAY ® B-50.02	1915		770	100	Fig. 2
VODOGRAY ® B-75.02	1915		770	100	Fig. 2



1 - the disinfected camera, 2 - a cap, 3 - the sensor of availability of water, 4 - UV the sensor, 5 - a cap for production of air, 6 - UV a lamp, 7 - a quartz cover, 8 - a grounding place, 9, 10 - branch pipes for connection of the block of washing

Fig. 1.3. The camera of disinfected.

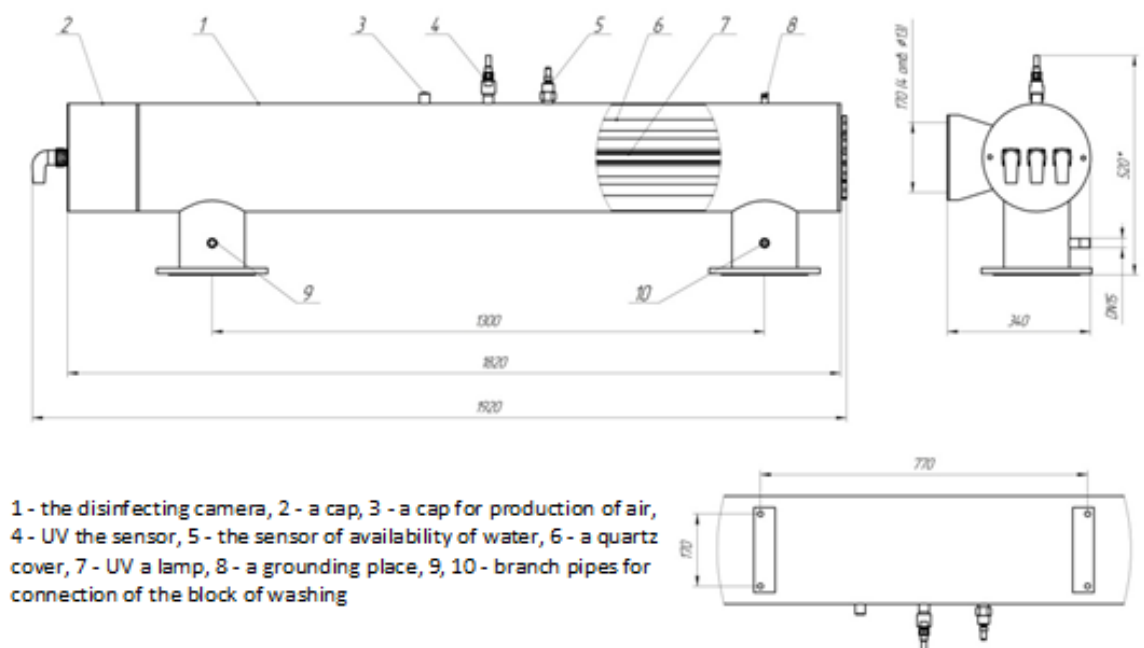


Fig. 1.4. The camera of disinfected.

1.1.3. UVC sterilizers of big productivity with system of chemical cleaning of quartz covers VODOGRAY ® B-100.02, VODOGRAY ® B-150.02, VODOGRAY ® B-200.

The UV this model of sterilizers is intended for disinfecting of drinking water which passed deep cleaning on membrane filters, or pure deep-well water.

UV a sterilizer consists of the camera of disinfected, a case of management and the block of chemical cleaning. The camera of disinfected represents the cylindrical camera in which some bactericidal UV of lamps are located. For protection against direct contact with water each UV the lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UV of radiation. The case of the camera of disinfected and other, its parts contacting to water are executed from stainless steel and other materials resistant to corrosion which are allowed by Ministry of Health for contact with foodstuff.

Cleaning of quartz covers of organic and mineral deposits is made with a method of washing of internal part of the camera of disinfected by special washing solution or 1,5 – 2% solution of oxalic or hydrochloric acid. Washing of the camera of disinfected is carried out by means of the washing block.

UV control of a sterilizer is exercised by means of a management case which provides inclusion and switching off of UV of lamps, inclusion and switching off of the block of washing, and also light indication of work of UV of lamps, the accounting of operating time of UV of a sterilizer, control of intensity of UV of radiation, control of availability of water in the disinfected camera, and also indication of operation of the block of washing.

UV sterilizers are equipped with system of automatic inclusion/shutdown of UV of lamps depending on availability of water in the disinfected camera, the monitoring system of operability of UV of lamps, the counter of the UV resource of lamps, system of protective



shutdown of a power supply system of installation at a casual touch of the service personnel to current carrying parts of UV of a sterilizer.

The block of washing consists of the pump and the capacity attached to it in which flushing solution is filled in. For washing of the camera of disinfecting it is necessary to block a stream passing through the camera of disinfecting of water, to switch off lamp UV, to connect to located on entrance and output branch pipes of the camera of disinfecting to branches hoses of the block of washing, to fill the block of washing with washing solution, to turn on the block of washing and to make chemical cleaning of internal part of the camera of disinfecting. Duration of a cycle of chemical cleaning makes 30 – 45 minutes. Then it is necessary to carry out neutralization of washing solution and to merge it in the sewerage and to make washing of the camera of disinfecting with clear water.

For work in the UV energy saving mode sterilizers can be equipped in addition with the special control unit which provides automatic shutdown of a certain quantity of UV of lamps at reduction of a channel of water via the camera of disinfecting and automatic inclusion of necessary quantity of UV of lamps at increase in a channel of water. The control unit works complete with an electronic flowmeter which has a current exit 0 ... 20 mA.

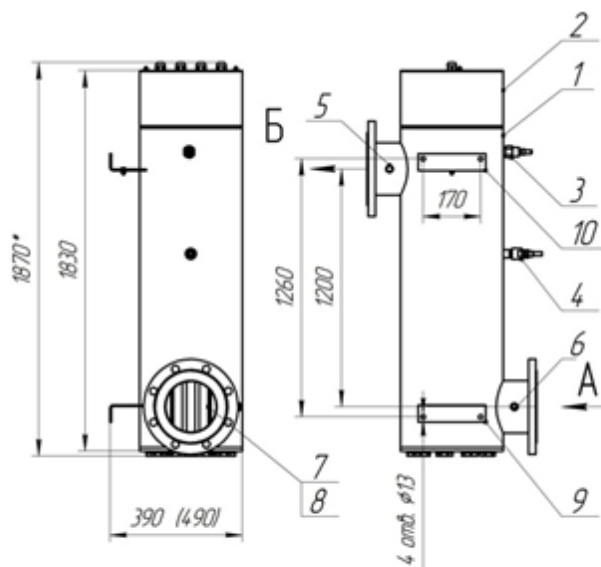
Power supply of UV of sterilizers is carried out from a single-phase electric network of alternating current with tension 220 ± 15 V and with a frequency of 50/60 Hz.

Pressure loss in UV sterilizers doesn't exceed 0,5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 1,0 MPa (10 kgfs/cm²).

The size UV of a dose is specified at transparency of water in UV range ($\lambda = 253,7$ nanometers) equal 75% (at coefficient of absorption of UV of radiation of $k = 0,25$ cm⁻¹) which corresponds to the cleared drinking water.

Table 1.5. The key technical parameters.

technical parameters	Name of UV sterilizer VODOGRAY ® B-XX.02		
	B-100.02	B-150.02	B-200.02
Productivity, m ³ /h, no more	0,21	0,51	3,65
Absorbed UV a dose (A dose of UV of radiation), J/m ² , not less	325	325	325
UV resource of lamps, h, not less	9000	9000	9000
Quantity of UV lamps, piece.	12	18	24
Power (at $\cos \phi = 0,96$), W	0,95	1,4	1,9
Conditional pass of entrance and output branch pipes	DN150	DN150	DN200
Weight (without water), kg, no more	105	125	150



A, B – water flow direction, 1 – the disinfecting camera, 2 – a cap, 3 – the sensor of availability of water, 4 – UV detector, 5, 6 – branch pipes for connection of the block of washing, 7 – a quartz cover, 8 – UV a lamp, 9, 10 – arm for fastening of the camera of disinfecting

Fig. 1.5. The camera of disinfecting. In brackets the sizes for sterilizer UV are specified VODOGRAY® B-200.02.

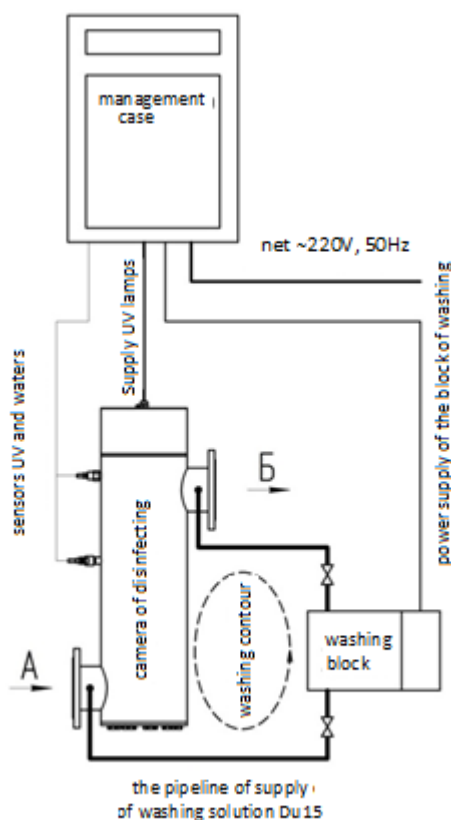


Fig. 1.6. Connection scheme.



1.1.4. UVC sterilizers with built-in by the mechanism of cleaning of quartz covers with a hand drive VODOGRAY ® B-1, VODOGRAY ® B-3, VODOGRAY ® B-7.

The UV this model of sterilizers is intended for disinfecting of drinking water which passed deep cleaning on membrane filters, or pure deep-well water.

It can be used for water disinfecting with the raised level of a mineralization (the raised content in water of salts of iron, rigidity, etc.), and also for water disinfecting with the increased level of the content of organic substances (the raised turbidity and chromaticity).

UV a sterilizer consists of the camera of disinfecting and a management case. The camera of disinfecting represents the cylindrical camera in which bactericidal UV a lamp is located. For protection against direct contact with UV water the lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UV of radiation. The case of the camera of disinfecting and other, its parts contacting to water are executed from stainless steel and other materials resistant to corrosion which are allowed by Ministry of Health for contact with foodstuff.

Cleaning of quartz covers of organic and mineral deposits is made by means of the disinfecting of the clearing mechanism of plunger type built in the camera which represents a set placed on an external surface of a quartz cover of ring brushes which fasten to a rod of the clearing mechanism. Process of cleaning of a quartz cover consists in movement by means of a rod of brushes along a cylindrical surface of a quartz cover. Movement of a rod of the clearing mechanism is carried out manually. Recommended frequency of cleaning of a quartz cover makes not less than 1 - 2 time a week.

UV control of a sterilizer is exercised by means of a management case which provides inclusion and switching off established in the camera of disinfecting of UV of a lamp, light indication of work of UV of a lamp, the accounting of operating time of UV of a sterilizer, control of intensity of UV of radiation (by the separate order), control of availability of water in the disinfecting camera (by the separate order).

UV sterilizers are equipped with the monitoring system of operability of UV of a lamp, the resource counter, system of protective shutdown of a power supply system of installation at a casual touch of the service personnel to current carrying parts of UV of a sterilizer.

Power supply of UV of sterilizers is carried out from a single-phase electric network of alternating current with tension 220 ± 15 V and with a frequency of 50/60 Hz.

Pressure loss in UV sterilizers doesn't exceed 0,5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 1,0 MPa (10 kgfs/cm²).

The size UV of a dose is specified at transparency of water in UV range ($\lambda = 253,7$ nanometers) equal 75% (at coefficient of absorption of UV of radiation of $k = 0,25$ cm⁻¹) which corresponds to the cleared drinking water.

Table 1.6. The key technical parameters.

technical parameters	name of UV sterilizer VODOGRAY® B-X		
	B-1	B-3	B-7
Productivity, m ³ /h, no more	1,1	3,65	8,5
Absorbed UV a dose (A dose of UV of radiation), J/m ² , not less	325	350	325
UV resource of lamps, h, not less	9000	9000	9000
Quantity of UV lamps, piece.	1	1	1
Power (at cos φ = 0,96), W	20	40	80
Conditional pass of entrance and output branch pipes	DN25	DN50	DN50
Weight (without water), kg, no more	8,5	12	15

Table 1.7. Overall dimensions of the camera of disinfecting.

UV sterilizer	L	L1	L2	L3	L4	No figure
VODOGRAY® B-1	650	625	300	205	200	Fig. 1
VODOGRAY® B-3	1120	1040	780	545	320	Fig. 2
VODOGRAY® B-7	1830	1750	1490	1255	400	Fig. 2

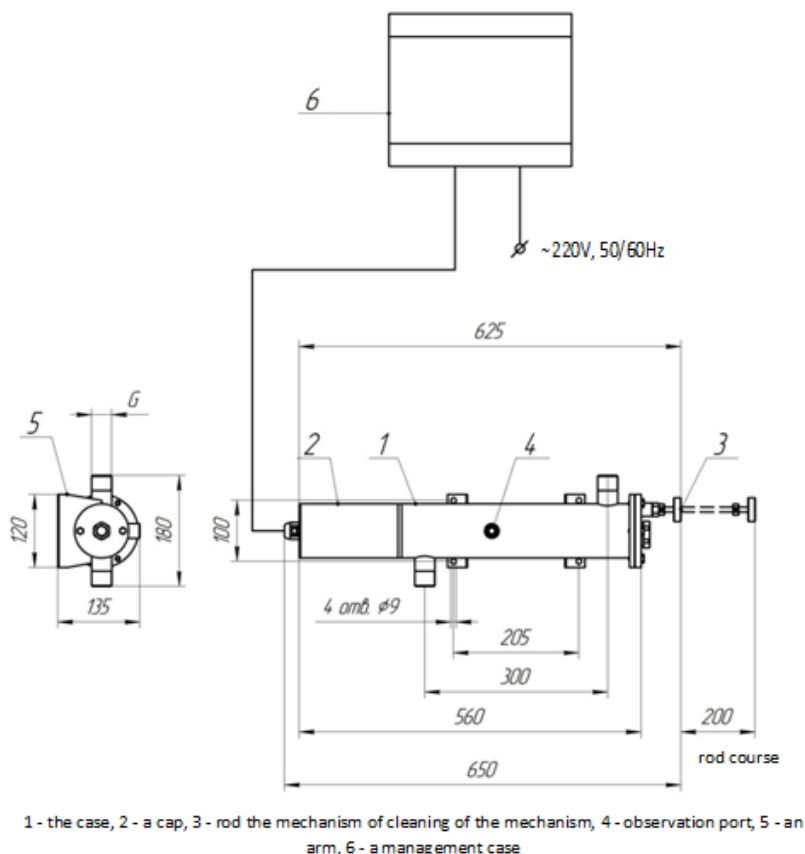


Fig. 1.7. UVC sterilizer VODOGRAY® B-1.

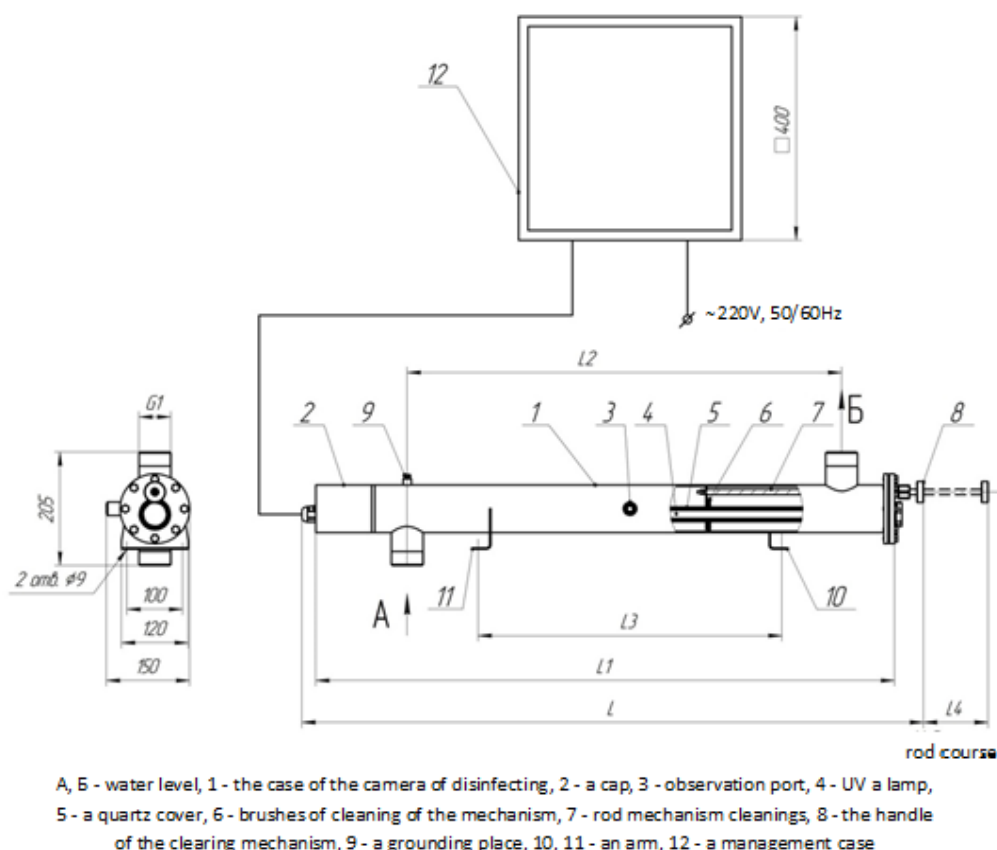


Fig. 1.8. UVC sterilizer VODOGRAY[®] B-3 (VODOGRAY[®] B-7).

1.1.5. UVC sterilizers UV sterilizers of small productivity with built-in system of electromechanical cleaning of quartz covers VODOGRAY[®] B-1.01, VODOGRAY[®] B-3.01, VODOGRAY[®] B-8.01

This model UV of sterilizers is intended for disinfecting of the cleared drinking water. It can be used for water disinfecting with the raised level of a mineralization (the raised content in water of salts of iron, rigidity, etc.), and also for water disinfecting with the increased level of the content of organic substances (the raised turbidity and chromaticity). The main advantage of this model is possibility of work in an autonomous mode without continuous service. The applied constructive decisions ensure reliable functioning of UV of sterilizers on remote objects that allows to lower costs of their operation considerably.

UV sterilizer consists of the camera of disinfecting and a case of management. The camera of disinfecting represents the cylindrical camera in which bactericidal UV lamp is located. For protection against direct contact with UV water the lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UV of radiation. The case of the camera of disinfecting and other, its parts contacting to water are executed from stainless steel and other materials resistant to corrosion which are allowed by Ministry of Health for contact with foodstuff.

Cleaning of a quartz cover of organic and mineral deposits is made by means of the disinfecting of the clearing mechanism built in the camera equipped with the electric drive.



Mechanism of cleaning represents a set placed on an external surface of a quartz cover of ring brushes which settle down on a special plate - leash. The leash with brushes is set in motion by means the screw of guide which settles down in the disinfecting camera. Process of cleaning of a quartz cover consists in movement by means of the running screw of brushes along a cylindrical surface of a quartz cover. Cleaning of a quartz cover is carried out in an automatic mode.

UV control of a sterilizer is exercised by means a case of management which provides inclusion and switching off established in the camera of disinfecting of UV of a lamp, light indication of work of UV of a lamp, the accounting of operating time of UV of a sterilizer, control of intensity of UV of radiation (by the separate order), control of availability of water in the disinfecting camera. Control of operation of the mechanism of cleaning of a quartz cover is exercised in an automatic mode.

UV sterilizers are equipped with the monitoring system of operability of UV lamp, the resource counter, the sensor of availability of water (provides automatic inclusion of UV lamp at emergence of water in the disinfecting camera), system of protective shutdown of a power supply system of installation at a casual touch of the service personnel to current carrying parts of UV sterilizer, the automatic mechanism of cleaning of a quartz cover.

Supply of UV sterilizers is carried out from a three-phase electric network of alternating current with tension 380/220 B and with a frequency of 50/60 Hz.

Pressure loss in UV sterilizers doesn't exceed 0,5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 1,0 MPas (10 kgfs/cm²).

The size UV of a dose is specified at transparency of water in UV range ($\lambda = 253,7$ nanometers) equal 75% (at coefficient of absorption of UV of radiation of $k = 0,25 \text{ cm}^{-1}$) which corresponds to the cleared drinking water.

Table 1.8. The key technical parameters.

technical parameters	Name of UV sterilizer VODOGRAY ® B-X.01		
	B-1.01	B-3.01	B-8.01
Productivity, m ³ /h, no more	1,1	3,65	8,5
Absorbed UV a dose (A dose of UV of radiation), J/m ² , not less	325	350	325
UV resource of lamps, h, not less	9000	9000	9000
Quantity of UV lamps, piece.	1	1	1
Power (at $\cos \phi = 0,96$), W	20	40	80
Power of the electric drive of the mechanism of cleaning of a quartz cover, W	90	90	90
Conditional pass of entrance and output branch pipes	DN50	DN50	DN50
Weight (without water), kg, no	32	48	65

Table 1.9. Overall dimensions of the camera of disinfecting

UV sterilizer	L	L1	L2	L3
VODOGRAY ® B-1.01	810	540	300	205
VODOGRAY ® B-3.01	1390	1120	790	500
VODOGRAY ® B-8.01	2100	1830	1500	854

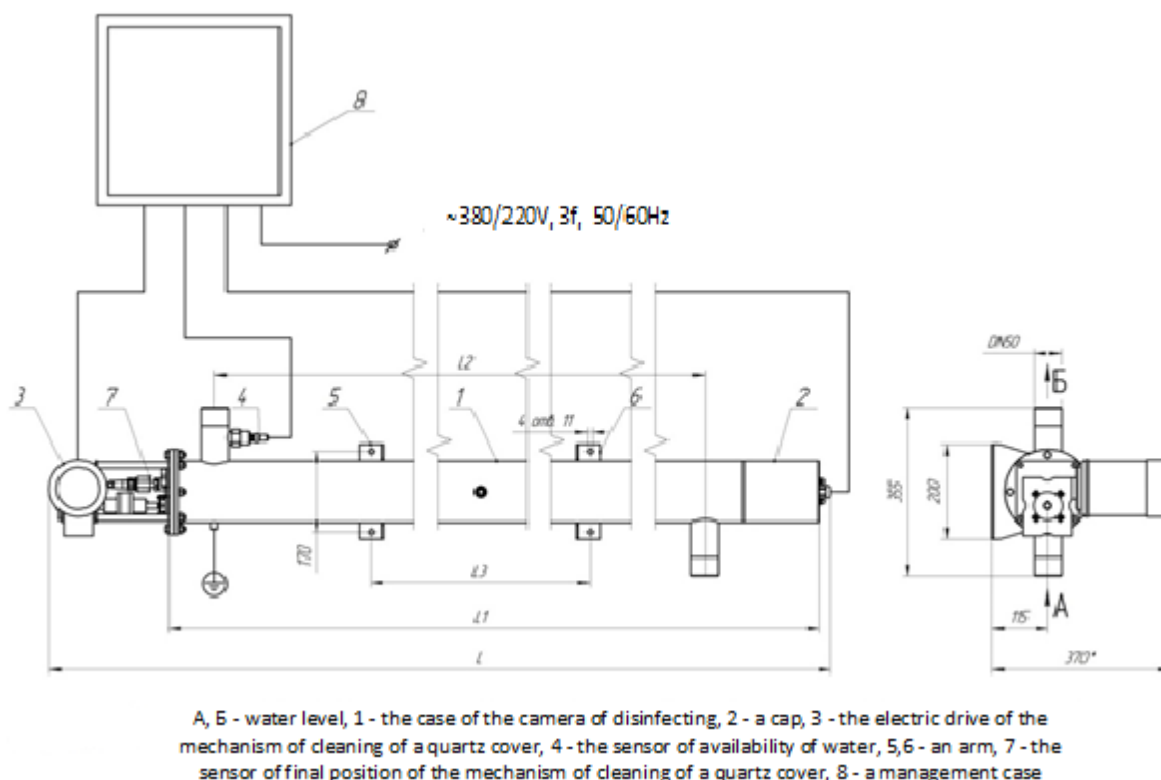


Fig. 1.9 UV sterilizer VODOGRAY ® B-X.01

1.1.6. UV sterilizers with built-in system of electromechanical cleaning of quartz covers of middle productivity VODOGRAY ® B-10.01, VODOGRAY ® B-20.01, VODOGRAY ® B-30.01, VODOGRAY ® B-50.01, VODOGRAY ® B-75.

This model UV of sterilizers is intended for disinfecting of the cleared drinking water. It can be used for water disinfecting with the raised level of a mineralization (the raised content in water of salts of iron, rigidity, etc.), and also for water disinfecting with the increased level of the content of organic substances (the raised turbidity and chromaticity). The main advantage of this model is possibility of work in an autonomous mode without continuous service. The applied constructive decisions ensure reliable functioning of UV of sterilizers on remote objects that allows to lower costs of their operation considerably.

UV a sterilizer consists of the camera of disinfecting and a case of management. The camera of disinfecting represents the cylindrical camera in which bactericidal UV of a lamp are located. For protection against direct contact with water UV lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission



of bactericidal UV of radiation. The case of the camera of disinfecting and its parts contacting to water are executed from stainless steel and other materials resistant to corrosion which are allowed by Ministry of Health for contact with foodstuff.

Cleaning of a quartz cover of organic and mineral deposits is made by means of the disinfecting of the clearing mechanism built in the camera equipped with the electric drive. Mechanism of cleaning represents a set placed on an external surface of a quartz cover of ring brushes which settle down on a special plate - leash. The leash with brushes is set in motion by means the screw of guide which settles down in the disinfecting camera. Process of cleaning of a quartz cover consists in movement by means of the running screw of brushes along a cylindrical surface of a quartz cover. Cleaning of a quartz cover is carried out in an automatic mode.

UV control of a sterilizer is exercised by means a case of management which provides inclusion and switching off established in the camera of disinfecting of UV of a lamp, light indication of work of UV of a lamp, the accounting of operating time of UV of a sterilizer, control of intensity of UV of radiation (by the separate order), control of availability of water in the disinfecting camera. Control of operation of the mechanism of cleaning of a quartz cover is exercised in an automatic mode.

Table 1.10. The key technical parameters.

technical parameters	Name of UV sterilizer VODOGRAY ® B-XX.01				
	B-10.01	B-20.01	B-30.01	B-50.01	B-75.01
Productivity, m ³ /h, no more	12,7	19,2	34	50	75
Absorbed UV a dose (A dose of UV of radiation), J/m ² , not less	325	350	325	325	325
UV resource of lamps, h, not less	9000	9000	9000	9000	9000
Quantity of UV lamps, piece.	3	5	4	6	9
Power (at cos φ = 0,96), W	0,15	0,4	0,45	0,5	0,7
Power of the electric drive of the mechanism of cleaning of a quartz cover, W	90	90	90	90	90
Conditional pass of entrance and output branch pipes	DN50	DN50	DN50	DN100	DN100
Weight (without water), kg, no	60	68	76	89	105

UV sterilizers are equipped with the monitoring system of operability of UV lamp, the resource counter, the sensor of availability of water (provides automatic inclusion of UV lamp at emergence of water in the disinfecting camera), system of protective shutdown of a power supply system of installation at a casual touch of the service personnel to current carrying parts of UV sterilizer, the automatic mechanism of cleaning of a quartz cover.

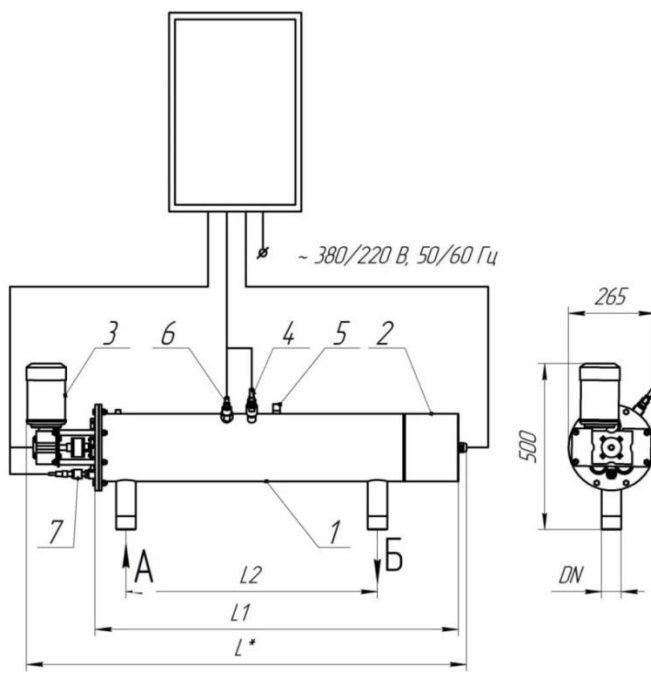
Supply of UV sterilizers is carried out from a three-phase electric network of alternating current with tension 380/220 B and with a frequency of 50/60 Hz.

Pressure loss in UV sterilizers doesn't exceed 0,5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 1,0 MPas (10 kgfs/cm²).

The size UV of a dose is specified at transparency of water in UV range ($\lambda = 253,7$ nanometers) equal 75% (at coefficient of absorption of UV of radiation of $k = 0,25 \text{ cm}^{-1}$) which corresponds to the cleared drinking water.

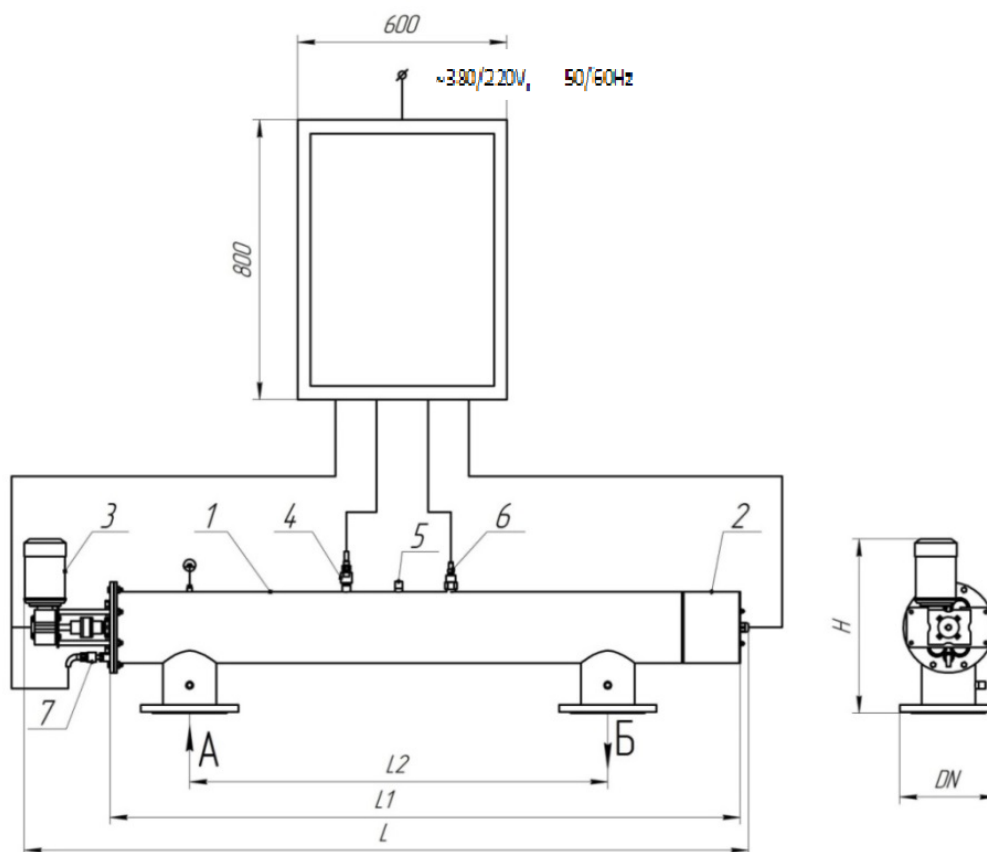
Table 1.11. Overall dimensions of the camera of disinfecting

UV sterilizer	L*	L1	L2	H	# figure
VODOGRAY ® B-10.01	1390	1120	760	500	Fig. 1
VODOGRAY ® B-20.01	1390	1120	760	500	Fig. 1
VODOGRAY ® B-30.01	2100	1830	1200	500	Fig. 1
VODOGRAY ® B-50.01	2100	1830	1200	500	Fig. 2
VODOGRAY ® B-75.01	2100	1830	1200	500	Fig. 2



A, Б – направление потока воды, 1 – Камера обеззараживания, 2 – Колпак, 3 – Электропривод механизма очистки кварцевых чехлов, 4 – УФ датчик, 5 – Клапан для выпуска воздуха, 6 – Датчик наличия воды, 7 – Датчик конечного положения механизма очистки кварцевых чехлов.

Fig. 1.10. UV sterilizer VODOGRAY ® B-XX.01



A, B - water flow direction, 1 – the camera of disinfecting, 2 – cap, 3 – the electric drive of the mechanism of cleaning of quartz cover, 4 - UV sensor, 5 - cap for production of air, 6 – the sensor of availability water, 7 - the sensor end position of the mechanism of cleaning quartz covers

Fig. 1.11. UV sterilizer VODOGRAY[®] B-XX.01.

1.2. UVC sterilizers series VODOGRAY[®] for disinfecting of sewage

1.2.1. UV sterilizers of channel type for small treatment facilities VODOGRAY[®] B-1KS, VODOGRAY[®] B-2KS, VODOGRAY[®] B-3KS, VODOGRAY[®] B-4KS, VODOGRAY[®] B-6KS, VODOGRAY[®] B-8KS

This model UV of sterilizers is specially developed for disinfecting previously the cleared sewage with the maintenance of the weighed particles no more than 10 mg/dm^3 . Simplicity and reliability of a design allows to apply it to disinfecting of sewage as a part of treatment facilities of cottages, small hotels, child care school and preschool institutions, etc. UV a sterilizer is established directly at the exit of small treatment facilities, for example in a well, or *приямке*. The main advantage of this model is possibility of work in an autonomous mode without continuous service. The applied constructive decisions ensure reliable functioning of UV of sterilizers throughout all term of operation that allows to lower costs of their operation considerably.

UV a sterilizer consists of the camera of disinfecting and a case of management . The



camera of disinfecting represents the rectangular camera in which bactericidal UV of a lamp are placed. UV of a lamp are placed on a removable cover over water. Such arrangement of UV of lamps allows to simplify considerably a design of UV of a sterilizer and to refuse the built-in mechanism of cleaning of quartz covers. For protection against direct contact with UV water the lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UV of radiation. The case of the camera of disinfecting and other, its parts contacting to water are executed from stainless steel and other materials resistant to corrosion.

Cleaning of quartz covers of organic deposits is carried out 1 time in three – four months. For cleaning of quartz covers it is necessary to uncover UV of a sterilizer and to wipe quartz covers pure rags.

UV control of a sterilizer is exercised by means of a case of management which provides inclusion and switching off established in the camera of disinfecting of UV of lamps, light indication of work of UV of lamps, the accounting of operating time of UV of a sterilizer, control of availability of water in the disinfecting camera.

UV sterilizers are equipped with the monitoring system of operability of UV of lamps, the resource counter, the sensor of availability of water (provides automatic inclusion of UV of a lamp at emergence of water in the disinfecting camera), system of protective shutdown of a power supply system of installation at a casual touch of the service personnel to current carrying parts of UV a sterilizer.

Supply of UV of sterilizers is carried out from the electric alternating current main with a voltage of 220 V and with a frequency of 50/60 Hz.

The size UV of a dose is specified at transparency of water in UV range ($\lambda = 253,7$ nanometers) equal 50% (at coefficient of absorption of UF of radiation of $k = 0,5 \text{ cm}^{-1}$) which corresponds to standardly cleared sewage with the maintenance of the weighed particles no more than 12 mg/dm^3 .

Table 1.12. Key technical parameters

technical parameters	Name of UV sterilizer VODOGRAY® B -XKS			
	B 1KS	B 2KS	B 3KS	B 4KS
Productivity at the dose of UV of the radiation equal to 300 J/m^2 , m^3/h , no more	2	3	4	6
UV resource of lamps, h, not less	13 000	13 000	13 000	13 000
Quantity of UV lamps, piece.	2	3	4	6
Power (at $\cos \phi = 0,96$), W	0,08	0,12	0,16	0,24
Conditional pass of entrance and output branch pipes	DN100	DN100	DN100	DN100
Weight (without water), kg, no more	34	38	42	50

Table 1.12. Key technical parameters(продолжение)

technical parameters	Name of UV sterilizer VODOGRAY® B-XKS	
	B 6KS	B 8KS
Productivity at the dose of UV of the radiation equal to 300 J/m ² , m ³ /h, no more	8	12
UV resource of lamps, h, not less	13 000	13 000
Quantity of UV lamps, piece.	6	8
Power (at cos φ = 0,96), W	0,45	0,6
Conditional pass of entrance and output branch pipes	DN100	DN100
Weight (without water), kg, no more	65	75

Table 1.13. Overall dimensions of the camera of disinfecting

UV sterilizer	L*	L1	L2	L3	L4	L5	H
VODOGRAY® B-1KS	1200	1000	770	330	280	325	350
VODOGRAY® B-2KS	1200	1000	770	330	280	325	350
VODOGRAY® B-3KS	1200	1000	770	330	280	325	350
VODOGRAY® B-4KS	1200	1000	770	500	450	325	350
VODOGRAY® B-6KS	1850	1650	1400	500	450	325	350
VODOGRAY® B-8KS	1850	1650	1400	600	400	325	350

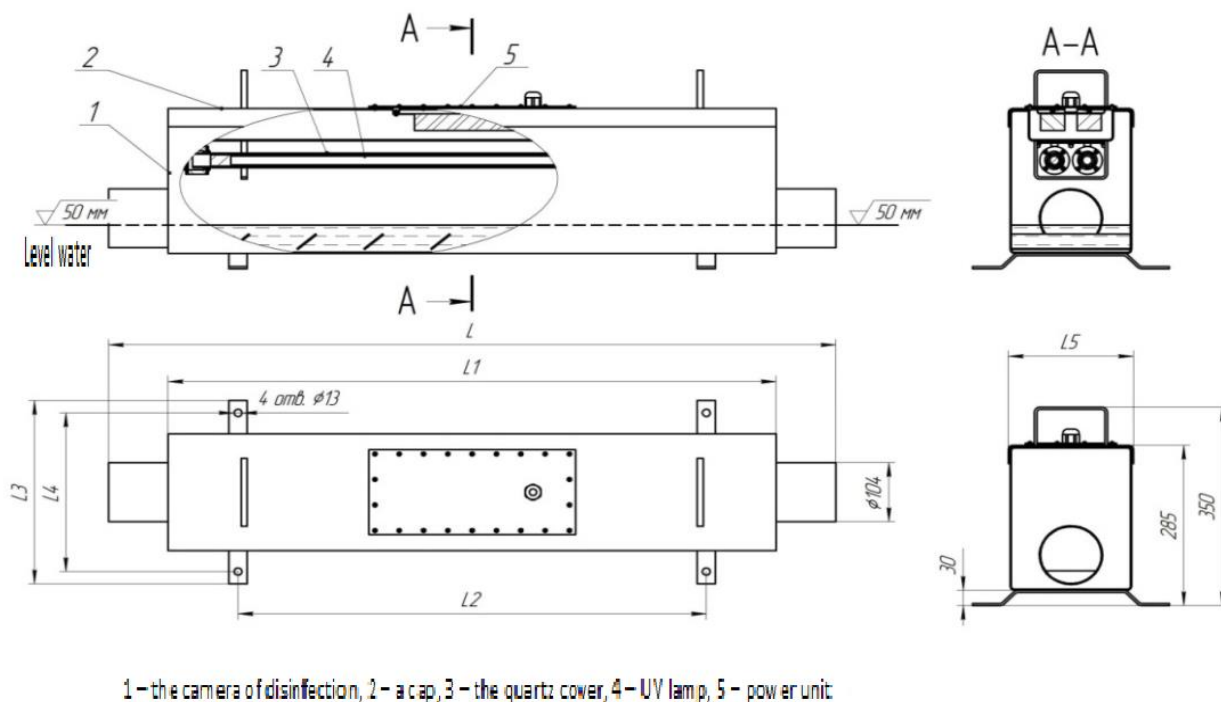


Fig. 1.12. UV sterilizers series VODOGRAY® B-XKS



1.2.2 . UV sterilizers of case type for disinfecting of sewage of small productivity with built-in system of electromechanical cleaning of quartz covers of VODOGRAY® V-1.01S, VODOGRAY® V-3.01S.

The UV this model of sterilizers is intended for disinfecting previously the cleared sewage with the maintenance of the weighed particles no more than 15 mg/dm^3 . It can be used for water disinfecting with the raised level of the maintenance of the weighed particles (to 25 mg/dm^3), however thus it is necessary to agree on possibility of application of UV of a sterilizer with the developer – Kharkiv electric industrial company. The main advantage of this model is possibility of work in an autonomous mode without continuous service. The applied constructive decisions ensure reliable functioning of UV of sterilizers on remote objects that allows to lower costs of their operation considerably.

UV a sterilizer consists of the camera of disinfecting and a management case. The camera of disinfecting represents the cylindrical camera in which bactericidal UV a lamp is located. For protection against direct contact with UV water the lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UV of radiation. The case of the camera of disinfecting and other, its parts contacting to water are executed from stainless steel and other materials resistant to corrosion.

Cleaning of a quartz cover of organic and mineral deposits is made by means of the disinfecting of the clearing mechanism built in the camera equipped with the electric drive. The clearing mechanism represents a set placed on an external surface of a quartz cover of ring brushes which settle down on a special plate - a lead. The lead with brushes is set in motion by means of the running screw which settles down in the disinfecting camera. Process of cleaning of a quartz cover consists in movement by means of the running screw of brushes along a cylindrical surface of a quartz cover. Process of cleaning of a quartz cover consists in movement by means of the running screw of brushes along a cylindrical surface of a quartz cover. Cleaning of a quartz cover is carried out in an automatic mode. Cleaning of a quartz cover is carried out in an automatic mode.

UV control of a sterilizer is exercised by means of a management case which provides inclusion and switching off established in the camera of disinfecting of UV of a lamp, light indication of work of UV of a lamp, the accounting of operating time of UV of a sterilizer, control of intensity of UV of radiation (by the separate order), control of availability of water in the disinfecting camera. Control of operation of the mechanism of cleaning of a quartz cover is exercised in an automatic mode.

UV sterilizers are equipped with the monitoring system of operability of UV of a lamp, the resource counter, the sensor of availability of water (provides automatic inclusion of UV of a lamp at emergence of water in the disinfecting camera), system of protective shutdown of a power supply system of installation at a casual touch of the service personnel to current

carrying parts of UV of a sterilizer, the automatic mechanism of cleaning of a quartz cover.

A power supply of UV sterilizers is carried out from the three-phase electric alternating current main with tension 380/220 V and with a frequency of 50/60 Hz.

Pressure loss in UV sterilizers doesn't exceed 0.5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 1,0 MPa (10 kgfs/cm²).

The size of UV dose is specified at transparency of water in UV range ($\lambda = 253.7$ nanometers) equal 45% (at coefficient of absorption of UV radiation of $k = 0.55 \text{ cm}^{-1}$) which corresponds to standardly cleared sewage with the maintenance of the weighed particles no more than 15 mg/dm³.

Table 1.14. The key technical parameters.

technical parameters	Name of UVC sterilizer VODOGRAY® B-X.01C	
	B-1.01C	B-3.01C
Productivity at the dose of UV radiation equal to 300	1,0	3,0
Productivity at the dose of UV radiation equal to 400 J/m ² , m ³ /h, no more	400	400
Resource of UV lamps, h, not less	9000	9000
Number of UV lamps, pieces	1	1
Capacity (at $\cos \phi = 0,96$), kW	40	80
Capacity of the electric drive of the mechanism of cleaning of a quartz cover, W	90	90
Conditional pass of entrance and output branch pipes	DN50	DN50
Weight (without water), kg, no more	48	65

Table 1.15. Overall dimensions of the camera of disinfecting.

UVC sterilizer	L	L1	L2	L3
VODOGRAY® B-1.01C	1390	1120	790	500
VODOGRAY® B-3.01C	2100	1830	1500	854

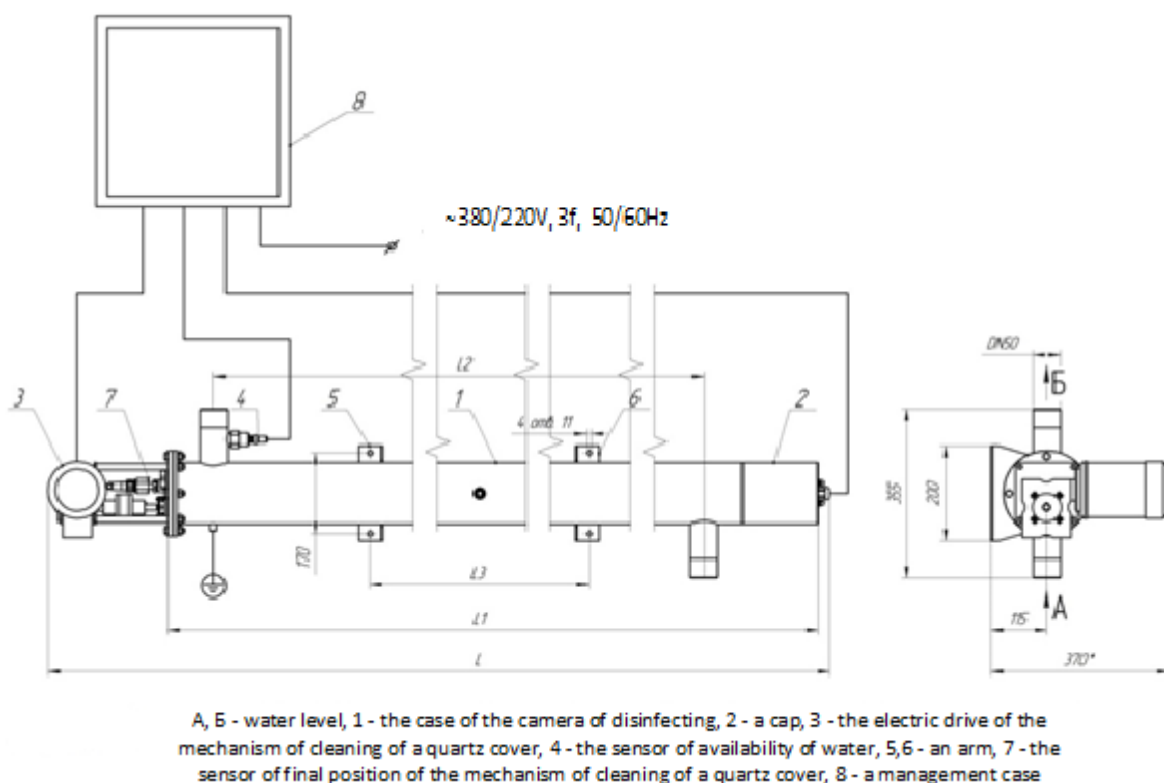


Fig. 1.13 UV sterilizer VODOGRAY® B-X.01C.

1.2.3. UVC sterilizers with built-in system of electromechanical cleaning of quartz covers VODOGRAY® V-4.01S, VODOGRAY® V-8.01S, VODOGRAY® V-15.01S, VODOGRAY® V-30.01S, VODOGRAY® V-40.01S, VODOGRAY® V-60.01S, VODOGRAY® V-80.01S.

This model of UVC sterilizers is intended for disinfecting previously the cleared sewage with the maintenance of the weighed particles no more than 15 mg/dm³. It can be used for water disinfecting with the raised level of the maintenance of the weighed particles (to 25 mg/dm³), however thus it is necessary to coordinate possibility of application of UV sterilizer with the developer – the Kharkiv electric industrial company. The main advantage of this model is possibility of work in an autonomous mode without continuous service. The applied constructive decisions ensure reliable functioning of UVC of sterilizers on remote objects that allows to lower costs of their operation considerably.

UVC sterilizer consists of the camera of disinfecting and a management case. The camera of disinfecting represents the cylindrical camera in which bactericidal UVC lamp are located. For protection against direct contact with water the UVC lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UVC radiation. The case of the camera of disinfecting and other, its parts contacting to water are executed from stainless steel and other materials resistant to corrosion.

Cleaning of quartz covers of organic and mineral deposits is made by means of the disinfecting of the clearing mechanism built in the camera equipped with the electric drive. The



clearing mechanism represents a set placed on an external surface of a quartz cover of ring brushes which settle down on a special plate - a lead. The lead with brushes is set in motion by means of the running screw which settles down in the disinfecting camera. Process of cleaning of quartz covers consists in movement by means of the running screw of brushes along a cylindrical surface of quartz covers. Cleaning of quartz covers is carried out in an automatic mode.

Control of UVC sterilizer is exercised by means of a management case which provides inclusion and switching off established in the camera of disinfecting of UVC lamps, light indication of work of UVC lamps, the accounting of operating time of UVC sterilizer, control of intensity of UVC radiation (by the separate order), control of availability of water in the disinfecting camera. Control of operation of the mechanism of cleaning of a quartz cover is exercised in an automatic mode.

UVC sterilizers are equipped with the monitoring system of operability of UVC lamps, the resource counter, the sensor of availability of water (provides automatic inclusion of UV lamp at emergence of water in the disinfecting camera), system of protective shutdown of a power supply system of installation at a casual touch of the service personnel to current carrying parts of UVC sterilizer, the automatic mechanism of cleaning of quartz covers.

Regarding UVC safety requirements sterilizers meet the requirements of GOST 12.2.007.0 - 75, "Rule of the Device of Electroinstallations (RDE)", and also to the relevant normative documents of EU and have the following parameters:

- electrical safety class in accordance with GOST 12.2.007.0 – 75 - 1;
- extent of protection against dust and moisture hit in accordance with GOST 14254 - 96 - IP34;
- climatic modification and category of placement in accordance with GOST 15150 – 69 - UHL 4;
- group of service conditions on mechanical durability in accordance with GOST 17516.1 - 88 - M1.

Non-failure operation of work of UVC sterilizers is provided without continuous service and control in the conditions of ambient temperature in the range from 278 K (5°C) to 308 K (35°C) and relative humidity from 70% at a temperature of 293 K (20°C) to 80% - at 298 K (25°C).

A power supply of UVC sterilizers is carried out from the three-phase electric alternating current main with tension 380/220 V and with a frequency of 50/60 Hz.

Pressure loss in UVC sterilizers doesn't exceed 0.5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 1,0 MPa (10 kgfs/cm²).

The size of UVC dose is specified at transparency of water in UV range ($\lambda = 253.7$ nanometers) equal 45% (at coefficient of absorption of UV radiation of $k = 0.55 \text{ cm}^{-1}$) which corresponds to standardly cleared sewage with the maintenance of the weighed particles no more than 15 mg/dm³.

Microbiological indicators of the disinfected sewage correspond the SanPiN 4630-88 "Protection of a surface water from pollution", the SanPiN 2.1.5.980-00 "Hygienic requirements to protection of a surface water", MU 2.1.5.732-99 "Sanitary and epidemiologic



supervision of disinfecting of sewage by ultra-violet radiation", MU 2.1.5.800-99 "The «Gossanepidnadzor» organization behind disinfecting of sewage", MU 3.2.1757-03 "Prevention of parasitic diseases.

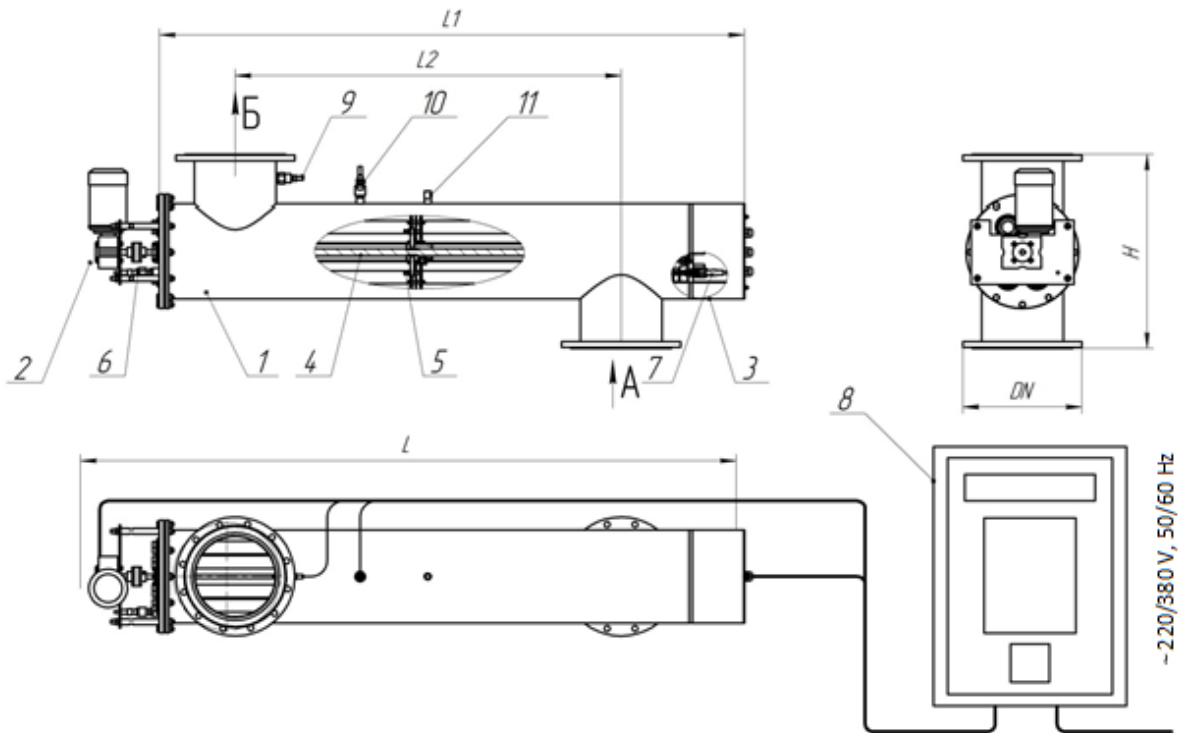
Sanitary and parasitological assessment of efficiency of disinfecting of water ultra-violet radiation", and also to normative documents of EU which regulate microbiological indicators of the sewage dumped in superficial reservoirs. Thus the total koliform in the disinfected drains doesn't exceed 500 KOE/100 ml, the quantity of thermotolerant koliformny bacteria in the disinfected drains doesn't exceed 100 KOE/100 ml, the quantity coliphages in the disinfected drains doesn't exceed 10 BOE/100 ml.

Table 1. 16 The key technical parameters.

Technical parameter	Name of UVC sterilizer VODOGRAY® B-XX.01C						
	B-4.01C	B-8.01C	B-15.01C	B-30.01C	B-40.01C	B-60.01C	B-80.01C
Productivity at the dose of UV radiation equal to 300 J/m ² , m ³ /h, no more	6,3	12,6	25,0	37,0	50	75	100
Productivity at the dose of UV radiation equal to 400 J/m ² , m ³ /h, no more	4,2	8,4	18,0	27,0	36	54	72
Resource of UV lamps, h, not less	9000	9000	9000	9000	9000	9000	9000
Number of UV lamps, pieces	3	6	6	9	12	18	24
Capacity (at cos φ = 0,96), kW	0,15	0,25	0,5	0,8	1,1	1,5	2,0
Capacity of the electric drive of the mechanism of cleaning of a quartz cover, W	90	90	90	90	90	90	90
Conditional pass of entrance and output branch pipes	DN100	DN100	DN150	DN150	DN200	DN250	DN250
Weight (without water), kg, no more	68	76	82	98	127	135	150

Table 1.17. Overall dimensions of the camera of disinfecting.

UVC sterilizer	L*	L1	L2	H
VODOGRAY® B-4.01C	1390	1120	760	500
VODOGRAY® B-8.01C	1390	1120	760	500
VODOGRAY® B-15.01C	2100	1830	1200	500
VODOGRAY® B-30.01C	2100	1830	1200	500
VODOGRAY® B-40.01C	2100	1830	1200	500
VODOGRAY® B-60.01C	2100	1830	1200	500
VODOGRAY® B-80.01C	2100	1830	1200	500



A, B - water flow direction, 1 - disinfecting camera, 2 - electric drive of the mechanism of cleaning of quartz covers, 3 - capdetector

Fig. 1.14. UV sterilizer VODOGRAY® B-XX.01S



1.2.4. UVC sterilizers with built-in system of electromechanical cleaning of quartz covers with a vertical arrangement of UV lamps VODOGRAY® B-200.01CB, VODOGRAY® B-300.01CB.

This model of UV sterilizers is intended for disinfecting previously the cleared sewage with the maintenance of the weighed particles no more than 15 mg/dm³. It can be used for water disinfecting with the raised level of the maintenance of the weighed particles (to 25 mg/dm³), however thus it is necessary to coordinate possibility of application of UV sterilizer with the developer – the Kharkiv electric industrial company. The main advantage of this model is possibility of work in an autonomous mode without continuous service. The applied constructive decisions ensure reliable functioning of UV of sterilizers on remote objects that allows to lower costs of their operation considerably.

UV sterilizer consists of the camera of disinfecting and a management case. The camera of disinfecting represents the special camera in which bactericidal UV lamp are located. For protection against direct contact with water the UV lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UV radiation. The case of the camera of disinfecting and other, its parts contacting to water are executed from stainless steel and other materials resistant to corrosion.

A distinctive feature of this model is vertical position of UV lamps and combining in a single unit camera disinfection and cabinets with control gear that allows you to place such UV sterilizers in small spaces (eg in underground wells).

Cleaning of quartz covers of organic and mineral deposits is made by means of the disinfecting of the clearing mechanism built in the camera equipped with the electric drive. The clearing mechanism represents a set placed on an external surface of a quartz cover of ring brushes which settle down on a special plate - a lead. The lead with brushes is set in motion by means of the running screw which settles down in the disinfecting camera. Process of cleaning of quartz covers consists in movement by means of the running screw of brushes along a cylindrical surface of quartz covers. Cleaning of quartz covers is carried out in an automatic mode.

Non-failure operation of work of UV sterilizers is provided without continuous service and control in the conditions of ambient temperature in the range from 278 K (5°C) to 308 K (35°C) and relative humidity from 70% at a temperature of 293 K (20°C) to 80% - at 298 K (25°C).

A power supply of UV sterilizers is carried out from the three-phase electric alternating current main with tension 380/220 V and with a frequency of 50/60 Hz.

Pressure loss in UV sterilizers doesn't exceed 0.5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 0,4 MPa (4 kgfs/cm²).

The size of UV dose is specified at transparency of water in UV range ($\lambda = 253.7$ nanometers) equal 45% (at coefficient of absorption of UV radiation of $k = 0.55 \text{ cm}^{-1}$) which corresponds to standardly cleared sewage with the maintenance of the weighed particles no more than 15 mg/dm³.

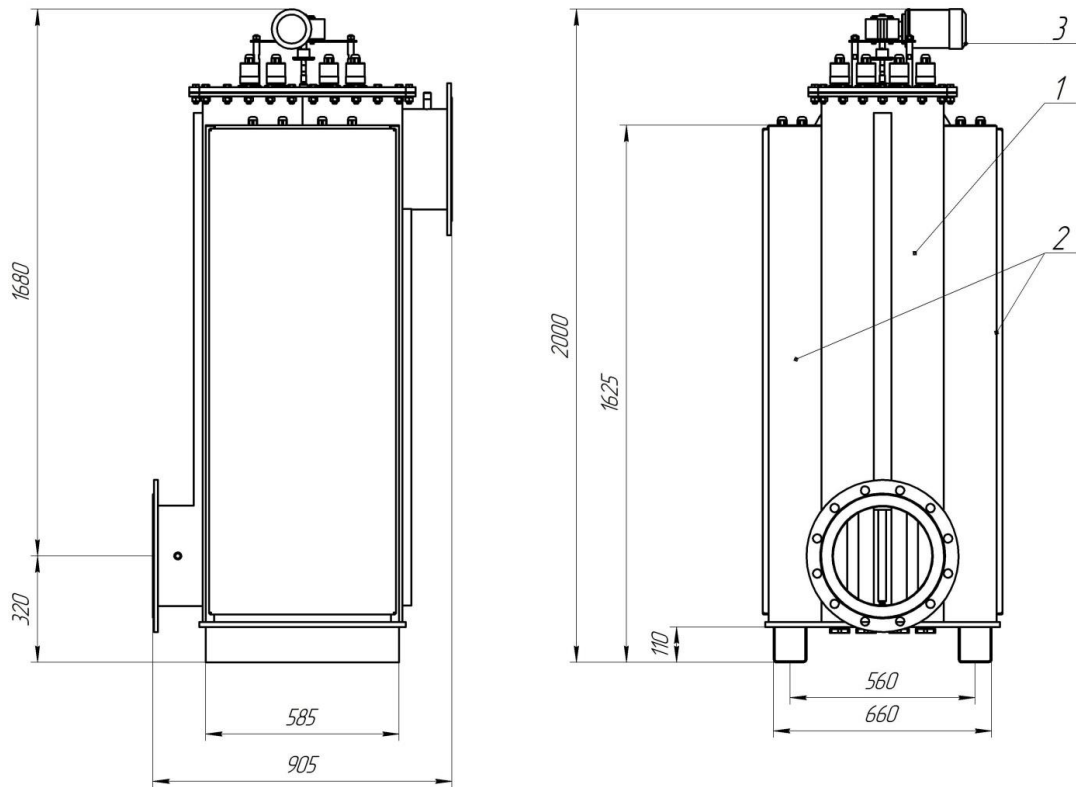
Microbiological indicators of the disinfected sewage correspond the SanPiN 4630-88 "Protection of a surface water from pollution", the SanPiN 2.1.5.980-00 "Hygienic requirements to protection of a surface water", MU 2.1.5.732-99 "Sanitary and epidemiologic supervision of



disinfecting of sewage by ultra-violet radiation", MU 2.1.5.800-99 "The «Gossanepidnadzor» organization behind disinfecting of sewage", MU 3.2.1757-03 "Prevention of parasitic diseases. Sanitary and parasitological assessment of efficiency of disinfecting of water ultra-violet radiation", and also to normative documents of EU which regulate microbiological indicators of the sewage dumped in superficial reservoirs. Thus the total koliform in the disinfected drains doesn't exceed 500 KOE/100 ml, the quantity of thermotolerant koliformny bacteria in the disinfected drains doesn't exceed 100 KOE/100 ml, the quantity coliphages in the disinfected drains doesn't exceed 10 BOE/100 ml.

Table 1. 17 The key technical parameters

technical parameters	Name of UV sterilizer VODOGRAY®	
	B-200.01CB	B-300.01CB
Productivity at the dose of UV radiation equal to 300 J/m ² , m ³ /h, no more	215	335
Productivity at the dose of UV radiation equal to 400 J/m ² , m ³ /h, no more	160	252
Operating pressure of water in the disinfection chamber, no more	0,4 MPa	
Resource of UV lamps, h, not less	16 000	
Type of UV lamps	amalgam	
Quantity of disinfecting sections 3B8.01KC	1	2
Quantity of case of start-up of regulating devices, piece	1	2
Quantity of cases of management, piece.	1	1
Power (at cos φ = 0,96), kW	5,5	7,9
Power of the electric drive of the mechanism of cleaning of a quartz cover, W	250	
Conditional pass of entrance and output branch pipes	DN300	
The mass of the disinfecting module (without water), kg, no more	350	375



1 - Корпус камеры обеззараживания, 2 - Шкафы с блоками питания УФ ламп, 3 - Электрический привод механизма очистки кварцевых чехлов.

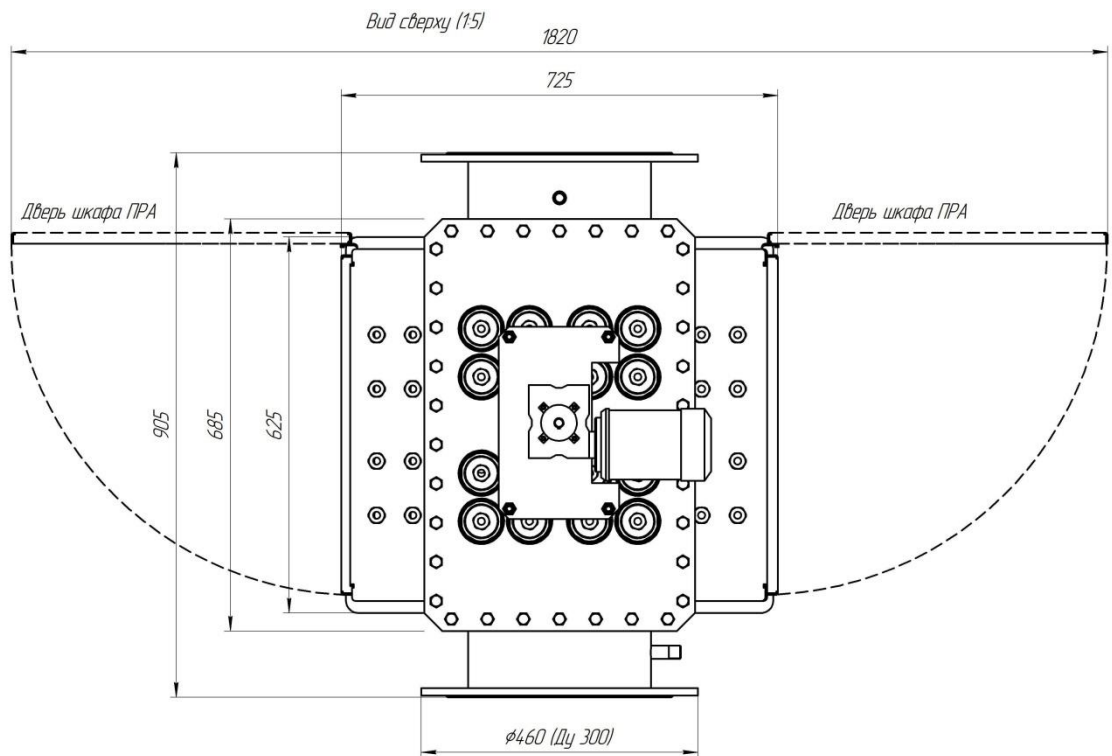


Fig. 1.14. UVC sterilizers VODOGRAY® B-XXX.01CB



1.2.5. UV sterilizers of channel type with built-in system of mechanical cleaning of quartz covers VODOGRAY® series – XXX.01KC: VODOGRAY® B-300.01KC, VODOGRAY® B-600.01KC, VODOGRAY® B-1000.01KC, VODOGRAY® B-1300.01KC.

This model UV of sterilizers belongs to systems of channel (tray) type and is intended for disinfecting previously the cleared sewage with the maintenance of the weighed particles no more than 15 mg/dm³. It can be used for water disinfecting with the raised level of the maintenance of the weighed particles (to 25 mg/dm³), however thus it is necessary to agree on possibility of application of UV of a sterilizer with the developer – Kharkiv electric industrial company. The main advantage of this model is possibility of work in an autonomous mode without continuous service. Distinctive feature of UV of sterilizers of this series is possibility of their direct installation to the existing canal on which disinfected drains flow. UV sterilizers of this series can take place as inside, and outside of the room. The applied constructive decisions ensure reliable functioning of UV of sterilizers and allow to lower costs of their operation considerably.

UV a sterilizer consists of one or several disinfecting sections 3B8.01KC, cases with the starting and control equipment (PRA case), the automatic regulator of a water level (drains) in the channel, a management case. The disinfecting section consists of a metal frame in which three disinfecting B8.01KC cartridges are located.

Structurally disinfecting section is executed so that to avoid losses of a hydraulic pressure in the course of water disinfecting. The current of disinfected water occurs along the UV axes of lamps which settle down in the horizontal plane.

The disinfecting cartridge consists of a bearing frame on which 8 sources of UV radiation, the mechanism of cleaning of quartz covers, the electric drive of the mechanism of cleaning of quartz covers, sensors of final position of the mechanism of cleaning of quartz covers, the sensor of control of intensity of UV of radiation are placed.

The source of UV of radiation consists of a quartz cover and bactericidal UV of a lamp placed in it. The quartz cover is executed from special quartz glass.

Cleaning of quartz covers of organic and mineral deposits is made by means of the disinfecting of the clearing mechanism built in the camera equipped with the electric drive. The clearing mechanism represents a set placed on an external surface of a quartz cover of ring brushes which settle down on a special plate - a lead. The lead with brushes is set in motion by means of the running screw which settles down in the disinfecting camera. Process of cleaning of quartz covers consists in movement of brushes along a cylindrical surface of quartz covers. Cleaning of quartz covers is carried out in an automatic mode.

In UV sterilizers of this series amalgamny UV of a lamp of the increased power are applied. Food of UV of lamps is carried out from special high-frequency converters (PRA) which are located in case of start-up of regulating devices (PRA case). In PRA case system of automatic control of operation of mechanisms of cleaning of quartz covers, the microprocessor controller, automatic and differential switches, magnetic actuators and other necessary equipment also settle down. All information on work of disinfecting sections is displayed on the color touch screen of the panel of the operator which is installed on a door of a case of PRA. Control of work of disinfecting sections is exercised in real time by establishment of modes on the screen of the panel of the operator.



The system of automatic control and management provides operational management of UV work of lamps and clearing mechanisms, the accounting of time of an operating time of each of UV of lamps, archiving of data and their transfer on an entrance of system of automatic control and UV management of a sterilizer.

The case of PRA is recommended to be placed near the channel.

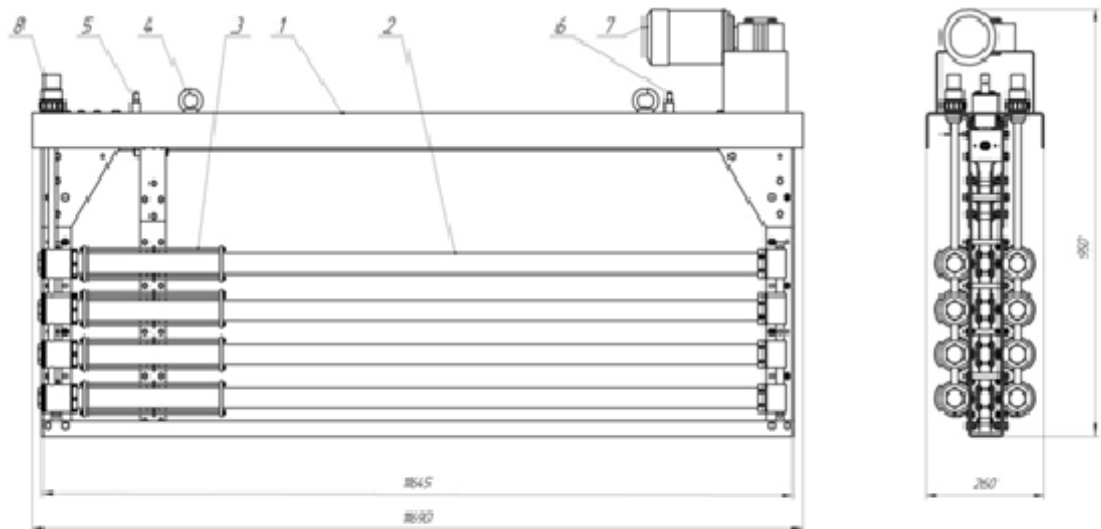
For management of a water level in the UV channel the sterilizer is completed with special system of automatic maintenance of a water level (drains) in the channel which consists of a regulating latch with the electric drive and the control unit. Control of a water level in the channel is exercised depending on an instant expense of drains. The automatic control and management system (ACS) provides inclusion and switching off of disinfecting sections, regulation of a total stream of UV of radiation depending on an instant consumption of water within 50 – 100%, control of the UV working parameters of a sterilizer, an archiving of data, transfer of received information on the GPRS channel on the remote computer of the operator and remote operational management of UV of a sterilizer.

Supply of UV of sterilizers is carried out from a three-phase electric network of alternating current with tension 380/220 V and with a frequency of 50/60 Hz.

Table 1.18. The main technical parameters.

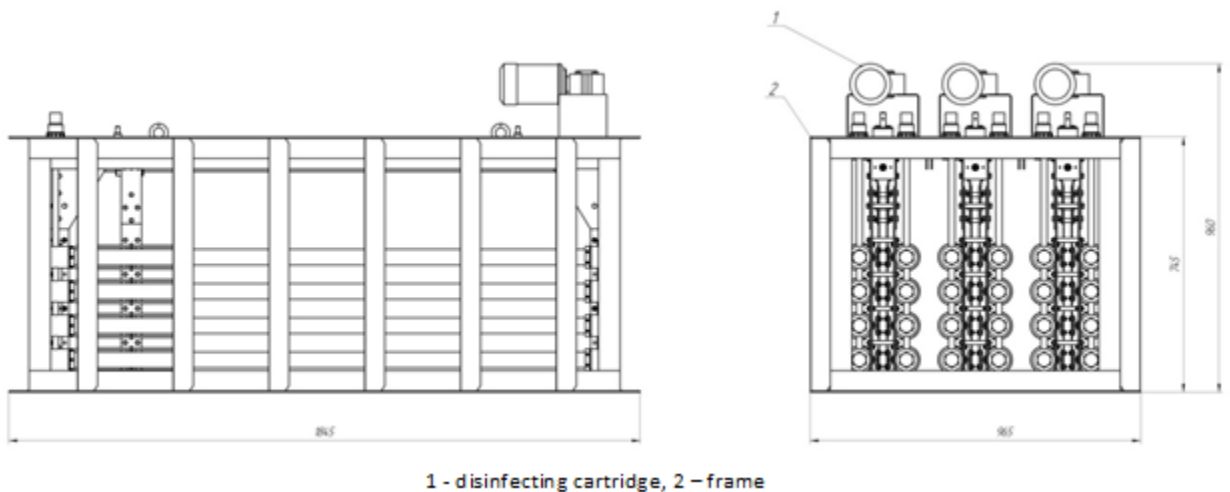
technical parameters	Name of UV sterilizer VODOGRAY® B-XX.01C			
	B-300.01KC	B-600.01KC	B-1000.01KC	B-1300.01KC
Productivity at the dose of UV radiation equal to 300 J/m ² , m ³ /h, no more	450	850	1250	1650
Productivity at the dose of UV radiation equal to 400 J/m ² , m ³ /h, no more	350	650	950	1250
Resource of UV lamps, h, not less	16000	16000	16000	16000
Number of UV lamps, pieces	24	48	72	96
Quantity of disinfecting sections 3B8.01KC	1	2	3	4
Quantity of case of start-up of regulating devices, piece	1	2	3	4
Quantity of cases of management, piece.	1	1	1	1
Power (at cos φ = 0,96), kW	12	24	36	48
Power of the electric drive of the mechanism of cleaning of a quartz cover, W	120	120	120	120
Overall dimensions of the disinfecting module 3B8.01KC: Length x width x height, mm	1845 x 965 x 960			
The mass of the disinfecting B8.01KC cartridge, kg, no more	120			
Overall dimensions of cases, no more: Length x width x height, mm	1000 x 1000 x 2100			
Weight of a case, kg, no more	125			

The size UV of a dose is specified at transparency of water in UV range ($\lambda = 253,7$ nanometers) equal 45% (at coefficient of absorption of UV of radiation of $k = 0,55 \text{ cm}^{-1}$) which corresponds to standardly cleared sewage with the maintenance of the weighed particles no more than 15 mg/dm^3 .



1 - cartridge framework, 2 quartz cover, 3 - the mechanism of cleaning of quartz covers, 4 - a bolt for dismantle, 5, 6 - the sensor of final position of the mechanism of cleaning of quartz covers, 7 - the electric drive of the mechanism of cleaning of quartz covers, 8 - the electric socket

Fig. 1.15. The disinfected cassette B8.01KC.



1 - disinfected cartridge, 2 - frame

Fig. 1.16. Disinfected section UV of a sterilizer 3B8.01KC.

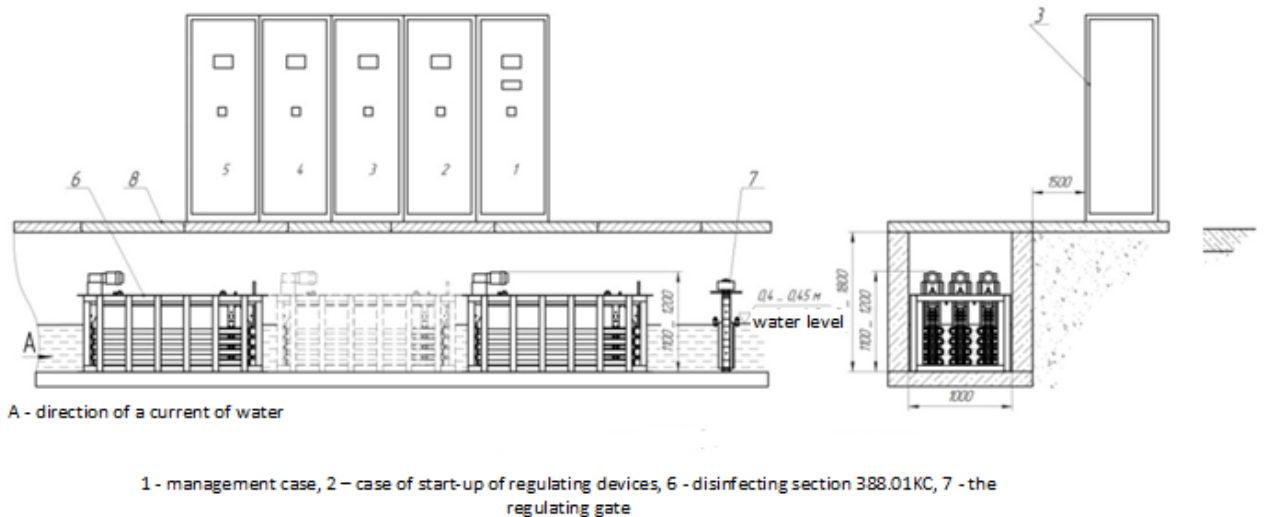


Fig. 1.17. The scheme of placement of UV of a sterilizer of VODOGRAY® V-1300.01KC with longitudinal placement of disinfecting cassettes.

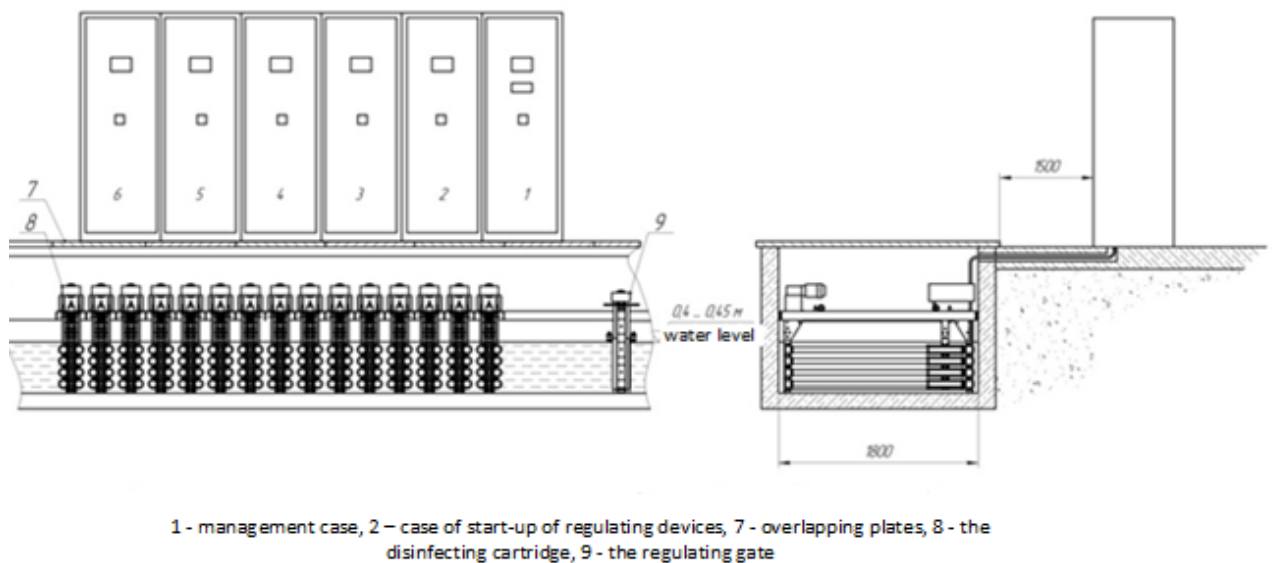


Fig. 1.18. The scheme of placement of UV of a sterilizer of VODOGRAY® V-1300.01KC with cross placement of disinfecting cartridges.

1.2.6. UV sterilizers with amalgamny lamps and built-in system of electromechanical cleaning of quartz covers VODOGRAY®B-18AC, VODOGRAY®B-24AC, VODOGRAY®B-36AC.

This model of UV sterilizers is intended for disinfecting previously cleared drinking and sewage. It can be applied to disinfecting of drinking water with the raised level of a mineralization (the raised content in water of salts of iron, rigidity, etc.), and also to water disinfecting with the increased level of the content of organic substances (the raised turbidity and chromaticity). The



main advantage of this model is possibility of work in an autonomous mode without continuous service. The applied constructive decisions ensure reliable functioning of UV sterilizers on remote objects that allows to lower costs of their operation considerably.

UV sterilizer consists of the disinfecting module and a management case. The module of disinfecting consists of entrance and output collectors and several in parallel connected cameras of disinfecting. The camera of disinfecting represents the cylindrical camera in which bactericidal UV lamp are located. For protection against direct contact with UV water the lamp is placed in a protective cover which is executed from transparent quartz glass with the increased coefficient of a transmission of bactericidal UV radiation. The case of the camera of disinfecting and other, its parts contacting to water are executed from stainless steel and other materials resistant to corrosion which are allowed by Ministry of Health for contact with foodstuff.

Cleaning of quartz covers of organic and mineral deposits is made by means of the disinfecting of the clearing mechanism built in the camera equipped with the electric drive. The clearing mechanism represents a set placed on an external surface of a quartz cover of ring brushes which settle down on a special plate - a lead. The lead with brushes is set in motion by means of the running screw which settles down in the disinfecting camera. Process of cleaning of quartz covers consists in movement by means of the running screw of brushes along a cylindrical surface of quartz covers. Cleaning of quartz covers is carried out in an automatic mode.

UV control of a sterilizer is exercised by means of a management case which provides inclusion and switching off established in the camera of disinfecting of UV lamps, light indication of work of UV lamps, the accounting of operating time of UF of a sterilizer, control of intensity of UV radiation (by the separate order), control of availability of water in the disinfecting camera. Control of operation of the mechanism of cleaning of a quartz cover is exercised in an automatic mode.

UV sterilizers are equipped with system of automatic inclusion/shutdown of UV lamps depending on availability of water in the disinfecting camera, the monitoring system of operability of UF of lamps, the counter of the UV resource of lamps, system of protective shutdown of a power supply system of installation at a casual touch of the service personnel to current carrying parts of UV sterilizer.

For work in the UV **energy saving mode** sterilizers **can be equipped** in addition with the special control unit which provides automatic shutdown of a certain quantity of UV lamps at reduction of a channel of water via the camera of disinfecting and automatic inclusion of necessary quantity of UF of lamps at increase in a channel of water. The control unit works complete with an electronic flowmeter which has a current exit 0 ... 20 mA.

Regarding UV safety requirements sterilizers meet the requirements of GOST 12.2.007.0 - 75, "Rule of the Device of Electroinstallations (RDE)", and also to the relevant normative documents of EU and have the following parameters:

- electrical safety class in accordance with GOST 12.2.007.0 – 75 - 1;
- extent of protection against dust and moisture hit in accordance with GOST 14254 - 96 - IP34;
- climatic modification and category of placement in accordance with GOST 15150 – 69 - UHL 4;



- group of service conditions on mechanical durability in accordance with GOST 17516.1 - 88 - M1.

Non-failure operation of work of UV sterilizers is provided without continuous service and control in the conditions of ambient temperature in the range from 278 K (5°C) to 308 K (35°C) and relative humidity from 70% at a temperature of 293 K (20°C) to 80% - at 298 K (25°C).

Supply of UV sterilizers is carried out from the three-phase electric alternating current main with tension 380/220 B and with a frequency of 50/60 Hz.

Pressure loss in UV sterilizers doesn't exceed 0.5 m of a water column. Working pressure of water in the camera of disinfecting shouldn't exceed 1.0 MPas (10 kgfs/cm²).

Microbiological indicators of the disinfected water of drinking quality water drinking conforms to GOST 2874-82 requirements ". Hygienic requirements and control of quality", SanPiN 2.2.4-171-10 "Hygienic requirements to water drinking, intended for consumption by the person", the SanPiN 2.1.4.1074-01 "Drinking water. Hygienic requirements to quality of water of the centralized systems of drinking water supply. Quality control", SanPiN 2.1.4.1116-02 "Drinking water. Hygienic requirements to quality of the water packaged in capacity. Quality control", SanPiN 10-124 RB 99 "Drinking water. Hygienic requirements to quality of water of the centralized systems of drinking water supply. Quality control", MU 2.1.4.719-98. Sanitary inspection behind use of ultra-violet radiation in technology of preparation of drinking water, and also to normative documents of EU which regulate microbiological indicators of drinking water.

Table 1. 19. Main technical parameters.

Technical parameter	Name of UV sterilizer VODOGRAY® B-XXAC		
	B-18AC	B-24AC	B-36AC
Productivity for drinking water, m ³ /h, no more: at a dose of UV radiation of equal 250 J/m and coefficient of absorption of 0.25 cm ⁻¹ ; at a dose of UV radiation of equal 325 J/m ² and coefficient of absorption of 0.25 cm ⁻¹	1000	1350	2000
	750	1000	1500
Productivity for sewage, m ³ /h, no more: at a dose of UV radiation of equal 300 J/m ² and coefficient of absorption of 0,55 cm ⁻¹ ; at a dose of UV radiation of equal 400 J/m ² and coefficient of absorption of 0,55 cm ⁻¹ .	375	500	750
	285	380	510
Resource of UV lamps, h, not less	16000	16000	16000
Quantity of UV lamps, piece.	18	24	36
Capacity (at cos φ = 0.96), kW	9.0	12.0	18.0
Capacity of the electric drive of the mechanism of cleaning of a quartz cover, W	90	90	90
Conditional pass of entrance and output branch pipes	DN200 ... DN400	DN350 ... DN600	DN400 ... DN800
The mass of the disinfecting module (without water), kg, no more	385	610	850

Microbiological indicators of the disinfected sewage correspond the SanPiN 2.1.5.980-00 "Hygienic requirements to protection of a surface water", MU 2.1.5.732-99 "Sanitary and epidemiologic supervision of disinfecting of sewage by ultra-violet radiation", MU 2.1.5.800-99 "The Gossanepidnadzor organization behind disinfecting of sewage", MU 3.2.1757-03 "Prevention of parasitic diseases. Sanitary and parasitological assessment of efficiency of disinfecting of water ultra-violet radiation", and also to normative documents of EU which regulate microbiological indicators of the sewage dumped in superficial reservoirs.

Table 1.20. Overall dimensions of the disinfecting module.

UV sterilizer	L*	L1*	H*	Fig.
VODOGRAY® B-18AC	2100	1000	1000	Fig. 1
VODOGRAY® B-24AC	2100	1500	1500	Fig. 2
VODOGRAY® B-36AC	2100	1500	1900	Fig. 3

* Overall dimensions and mass of disinfecting modules depend on existence and like managing directors of gates and can differ from specified in drawings and in the table.

Overall dimensions of a case of management don't exceed 1000 x 1000 x 2100 mm. The mass of a case of management doesn't exceed 175 kg.

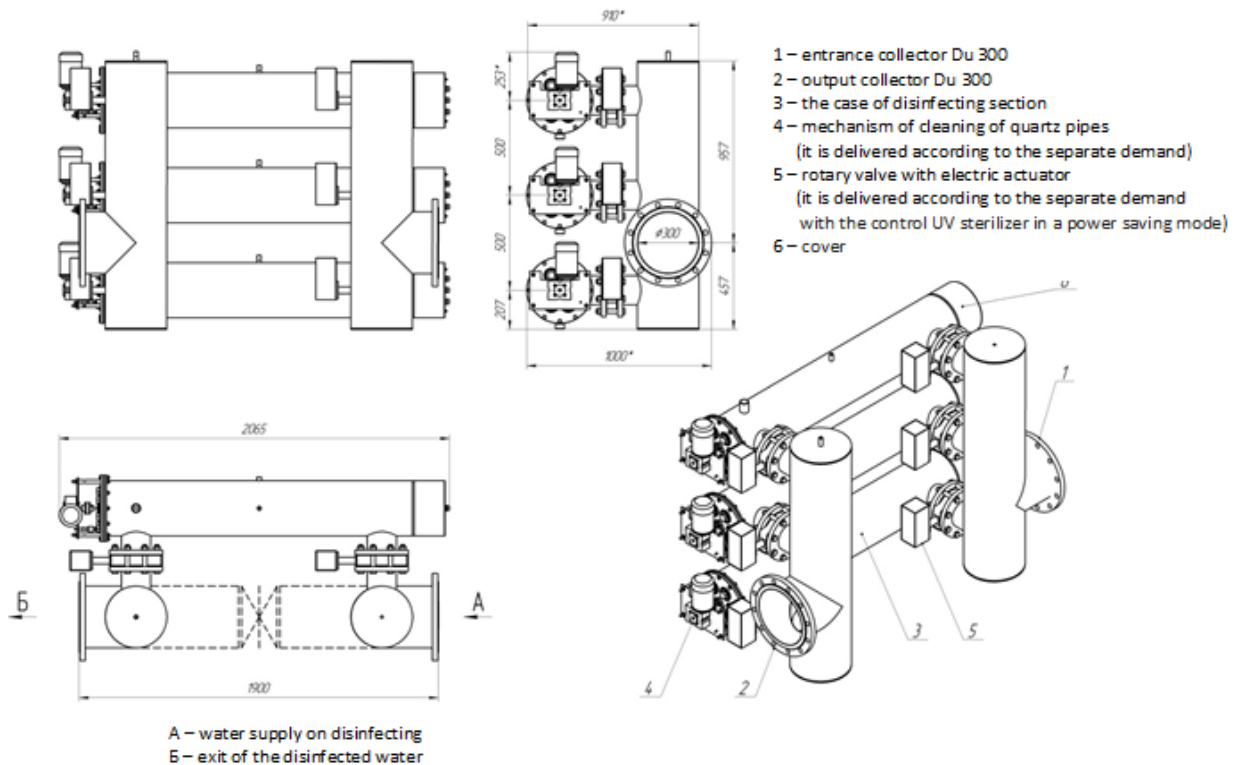


Fig. 1.19. The module of disinfecting of UV sterilizer of VODOGRAY® B-18AC with the installed operating gates with the electric drive.

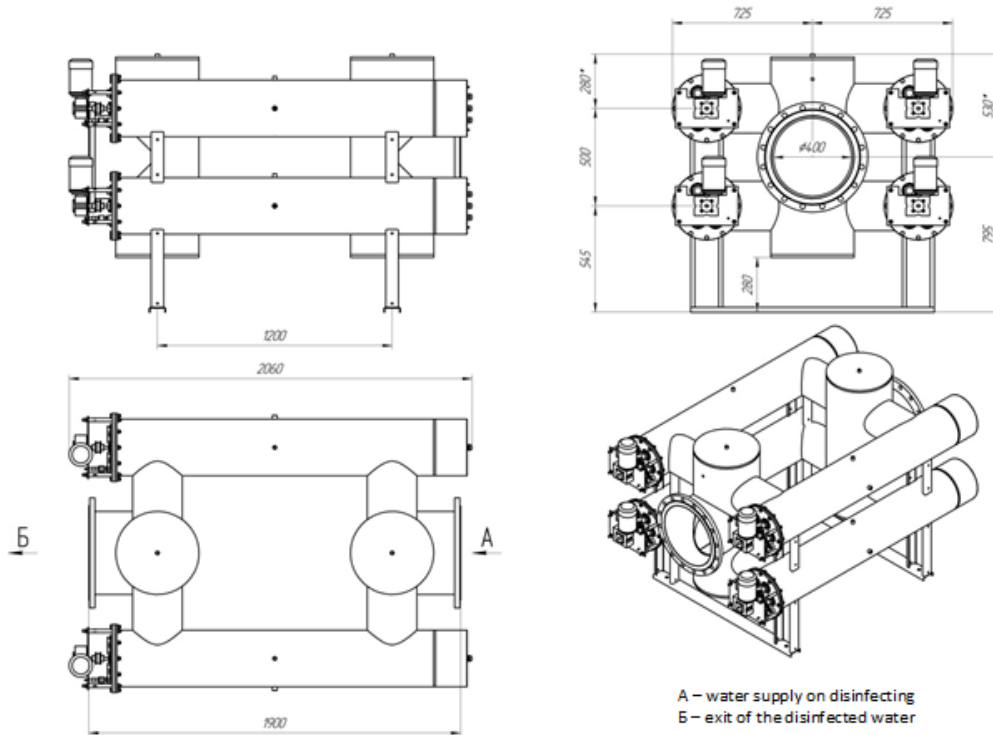


Fig. 1.20. The module of disinfecting of UV sterilizer of VODOGRAY® B-24AC without operating gates.

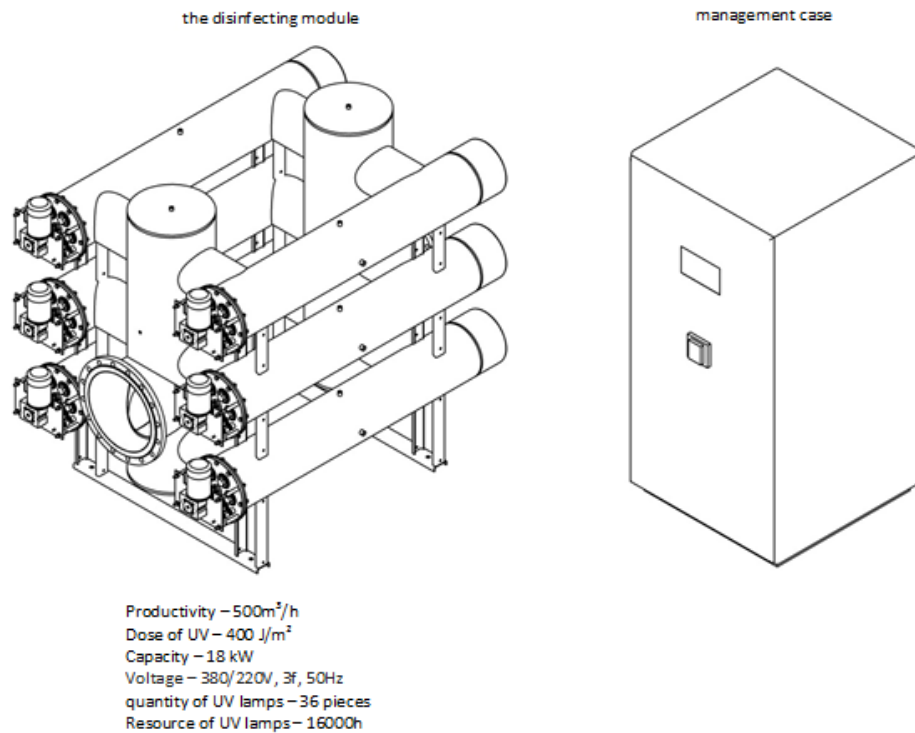
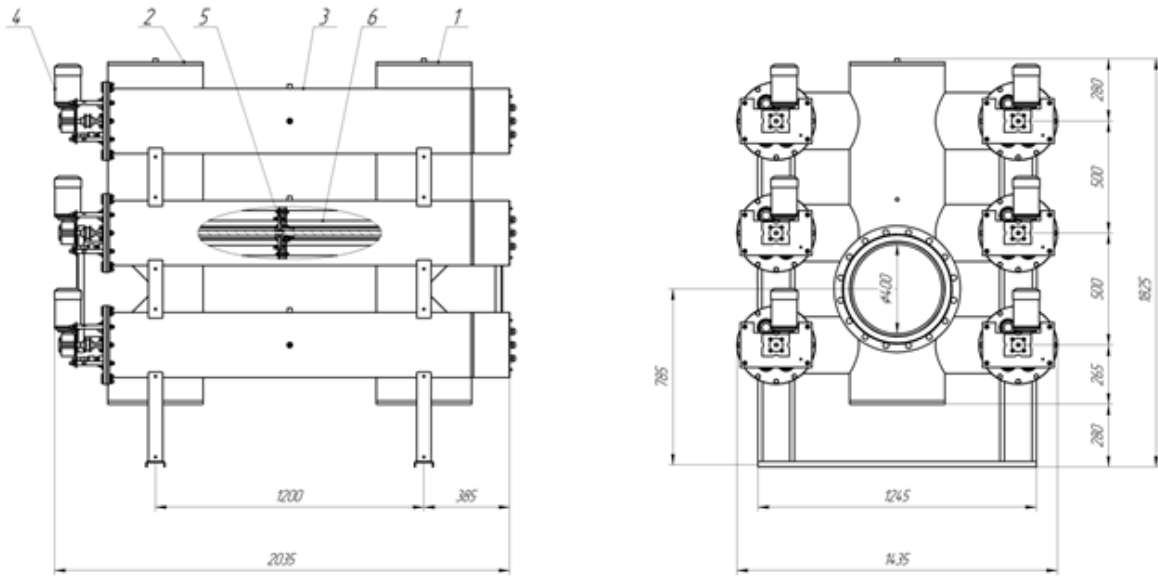


Fig.1.21. UV sterilizer VODOGRAY® B-36AC



- 1 – entrance collector Du400
- 2 – output collector Du400
- 3 – the case of disinfecting section
- 4 – the electric drive of the mechanism of cleaning of quartz covers
- 5 – the mechanism of cleaning of quartz covers
- 6 – quartz covers with placed in them UV lamps

Fig. 1. 22. Module of disinfecting of UV sterilizer of VODOGRAY® B-36AC

Scheme of electric connection

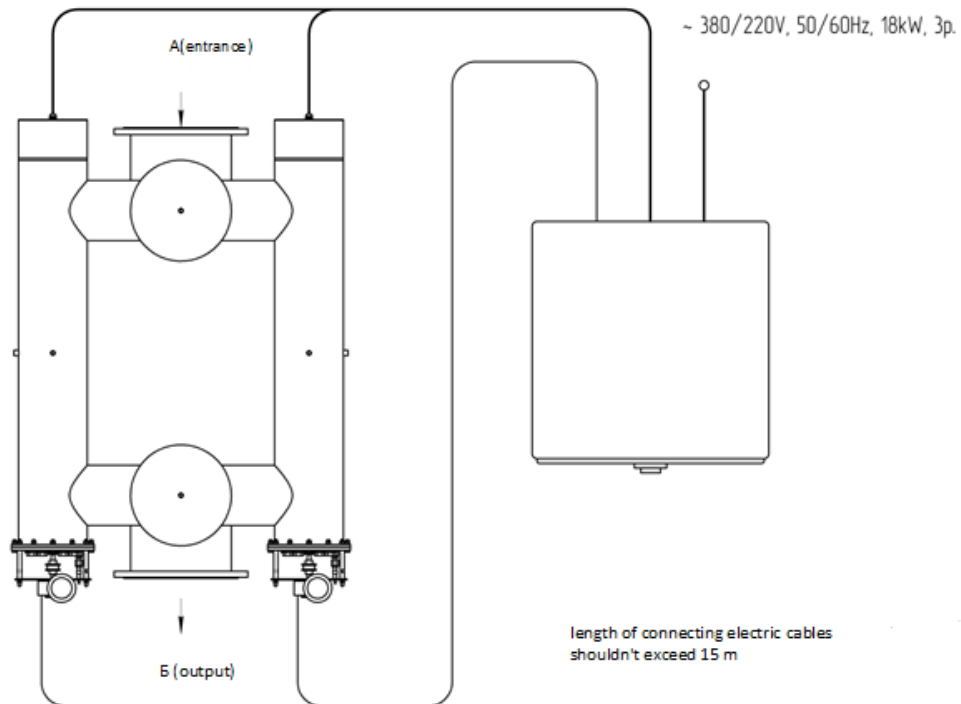


Fig. 1. 23. Scheme of connection of UV sterilizers of the VODOGRAY®-XXAC series



2. Systems of disinfestation of air an ultraviolet series OBP01, OBP 11 and OBP 05.

2.1 Bactericidal UV irradiators with open sources of UV of radiation of the suspended (OBP01.0130 and OBP01.0230) directed (OBP01.0416) and mobile (OBP11.0330 and OBP11.0630) of types.

Bactericidal UV OBP01.0130, OBP01.0230, OBP11.0330 and OBP11.0630 irradiators with open sources of UV of radiation are intended for disinfecting of air and rooms to bactericidal UV by radiation. They possess high coefficient of use of UV of radiation that allows to apply them to effective destruction being in room air, and also on its walls, a floor, a ceiling, etc. different types of microorganisms, including bacteria and viruses. Considering that in these irradiators open UV of radiation (closed) without ozonic sources, and bactericidal UV radiation harmfully are used affects the unprotected surfaces of a body of the person and animals, and also houseplants, application of these irradiators possibly only in that case when in disinfected rooms there are no people and animals.

Bactericidal UV irradiators of OBP01.0130, OBP01.0230 belong to irradiators of suspended type. Their design provides possibility of their fastening to a ceiling (on hooks) or to a wall (on arms). When fastening irradiators to a ceiling (for example, on cables) efficiency of UV of radiation can exceed 80%, at an arrangement of irradiators on a wall the efficiency of radiation is close to 50%.

Bactericidal irradiators of OBP11.0330 and OBP11.0630 belong to bactericidal irradiators of mobile type. Their main advantage is possibility of processing of several rooms by means of one irradiator. The efficiency of UV of radiation of bactericidal irradiators of OBP11.0330 and OBP11.0630 makes 75%.

Bactericidal irradiators of OBP01.0416 belong to irradiators of the directed action (i.e. to irradiators with partially opened UV lamps). The main area of their application is disinfecting of various surfaces by the directed stream of UV of radiation. The efficiency of UV of radiation of bactericidal irradiators of OBP01.0416 makes 45% that at observance of the appropriate measures of safety allows apply these irradiators in the presence of people in rooms.

Efficiency of disinfecting of air by means of bactericidal irradiators of the OBP01 and OBP11 series is defined proceeding from the power of a stream of bactericidal UV of radiation radiated by an irradiator and type of the steadiest bactericidal UV which was in the room against action of radiation of a microorganism, for example bacteria of an intestinal stick (*Escherichia Coli*), golden стафилококка (*Staphylococcus Aureus*), a tubercular stick (*Micrococcus Tuberculosis*) or other.



Table 2.1. Key technical parameters of bactericidal UV of irradiators.

Indicator	Irradiator type				
	OBP01.0130	OBP01.0230	OBP01.0416	OBP11.0330	OBP11.0630
Quantity of UV of lamps, piece.	1	2	4	3	6
UV type of lamps	LTC30T8	LTC30T8	LTC15T5	LTC30T8	LTC30T8
UV resource of a lamp, h	9000				
Efficiency of radiation, %	80		45	75	
the volume of the disinfected room at efficiency of disinfecting of air $J = 99\%$ (for <i>Staphylococcus Aureus</i>), m ³	84	170	50	235	470
Overall dimensions:					
- length, mm,	955	955	460	600	600
- width, mm,	60	180	155	500	500
- height, mm	160	100	406	1170	1170
Weight, kg, no more	3,3	4,5	5,6	8,5	12,7

Supply of bactericidal irradiators is carried out from an electric network of alternating current by a voltage of 220 V and with a frequency of 50/60 Hz. Electrical safety class in accordance with GOST 12.2.007.0-75 – 1. Extent of protection of a cover in accordance with GOST 14254-80 - IP54. Operating mode – long. The specified efficiency of disinfecting is reached after continuous work of a bactericidal irradiator within 1 hour.

Bactericidal irradiators of the OBP01 and OBP11 series are executed from stainless steel in a heat and moisture-proof execution that allows to apply these irradiators at the enterprises of the food industry, for example, to disinfecting of production rooms, refrigerators, storerooms, etc.

The design of bactericidal irradiators conforms to requirements of the management P 3.5.1904-04 "Use of ultra-violet bactericidal radiation for air disinfecting in rooms".

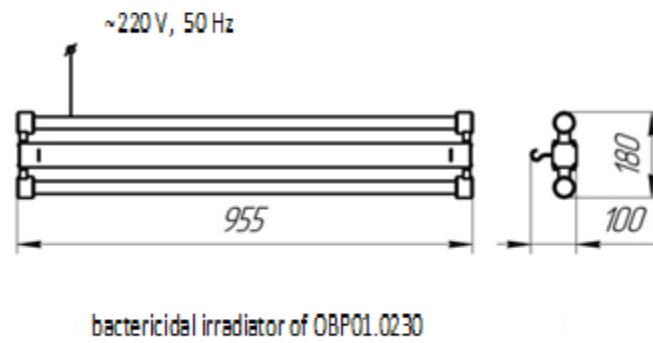
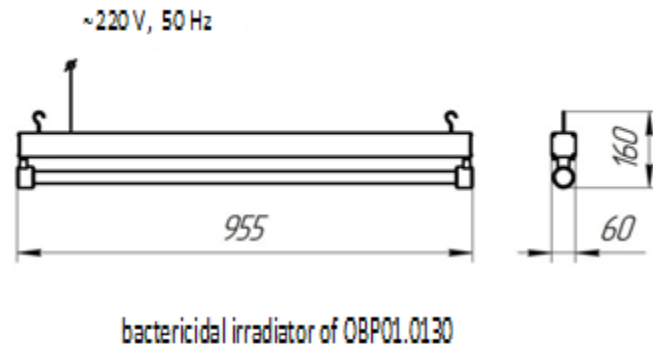


Fig. 2.1. Bactericidal irradiators of the suspended OBP01.0130 and OBP01.0230 type.

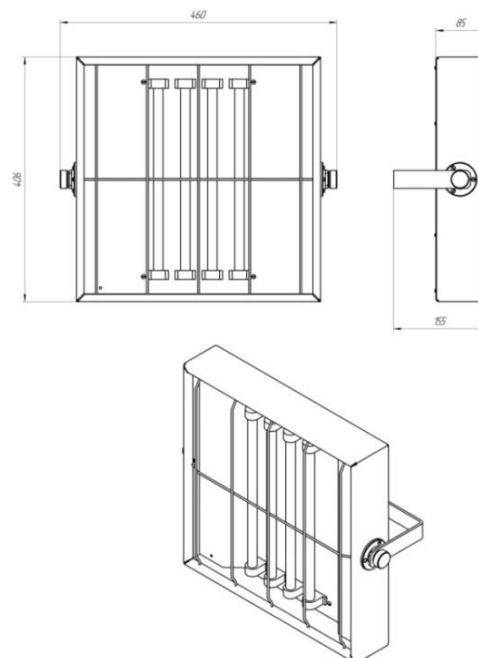


Fig. 2.2. Bactericidal irradiators of the directed action of OBP01.0416.

2.2.. Bactericidal UV irradiators with open sources of UV of radiation - UV air retsirkulyator (OBP05 series)

Bactericidal UV OBP05 series irradiators (UF air retsirkulyator) belong to irradiators with open sources of UV of radiation and are intended for disinfecting by bactericidal UV by air radiation in rooms. Their main difference from usual bactericidal irradiators of the OBP01 and OBP11 series are full shielding of UV of lamps that existence of the built-in fan is reached them by placement in the irradiator case, and. Considering that all stream of bactericidal UV of radiation is concluded in the irradiator case, bactericidal UV radiation has no harmful effect on the unprotected surfaces of a body of the person and animals, and also on houseplants. UV retsirkulyator are equipped with modern without ozon UV lamps that allows apply them to air disinfecting in child care school and preschool institutions, offices, hospitals, on transport, etc.

Efficiency of disinfecting of air by means of bactericidal irradiators of the OBP05 series is defined proceeding from the power of a stream of bactericidal UV of radiation radiated by an irradiator and type being in the room of the steadiest against action of bactericidal UV of radiation of microorganisms, for example bacteria of an intestinal stick (*Escherichia Coli*), golden staphylococcus (*Staphylococcus Aureus*), a tubercular stick (*Micrococcus Tuberculosis*) or other.

Table 2.2. Key technical parameters of bactericidal UV of retsirkulyator.

Indicator	Irradiator type			
	OBP05.0208	OBP05.0215	OBP05.0315	OBP05.0415
Quantity of UF of lamps, piece.	2	2	3	4
UV type of lamps	LTC8T5	LTC15T8	LTC30T8	LTC30T8
UV resource of a lamp, h	9000			
The area of the protected room * with a height of ceiling of 3,5 m and efficiency of disinfecting of air J =η 90%, m ²	12 - 18	28 - 43	42 - 65	60 - 100
Power consumption, W	25	50	65	95
Equivalent noise level, dB, no more	36			
Overall dimensions, no more: Length x width x height, mm	110 x 150 x 700			
Weight, kg, no more	4,5	5,6	6,0	6,5

Table 2.2. Key technical parameters of bactericidal UV of retsirkulyator.

Indicator	Irradiator type		
	OBP05.0230	OBP05.0430	OBP05.0830
Quantity of UV of lamps, piece.	2	4	8
UV type of lamps	LTC30T8	LTC30T8	LTC30T8
UV resource of a lamp, h	9000		
The area of the protected room * with a height of ceiling of 3,5 m and efficiency of disinfecting of air J = 90%, m ²	120	225	450
The volume of the protected room * at efficiency of disinfecting of air J = 95%, m ³ /h	150	240	480
The volume of the protected room * at efficiency of disinfecting of air J = 99%, m ³ /h	130	195	385
Power consumption, W	150	200	300
Equivalent noise level, dB, no more	40	40	40
Overall dimensions, no more: Length x width x height, mm	410 x 265 x 1000		
Weight, kg, no more	5,6	8,5	12,7

* - Data are specified for sanitary – an indicative microorganism of Staphylococcus Aureus.

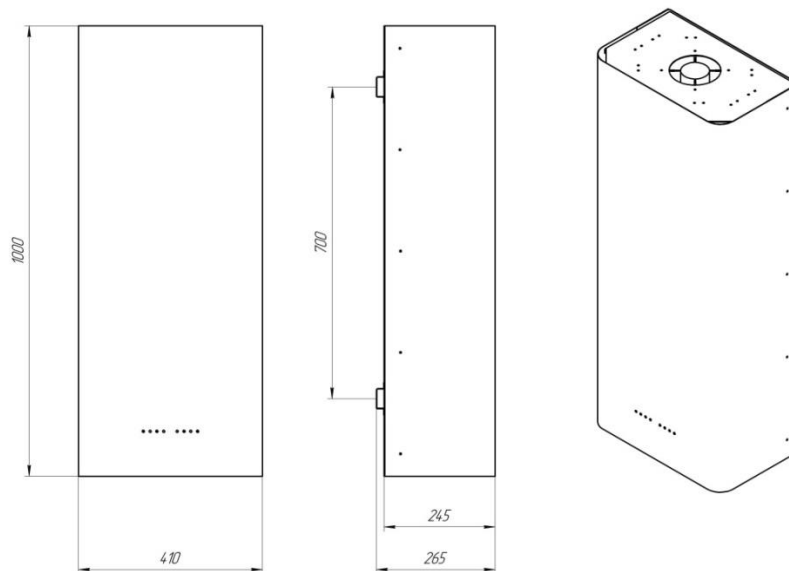


Fig. 2.3. Bactericidal irradiators of suspended type with open sources of UV of radiation (UV retsirkulyator) OBP05.0230, OBP05.0430 and OBP05.0830.

Supply of bactericidal irradiators is carried out from an electric network of alternating current by a voltage of 220 V and with a frequency of 50/60 Hz. Electrical safety class in accordance with GOST 12.2.007.0-75 – 1. Extent of protection of a cover in accordance with GOST



14254-80 - IP54. Operating mode – long. The specified efficiency of disinfecting is reached after continuous work of a bactericidal irradiator within 1 hour.

Bactericidal irradiators can be executed from stainless steel in a heat and moisture-proof execution that allows apply these irradiators at the enterprises of the food industry, for example, to disinfecting of production rooms, refrigerators, storerooms, etc.

The design of bactericidal irradiators conforms to requirements of the management P 3.5.1904-04 "Use of ultra-violet bactericidal radiation for air disinfecting in rooms".

2.3. Bactericidal UV irradiators with open sources of UV of radiation - UV retsirkulyator of air of industrial function (OBP05 Series)

Bactericidal UV retsirkulyator of air of industrial function of the OBP05 series belong to irradiators with open sources of UV of radiation and are intended for disinfecting by bactericidal UV by air radiation in shops and premises of the industrial enterprises. Their main difference from usual bactericidal irradiators are full shielding of UV of lamps that existence of the built-in fan is reached them by placement in the irradiator case, and. Considering that all stream of bactericidal UV of radiation is concluded in the irradiator case, bactericidal UV radiation has no harmful effect on the unprotected surfaces of a body of the person and animals, and also on houseplants. UV retsirkulyator are equipped with modern with open sources UV lamps that allows to apply them to air disinfecting at the enterprises of the food industry, in hotels, housing estates, banks, hospitals, etc.

Table 2.3. Key technical parameters of bactericidal UV of retsirkulyator.

Indicator	Irradiator type			
	OBP 05.2430	OBP 05.3030	OBP 05.2064	OBP 05.2664
Quantity of UF of lamps, piece.	24	30	20	26
Type of UV of lamps	LTC30T8	LTC30T8	LTC64T5	LTC64T5
Resource of UV of a lamp, h	9000	9000	9000	9000
The volume of the protected room * at efficiency of disinfecting of air J = 95%, m ³ /h	1000	1600	3250	4350
The volume of the protected room * at efficiency of disinfecting of air J = 99%, m ³ /h	800	1250	2250	3500
Power consumption, W	1200	1350	2000	2400
Overall dimensions, no more: Length x width x height, mm	1600 x750 x655		2750 x 765 x 655(715)	
Weight, kg, no more	110	118	126	134

In brackets the sizes for OBP05.2624 are specified

- Data are specified for sanitary – an indicative microorganism of Staphylococcus Aureus.

Efficiency of disinfecting of air by means of bactericidal irradiators of the OBP05 series is defined proceeding from the power of a stream of bactericidal UV of radiation radiated by an irradiator and type being in the room of the steadiest against action of bactericidal UV of radiation of microorganisms, for example bacteria of an intestinal stick (*Escherichia Coli*), golden staphylococcus (*Staphylococcus Aureus*), a tubercular stick (*Micrococcus Tuberculosis*) or other.

Food of bactericidal irradiators is carried out from an electric network of alternating current by a voltage of 220 V and with a frequency of 50/60 Hz. Electrical safety class in accordance with GOST 12.2.007.0-75 – 1. Extent of protection of a cover in accordance with GOST 14254-80 - IP54. Operating mode – long. The specified efficiency of disinfecting is reached after continuous work of a bactericidal irradiator within 1 hour.

Bactericidal irradiators can be executed from stainless steel in a heat and moisture-proof execution that allows apply these irradiators at the enterprises of the food industry, for example, to disinfecting of production rooms, refrigerators, storerooms, etc.

The design of bactericidal irradiators conforms to requirements of the management P 3.5.1904-04 "Use of ultra-violet bactericidal radiation for air disinfecting in rooms".

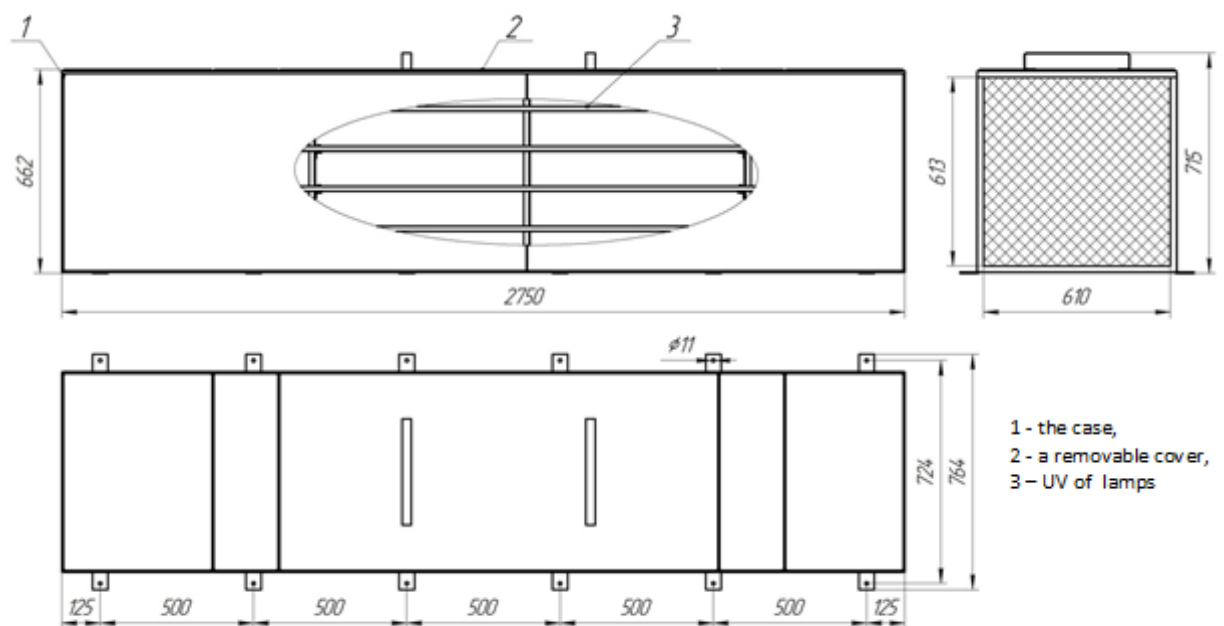


Fig. 2.4. Bactericidal irradiators (UV retsirkulyator) OBP05.2064, OBP05.2664.

2.4 Bactericidal UV irradiators with open sources of UV of radiation for disinfecting of refrigerators of refrigerators and salons of motor, railway, river, sea and air transport

Bactericidal UV OBP02.0116 and OBP02.0316 irradiators with open sources of UV of radiation are intended for disinfecting of refrigerators of automobile and railway refrigerators, air and salons of land, river, sea and air transport to bactericidal UV by radiation. They possess high



efficiency of UV of radiation (more than 65%) that allows to apply them to effective destruction being in room air, and also on its walls, a floor, a ceiling, etc. different types of microorganisms, including bacteria and viruses. In these irradiators open sources of UV of radiation which provide effective disinfecting of air are used and have no adverse impact on an organism being in salon of the vehicle of people.

The design of bactericidal irradiators of OBP02.0116 and OBP02.0316 provides possibility of their fastening on special rubber shock-absorbers to permanently fixed designs of the vehicle. The case of irradiators of this series is executed from stainless steel. Bactericidal UF of a lamp take place in special quartz covers that their use allows at temperatures from - 25°C to +60°C and high humidity (to 98%).

Table 2.4. Key technical parameters

Indicator	Irradiator type	
	OBP 02.0116	OBP 02.0316
quantity of UV of lamps, piece.	1	3
V type of lamps	LTC16T5	LTC16T5
V resource of a lamp, h	9000	9000
fficiency of radiation, %	70	65
he volume of the disinfected room at efficiency of disinfecting of air J = 99% (for Staphylococcus Aureus), m ³	40	100
verall dimensions, no more: Length x width x height, mm	408 x 80 x 105	408 x 105 x 160
eight, kg, no more	2,5	4,2

Depending on a design supply of bactericidal irradiators can be carried out from: the electric alternating current main a voltage of 220 V and with a frequency of 50/60 Hz, from an onboard electric network of a direct current of 12 V or 24 Century.

Interpretation of a symbol of a bactericidal irradiator of OBP02.0116.12(24):

- OBP – type of a bactericidal irradiator;
- 02 – series number;
- 01 – quantity of established UV of lamps, piece;
- 16 – power is one UV of a lamp, W;
- 12(24) – supply voltage, V (direct current).

Interpretation of a symbol of a bactericidal irradiator of OBP02.0316.220:

- OBP – type of a bactericidal irradiator;
- 02 – series number;
- 03 – quantity of established UF of lamps, piece;
- 16 – power is one UV of a lamp, W;

220 – supply voltage, V (alternating current, with a frequency of 50/60 Hz).

Electrical safety class in accordance with GOST 12.2.007.0-75 – 1. Extent of protection of a cover in accordance with GOST 14254-80 – IP65. Operating mode – long. The specified efficiency of disinfecting is reached after continuous work of a bactericidal irradiator within 1 hour.

Bactericidal irradiators of the OBP02 series are executed from stainless steel in a heat and moisture-proof execution that allows to apply these irradiators not only on transport, but also at the enterprises of the food industry, for example, to disinfecting of production rooms, refrigerators, storerooms, etc.

The design of bactericidal irradiators conforms to requirements of the management P 3.5.1904-04 "Use of ultra-violet bactericidal radiation for air disinfecting in rooms".

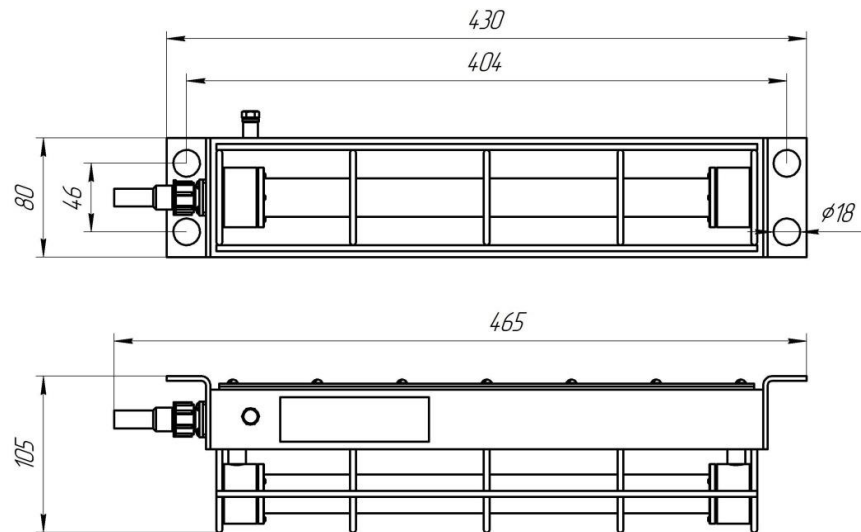


Fig. 2.5. Bactericidal irradiator OBP02.0116.

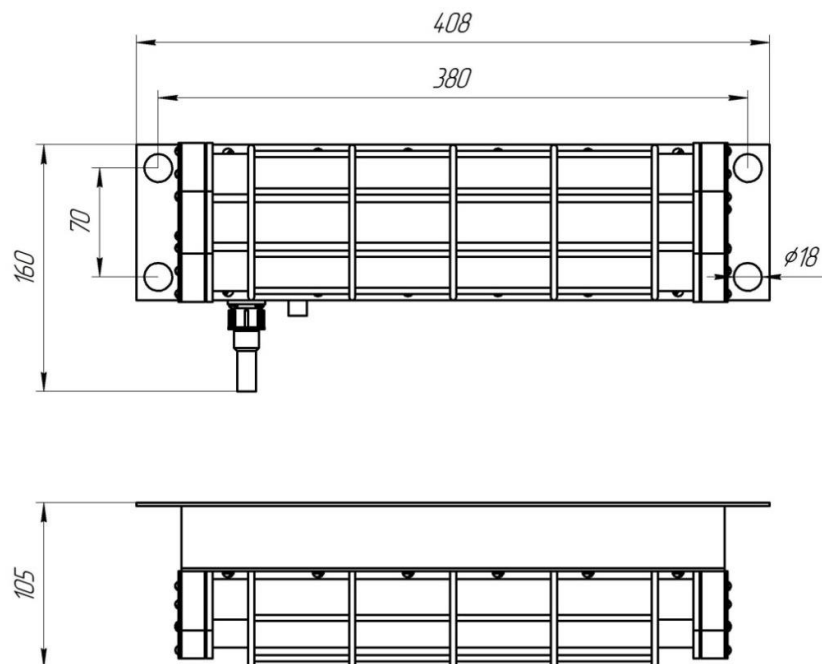


Fig. 2.6. Bactericidal irradiator OBP02.0316.



3. Photochemical ozonizers

3.1. Photochemical ozonizers of small productivity for disinfecting of salons of motor, railway, river, sea and air transport, refrigerators of refrigerators and rooms of vegetable storehouses

Photochemical generators of ozone of small productivity of OBP07.3T5 and OBP07.5T5 are intended for:

- the general disinfection of rooms and air deodorization in salons of passenger buses, trolleybuses, trams, railway cars, subway cars;
- when carrying out the general disinfecting and deodorization of crude basements and objects with high humidity;
- sanitary processing of refrigerators and rooms of vegetable storehouses and the vegetables which were stored in them, fruit and meat and dairy production by means of ozone for the purpose of ensuring safety of commodity quality of production, increase in terms of its storage and decrease in losses.

Depending on a design power supply of photochemical generators of OBP07.3T5 ozone. X and OBP07.5T5. X it can be carried out from: the electric alternating current main a voltage of 220 V and with a frequency of 50/60 Hz, from an onboard electric network of a direct current of 12 V or 24 V.

Interpretation of a symbol of a photochemical ozonizer of OBP07.YT5.12(24):

OBP – type of a photochemical ozonizer;

02 – series number;

YT5 – type and quantity of the established lamps generating ozone, piece;

12(24) – supply voltage, V (direct current).

Interpretation of a symbol of a photochemical ozonizer of OBP07.YT5.220:

OBP – type of a photochemical ozonizer;

02 – series number;

YT5 – type and quantity of the established lamps generating ozone, piece;

220 – supply voltage, V (alternating current with a frequency 50/60gts).

Electrical safety class in accordance with GOST 12.2.007.0-75 – 1. Extent of protection of a cover in accordance with GOST 14254-80 – IP44. Operating mode – long.

For deodorization implementation, unlike disinfection high concentration of ozone aren't necessary. The positive effect is reached at the content of ozone in air of the room in which ozone deodorization is made, at doses of ozone at the level of 0,2 – 1,0 mgO³/m³ that is quite close to the safe size of maximum permissible concentration of ozone (maximum concentration limit) equal 0,1 mgO³/m³.

Table 3.1 - Approximate concentration of ozone necessary for deodorization of some objects.

Type of the deodorized room	Concentration of ozone necessary for deodorization, mgO ₃ /m ³
Rooms with a slight smell (waiting rooms, a compartment of railway cars, railway couchette cars, subway cars, salons of buses, trams, trolleybuses, etc.)	0,2 – 1,0
Rooms with a strong smell (kitchens, cellars, storerooms, warehouses, toilets, rooms for smoking, etc.)	1,0 – 2,5
Rooms for collecting household garbage	10 - 30
The room after a fire	15 - 50

Ozone generated by photochemical ozonizers effectively destroys being on surfaces of food products, and also surfaces of refrigerators, container and bacterium packing, viruses, mold mushrooms and other microorganisms. Use of ozone as a disinfectant is recommended "By temporary methodical recommendations about use of ozone for disinfection of fruit storages and vegetable storehouses and potatoes storage" (The Ukrainian scientific research institute of trade and public catering, 1981), Methodical recommendations about use of ozone as a disinfectant, Food Industry Ministry of the USSR, 1976. And also other normative documents.

Table 3.2. Recommended modes of ozone processing of fruit and vegetable production in a mode of long storage (an extract from Temporary methodical recommendations about use of ozone for disinfection of fruit storages and vegetable storehouses and potatoes storage).

<i>Production</i>	<i>Concentration of ozone, mgO₃m³</i>	<i>Ozonization time per day, h, not less</i>	<i>Number of processings in a week (reference)</i>
Cabbage	7 - 13	4	1 - 2
Carrots	5 - 15	4	3 days in a row of 1 - 2 time a month
Garlic	9 - 14	5	2 - 3
Onions	8 - 10	4 - 5	1-2 time per day
Grapes	3 - 8	3	3 - 4
Salad	9 - 12	2	4 - 5
Apples	4 - 9	5	2 - 3

Design and principle of action. Photochemical generators of ozone OBP07.3T5 and OBP07.5T5 (fig. 3.1) are executed in the form of a monoblock in which there are lamp generators of ozone, high-frequency power units, the block of fans, a timer (or the programmable microprocessor controller), the blocking relay. On the lateral panel of a monoblock the light-signal indicator of work of an ozonizer, the switch of operating modes and electric sockets for



connection of an ozonizer to an electric network, and also to the contactless sensor blocking inclusion of an ozonizer at an open door of the refrigerator and the portable light-signal indicator of work of an ozonizer are placed. The switch of operating modes ensures functioning of a photochemical ozonizer in two modes. In the first mode disinfecting of the internal room of the refrigerator before loading in it of production and after its unloading is provided. The second operating mode of an ozonizer is intended for periodic processing of fruit and vegetable production during its storage. The case of a monoblock is executed from high-quality AISI 316 stainless steel.

Table 3.3. Key technical parameters

Parameter	Units of measure	quantity	
		OBP07.3T5	OBP07.5T5
The maximum volume of the processed room (at storage of grapes or apples), no more	m ³	100	175
Productivity on ozone (nominal) ¹	gO ₃ /h	1,0 – 1,2	1,5 – 2,0
Power (at cos φ = 0,96)	Watt	90	125
Dimensions	mm	755x165x240	
Weight, netto	kg	17,2	19,8
Resource of ozone-forming generating lamps, no more	hours	16 000	
Duration of operation of the photochemical generator of ozone (under normal conditions works)	years	10 - 15	

Operating mode – long. The class of protection against defeat by electric current – 1 in accordance with GOST 12.2.007.0-75, extent of protection of a cover isn't lower - IP44 in accordance with GOST 14254-96.

Photochemical generators of ozone OBP07.3T5 and OBP07.5T5 don't need the power supply of a high voltage that provides their safe operation in crude rooms. The photochemical ozonizer, unlike an electrodigit ozonizer, can make ozone directly from the damp air which was in the room without its additional drying.

Safety rules at operation of photochemical generators of ozone OBP07.3T5 and OBP07.5t5.

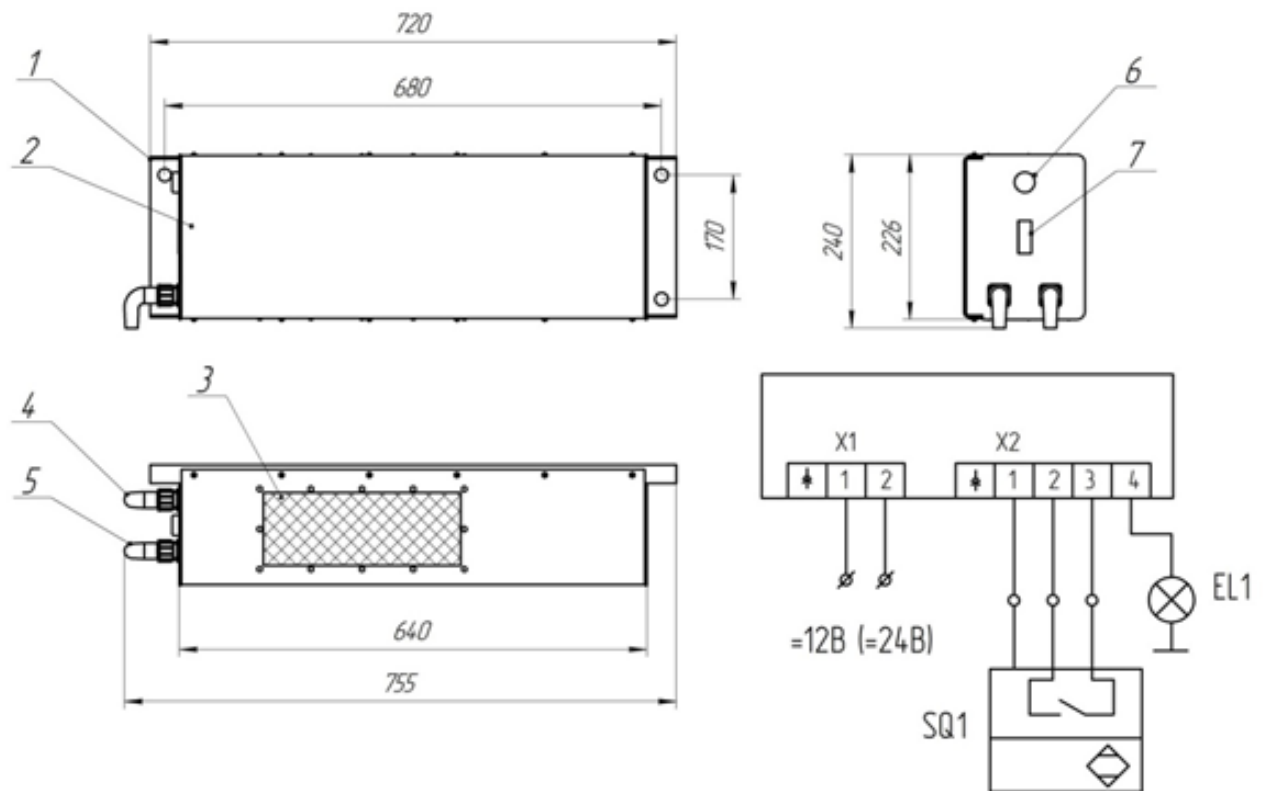
Inclusion/switching off of an ozonizer needs to be made by means of located outside of the switch equipped with the light indicator. It is allowed to enter the processed room (luggage office) only after decrease in concentration of ozone in it below extremely – admissible concentration

¹ Количество генерируемого озона зависит от параметров облучаемого воздуха, в основном от его температуры и влажности, а также от запылённости воздуха.

(maximum concentration limit). Maximum permissible concentration of ozone in air of a working zone make $0,1 \text{ mg/m}^3$, in atmospheric air - $0,16 \text{ mg/m}^3$.

Measurements of concentration of ozone in the processed room it is necessary to carry out by means of a gas analyzer OZONE – maximum concentration limit or similar. The gas analyzer OZONE – maximum concentration limit defines most resolved concentration of ozone in the working room in the service personnel time spent in it.

For ensuring high overall performance of the photochemical generator of ozone it is necessary to watch the term of operation of generating lamps. Considering that the resource of generating lamps makes 16 000 hours, their replacement is made in some years of work of a photochemical ozonizer.



1 - the case, 2 - a casing, 3 - a window, 4 - the socket (x1) for connection to an onboard network of tension = 12B, 5 - the socket (x2) for connection of blocking of a door of the refrigerator, 6 - a light signaling device, 7 - a timer, SQ1 - contactless sensor, EL1 - light fittings

Fig. 3.1. Photochemical generators of ozone OBP07.3T5 and OBP07.5T5.

3.2. Installation for DZO grain disinfecting – 1,0

The DZO installation – 1,0 is intended for disinfecting of grain, dry compound feed and other products by ozone. At production of bakeries and long storage of grain always there is a probability of their infection with microorganisms (a mold, mushrooms, etc.), and also toxins which are emitted with these microorganisms and various insects. Besides the grain which very

often was stored in warehouses is exposed to invasions of rodents therefore grain is exposed to infectious infection and becomes unsuitable for further use. One of the most effective and ecologically safe means of protection of grain and bakeries is their processing by ozone.

Use of ozone as a disinfectant is recommended by the instruction "Disinfection and deodorization in refrigerators in the way of ozonization" (The Ministry of Trade of the USSR, 1973); Methodical recommendations about use of ozone as a disinfectant, (Food Industry Ministry of the USSR, 1976), and also other normative documents. Since 1984 ozone is included in the list of new means of disinfection of veterinary objects. In 1997 in the USA ozone was recognized by the decision of the governmental commission as safe means for use the existing and potential technologies connected with storage and processing of food. In 1998 ozone was brought by Ministry of Health of the Russian Federation in the list of disinfectants (per. No. 0039 - 98/21) also is allowed for air disinfection in LPU.

Installation is intended for operation at ambient temperature from -15 °C to +35 °C and relative humidity of air with the top value of 80% at +25 °C. Climatic modification and category of placement – UHL 4 in accordance with GOST 15150-69. Electrical safety class – 1 in accordance with GOST 12.2.007-80. Extent of protection of a cover from dust and IP 34 moisture hit in accordance with GOST 14254-80. Group of service conditions on mechanical durability – M1 in accordance with GOST 17516.1-88. Food of installation is carried out from the electric alternating current main of 220V and frequency 50Hz.

Table 3.3. Key technical parameters

Parameter	quantity
Number of reactors, piece.	1
Volume of the reactor, m ³	0,85
Volume of one-time loading, kg	600 - 650
Productivity (nominal), t/h (at the bulk density of grain $\rho = 760 \text{ kg/m}^3$ and its humidity of 14%)	1,0
Duration of an operation cycle, minutes	30
Dimensions, m	1,8 x 1,2 x 2,7
Weight, kg	375

Structurally DZO installation – 1,0 consists of the bunker, a frame, the exhaust fan with a destructor of residual ozone, an ozonizer and the additional equipment. Installation has a modular design that allows to achieve necessary productivity easily. The disinfected product by means of an elevator or the pneumoconveyor is loaded in the bunker where there is its contact from ozone - air mix. Ozono – air mix is generated in the special device – an ozonizer. The disinfected product via the gate (the bottom hatch) is unloaded in bags or other container and transported to a place of its further processing.

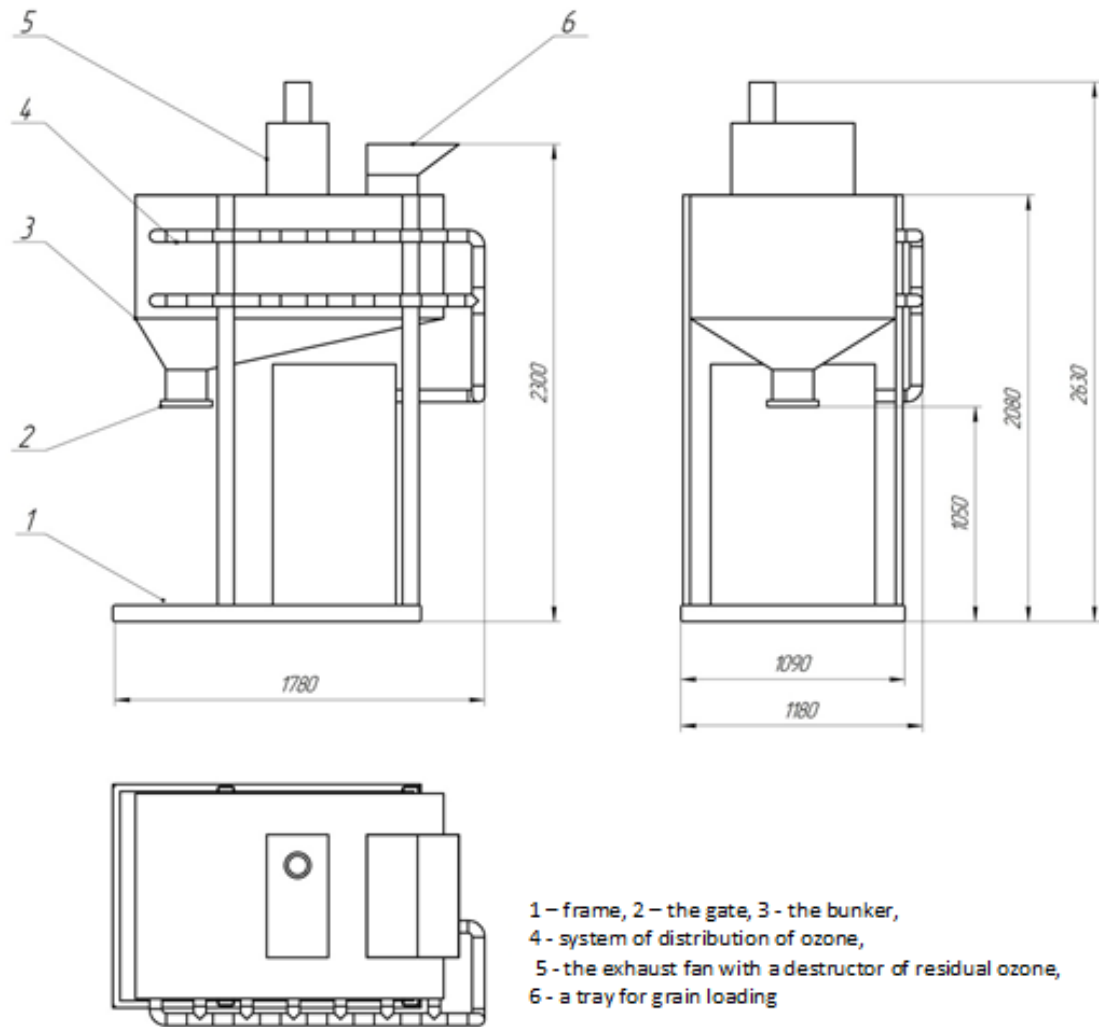


Fig. 3.2. Installation for DZO grain disinfecting – 1,0.

In addition it can be equipped with an elevator, the air conveyor, the conveyor and other service equipment.

The generator of ozone applied in installation doesn't need special preparation of air and allows operate installation at any time years that allows achieve high economic effect.



4. Drum sterilizers of OBP09.1T5SN, OBP09.3T5SN, OBP09.3T6SN, OBP09.3T10SN

Drum sterilizers of OBP09.1T5SN, OBP09.3T5SN, OBP09.3T6SN, OBP09.3T10SN are intended for disinfecting of loose foodstuff by the combined action of ultraviolet radiation and ozone.

Distinctive feature of drum sterilizers is low energy consumption, possibility of effective cold sterilization of loose foodstuff, and also simplicity and reliability of operation. Specific expenses of the electric power for sterilization of loose foodstuff make 2,7 ... 12 kW/t at efficiency of sterilization on a mold and mushrooms 65 ... 80% and more.

Efficiency of sterilization depends on extent of filling of a drum (for ensuring effective sterilization the drum has to be filled with a sterilized product on 1/3 of its volumes), from power and quantity of the established ultraviolet lamps and from duration of a cycle of sterilization.

Table 4.1. Results of cold sterilization of a back of a cod the combined action of ultraviolet radiation and ozone.

Controlled parameter	Back a cod (control)	Back a cod (at a dose of UV of radiation of equal 70 kJ/m ²)	Efficiency of processing, %
MAFAM	120 units in 1 g	units in 1 g	71
BGKP	it isn't revealed	it isn't revealed	-
Mold mushrooms	90 KOE in 1 g	30 KOE in 1 g	67
Pathogenic flora	it isn't revealed	it isn't revealed	-

The increase in a dose of UV of radiation allows to improve considerably sanitary indicators of sterilized production, without changing its organoleptic indicators.

Service conditions - normal in accordance with GOST 15150 - 69.

- The sterilizer has to be operated at environment air temperature from +15 °C to +35 °C and relative humidity no more than 98% at a temperature of 25 °C.
- Requirements to quality of electric energy - in accordance with GOST 13109-79.
- Electrical safety class - 1 in accordance with GOST 12.2.007.0-88.
- Extent of protection of a cover of installation from dust and moisture hit – IP54 in accordance with GOST 14254-80 (washing by streams of hot water is allowed).
- Climatic modification and category of placement – UHL 4.2 in accordance with GOST 15150-69.
- Requirements for safety measures – according to PUE, PTE and TB.
- The radiation UF level in a service zone no more than 0,01 W/m².

Table 4.2. Key technical parameters

Parameter name	value			
	OBP09.1T5SN	OBP09.3T5SN	OBP09.3T6SN	OBP09.3T10SN
Productivity, kg/h	25 - 50	70 - 95	200 - 390	350 - 680
Duration of the sterilization cycle, minutes	15 - 30	15 - 30	15 - 30	15 - 30
Quantity of established UV of lamps, piece.	1	3	3	3
Existence of the built-in generator of ozone	-	+	+	+
Existence of the microprocessor controler and system of visualization of technological process	-	-	+	+
The lamp UV average resource before replacement, hour	9000	13000	16000	16000
Power consumption, kW, no more	0,3	0,5	1,2	1,85
Overall dimensions, no more: Length x width x height, mm	1950x800x1950	1950x800x1950	3000x1050x1650	3000x1050x1650
Weight, kg, no more	175	210	325	350

Supply of drum sterilizers is carried out from the three-phase electric alternating current main with a frequency of 50 Hz with a voltage of 380/220 V.

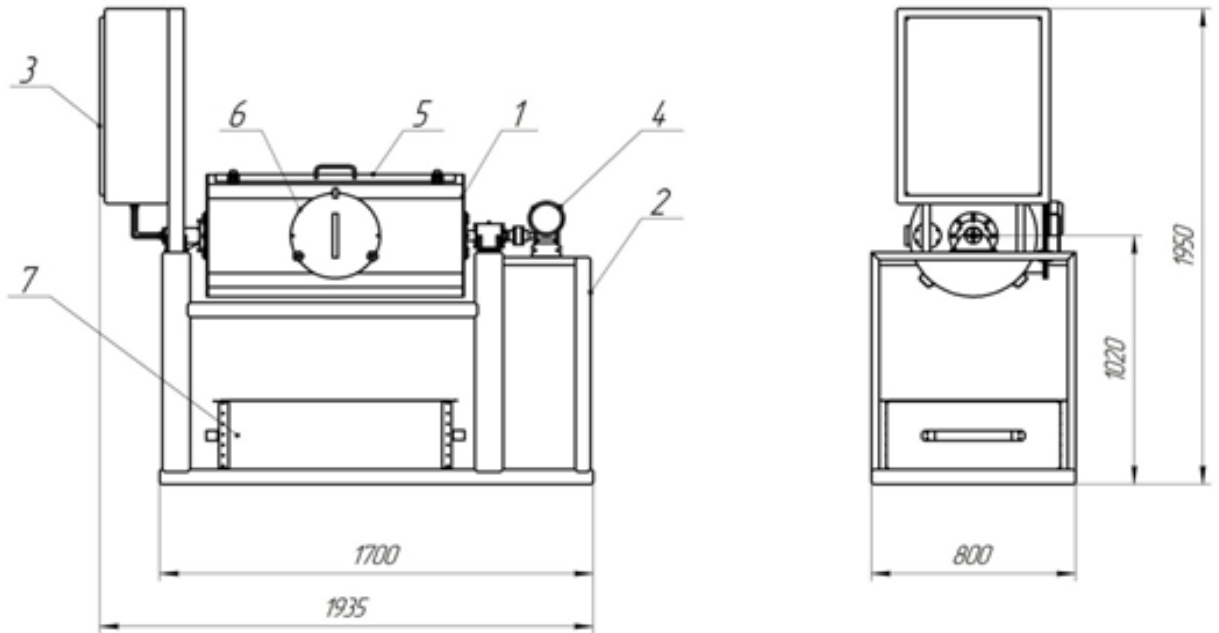
Drum sterilizers (fig. 5.1) consist of the camera of sterilization of drum type (1), a frame (2), the control panel (3), the electric drive (4), hatches for loading (5) and unloadings of production (6), a tray for unloading of processed production (7), a source of ultraviolet radiation and an ozonizer. Dimensions and quantity of disposable sterilized production are defined from conditions of ensuring maximum efficiency of disinfecting.

The case of the camera of sterilization, trays and frame are executed from stainless steel of the AISI 304 or its brand of analogs. The design of a drum sterilizer allows to make its sink hot water under pressure.

Sterilized production is loaded into a tray (6), from where it through the open hatch (5) arrives in the sterilization camera where it is exposed to processing by short-wave ultra-violet radiation. Sterilized production through the hatch (5) is unloaded in a reception tray (7). For providing optimum conditions of sterilization production smoothly mixes up in the rotating reel - the sterilization camera.

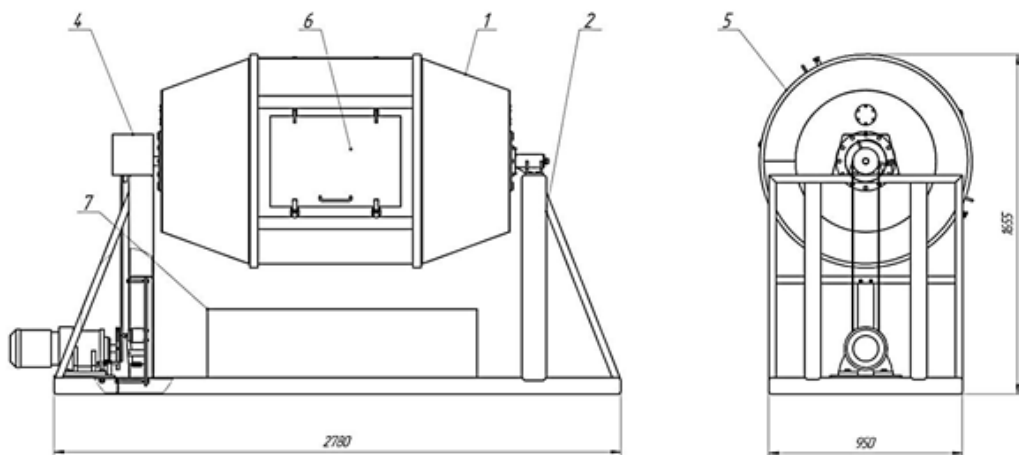
Control of work of a sterilizer is exercised in an automatic mode with the help of the built-in program module. The control panel provides smooth inclusion and switching off of the electric drive of the camera of sterilization, a revery mode of rotation, inclusion and switching off of

sources of ultra-violet radiation and the built-in ozonizer, indication of operating modes of a sterilizer, control of work of UV of lamps and the built-in ozonizer, the alarm system about the beginning and sterilizer completion of work, and also about modes of its work. Indication about operating modes of a sterilizer is brought to the touch screen of the color display which is installed on the forward panel of the control panel (an additional option).



1 - camera of sterilization of drum type, 2 – frame, 3 - management case, 4 - electric drive, 5 - loading hatch, 6 - the hatch for production unloading, 7 - tray

Fig. 4.1. Drum sterilizers of OBP09.1T5SN and OBP09.3T5SN.



1 - camera of sterilization of drum type, 2 – frame, 4 - electric drive, 5 - loading hatch, 6 - the hatch for production unloading, 7 - tray

Fig.4.2 Drum sterilizers of OBP09.3T6SN and OBP09.3T10SN.

5. Activator (protectant) of seeds

Activators (protectant) of seeds of conveyor type or of drum type are intended for disinfection of grain, and also pre-seeding activation of seeds of grain, vegetable and oil-bearing crops by ultraviolet radiation for the purpose of disinfecting, and also increase of their viability, energy of germination and productivity.

UV radiation has a positive effect on the increase of harvest of sunflower, rape, cereals, melon and vegetable crops. This greatly increases their resistance to drought and other adverse weather conditions. The results of field tests of UV installation and irradiation of seeds before planting showed that the yield increase was 10 - 15 % (in the laboratory yield increase sunflower exceeded 50%). Installed decrease (25%) of the extent of destruction sunflower seeds viral and fungal diseases.

So UV processing by radiation of seeds of sunflower increases its crop more than by 10%, wheat – for 10 - 15%, corn – for 8 - 17%, barley – for 10 - 14%, pepper – for 8 - 15%, an eggplant – for 7 - 12%, cucumbers – for 8 - 14%, sugar beet – for 10 - 15%, water-melons and melons – for 8 - 16%. Along with it processing of seeds of UV by radiation positively influences sugar content increase, the content of vitamin C, carotene, etc. acceleration of maturing of agricultures for 3 – 15 days is besides observed.

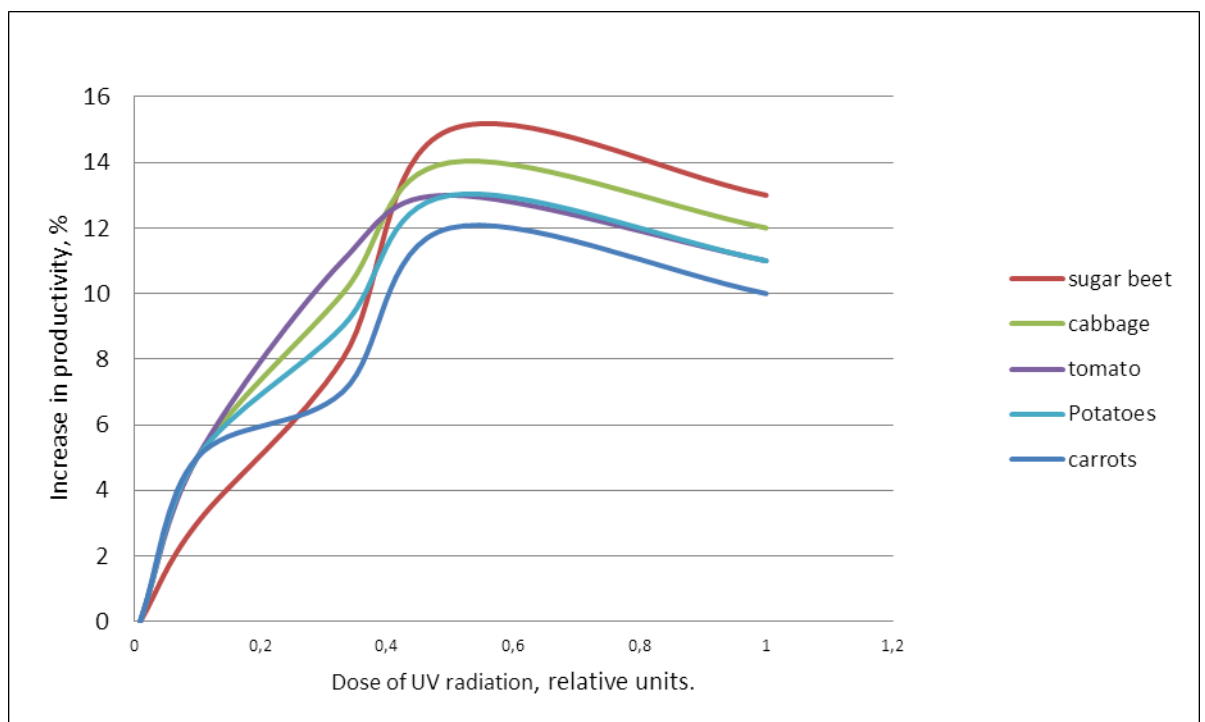


Fig.5.1. Influence of UV radiation on increase of productivity of some vegetable cultures

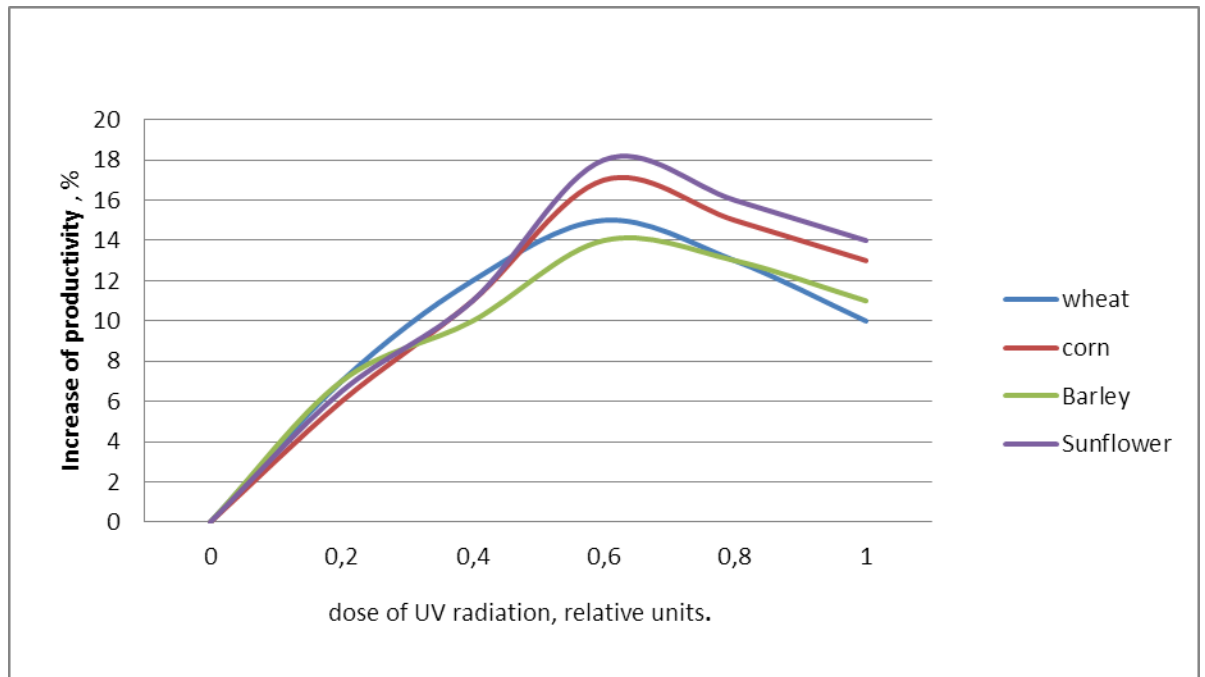


Fig.5.2. Influence of UV radiation on increase of productivity of some grain crops

The main advantages of the pre-photic stimulation of seeds of grain, oilseeds and vegetable crops ultraviolet radiation:

- Low cost of treatment of seeds.
- Significant increase in productivity agricultures that allows minimum cost to maximize profits.
- Increased energy and germination of seed germination, which were subjected to UV radiation photostimulation, and as a consequence of the reduction of crop losses - due to insufficient soil moisture during seeding.
- Reduction in the time of ripening.
- transfer the products in the category of green technologies and organic farming , thereby increasing the export potential of products grown due to the rejection of the use of toxic chemicals.

5.1. Activators (protectant) of seeds of drum type

Activators of the drum type OBP09.1240AC and OBP09.1264AC are intended for preseeding activation and disinfection (treatment) of seeds by ultra-violet radiation for the purpose of increase of viability, energy of germination and productivity of grain, oilseeds and vegetable crops.

Drum activators of the OBP09AS series (fig. 1) consist of the camera of radiation of drum type, a frame, the control panel, the electric drive, the hatch for loading and unloading of production, a tray for unloading of processed production, a source of ultra-violet radiation. Dimensions and quantity of disposable sterilized production are defined from conditions of ensuring maximum efficiency of disinfecting.

The design of a drum sterilizer allows its sink hot water under a high pressure.

Processed seeds via the loading hatch it is loaded in the radiation camera where it is irradiated with short-wave ultra-violet radiation. As a result of such processing there is a photoactivation of

biological processes and disinfecting of seeds. Processed production via the loading hatch is unloaded in a reception tray. For increase in efficiency of processing of seeds before loading it is possible to process them 5 – 10% water solution of peroxide of hydrogen.

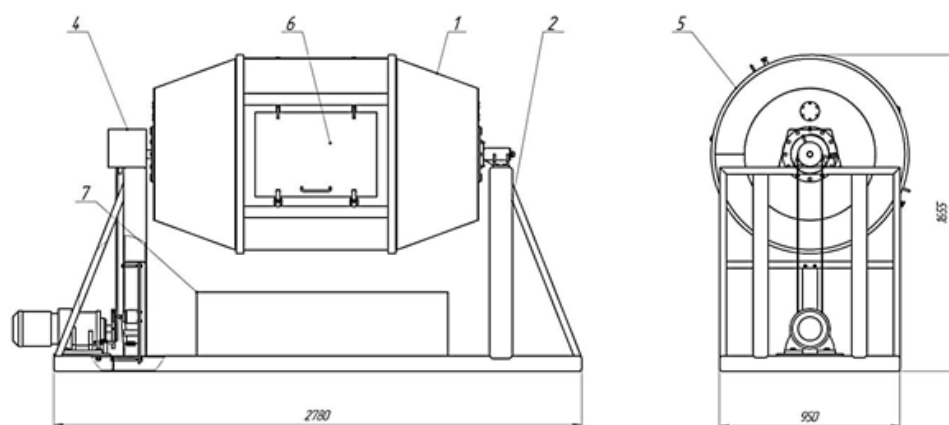
The mode of rotation of the camera of radiation is chosen so that to provide maximum efficiency of process of activation and disinfecting of seeds and to exclude their mechanical damage.

The drum activator is equipped with modern energy saving UV lamps with the raised resource of operation.

Service conditions - normal in accordance with GOST 15150 — 69.

Table 5.1. Main technical parameters and requirements

Parameter name	Value	
	OBP09.03T5AC	OBP09.05T5AC
Productivity on seeds, kg/h:		
- sunflower, oats (bulk density of 400 kg/m ³)	150	230
- barley, cotton (bulk density 560 - 600 kg/m ³)	200	300
- buckwheat, rice, potatoes (bulk density 660 - 680 kg/m ³)	240	370
- flax, beet, soybean (bulk density 720 - 750 kg/m ³)	260	400
- wheat, millet, corn, beans (bulk density 760 - 800 kg/m ³)	280	430
Duration of sterilize cycle, minutes	15	
Average resource of UV lamp before replacement, hours	13 000	
Power consumption, kW, no more	1,5	2,5
Overall dimensions, mm (length x width x height)	1950x800x1950	3000x1050x1655



1 - camera of sterilization of drum type, 2 – frame, 4 - electric drive, 5 - loading hatch, 6 - the hatch for production unloading, 7 - tray

Fig. 5.3. Activators of the drum type OBP09

A power supply of drum sterilizers is carried out from the three-phase electric alternating current main with a frequency of 50 Hz with a voltage of 380/220 V.



- The sterilizer has to be operated at environment air temperature from +15 °C to +35 °C and relative humidity no more than 98% at a temperature of 25 °C.
- Requirements to quality of electric energy - in accordance with GOST 13109-79.
- Electrical safety class - 1 in accordance with GOST 12.2.007.0-88.
- Extent of protection of a cover of installation from dust and moisture hit – IP54 in accordance with GOST 14254-80 (washing by streams of hot water is allowed).
- Climatic modification and category of placement – UHL 4.2 in accordance with GOST 15150-69.
- Requirements for safety measures – according to PUE, PTE and TB.
- The radiation UV level in a service zone no more than 0.01 W/mm².

5.2. Activator (protectant) of seeds of conveyor type OBP10K.24T5AC

OBP10K activators are intended for disinfection of grain, and also pre-seeding activation of seeds of grain, vegetable and oil-bearing crops by ultraviolet radiation for the purpose of disinfecting, and also increase of their viability, energy of germination and productivity.

UV radiation has a positive effect on the increase of harvest of sunflower, rape, cereals, melon and vegetable crops. This greatly increases their resistance to drought and other adverse weather conditions.

The results of field tests of UV installation and irradiation of seeds before planting showed that the yield increase was 10 - 15 % (in the laboratory yield increase sunflower exceeded 50%). Installed decrease (25%) of the extent of destruction sunflower seeds viral and fungal diseases.

Table 5.2. Main technical parameters and requirements

Parameter name	Value	
	OBP10K.12T5AC	OBP10K.24T5AC
Productivity on seeds, kg/h:		
- sunflower, oats (bulk density of 400 kg/m ³)	500	850
- barley, cotton (bulk density 560 - 600 kg/m ³)	750	1 500
- buckwheat, rice, potatoes (bulk density 660 - 680 kg/m ³)	900	1 800
- flax, beet, soybean (bulk density 720 - 750 kg/m ³)	1 075	2 150
- wheat, millet, corn, beans (bulk density 760 - 800 kg/m ³)	1 250	2 300
Average resource of UV lamp before replacement, hours	13 000	
Power consumption, kW, no more	3,6	4,5
Overall dimensions, mm (length x width x height)	2450 x 1035 x 2000	

A power supply of activator is carried out from the three-phase electric alternating current main with a frequency of 50 Hz with a voltage of 380/220 V.

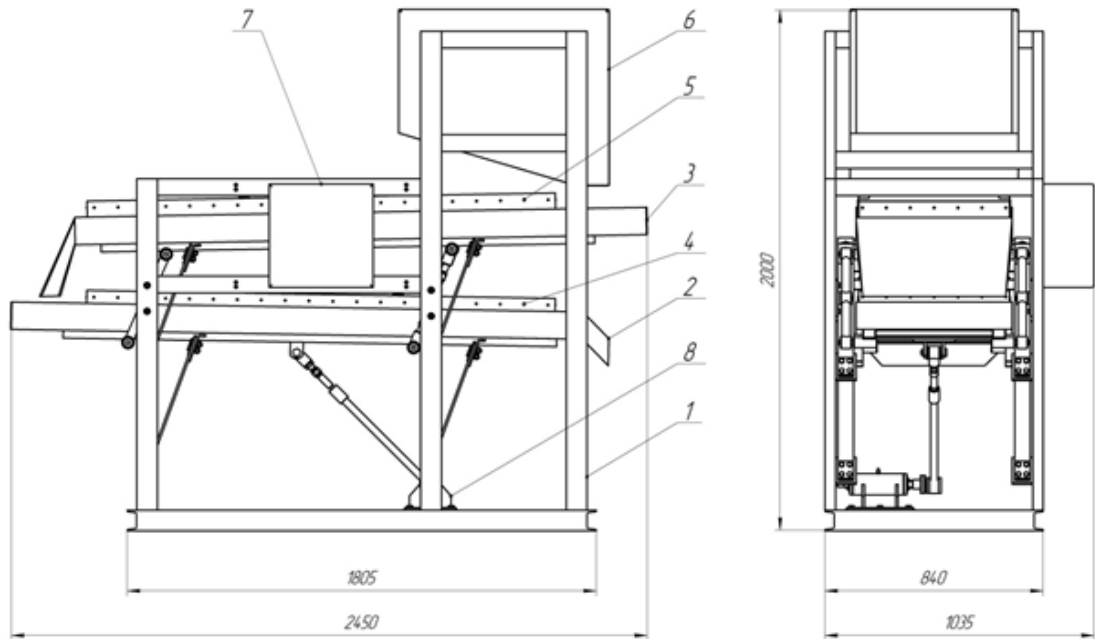


Fig. 5.4. Activators (protectants) of seeds of conveyor type OBP10K

OBP10K.24T5AS activator consists of a frame (1) where there are lower and upper trays vibration (2 and 3), the bunker (6) for the dosed supply of grain (seeds) on the processing, two irradiators (4 and 5), drive vibrator (8) and control panel (7) drive are established. Processed grain (seeds) via regulating gate of the loading bunker arrive in the upper tray of vibration (3) on which they move in a radiation zone where there is their processing by short-wave ultraviolet radiation, and then in the lower tray of vibration (4) in which their radiation also is made. The result of this treatment is disinfection of grain and photo-activation of biological processes seeds. Processed production is unloaded in a reception tray or directly in bags. The activator is equipped with modern energy saving UV lamps with the raised resource of operation.

Conditions - normal according to GOST 15150 - 69.

- The activator has to be operated at environment air temperature from +15 °C to +35 °C and relative humidity no more than 98% at a temperature of 25 °C.
 - Requirements to quality of electric energy - in accordance with GOST 13109-79.
 - Electrical safety class - 1 in accordance with GOST 12.2.007.0-88.
- Degree of defence of shell of setting from the hit of dust and moisture – IP22 in accordance with GOST 14254-80.
 - Climatic modification and category of placement – UHL 4 in accordance with GOST 15150-69.
 - Requirements for safety measures – according to PUE, PTE and TB.
 - The radiation UV level in a service zone no more than 0,01 W/m².



6. Energy saving technology of increase of octane level of gas-condensate and of oil straight-run petrol without application of correcting additives.

The method of electrophysical modification of straight-run petrol developed by the Ukrainian scientists as a result of which there is an essential increase of octane level of straight-run petrol es without application of correcting additives is the basis for technology.

The offered technology can be used as for direct processing of straight-run petrol on oil depots and gas stations, and as a part of the technological scheme of oil refineries on production of straight-run petrol. The second direction is preferable in that case when easy grades of oil are exposed to processing, and received straight-run petrol contain a significant amount of easily flying hydrocarbons.

Development of manufacture of petrol in the first place is connected with aspiration to improve basic operational property fuel knock petrol stability, estimated octane level and reduce the cost of its receipt. Basically, commercial gasoline produced by compounding (mixing) of several components, additives and supplements. So, for example, for the improvement of operating properties of petrol, including increasing their octane level in petrol injected oxygen-containing such ingredients as methyl tert - butyl ether (MTBE), ethyl tert - butyl ether (ETBE), fuel ethanol and other The composition of introduced into petrol additives is determined used in oil refineries (NPZ) technologies for production of petrol.

Transition of Europe to the highest class of fuel and introduction of new norms according to which the content of aromatic connections in petrol has to be lowered from 42% to 35%, resulted in the increased demand for ecological additives for petrol. Since January 1, 2000 in Europe norms of Euro - 3 took effect, since 2006 - Euro - 4, is applied today Euro standard - 5 and Euro introduction - 6 prepares. Many investments were made in preparation of such technological breakthrough. Just for the last three years of the last century in each of the European oil refineries it was on the average invested 250 million dollars. From this sum of 15% directed on updating of old technologies, 60% - on acquisition of new and 20% - on development and use of oxygen-containing additives. Unfortunately, the Ukrainian oil-processing industry in the development far lagged behind the European producers of petrol and isn't able to provide production of the gasoline meeting the modern requirements of automotive industry. In this connection there was a need of development of such technology which at the minimum expenses would provide high-octane level petrol conforming to modern European requirements, without application of correcting additives.

The way of increase of octane level of straight-run petrol is the basis for the developed technology due to education in them as a result of photochemical oxidation and a complex of electrophysical impacts of oxygen-containing components. Formed as a result of proceeding the physicist – chemical reactions free radicals react with the alkanes which were in petrol and provide chain reaction of oxidation of hydrocarbons. Oxygencontaining connections synthesized as a result of proceeding reactions (10 – 10,5%) provide increase in octane level of petrol at 10 – 17 units. Results of electrophysical processing of straight-run petrol are presented in table 1.

Table 6.1. Comparative indicators of straight-run petrol before processing.

No	index	Initial straight-run petrol	Petrol after his physicist – chemical processing
1	Density at 20 ° C, kg/m ³	707,9	743,0
2	Detonation firmness: the octane level determined by a motor method	64,3	81,2
3	Temperature began distillations, ° C	35	44
4	Group type:		
	- light C1 paraffin – C4	3	0,5
	- normal C5 paraffin – C11	55,6	25,3
	- isoparaffin	12,4	39,5
	- cyclic hydrocarbons, from them:		
	(benzene)	10,2	15,5
		(3,7)	(0,8)
	- naphthenic hydrocarbons	18,8	8,7
	- oxygencontaining hydrocarbons	0,0	10,5
	In total	100	100

Apparently from the results given in the table, the increase in octane level of straight-run petrol occurred on 16,9 units (on a motor method), and made 78 - 81,2 units that corresponds to brand A petrol – 80 (AI – 91, AI – 92), gassing of petrol decreased to 0,5%.

The received gasoline differs high stability

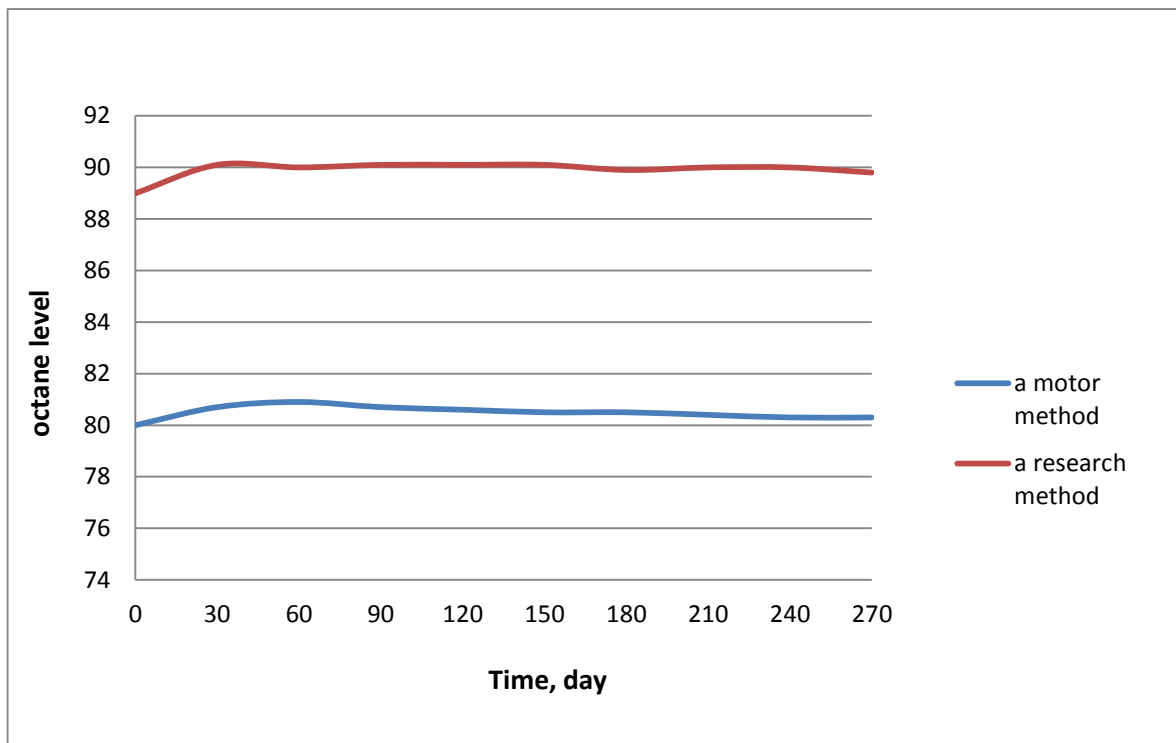


Fig. 6.1. Change of octane level of the modified petrol received from straight-run petrol with octane level 64,3.



Economic feasibility of offered technology of modification of straight-run petrol is defined by cost of receiving high-octane petrol which is defined by the size of the expenses connected with operation of technological installation. Operational costs consist of the cost of the consumed electric power, cost of replaceable accessories of elements and a service personnel salary.

Considering that this installation was developed for needs of the industrial and agricultural enterprises needing rather small amounts of high-octane petrol of brand A – 80, AI - 91 and AI – 92, we will consider cost of operation of installation with a productivity of 500 liters in hour. So, power consumption of installation with a productivity of 500 l/h makes 25 kW that at the round-the-day operating mode and cost of the electric power of equal 1,25 UAH/kW • will make 25 h • 365 days • 24 hours • 1,25 UAH/kW • h • 0,95 = 274 thousand hryvnias (the coefficient 0,95 considers costs of time of preventive maintenance of the equipment). The cost of account accessories of elements approximately makes 50,0 thousand UAH/year. 1 operator can serve installation. Installation service at a triple-shift operating mode requires 4 persons with the general fund a salary of 250,0 thousand UAH/year. Simple calculation shows that operational expenses on service of installation will make 574 thousand UAH/year. Productivity of installation makes 500 liters of petrol at a hour, or 4 161 000 liters a year. Thus, cost of modification of petrol will make 0,138 hryvnias. The difference in the wholesale cost of straight-run petrol and brand A petrol – 92 makes about 2,45 UAH/l. Respectively, the size of a surplus value (annual economic effect) will make 4 161 000 liters • (2,45 – 0,138) UAH = 9 620 232 hryvnias. Considering that capital expenditure for production, installation and start in operation of installation with a productivity of 500 l/h (11 000 l/days) makes 1 500 000 hryvnias, the payback period of capital expenditure will make 2 – 2,5 months. During the installation work within 8 hours per day, the payback period of capital expenditure will make 8 – 9 months.

6.1. Installation for receiving high-octane petrol OCTANE 92

Appointment. Receiving high-octane petrol of brand A – 80 (AI – 91, AI - 92) from straight-run oil gasoline.

Scope. The developed installations can be used as in an autonomous mode, for example for processing of straight-run petrol on oil depots and automobile gas stations, and as a part of the technological scheme of oil refineries on production of straight-run petrol. The second direction is preferable in that case when easy grades of oil are exposed to processing, and received straight-run petrol contain a significant amount of easily flying hydrocarbons.

Principle of action. The way of increase of octane number of straight-run petrol is the basis for the developed technology by photochemical oxidation and electrophysical impacts and education in them oxygen-containing connections. The peroxide radicals which were formed thus that initiate chain reaction of oxidation of hydrocarbons being in petrol. Oxygencontaining connections synthesized as a result of proceeding reactions (до10%) provide increase in octane level of petrol at 10 – 17 units. Results of electrophysical processing of straight-run petrol are presented in table 1.

The technological scheme of transformation of oil straight-run petrol is shown in fig. 2.

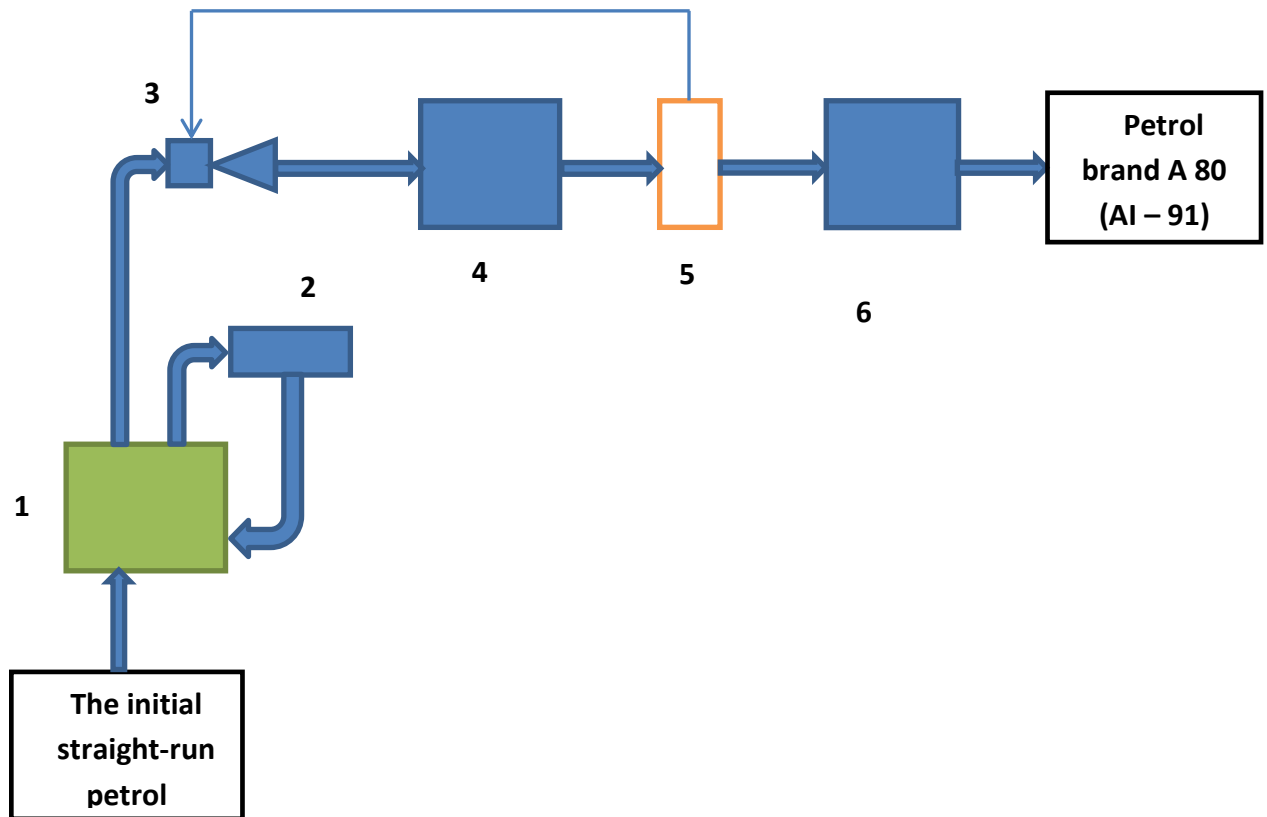


Fig. 6.2. Technological scheme of transformation of oil straight-run petrol: 1 – accumulative capacity of the activator; 2 – dynamic activator; 3 – ejector; 4 – photochemical FH1 reactor; 5 – separator – a gas separator; 6 – photochemical FH2 reactor.

Initial oil straight-run petrol with low octane level moves in the activator (1) where occurs his physicist - mechanical activation. Further the activated straight-run petrol arrives in the photochemical reactor FH1 (4) where as a result of photochemical reactions formation of peroxides, their disintegration on radicals and course of chain reaction of transformation of petrol is carried out. For an intensification of photochemical processes on an entrance of the photochemical reactor FH1 mix of the gaseous products allocated by means of a separator (5) moves. Further petrol arrives in the second photochemical reactor FH2 (6) where process of its isomerization is carried out. The petrol received as a result of such processing completely corresponds to high-octane unleaded petrol with the improved ecological properties of EVRO-3,4 in accordance with GOST P 5186-2002 (EN-228) of brand A - 80 (AI – 91) to GOST 2084-77 and GOST P 51105-97, and can be used or for filling of cars, or as initial raw materials for receiving the mixed of petrol with higher octane level, for example the AI brands – 95 or AI – 98.



Table 6.2. The key technical parameters of the OCTANE installations – 92

<i>Parameters</i>	Units of measure	<i>OCTANE–92/500</i>	<i>OCTANE–92/1000</i>	<i>OCTANE–92/1500</i>
Productivity on a finished product	l/h	500	1000	1500
Power consumption	kW	15	30	45
Voltage (3 f., 50/60 Hz)	V	~380	~380	~380
Dimensions:				
- length	mm	2500	3500	4000
- width	mm	2100	2100	2100
- height	mm	2450	2450	2450

Prime cost of the received finished product makes 0,0125 EURO. The payback period of capital expenditure during the triple-shift work makes 2,5 – 3 months.

The main advantages of the OCTANE installation – 92.

1. Low capital expenditure.
2. Possibility of placement of installation in the automobile container.
3. Simplicity of operation.
4. Low operational costs.
5. Lack of heating elements.
6. High safety of operation.
7. Ecological safety.
8. Low prime cost of the received finished product (A80 petrol).
9. Small payback period.